FIJI

MINISTRY OF FISHERIES AND FORESTS
and
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

A REVIEW OF THE FOREST REVENUE SYSTEM AND TAXATION OF THE FORESTRY SECTOR IN FIJI

by

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Final version: October 2005

This report is the output of a two-week assignment (during October 2003) on loan to the Government of Fiji, funded out of the FAO Regular Programme Budget. The author wishes to acknowledge the help and co-operation given by staff of the Forestry Department, the Ministry of Fisheries and Forests and others in the forestry sector in Fiji with the completion of this work. In particular, Mr Osea Tuinivanua and Mr Manoj Charan have provided very valuable support to this work. The conclusions and recommendations presented here are those of the author and do not represent the official policy of the Food and Agriculture Organization of the United Nations or the Government of Fiji.

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A REVIEW OF THE FOREST REVENUE SYSTEM AND TAXATION OF THE FORESTRY SECTOR IN FIJI

EXECUTIVE SUMMARY

Introduction

This report presents an analysis of the economics of forest harvesting and processing in Fiji. The analysis has been used to examine the level of economic rent from roundwood production and to comment on the forest revenue system in the country. The results and analysis presented here are based on information collected during a two-week mission to Fiji (from 14-24 October 2003), along with additional information collected from FAO databases and other international sources.

The paper was prepared in response to a request from the Government of Fiji to FAO, for assistance with reviewing the forest revenue system in the country. The requirement for this work arose out of the recommendations of a 1989 study of the forestry sector in Fiji. The analysis here addresses three issues raised in that study, namely: the forest revenue system in Fiji; taxation of the forest industry; and the costs and benefits of the forest industry to the national economy.

Analytical framework

The analysis of the forest revenue system has been based on the theory of *"economic rent"*. In the forestry context, economic rent is the value of forest productivity, which can be determined by subtracting all of the costs of production and processing from the final value of outputs sold in the market place. This is often referred to as the *"residual stumpage value"* methodology and is a standard methodology used in many countries around the World to estimate the value of standing trees.

Production and processing costs have been calculated from the costs of labour, raw materials and capital used in forest industry operations, using standard economic and accounting methodologies. In addition, economic rent calculations recognise the necessity for forest operators to earn a reasonable rate of return on the capital employed in their operations (i.e. a return on capital or ROC). This rate of return, sometimes referred to as *"normal profit"*, has been set at a level of 20 percent, which seems reasonable in view of the other investment opportunities available in Fiji, the risk associated with forest operations and the expectations of those involved in the industry.[1]

In theory, the economic rent from forest operations should accrue to the owners of the forest resource. Therefore, in the case of Fiji, the majority of this should accrue to landowners. However, as the Government is responsible for revenue collection and disbursement, a small share should also accrue to the Government to cover their administration costs.

If the sum of all forest charges is less than the economic rent, then the remaining amount accrues to forest operators and is usually referred to as *"excess profit"* or *"windfall profit"* (i.e. an amount over and above the *"normal profit"* required to remain in business). The aim of the forest revenue system should be to ensure that landowners receive the maximum benefit possible from the use of their resource and to minimise any *"excess profit"* earned by the industry.

[1] Note: a 20 percent ROC s not the same as a 20 percent profit margin (see Section 5.2 on page 42 for further explanation of the calculation methodology employed here).

Data collection and analysis

The economics of forest harvesting and processing was analysed using two models:

- **The forest harvesting cost model** calculates the cost of forest harvesting, extraction and delivery to the mill, from the costs of labour, consumables and capital (including ROC) employed in forest operations. The model is based on standard cost accounting methodologies as described in FAO (1977). The model was originally constructed to analyse the costs of forest operations in Suriname, but it has been modified to reflect harvesting costs, productivity and site conditions prevalent in Fiji.
- **The forest industry model** calculates the profitability of forest processing operations in a similar way to above, with the exception that it uses projected cash-flows from the operation to calculate profitability (i.e. net present value or NPV). This model was originally constructed to analyse the profitability of forest processing operations in Indonesia, but it has also been adjusted to reflect the scale of operations, productivity levels and costs in the industry in Fiji. For the purposes of this analysis, the model examines the situation of a medium-sized sawmill in the country.

The cost information produced from the forest harvesting cost model is used as an input to the forest industry model. These costs, plus other operational costs (including forest charges), are then used in the forest industry model to estimate net income, by subtracting the total of these costs from the value of output (i.e. forest product prices multiplied by production volumes). Annual net income from processing operations is included in the projected cash-flow, along with the cost of capital investments (i.e. plant and machinery).

The cash-flow from operations is discounted (at the required ROC) to produce the NPV of the sawmill investment, which is equal to the *"excess profit"* from operations. The forest industry model estimates the share of the economic rent that is currently captured by the Government and landowners in the form of forest charges. It also estimates the amounts that should be paid as corporate taxes by forest operators.

Data for all of these models has been collected from three main sources:

- Baseline estimates of unit costs, prices, consumption of materials and productivity rates has been taken from information published by the Forestry Department and other international data sources.
- Where necessary, these costs have then been adjusted to reflect local conditions, based on discussions with representatives of the industry and government in Fiji.
- Further adjustments were also made as a result of site visits to and discussions with a number of forest operators on Viti Levu and Vanua Levu.

It should be noted that there will always be some uncertainty with the results of any economic rent analysis. Firstly, it is often difficult to obtain reliable and accurate cost and price information. Forest operators have an incentive to exaggerate costs and understate the value of production. Secondly, in some cases, forest operators may not themselves have a reliable view of their costs. Thirdly, there are often problems regarding the level of efficiency in the industry. It is quite common for economic rent to be dissipated through inefficient operations, so it is not always the case that surplus economic rent (i.e. the share of economic rent that is not captured by government and landowners) accrues to the forest operator as excess profit. Finally, it should be noted that economic rent calculations are often based on industry averages. Some operators will be more or less efficient than others, some will be better or worse at marketing their product and some will benefit (or suffer from higher production costs) due to factors such as the scale of operations, site conditions and location. Thus, the results of this analysis should only be used as a general guide to the level of charges that might be collected.

Trends and current status of forest charges in Fiji[2]

In most tropical countries, the charges for harvesting roundwood are determined in one of two ways:

- In some counties, tropical forest resources are owned by the state and the state sets royalty rates and collects charges, which then become part of the government's revenue collection.
- In other countries, landowners own forest resources and are free to set their own charges in negotiation with forest operators, which they then keep themselves.

In both of the above situations, the two main issues of concern in any analysis of forest charges are the levels of charges that are set (i.e. how much of the economic rent is captured by the resource owners' forest charges) and the distribution of charges (i.e. how much of the charges collected should go to the Government and how much should be retained by people living in and around forest areas)

The system of forest charges that has developed in Fiji is somewhat unusual in that the government sets and collects royalties (that are then distributed to landowners) but, on top of this, landowners have also started to collect their own additional charges (*"commissions"* and payments for *"goodwill"*). In other words, the total level of charges that is eventually set is determined largely by negotiation between landowners and forest operators (i.e. they negotiate the surplus in addition to the royalty payments). A summary of all of the forest charges currently collected in Fiji is given in Table 1.

Table 1 Summary of forest charges in Fiji in 2003

Type of charge	Amount by species class (in FJD per m^3)			
	Class 1	**Class 2**	**Class 3**	**Class 4**
Royalty				
Zone 1 (Viti Levu)	40.00	30.00	10.00	6.50
Zone 2 (Vanua Levu)	40.00	30.00	9.30	6.00
Zone 3 (elsewhere)	32.00	32.00	8.00	6.00
Premium				
Zone 1 (Viti Levu)	4.00 - 6.00			
Zone 2 (Vanua Levu)	nil			
Zone 3 (elsewhere)	nil			
Commission				
Zone 1 (Viti Levu)	20.00 - 45.00	10.00 - 20.00	10.00 - 15.00	10.00 - 12.00
Zone 2 (Vanua Levu)	15.00 - 25.00	10.00 - 15.00	10.00 - 15.00	10.00 - 12.00
Zone 3 (elsewhere)	data not available			
Goodwill	0.50-12.00			
Land Rent	varies			
Scaling Fee	3.50			
Map Fee	varies (charged on the basis of cost recovery)			
Application Fee	varies (charged on the basis of cost recovery)			
Renewal Fee	varies (charged on the basis of cost recovery)			
Processing Fee	varies (charged on the basis of cost recovery)			

Source: various documents, interviews and field visits.

Although nearly all of the charges collected are distributed to the landowners, the government retains a small proportion of the total charges collected, to cover their administrative costs (i.e. the *"fees"* at the bottom of the table). It should also be noted that the distribution (amongst landowners) of the charges collected may differ between the official charges collected as royalties and the additional charges collected directly by landowners.

Comparing the historical trends in forest charges (over the last two decades) with inflation and changes in sawnwood prices, Royalties have increased broadly in line with inflation in the three lowest species classes.

[2] The term *"forest charges"* is used here to cover all payments made to government and landowners by forest operators, including royalties, fees and other payments made to landowners.

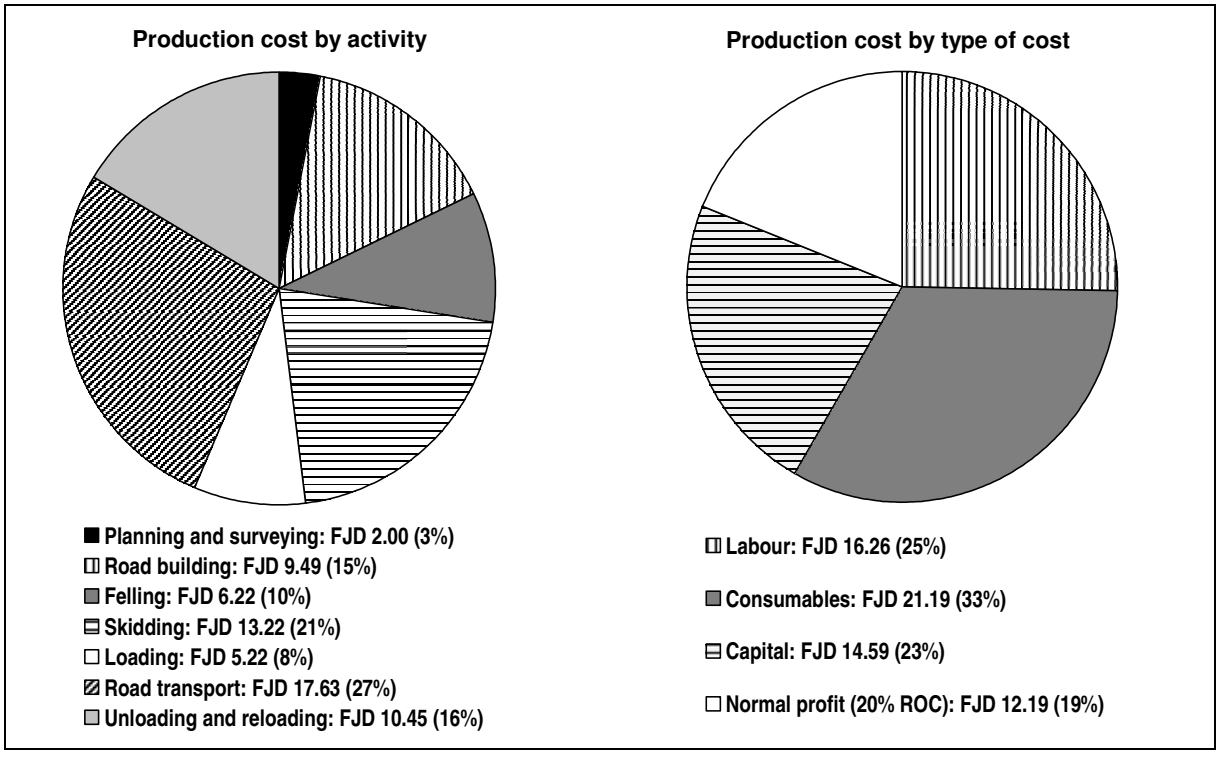
Royalties for Class 1 species have increased by 25 percent in real terms, which roughly matches the increase in average sawnwood export prices. It should also be noted that payment of the informal charges directly to landowners is a fairly recent innovation, which was started by forest processors. These developments suggest that there is a lot of competition for access to the resource and that forest charges have responded to changes in product prices and resource availability.

Results of the economic rent analysis

Economic rent has been calculated for a *"typical"* forest operation in Fiji. In the forest harvesting operation, it has been assumed that the operator is harvesting 200 ha per year, at an average harvesting intensity of 30 m^3/ha, to give an average level of production of 3,000 m^3/year. It has been assumed that the forest operator has to construct 20 metres of road per ha (including an access road) and has a haulage distance of 50 km (each way). At this level of production and working for 8 months per year (with an 8-hour day), the operator could harvest, extract, load and unload and transport the total volume of roundwood production with one chainsaw crew, one D6 bulldozer (for road building and skidding), one loader and one truck (with a 25 m^3 capacity). It has also been assumed that the average age of the truck is 7 years old, while the average age of the other equipment is 18 years old. The depreciated value of these items has been calculated and used in the economic rent calculations.

Under the above assumptions, the total delivered cost of roundwood production would be around FJD 64/m^3. This is quite reasonable in comparison with production costs in other tropical countries. Figure 22 shows the composition of this cost by production activity and type of cost. Changes in transport distance would change production costs slightly, at a rate of roughly FJD 0.17/m^3 per kilometre. Lower harvesting intensities could increase production costs significantly, but this would depend upon how much road building would be required in forests with lower stocking.

Figure 1 Total delivered roundwood production cost in Fiji (by activity and type of cost)



For the analysis of forest processing costs, the following assumptions have been made about the status and condition of an *"average"* sawmill in Fiji:

- output capacity of 5,000 m^3/year, with a current level of capacity utilisation of 60 percent, giving a current output level of about 3,000 m^3/year;
- average product recovery rate of 50 percent across all product types, giving a required log input of 6,000 m^3/year;
- sawnwood production of a range of grades, with 50 percent for export and 50 percent for the domestic market, with most of the Class 1 and 2 species going into the export market; and
- a debt-equity ratio of 20:80, with debt financed at a real interest rate of 12 percent.

Total fixed and variable operating costs used in the model are presented in Table 2 below. The log cost in this table includes the delivered roundwood production cost and the payment of all forest charges (as shown in Table 1 above) across the range of species used in the sawmill (see Table 3 for details of the assumed species composition of production).

Table 2 Fixed and variable operating costs for an "average" sawmill in Fiji

Variable costs (FJD per m^3 of production)	**Sawnwood for export market**	**Sawnwood for domestic market**
Log cost	275.94	225.54
Labour	78.96	78.96
Resins/chemicals/treatment	15.00	15.00
Fuel, energy and consumables	60.00	45.00
Packaging	32.00	6.00
Delivery	15.00	15.00
Total	**476.90**	**385.50**
Fixed costs (FJD per m^3 of capacity)		
Personnel: administration	12.00	12.00
Personnel: support staff	7.00	7.00
Personnel: maintenance staff	9.73	9.73
Sales cost	15.00	15.00
General overhead	30.00	30.00
Total	**73.73**	**73.73**
Total cost (FJD per m^3 of production)		
Total calculated at final level of utilisation	**599.79**	**508.39**

For the capital cost of the sawmill, it has been assumed that the depreciated value of all plant and machinery is about FJD 1.4 million, with a further FJD 573,000 invested in working capital, giving a total investment of around FJD 2.0 million. The depreciation period used is five years and various assumptions were also made about the replacement or overhauling of some capital items after three to five years.

The composition of sawnwood production (by species class and grade) assumed in the model and the selling prices of each of the different products are shown in Table 3. The average selling price is FJD 763/m^3, which is in the region of the average product prices revealed in discussions with sawmillers.

Table 3 Product sales by market and grade of production for an "average" sawmill in Fiji

Product	Grade	Export tax (percent)	Output (percent)	Mill net price (FJD per m^3)	Real price change (percent/year)
Sawnwood for export market					
Class 1	FF Select	0	50.0	1,200	0.0
Class 1	FF Standard	0	7.5	900	0.0
Class 1	Ungraded	0	2.5	900	0.0
Class 2	FF Select	0	30.0	800	0.0
Class 2	FF Standard	0	7.5	800	0.0
Class 2	Ungraded	0	2.5	750	0.0
Total/average			**100**	**1,009**	**0.0**
Sawnwood for domestic market					
Class 1	FF Select	0	15.0	750	0.0
Class 1	FF Standard	0	5.0	550	0.0
Class 2	FF Select	0	5.0	580	0.0
Class 2	FF Standard	0	5.0	480	0.0
Class 3	FF Select	0	35.0	480	0.0
Class 3	FF Standard	0	12.0	480	0.0
Class 4	FF Select	0	15.0	480	0.0
Class 4	FF Standard	0	3.0	480	0.0
Class 3 and 4	Ungraded	0	5.0	250	0.0
Total/average			**100**	**518**	**0.0**

Given the above costs and prices, the composition of sawnwood production costs for the *"average"* sawmill in Fiji was calculated and is shown in Box 1 below. The delivered roundwood cost includes an allowance for *"normal profit"* in the harvesting operation, but excludes the payment of forest charges. Forest charges include the payment of all official and unofficial charges (i.e. *"goodwill"* and *"commissions"*). Capital costs represents the consumption of existing and replacement capital throughout the life of the sawmill investment (assuming zero residual value), while *"normal profit"* represents the amount required for the sawmill operator to earn a 20 percent ROC (after tax) on their equity investment in the sawmill. Corporation tax is the estimated average annual tax liability divided by annual sawnwood production.

Box 1 Composition of sawnwood production costs for an "average" sawmill in Fiji

Delivered roundwood cost (excl. charges, incl. ROC of 20% on harvesting operation)	128.47	17%
Forest charges	122.27	16%
Other fixed and variable operating costs	303.35	40%
Total: operational costs	**554.09**	**73%**
Capital costs	85.17	11%
"Normal profit" (i.e. ROC of 20% on sawmill investment)	82.35	11%
Corporation tax	35.25	5%
"Excess profit"	6.27	1%
Total: capital costs, taxes and profit	**209.04**	**27%**
Average product value (FJD per cubic metre of sawnwood produced)	**763.13**	**100%**

The economic rent from production is equal to forest charges plus *"excess profit"* and amounts to FJD 128.54 per cubic metre of sawnwood produced, or about 17 percent of the average product value. With

the assumed product recovery rate of 50 percent, this implies that the economic rent is equal to FJD 64.27 per cubic metre of roundwood consumed by the sawmill. As these figures show, under the above assumptions, the majority of the economic rent from production is captured by the existing forest charges. Given the variability in costs and prices that probably exists across the sector and the fact that these are calculations based on averages, these figures suggest that there is little room to increase forest charges.

Figure 2 Distribution of the economic rent from production in Fiji between landowners, government and industry per cubic metre of roundwood (CUM)

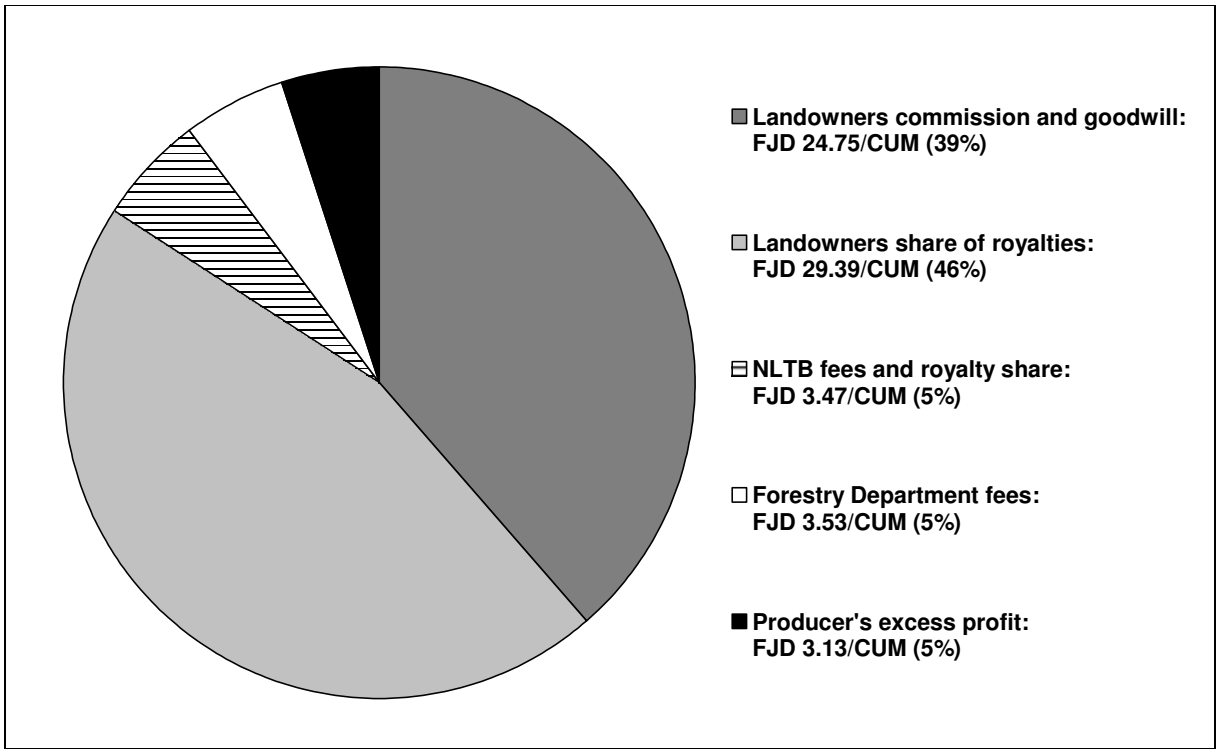


Figure 2 shows the distribution of economic rent from production (per cubic metre of roundwood) between landowners, the Government and industry. The figure shows that total forest charges currently capture 95 percent or almost all of the economic rent from production. Fees paid to the Forestry Department and NLTB each account for a further 5 percent of the economic rent. Landowners receive the remaining 85 percent of the economic rent. Of this, slightly more than half of this comes through the official system of royalty payments as opposed to the unofficial system of *"commissions"* and payments for *"goodwill"*.

It should also be noted that, in addition to the payments of charges to the Government, the *"average"* sawmill should be paying corporation taxes to the Government of around FJD 35.25 per cubic metre of sawnwood produced (equal to about FJD 17.63 per cubic metre of roundwood).

The results above have been compared with the figures quoted in the submission on forest charges from the Fiji Sawmillers Association (FSA, 2003). Although there are some differences between these results and the figures from the FSA, the overall results are broadly comparable. For example, they quote figures for total sawnwood production costs (excluding a profit margin) in the range of FJD 570/m^3 to FJD 720/m^3. The figure calculated here for total operational costs plus capital costs amounts to FJD 640/m^3 (see Box 1), which is roughly in the middle of this range.

It should be noted that the above results are not simply a reiteration of the FSA figures, having been based on data collected from a number of sources in Fiji and elsewhere and having been calculated in an entirely different way. Indeed, the purpose of this analysis was to bring some international experience and a rigorous

analytical approach to the forest charging issue, in order to provide the Forestry Department with an independent estimate of the economic rent from production. As the figures calculated here are not markedly different from those provided by the FSA, it is suggested that this might be taken as an indicator of their reliability.

Further analysis has examined the variation in economic rent between the different species classes. Based on the price data shown in Table 3, this has shown that there could be much wider variation in the economic rent from different species than is currently reflected in the forest charges. However, it is felt that the reliability of the price data is currently insufficient to support a radical revision to the relative levels of the forest charges for different species classes. A relatively simple methodology has been presented to allow this to be explored further.

Conclusions and recommendations

On the whole, the procedures currently in place for monitoring production and collecting forest charges are excellent. However, it is debatable whether the Government recovers all of their administrative costs of implementing the system. There is also some uncertainty about whether the current licensing arrangements provide landowners and producers with a secure and binding agreement to supply roundwood and pay all unofficial charges.

- **Recommendation 1: Administrative costs.** The Forestry Department should review their expenditure on forest monitoring, control and charge collection to assess whether their fees cover their costs. If not, they should consider increasing their fees. There is very little room for an increase in charges, but a modest increase in the Scaling Fee would probably do no harm. NLTB may wish to consider this issue as well.
- **Recommendation 2: Licences and security of wood supply.** In consultation with interested stakeholders, the Forestry Department and NLTB should examine whether the problem of landowners and/or producers reneging on production agreements is a major problem and what, if anything, they should do about it. The aim should be to use licences to reinforce the agreement to supply roundwood in a harvesting area, to minimise the likelihood of broken contracts and the consequential costs to both landowners and producers.

Currently, the sum of official and unofficial forest charges appears to account for the majority of the economic rent from production, suggesting that there is little scope to increase charges overall. However, the amounts collected in the form of unofficial charges are not recorded anywhere and can not be accurately judged. It would be in everyone's interest if this information was recorded properly and published.

- **Recommendation 3: Total charge collection.** The Forestry Department should record the total amount of revenue collected from unofficial charges and publish this information along with the statistics on official revenue collection. The level of unofficial payments (lump-sums and per cubic metre) should be recorded in licence agreements.

The current system whereby forest charges are set by a mixture of administrative decree (official charges) and negotiation (unofficial charges) has distinct advantages in terms of promoting economic efficiency. This is because there appears to be a high level of competition for the resource. Therefore, there is little economic justification to increase the overall level of forest Royalties. However, the relative levels of the Royalties for different species classes is worthy of further examination, as well as the composition of the species classes. A modest increase in the level of Royalties for the higher valued species could be partly offset by reductions in Royalties for the lower valued species classes. Improvements in the availability of information about the levels of (unofficial and official) charges currently being paid would also assist landowners and producers in their negotiations.

- **Recommendation 4: Analyse the relative values of different species.** The Forestry Department should collect some better information about product prices (in domestic and export markets) and the mixture of products typically produced from each species (by grade and market destination). This should be analysed to identify the relative levels of economic rent from different species and revise the composition of the species classes.
- **Recommendation 5: Revision of the Royalties.** Royalties should not be increased by very much (if at all). For example, Royalties in the top two species classes could be increased in line with inflation and Royalties in the lower two species classes could be kept the same or even reduced. The relative levels of the different species classes (and movement of individual species between the classes) should be determined from the outcome of Recommendation 3,
- **Recommendation 6: Average levels of unofficial charges.** The Forestry Department should publish annually the average level of unofficial charges paid by producers (per cubic metre) by species class and zone.

Competition requires a *"level playing field"* and the Forestry Department should not restrict the awarding of licences to specific groups or individuals. However, they should also ensure that all operators are competent and able to follow the same requirements for good harvesting practice. The frequent use of short-term Annual Licences and the fragmented nature of forest ownership are a barrier to the long-term development of the sector, which will require security of supplies and economies of scale. The Forestry Department might examine how they can encourage improved performance in the processing sector through the types of licences available to producers and by increasing the scale and security of wood supply.

- **Recommendation 7: Awarding licenses.** Licences should continue to be awarded in an open and transparent manner without fear or favour, subject to the condition that all producers have to meet the same minimum standards of competence and comply with all forest regulations.
- **Recommendation 8: Long-term strategy.** The Forestry Department should consult with all interested stakeholders about the feasibility of developing a long-term strategy for the sector. In particular, this should focus on improving the security of wood supply from the highly fragmented forest ownership, while maintaining the overall objective that landowners should continue to receive the maximum possible benefit from the use of their forest resources.

The question of how much of the forest charges should go through official channels and how much should go through unofficial channels is a sensitive issue. Ultimately, the decision about this should be a political decision, which is beyond the scope of this report. An impartial economic appraisal of the situation could conclude that, if landowners are capable of looking after their own interests, then there is no need for the NLTB to collect forest charges at all. However, the current system whereby NLTB are involved has two advantages:

- it provides a more formal and accountable system to ensure that everyone that is entitled to a share of the benefits from production is given a share; and
- it provides a safety-net to ensure that landowners receive the maximum possible amount of benefits from the utilisation of their resource.

Evidence from other countries that have given landowners more control over forest charges has shown that that they sometimes lose out in the long run. Therefore, this would support the argument that NLTB should continue to be involved in the administration of the forest revenue system.

- **Recommendation 9: Revenue collection and disbursement.** NLTB should continue to play a role in revenue collection and disbursement in order to provide a safety-net for landowners.

1 INTRODUCTION

In many countries, forest resources represent a significant natural asset that can be used to produce a wide range of economic, environmental and social goods and services. Revenues from harvesting forest resources generate income for resource owners and encourage the conservation and sustainable management of those resources. Taxes paid by the forest industry also generate revenues that the government can use to support economic development and other government policies and programmes.

In 1988, a report by the Food and Agriculture Organization of the United Nations (FAO) identified a number of economic issues in the forestry sector in Fiji that should be considered further (Rizer, 1988). These included the following:

- **Royalty rates:** a study should examine the royalty payments made to landowners to examine the appropriate level of payments and determine a workable royalty system for Fiji;
- **Taxation of the industry:** a study should examine the taxes paid and subsidies received by the industry to determine whether these are in the long-term interests of the Fijian economy;
- **Cost-benefit analysis of the industry:** a study should examine the full social, economic and environmental costs of the forestry sector in Fiji to guide future forestry policymaking;
- **Input-output study:** an input-output model should be constructed to examine the linkages between the forestry sector and other parts of the Fijian economy to guide future forestry policymaking;
- **Stabilisation study:** a study should examine the need for a revenue stabilisation fund to ensure a stable flow of income in the industry and tax receipts from the industry to government; and
- **Industry restructuring:** a study should examine the economic and financial implications of different administrative and institutional arrangements for government involvement in forest management and processing.

A further request for FAO assistance in the above areas was made by the Permanent Secretary of the Ministry of Fisheries and Forests (MoFF) in 2003 (Mathias, 2003). This report addresses the first two of the above issues and will also comment on the remaining issues, in particular the cost-benefit analysis of the sector.

The remainder of this report is in seven main sections. Section two briefly describes the concept of economic rent: what it means; how it is calculated; and why it is so important. The third and fourth sections of the report describe the trends and current status of the forestry sector and the forest revenue system in Fiji. Section five describes the data and calculations used in the analysis of economic rent in the sector and presents the results of this analysis. Section six discusses the taxation of the industry and section seven presents some information about the costs and benefits of the forestry sector to Fiji. Conclusions and recommendations are presented in the final section of the report.

2 ECONOMIC RENT AND FOREST CHARGES

Economic efficiency is an underlying objective of government policy in most countries and should be reflected in forestry policies. Economic theory shows that economies tend to function most efficiently when the levels of output and prices of goods and services are established through competitive markets. Therefore, in situations where the government influences the production of a good or service, such as in the case of forest charges,[3] it is important to ensure that these policies do not introduce unnecessary distortions into the economy.[4]

Forest charges can be structured in a variety of ways, such as: flat-rate charges per cubic metre of roundwood cut or taken from the forest; annual charges on the area of forest in a concession; percentage tariffs on the value of forest products produced or exported; or as a combination of such charges (see: Gray (1983), for a comprehensive discussion of the different types of forest charges commonly in use around the World). Such charges are often set with reference to the economic rent from roundwood production. However, there has been a long-running debate about whether forest charges in many countries have been set at sufficiently high levels to capture a significant share of the economic rent from roundwood production (see, for example: Repetto and Gillis (1988) for an early review of the level of forest charges in place around the world).

This section of the report describes what economic rent is and shows how it can be calculated and used as a guide for setting forest charges. It then describes some of the challenges to calculating economic rent, before finishing by re-emphasising why it is so important to establish the correct level of charges for the use of forest resources.

2.1 What is economic rent?

Economic rent can be defined as the surplus value created during the production of a good or service, due to the ownership of a factor of production that is in fixed or limited supply. In many economic activities, it is not possible to create economic rents. Thus, for example, if a sawmiller could sell sawnwood for far more than the cost of production (and thus, earn an economic rent from that activity), other producers would soon enter the market and drive product prices down, such that the surplus would disappear. However, if that activity was dependant upon a factor of production in fixed supply (e.g. a prime location in a city or an exclusive property right such as a patented production process or copyright on a product design), then other producers could not enter that particular part of the market and drive prices down and the economic rent would persist.

The classic example of an economic rent is a land rent. Land supply is generally fixed and land (usually) costs nothing to produce yet, with the addition of other inputs, land can be made to produce outputs that are higher in value than the total cost of these other inputs. On very productive land or land in favourable locations, the economic rent is high; while in more remote or less productive areas, economic rent is much lower. In a competitive market, potential users of the land would compete to use the land, resulting in a rental payment to the owner(s) of the land that would be equal to the economic rent from the best use of that land.

It should also be noted that other factors of production can earn economic rents if there are artificial barriers or other rigidities that restrict the supply of these factors to the market. An important point for governments to

[3] The term *"forest charges"* is used here as a generic term to include all fees, royalties and other payments made by users of the forest resource. The latter terms all have specific meanings in Fiji, which are described in Section 4 of this report. In many countries, forest charges are set by the government and equate to the standing or *"stumpage"* price of roundwood. However, in the case of Fiji, it should be noted that landowners also set their own charges for the use of the resource.

[4] In some cases, distortions in the economy can be justified on social, environmental or economic grounds. It is beyond the scope of this study to examine if and when such distortions could be justified in Fiji, although Section 7 will offer some preliminary comments on this.

note is that they can have a major impact on the creation of rents in many parts of the economy if the policies they pursue affect the flow of capital or place other constraints on the way that markets function.

2.1.1 Economic rent and charges in the forestry sector

Economic rent in the forestry sector differs between plantation forests and natural forests. In plantation forests, inputs are required to plant and manage the trees, so it is the land that is in fixed supply and the economic rent is basically a land rent. In the case of natural forests, the situation is slightly different because the trees are produced for free (i.e. the resource occurs naturally). In this case, it is the forest that is in fixed supply (i.e. natural forest can not be created, except over a very long time-period) so the economic rent is the standing (or *"stumpage"*) value of the roundwood that can be produced from these free trees.

As already noted, in competitive markets, buyers and sellers would compete to establish land rents and prices for roundwood from the natural forest, such that all of the economic rent would accrue to the owners of the resource. Thus, for example, in the case of forest plantations, forest managers would compete for land with other potential land users, resulting in market-based rental payments for the land. Similarly, in the case of natural forests, purchasers of roundwood would compete with each other to determine market-based stumpage prices, such that forest owners would receive the full value of the economic rent from the trees that are produced by nature. In some countries, roundwood is sold standing by competitive means such as auctions or tenders but, for a number of reasons, this is not common in tropical forests managed under selective cutting systems.

In cases where competition is imperfect, it is possible for the forest industry to capture some of the economic rent from forest production, resulting in lower payments to the owners of the resource and a distortion of the benefits from forest production away from the owners of the resource and towards the industry. Such imperfect competition in the market for harvesting rights is quite common for a number of reasons. Firstly, there is often an information failure. The forest industry operates in competitive local and international markets and usually has a good understanding of the costs and value of production while resource owners often have much less information about what their resource might be worth. Secondly, the structure of the market may also limit competition. Small numbers of producers in the forest processing sector may reduce competition for the resource, particularly when the effect of location is taken into account. For example, because of the relatively high costs of transporting roundwood, competition to harvest roundwood from a forest at any particular location is often limited to only a handful of local companies. This is certainly the case in Fiji, where the number of forest processing companies is quite small. Thus, in the absence of perfect competition, the rationale for using economic rent analysis is that it provides a methodology for estimating what stumpage prices would be under more competitive conditions and it can be used to as a guide to setting forest charges that result in the full recovery of economic rent for the resource owners.

The rationale behind government involvement in the setting of forest charges depends on the type of forest ownership. In many countries, natural forests are owned by the state, so the forest charges set by the government are equivalent to the stumpage price of roundwood. In such cases, it is important for the government to set the correct level of charges so that government revenues from forest harvesting are optimised and so that the resource is priced correctly.

In the case of Fiji, the majority of the natural forest is owned by traditional landowners and the royalties collected by government are distributed amongst them. In addition, landowners also set their own charges for harvesting rights on top of the government royalties (*"commissions"* and payments for *"goodwill"*). Therefore, the role of government in setting forest charges is somewhat less important than in many other countries. However, at the national level, it is still in the interest of economic efficiency to ensure that the resource is priced correctly. Furthermore, it could be argued that the government should influence stumpage prices or forest charges to protect resource owners and ensure that they gain the maximum benefit from the use of their resource.

An additional point that should be considered is that there are also a few relatively small forest charges that are collected and retained by the Government (i.e. the Forestry Department) and other statutory bodies such as the Native Land Trust Board (NLTB). In such cases, these charges should be included in the economic rent analysis and the level of these charges should be set at a rate that allows these institutions to recover all reasonable costs incurred for the services rendered.

2.2 How is economic rent estimated?

It can usually be assumed that the markets for most of the factors of production in the forestry sector are competitive markets. Therefore, the economic rent from forest harvesting can be simply estimated by subtracting the costs of production from the value of production, where the value of production is measured at a point where the product is sold in a competitive market. This *"residual value"* approach is the methodology used in many countries around the World to estimate economic rent and stumpage prices or forest charges.

However, this calculation is often more complicated than it seems. Firstly, it is usually necessary to build-up the total cost of production from the cost of individual activities (e.g. forest management and planning, felling, extraction and transport to the point of sale). Secondly, the cost of each activity also usually has to be constructed from its individual components (e.g. labour costs; the costs of consumable items used in the activity such as raw materials, fuel and minor tools and spare parts, and the cost of capital such as equipment, machinery and buildings). In addition to these cost components, the calculation of total production cost should also include an allowance for normal profit (see Box 2).

Box 2 Normal profit in the calculation of production costs and economic rent

In any economic activity it is necessary for producers to earn a certain amount of profit to justify their continued investment in that activity. This level of profit is usually referred to as normal profit, which, in the forestry context, can be defined as:

> *"the level of profit that provides a return on the forestry company's investment in capital and infrastructure, which is just sufficient to keep the forestry company operating in the sector."*

The level of normal profit is usually determined with reference to the returns that can be made from investing in other sectors of the economy or in financial instruments (such as stocks, bonds or savings accounts), with an adjustment to take into the account the relative risk associated with investing in the forestry sector compared with the risk from these other types of investments.

Thirdly, the calculation can involve estimating the costs of numerous activities, depending upon the point at which the product is sold in a competitive market. For example, if there are many buyers and sellers of delivered roundwood (e.g. where there are independent loggers) it may be possible to obtain market prices for delivered roundwood and calculate the economic rent by subtracting harvesting, extraction and delivery costs from these prices. If, however, most roundwood is used in integrated forest operations (i.e. harvesting and processing by the same company), then it may be necessary to work back from forest product prices. This will involve taking into account the costs of forest processing (in addition to the costs mentioned above) in the calculation of economic rent. In the case of forest plantations, the economic rent calculation is complicated further by the need to include in the calculation the costs of planting and managing the resource (including an allowance for normal profit on the forest plantation investment).

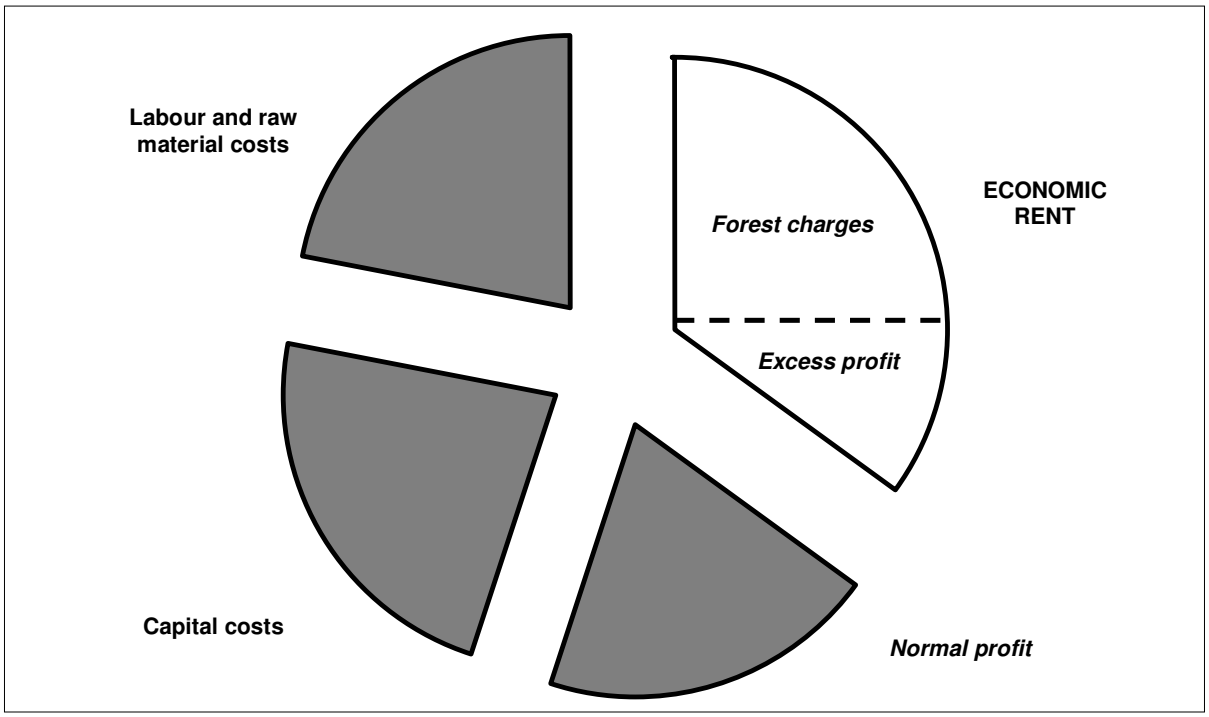
The two cost components that are generally the most difficult to estimate are capital costs and the level of profit that a forest operator should be allowed to retain (i.e. the normal profit). The cost of capital is usually based on the economic depreciation of capital used in the production process (see Whiteman (1999a) for a discussion of depreciation). The level of normal profit is usually expressed as a required rate of return on the total amount of capital invested in the production process.

The pie chart shown in Figure 3 demonstrates how the market price of delivered roundwood might be distributed between labour and raw material costs, capital costs, normal profit and economic rent.[5] The price paid for roundwood is represented by the size of the pie. The various components of the delivered roundwood production cost are represented by the shaded slices of the pie and the unshaded slice represents the economic rent.

It is worthwhile noting that, in most forest operations, a large proportion of the roundwood production cost is usually accounted for by the cost of capital and normal profit. Because this cost is largely fixed (i.e. it doesn't vary with output levels), the efficiency of capital utilisation can have a dramatic impact on the total roundwood production cost and, consequently, the level of economic rent earned from roundwood production.

Where forest charges fail to capture all of the economic rent from production, the remaining surplus accrues to the producer and is referred to as *"windfall profit"* or *"excess profit"*.

Figure 3 The relationship between production costs, profits, economic rent and forest charges



2.3 The main challenges when calculating economic rent

There are three main challenges when attempting to calculate economic rent: the collection of accurate and reliable cost and price information; the variability in economic rent in different locations and types of forest; and the question of what is an appropriate level of normal profit in the sector.

2.3.1 Data quality

There are two main problems with the collection of cost and price data for economic rent analysis. The first is that such information is often not readily available and, even if it is, it may not be very reliable. This is

[5] Note here that the economic rent is shown as the difference between the production cost and the market price of roundwood. In the case of Fiji, very little roundwood is traded on the open market, so the analysis has gone a stage further and calculated the economic rent as the difference between the value of finished products and their production costs. These figures have then been converted to give the economic rent per cubic metre of roundwood production.

particularly the case with some of the components of the production cost (e.g. the cost of repairs and maintenance) where forest operators often do not keep accurate records. This can partly be overcome by referring to machine operator's handbooks and collecting information about the cost of typical repair and maintenance activities in order to calculate an estimate of the cost. Another way in which the situation may be addressed is by asking forest operators about how often they perform various activities such as maintenance in order to get a general idea of the cost of such activities.

The second problem that occurs is that it is often in the interest of the respondents to any enquiry to understate prices and overstate costs in order to give the impression that profitability is low (and, consequently, that forest charges should be low). Some take this a step further and deliberately record low prices in their records in order to alter their tax position (this is particularly a problem in integrated forest operations where this practice, known as artificial transfer pricing, can be used to considerable advantage). This problem can only be overcome by judging how reliable the data collected is, by comparing the responses given by individuals with each other and with any competitive market information that may be available.

2.3.2 Variability

The second challenge is that, like any rent, the level of economic rent from roundwood production can vary greatly due to a number of factors such as the productivity of a site, the volume of commercial species present, transport distances and other site conditions.

Where the total roundwood production cost varies due to factors over which the forest operator has little control, this variability should be taken into account in the design of the forest charging policy. In other words if, for example, the total roundwood production cost from a particular area is high because it is a long way from the market, this should be accommodated in the forest charging system by setting a lower forest charge for outputs produced from this area. Examples of factors that should be accommodated in this way include: the level of stocking of commercial species in the forest; terrain and other working conditions; and the distance from the forest to the market. The most important of these factors is likely to be transport distance and this is the main variable that is examined in this analysis.

There is also a second group of factors that can affect the economic rent from production, over which forest operators do have some control. These mostly concern the efficiency of operations and include variables such as: the length of skid-trails used to extract timber; harvesting machine availability and utilisation rates; and the utilisation of appropriate technology. In these cases, the charging policy and the way in which forest licences are awarded and supervised should aim to encourage greater efficiency and the reduction of the total roundwood production cost, in order that the economic rent from production can be maximised. In other words, inefficiency and low productivity is not a reasonable excuse for setting low forest charges.

2.3.3 Normal profit

The last major challenge in the calculation of economic rent is determining what the normal level of profit should be. As noted above, the forest charging system should aim to set charges at a level that results in resource owners capturing most or all of the economic rent from forest production. However, if forest charges are set at a level that is too high, this will reduce the level of profits in the sector and will reduce investment in the sector. The consequences of this could be just as damaging for the sector as setting a level of forest charges that is too low. Therefore, a careful balance must be achieved between the rights of forest owners to receive the full value of production from their resource and the need of forest operators to earn a normal level of profit.

In discussions with a number of forest operators, it was claimed that they are currently not making any profit and that they are just recovering their operating costs (i.e. they were implying that they were not making enough income to cover capital costs, let alone an allowance for normal profit or a return on capital).

However, some visits to sawmills and discussions with the Forestry Department showed that they are making new capital investments, so it seems unlikely that they are not making any profit.

In view of the fact that the charging policy should, in the long-run, allow forest operators to make new investments, normal profit has been included in the calculation of economic rent as an amount that allows the forest operator to earn a rate of return of 20 percent on their capital investment. The figure of 20 percent return on capital (ROC) has been based on discussions with various stakeholders in the sector and is comparable with the current rate of interest in Fiji, after allowing for the risk of investment in the forestry sector.[6]

2.4 The importance of setting the correct level of forest charges

The above discussion has explained the concept of economic rent and shown how it can be calculated and used to guide forest charging policies. This section briefly discusses the two main reasons why it is so important to try to achieve the correct level of forest charges.

2.4.1 Landowners income

The most obvious reason for setting the correct level of forest charges is that this will have a direct impact on the income that landowners will obtain from the utilisation of their forest resource. If charges are too low (which is often the case) landowners income will not be maximised and this will reduce the potential for forest revenues to lift landowners out of poverty. If, on the other hand, forest charges are set too high, this may also result in reduced production from the sector and could lead to landowners obtaining sub-optimal levels of revenues from the sector.

Related to this, if forest resources appear to be producing relatively low levels of income, there will be little incentive to preserve and manage them for wood production and more of an incentive to convert them to other land-uses. While this is probably not a major concern in Fiji at the moment, it could be important in the long-run if competing activities such as agriculture increase in importance.

A third more subtle reason for attempting to get the forest charging policy right is that governments tend to base the priority that they give to different parts of their administration on the relative importance of each sector to the national economy. If the revenues generated from forest charges are low, this will generally limit the attention that the government gives to the forestry sector and reduce the scope for the forestry administration to finance and implement other policies for the sector that they wish to pursue.

2.4.2 Efficiency

Although revenue collection is often an important consideration, a potentially far more important concern about forest charging policies is that, if the policies are not well designed, they can allow low levels of efficiency in roundwood production and forest processing to persist. This leads to waste and the misallocation of resources (not only in terms of forest resources, but also labour and capital) and can have negative social and environmental consequences as well.

Some examples of the detrimental effects of poorly designed forest charging policies include:

- low charges reduce the incentive for forest operators to reduce production costs to a minimum;

[6] The commercial bank lending rate in Fiji is currently about 8 percent to 12 percent in real (i.e. inflation adjusted) terms, but banks are reluctant to invest in forest operations. Finance companies that offer loans for purchasing mobile equipment (e.g. bulldozers, skidders and trucks, etc.) charge 15 percent to 18 percent and are making loans to the sector. Considering that these institutions have a more balanced portfolio of investment risks, the required rate of return for investors in the forestry sector should be somewhat high than this, so a rate of return of 20 percent (in real terms) seems reasonable.

- incorrect charges for different locations and species can discourage producers from maximising production from each area of forest and can give an unfair advantage to certain locations and certain types of forest; and
- low charges reduce the incentive to improve the marketing of roundwood and forest products.

Not only are these effects wasteful, but they can encourage the development of a processing sector that is too large (i.e. if roundwood is cheap – more companies want to use it) and discourage efficiency in roundwood utilisation in the processing sector.[7] They can also lead to vast amounts of capital being tied-up in a poorly performing forest processing sector, when some of this capital would be more profitably employed in other sectors of the economy.

There may be circumstances where the government deliberately decides to influence charging policies in order to give a subsidy to roundwood production or to the domestic forest processing industry. However, experience has shown that forest charging policies are often a crude tool for implementing broader forestry or economic development policies and can often result in unintended effects. For example, economic rent that is not captured by resource owners might be kept by forest operators, but it could be passed on to consumers, contractors or others involved in the production process.[8]

In summary, these issues are critical because they have the potential to distort the whole of the economy and trap economic development into a cycle of poorly performing industries dependent upon the wasteful use of the forest resource.

[7] For example, there is no incentive to invest thousands of dollars in machinery with high product recovery rates to save a few hundred dollars on wood raw material costs.

[8] This can also include government officials involved in the awarding and monitoring of forest licences. In many countries, low rent capture finances corruption in the forestry sector.

3 TRENDS AND CURRENT STATUS OF THE FORESTRY SECTOR

In order to assess the potential revenue collection from forest royalties and taxes and to examine the contribution of the sector to the Fijian economy, it is essential to obtain information about the trends and current status of the sector. This section of the report briefly presents some recent information about forest resources, forest management, institutions and policies in Fiji, along with statistics about forest area, production, consumption and trade. More detailed statistics can also be found in Appendix 1 of this report.

3.1 General description

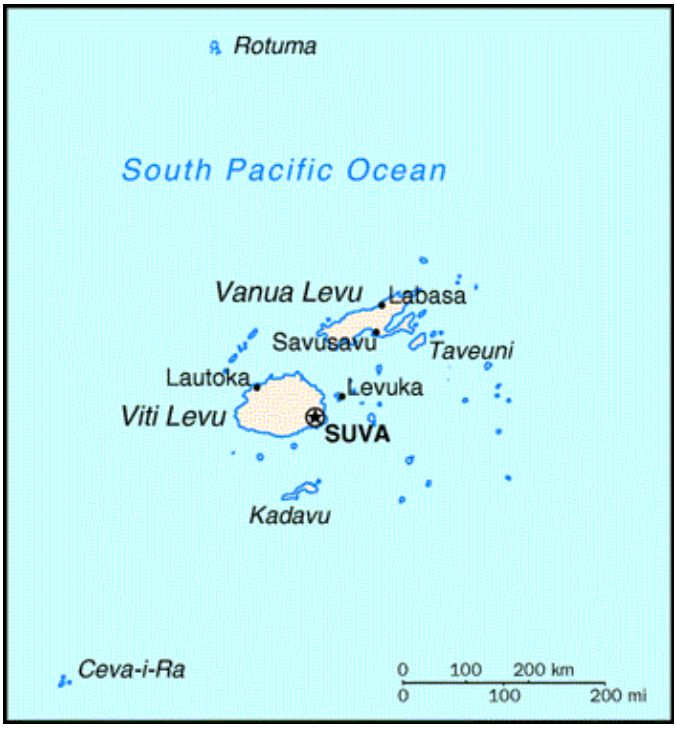
The Republic of the Fiji Islands, in the southern Pacific Ocean, is located approximately 3,100 km north-east of Sydney, Australia, and approximately 5,000 km south-west of Honolulu, Hawaii. The islands lie between 178° E and 179° W longitude and between 16° and 23° S latitude, just inside the tropical belt. Fiji is made up of about 330 islands and about 500 more tiny atolls, islets, and reefs, which cover a total land area of about 18,390 km^2. The island of Viti Levu (Big Fiji) covers about half of Fiji's area (10 429 km^2) and Vanua Levu (Big Land) about a third (5 556 km^2), followed by Taveuni (434 km^2). The smaller islands are largely encompassed in two recognized groups, the Yasawa Group and the Lau Group. Rotuma, an isolated island about 450 km north of Vanua Levu, is also a part of Fiji (see Figure 4). About 100 of the islands are inhabited and support a population of 806,212 (end 1999), with a population growth well below 2 percent (Bureau of Statistics, 2003). The two largest islands (Viti Levu and Vanua Levu) together contain over 90 percent of the population.

The climate in Fiji is tropical, but cooling winds make the climate relatively comfortable. Temperatures range from about 16° C to 32° C. December to April, which are also the rainy season, are the hottest months, with daily highs reaching 32° C. The windward (south-eastern) sides of the islands receive as much as 3,330 mm of rain a year, while the leeward northern sides receive about 2,540 mm. Heavy rains and cyclones often occur between November and April.

The large islands are of volcanic origin, of varying geological age and of moderately fertile soil, with fairly steep dissected topography in the forest areas. Mount Tomaniivi, on Viti Levu, is the highest point at 1,324 m. A number of the smaller islands are coral formations, rising only a few meters above sea level. Nearly all the islands are surrounded by coral reefs. The major rivers on Viti Levu include the Rewa, Sigatoka, Nadi and Ba. The Dreketi is the largest river on Vanua Levu.

Three major landforms occur in Fiji: flatlands, hilly lands and steep lands. Elevations range up to around 1,300 m and the mountainous topography produces pronounced windward/leeward rainfall effects. Rain forests dominate the windward and summit steep lands. Dry forests on the leeward sides have been largely usurped by grazing and fire, and persist only as remnants. Instead, extensive lowland areas support *talasiqa* vegetation, extensive degraded areas dominated by grasses and ferns.

Figure 4 Map of the Fiji Islands



3.2 Description of forest resources

The following description of forest resources is derived from Mueller-Dombois and Fosberg (1998).

3.2.1 Closed Forests

Broadleaved lowland rain forest: on Viti Levu and Vanua Levu, this forest is mostly a mixed assemblage of 20 to 30 m tall trees, largely dominated by primary Fijian species on the steep lands, but largely displaced on flatter lands, with a lower limit of annual rainfall of 2,500 mm. The canopy matrix includes 40 to 50 angiosperm species featuring *Calophyllum vitiense* and *Endospermum macrophyllum,* along with *Canarium vitiense, Cleistocalyx* spp., *Garcinia vitiense, Heritiera ornithocephala, Myristica castaneifolia, Palaquium hornei, Parinari insularum* and *Syzygium* spp. Kauri *(Agathis vitiense)* and two other gymnosperms, *Dacrydium elatum* and *Nageia vitiensis,* are also common and become more frequent in a drier forest subtype with rainfall as low as 2,250 mm per year.

A mature lowland rain forest type on Vanua Balavu of the Lau Group features *Dysoxylum mollissimum* ssp. *molle, Ficus prolixa, Kleinhovia hospita, Maniltoa floribunda* and *Veitchia joannis* on shallow soils over limestone or basalt. Kabara Island, also in the Lau Group, has a little-disturbed rain forest that occupies a plateau of limestone rock with little soil development. The main trees here are *Ficus* spp., *Intsia bijuga, Koelreuteria elegans, Pittosporum brackenridgei* and *Milletia pinnata*.

The terrain of Rotuma is mostly rolling-hills and most of it is has been cleared for coconut plantations and mixed agriculture. The remaining patches of forest on steep slopes, cinder cones and little-weathered lava are dominated by a forest of *Dendrocnide vitiensis, Elattostachys falcata, Planchonella samoensis* and *Pometia pinnata*.

Cloud forest: this unique, stunted ecosystem is restricted to mountaintops and ridges above 600 m elevation near the coast and above 900 m inland. Stunting is related to cooler temperatures, higher winds and lower light levels that reduce photosynthesis, along with excess moisture levels that accelerate nutrient

leaching and decrease soil aeration. Except at the lower elevational limits of cloud forest, common lowland species in Fiji do not generally penetrate into this zone. At 1,200 m elevation, unique trees include *Ardisia brackenridgei, Dysoxylum lenticellare, Fagraea vitiensis* and *Weinmannia* sp., and among the shrubs are *Pipturus argenteus, Randia vitiensis and Scaevola floribunda*. At 800 m, several common lowland species are seen, including *Alstonia vitiensis, Bischofia javanica, Calophyllum neo-ebudicum, Heritiera ornithocephala, Palaquium hornei* and *Parinari insularum*. Taxa occurring in all cloud forest elevational variants include *Cyathea alata, Dysoxylum gillespianum, Macaranga seemannii* and *Syzygium* sp.

Broadleaved dry forest: the leeward lowland primary dry forests in Fiji have largely been destroyed by grazing and fire. These *"dry"* forests are only seasonally dry and during the warm season they receive as much rain as the wet uplands. On Viti Levu, no primary dry forest remains. Instead, stands of *Casuarina equisetifolia* have taken their place. Those forests in advanced stages of recovery are associated with the trees *Acacia richii, Alphitonia zizyphoides, Gymnostoma vitiense* and *Trichospermum richii* and the palm *Pritchardia pacifica*.

A dry forest of sandalwood *(Santalum yasi),* along with *Casuarina equisetifolia* and *Gymnostoma vitiense,* occurs on Vanua Levu. Associated species include *Fagraea gracilipes* and *Myristica castaneifolia*. The sandalwood trade in Fiji, during the early nineteenth century, heavily depleted these forests and the species survives only as small relict populations.

Mangrove forest: the richest mangroves in Fiji occur at the mouths of major river deltas around mud-covered stream banks in the tidal zone. Seven mangrove species are represented. *Rhizophora stylosa* and *R.* x *selala* form a scrubby seaward fringe, replaced further inland by a mixed forest of *Bruguiera gymnorrhiza, Excoecaria agallocha, Lumnitzera littorea* and *Xylocarpus granatum. Rhizophora samoensis* is scattered throughout.

Coastal forest: a zone dominated by pure stands of *Casuarina equisetifolia* or *Pandanus tectorius* is supplanted inland by a mixed littoral forest that includes *Barringtonia asiatica, Calophyllum inophyllum, Cocos nucifera, Cordia subcordata, Hibiscus tiliaceus, Hernandia nymphaeifolia, Terminalia catappa, Thespesia populnea* and *Tournefortia argentea*.

A unique coastal forest exists at Sigatoka, on the south-west coast of Viti Levu. Here the dune forest is dominated by native species that normally grow inland, such as *Calophyllum inophyllum, Dysoxylum mollissimum* ssp. *molle* and *Syzygium richii*. These dunes are composed of magnetite sands rich in iron, which may explain the occurrence of this unique forest.

Mixed upland rain forest: found above 400 m near the coast and above 600 m inland on Viti Levu, Vanua Levu and Taveuni, the physiognomy of upland rain forests differs from that of lowland forests in being lower-statured, with crowns lower on their trunks. Temperatures are cooler and rainfall is generally higher, except that some upper elevation areas experience seasonal droughts, such as the high mountain ranges on the lee side of Viti Levu. Thus, a wet-zone forest with more than 3,750 mm annual rainfall can be distinguished from an intermediate-zone forest with 2,000 to 3,750 mm rainfall.

The wet-zone forest features two gymnosperms, *Agathis vitiensis* and *Nageia vitiensis*, along with a mix of many species also found in lowland rain forest, such as *Calophyllum vitiense*, *Dysoxylum molllisimum* spp. molle, *Endospermum macrophyllum*, *Garcinia myrtifolia*, *Metrosideros collina*, *Myristica castaneifolia*, *Podocarpus affinis* and *Syzygium effusum*.

The intermediate-zone forest features *Agathis vitiensis*, with *Dacrydium elatum* replacing the two *Podocarpus* species. The associated tree species are mostly the same as those found in lowland rain forest. Also appearing are the tree fern *Cyathea lunulata* and the smaller subcanopy trees *Alstonia vitiensis*, *Discocalyx divaricata* and *Plerandra vitiensis*. Invasions of the fern *Dicranopteris linearis* and the grass *Miscanthus floridulus* follow recurring fires.

Mixed dry forest: Although no longer extant in Fiji except as remnant stands, the typical Fijian dry forest is dominated by the conifer *Dacrydium nidulum* var. *nidulum* and *Fagraea gracilipes*. This mixed forest also includes the gymnosperm, *Podocarpus neriifolius*, the ironwood *Gymnostoma vitiense*, as well as *Aleurites moluccana*, *Dysoxylum mollissimum* spp. *molle*, *Ficus theophrastoides*, *Gironniera celtifolia*, *Intsia bijuga*, *Myristica castaneifolia*, *Parinari insularum*, *Premna taitensis* var. *taitensis* and *Syzygium* spp.

3.2.2 Open forests

Broadleaved freshwater wetland vegetation: poorly drained coastal flatlands along major rivers in peat or gley soils support scattered *Pandanus* savannah that includes native *Annona glabra, Barringtonia racemosa, Fagraea berteroana* and *Glochidion cordatum* and introduced *Psidium cattleianum* and *P. guajava*. Found on gley but not on peat are *Hibiscus tiliaceus, Inocarpus fagifer* and the palm *Metroxylon vitiense*.

3.2.3 Other wooded land

Shrubs: the coastal vegetation of Fiji follows that typically found elsewhere in this part of the Pacific, with a herb zone followed inland by a shrub zone dominated by *Scaevola taccada,* along with *Clerodendrum inerme, Sophora tomentosa* and *Wollastonia biflora*.

Forest fallow (*talasiqa* vegetation): in Fiji, *talasiqa* (*"sunburnt"*) vegetation covers about a third of both Viti Levu and Vanua Levu. It refers to once-forested dry lowlands now degraded by fire and grazing into a mosaic of pyrophytic grasslands and savannahs. Large grasslands of *Miscanthus floridulus* and *Pennisetum polystachyon* dominate some areas, but in areas of severe soil nutrient impoverishment, low-growing plants of the indigenous ferns *Pteridium aquilinum* var. *esculentum* and *Dicranopteris linearis* are the primary vegetation cover. Because the latter stage of vegetation development of the lack of fuel trees such as *Casuarina equisetifolia* and *Pandanus tectorius* and shrubs such as *Alphitonia zizyphoides, Dodonaea viscosa, Melastoma denticulata, Morinda citrifolia* and *Mussaenda raiateensis* can become established.

3.2.4 Forest plantations

Fiji has had the most aggressive forest plantation establishment policy of any of the Pacific Islands. The Forestry Department has been establishing forest plantations at all of their fourteen stations across Fiji. The main softwood plantation species grown is Caribbean pine (*Pinus caribaea*); the main hardwood species are mahogany and teak.

The aim of the forest plantation programme is to increase Fiji's forest plantation estate in order to meet the local demand for timber and to maintain a sustainable export trade in timber products. Establishment of hardwood plantations is now the responsibility of the Fiji Hardwood Corporation Ltd (FHCL), which aims to establish 2,000 hectares per year and to reach a total area of about 85,000 hectares by the year 2010. Fiji Pine Limited (FPL) manages the softwood plantations, which are planned to increase to about 55,000 ha by 2006.

3.3 Trends and current status of forest area

Statistics on the trends and current status of the forest area in Fiji depend upon the data sources, definitions and measurement conventions used. The three most recent sources of information on forest area are briefly described below.

3.3.1 FAO Global Forest Resource Assessment 2000 (FRA 2000)

FRA 2000 attempts to produce internationally comparable estimates of forest cover and changes in forest cover for every country in the World, based on a globally consistent set of definitions and measurement conventions. The figures presented in FRA 2000 are based on the statistics available in national inventory reports and other published documents. These are then adjusted to reflect the definitions and measurement

conventions used in FRA 2000 to produce internationally comparable statistics. Thus, the figures presented in FRA 2000 may differ from those presented in national statistics.

The FRA 2000 estimate of the total forest area in Fiji in 2000 is 814,732 ha or about 46 percent of the total land area (FAO, 2001). The annual change in forest area between 1990 and 2000 has been estimated as about -1,747 ha per year (or a loss of about 0.2 percent of the forest area each year), implying a total forest area in 1990 of about 832,202 ha (based on: Tang *et al*, 1993).

According to FRA 2000, the area of forest plantations in Fiji is about 97,200 ha (or 12 percent of the total forest area), implying that the area of indigenous forests is about 717,500 ha. It is also estimated that the area of forest plantations is currently increasing by about 9,200 ha per year. A detailed breakdown of the species, purpose and ownership of forest plantations is also given in FRA 2000 and is shown in Table 4.

Table 4 Forest plantation area in Fiji in 2000, as reported in FRA 2000

Species group	Total area		Area by main purpose or use				Area by ownership/management			
			Industrial use		Non-industrial use		Public		Private	
	(in ha)	(in %)	(in ha)	(in %)	(in ha)	(in %)	(in ha)	(in %)	(in ha)	(in %)
Mahogany	42,000	43.2	42,000	100.0	0	0.0	34,440	82.0	7,560	18.0
Other Broadleaves	4,900	5.0	4,900	100.0	0	0.0	4,018	82.0	882	18.0
Pine	43,300	44.5	43,300	100.0	0	0.0	43,300	100.0	0	0.0
Unspecified	7,000	7.2	7,000	100.0	0	0.0	5,740	82.0	1,260	18.0
Total/average	**97,200**	**100.0**	**97,200**	**100.0**	**0**	**0.0**	**87,498**	**90.0**	**9,702**	**10.0**

Source: FAO (2001).

3.3.2 National estimate of forest area in 1995

The previous estimate of forest area published by FAO (FAO, 1997) was based on a national estimate of forest area for the year 1995 (Hasni, 1997). This reported a total forest area of 840,512 ha, of which 747,266 ha was natural forest and 93,246 ha was forest plantations (see Table 5). In addition, it was estimated that there was a further 152,775 ha of other wooded land (land with trees, but insufficient crown cover or in individual plots that are too small to be considered as proper *"forest"* according to FAO's terms and definitions).

The figure for total forest plantation area is roughly comparable with that presented in FRA 2000, but the figure for the area of natural forest is slightly higher than the figure presented in FRA 2000, probably because of differences in definitions and measurement conventions between the statistics collected by national authorities and the those used in the FRA.

Table 5 Total forest area in Fiji in 1995, as reported in Hasni (1997)

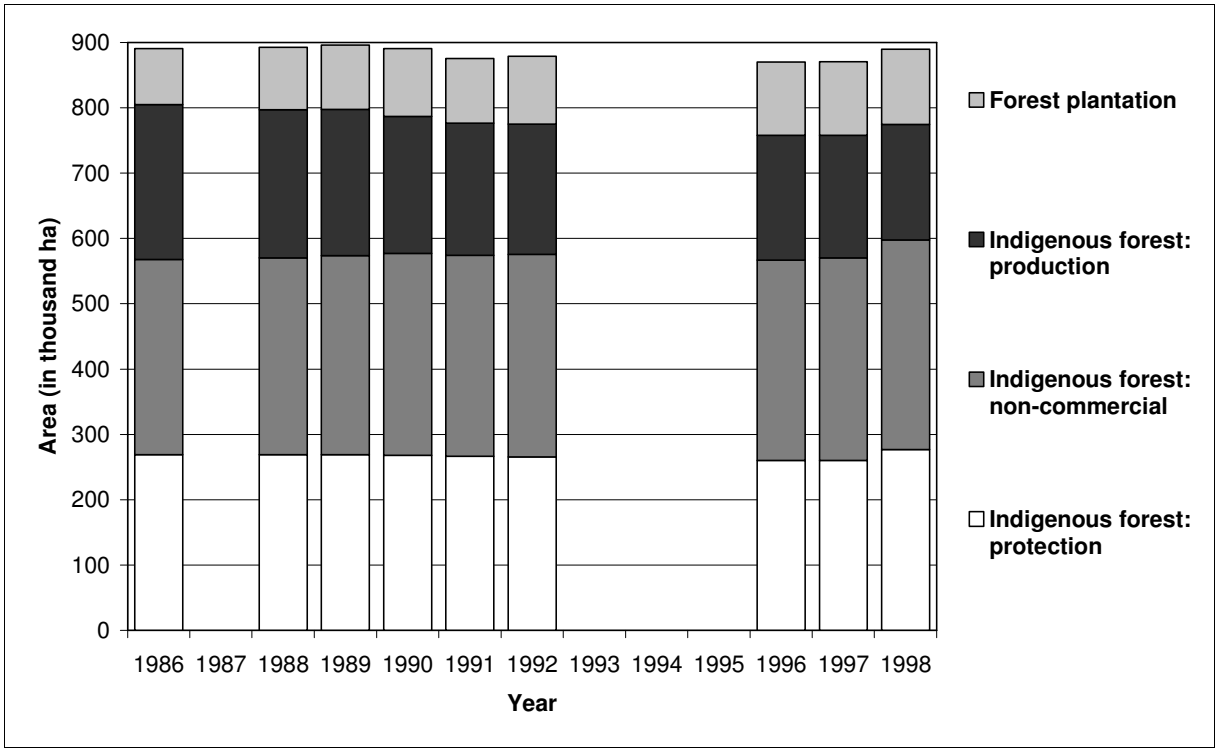
Forest type	Area (in ha)
Dense natural forest	*284,328*
Medium dense natural forest	*420,474*
Mangrove forest	*42,464*
Total: natural forest	747,266
Hardwood plantation	*48,268*
Pine Plantation	*44,978*
Total: forest plantations	93,246
Total: forest	**840,512**
Scattered natural forest	*152,775*
Total: other wooded land	152,775
Total: forest and other wooded land	**993,287**

Source: Hasni (1997).

3.3.3 Forest area statistics reported by the Forestry Department

The Forestry Department in Fiji also report statistics on the area of forest land in their annual reports (Forestry Department, 1998 and earlier). These show a total forest land area of around 890,000 ha, which has changed very little over the last 15 years (see Figure 5 and Table 23 in Appendix 1).

Figure 5 Distribution of forest land in Fiji by forest type and land ownership 1986 - 1998, as reported by the Forestry Department



Source: Forestry Department (1998 and earlier).

According to these statistics, the forest plantation area has increased from around 85,000 ha in 1986 to around 115,000 ha in 1998. This is a much lower rate of increase (2,500 ha per year) than the figure presented in FRA 2000 (9,200 ha per year). The total area of forest plantations is also about 20,000 ha higher than the figures presented earlier, perhaps because this includes land destined for forest plantation establishment that has not been planted yet.

The reported area of indigenous forest is around 775,000 ha, which is also somewhat higher than the figures presented earlier. This may be because some scattered forest areas are included in these figures as *"forest"*, whereas they would be counted as *"other wooded land"* according to FAO's definitions and measurement conventions.

These statistics (see Table 23) also show that landowning communities (*"Native land"*) own the majority of forests in Fiji (around 84 percent).

3.3.4 Summary of forest area statistics

Although the statistics used to identify the trends and current status of forest area in Fiji are somewhat conflicting, it appears that the total area of forest in Fiji is somewhere between 815,000 ha and 890,000 ha, depending on the definitions and measurement conventions used. Changes in the total forest area indicate that deforestation is very low, although some deforestation in indigenous forest areas is partly offset by increases in the area of forest plantations. The area of forest plantations may be between 100,000 ha and 115,000 ha, implying that the area of indigenous forests could be between 720,000 ha and 775,000 ha.

3.4 Trends and current status of forest management

3.4.1 History of forest management and silviculture

Fiji is a Melanesian island group, but with strong Polynesian influences. Traditional forest management was largely restricted to family home-gardens, which utilised agroforestry techniques, while the broader extent of accessible *mataqali* (village or clan) forest lands were used as a communal source of fuel, building materials and for hunting and gathering activities. Timber and particularly sandalwood attracted the first European traders to Fiji, with most of the sandalwood being logged before 1820. Throughout the 19th Century, planters arrived and cleared lowland forests for cotton, sugar and coconuts. Industrial timber harvesting grew slowly. In 1928, nine sawmills were producing around 6,000 cubic metres of timber. By the late-1940s, timber supplies in the vicinity of main centres of population were being depleted and serious erosion was occurring in the *"dry zone"* as a result of uncontrolled grazing, burning and timber cutting. The Forestry Department was established in 1938 with the objective of monitoring and controlling the exploitation of the native forest. A programme for resource development through large-scale plantations was implemented during the 1960s. The principal species planted were *Pinus caribaea* and *Swietenia macrophylla*. Since the 1980s, Fiji has been a modest exporter of forestry products, following the start of significant harvesting in the forest plantations in 1987.

3.4.2 Trends in forest management

The principal trend in forest management in Fiji during the past 30 years has been the effort to establish a significant plantation estate as a substitute and complement to natural forest wood supplies. Fiji now has a significant plantation estate, much of which is presently approaching maturity. The plantations are expected to provide an important alternative to natural forest harvesting, and should enable significant areas of natural forest to be retired into some form of conservation status (Brown, 1997; Oliver, 1999).

3.4.3 Current forest management objectives

The principal elements of Fijian forest policy have remained largely unchanged during the past half-century. A Forest Policy was approved in 1950, with the following key forest management objectives:

- to protect and develop natural vegetation where its retention is necessary for climatic reasons and for the conservation of soil and water necessary for good agriculture and continuous supplies of forest produce;
- to develop the production of such timbers as can be produced economically and to provide a surplus for export;
- to maintain and improve soil fertility by preserving or extending forest cover; and
- to check soil erosion and to recover areas already eroded.

A National Forests Action Plan (NFAP) was finalised in 1990, leading to the identification of 29 projects, in the fields of forest management and industrial development, forestry in land-use, conservation and institutional strengthening. A subsequent Forestry Sector Review has resulted in the incorporation of additional recommendations into the NFAP to help promote sustainable forest management (FAO, 1995 and 1998a).

3.4.4 Forest management plans

Natural forests in Fiji are largely under the control of customary landowners and management responsibilities, outside of periods of logging, lie with these landowners. Management of large tracts of forests is generally passive, with little or no management input. All logging licenses issued in Fiji must comply with the requirements of the Fiji National Logging Code of Practice, which was produced in 1990.

The Code of Practice requires the preparation of detailed logging and management plans. Planning infrastructure has been strengthened by the implementation of a Forest Resources Tactical Planning Project, which assisted in the provision of mapping data and training to help establish a practical and effective process for the preparation of environmentally sound coupe-level logging plans, hardwood plantation plans, and management plans. Management responsibility for Fiji's plantation resource is vested in FHCL and FPL. Both corporations have detailed management plans in place.

3.4.5 Silviculture and forest management practices

At present, there is little or no management of indigenous forests except during the period when an area is being logged. Logging is generally carried out under a selection system, after which management responsibility reverts to the *mataqali* landowners. Experience shows that if logged-over forest is left undisturbed for 20 years it can be cut again. Sometimes, however, logged forest has been converted to agricultural use. Currently, plantation reforestation activities are carried out by FHCL, while FPL is involved in afforestation activities. More than 50,000 ha of hardwood plantations, mainly *Swietenia macrophylla*, have been planted, mainly by direct planting of seedlings at wide (9 x 4 metres) spacing. No pruning or thinning is carried out and rotations are 30 - 35 years. Around 40,000 ha of *Pinus caribaea* has been planted. Seedlings are planted at densities of 1000 - 1500 stems per hectare. On high quality sites, pruning to 6 metres is carried out for sawlog production. Thinning regimes are still being developed. *Pinus caribaea* is presently grown on rotations of around 17 years.

3.4.6 Forest conservation measures

The total area of protection forest in Fiji is around 280,000 ha (see Table 23). Of this, the formal protected areas network comprises a range of forest and nature reserves covering more than 37,000 ha. Nature reserves provide full protection to flora, fauna, soil and water resources. Conversely, Forest Reserves provide only a limited degree of protection status. Activities in these forests are restricted by a requirement to obtain a written consent from the Conservator of Forests. Several other communally-operated parks have also been established.

Environmental management is being integrated into planning and development processes to safeguard the environment and its regeneration capacity. A National Environment Working Group has been established to formulate a national environmental strategy, covering environmental protection and natural resources management. The Department of Environment is presently developing multi-sectoral legislation to support sustainable development and a Fiji Biodiversity Strategy Action Plan.

3.4.7 Forest protection measures

Cyclones are a frequent occurrence in Fiji, with the country being struck by 21 cyclones between 1980 and 1997. Detailed records of plantation damage were kept for several cyclones, but others were equally destructive. For example, Cyclone Kina in 1992 damaged almost 12,000 ha of plantations, of which 3,000 ha were written off. More than 7,000 ha were rehabilitated by firming or propping and the remainder was partially rehabilitated. Thus, wind-firmness is an important property in plantation species selection. Natural forests also sustain periodic heavy damage during cyclones (Strelke, 1997).

Wildfires cause significant losses as well. Escapes from burning of sugar cane are a major source of forest fires. In 1989, almost 1,000 ha of plantation were burned in a wildfire. FPL has introduced a programme of prescribed burning, particularly in stands adjacent to sugar cane fields, to reduce wildfire damage. Two insects, Ambrosia beetles (*Crossotarsus externedentatus*) and subterranean termites (*Neotermes samoanus*) have caused considerable concern in *Swietenia macrophylla* plantations. Attacks by Ambrosia beetles caused planting to be suspended in the late 1970s, but better management of debris appears to be effectively managing the problem. Biological control of subterranean termites through the application of

entomophilic nematodes shows significant promise. The major fungal problem in Fiji is Brown root rot (*Phellinus noxius*).

3.4.8 Forest harvesting practices

It is estimated that around 150,000 ha of natural forest has been systematically harvested on Fiji. Logging has been based on a selection system, but generally without any post-logging silvicultural treatment. The selection system utilised in Fiji generally operates on a 20-year cutting cycle. Sometimes, however, logged-over forest has been converted to other uses. Natural forest management based on reduced impact logging is presently being implemented in a 5,000 ha pilot project (Natural Forest Management pilot project). To harvest timber on native land, a Forestry Right License is required under law. These are negotiated through the NLTB. There are four categories of tenure for timber cutting rights in the natural forests:

- Timber concessions (15-30 year period);
- Long term licenses (10 years);
- Annual licenses; and
- Other licences and prepayment licenses (usually for land clearing).

The area of timber concessions and long term licenses was around 263,000 ha in 1998, of which 132,000 ha was production forest (see Table 24). However, the majority of forest processing companies harvest roundwood under annual licences.

The Fiji National Code of Logging Practice was implemented in 1990. The code prescribes desirable practices aimed at protecting the forest environment, its assets and its users, while allowing the execution of economically viable harvesting within acceptable safety standards. The main elements of the code include requirements for planning, operational standards, environmental requirements, equipment and safety standards and requirements for training and supervision. The code covers all commercial logging operations (Jiko, 2000).

3.4.9 Public participation in forest management

The large area of Fijian forests under customary ownership ensures a high degree of, at least *de facto*, people's participation in forest management. The government has, however, accorded priority to ensuring greater landowner participation in all aspects of forestry sector development. An objective is to have landholders participate more as shareholders or owner-operators in forestry activities. As part of extension and community forestry programmes, the Forestry Department has collaborated with a number of other agencies to run forest awareness activities. These are aimed at improving awareness and educating communities in the importance of mangrove ecosystems and forest protection, the importance of sustainable forest management and relationships between forest, land and marine ecosystems.

3.4.10 Special programmes and incentives to promote sustainable forest management

A variety of projects and programmes in support of sustainable forest management has been implemented in Fiji, many of which derive from the National Forestry Action Plan of 1990. A key initiative has been the development of the National Code of Logging Practice, introduced in 1990 and subsequently supported by the Forest Resource Tactical Planning Project. Both of these initiatives, and the Forestry Decree of 1992, have contributed significantly to reaching a goal of sustainable forest management. The Natural Forest Management pilot project is utilising reduced impact logging techniques across 5,000 ha of natural forest. Permanent sample plots have been established in anticipation of implementing a full sustainable forest management regime. Two eco-forestry initiatives are incorporating this pilot work into their current projects, which aim to involve landowners in management decisions and practices.

Fiji has imposed a ban on log exports, with the primary objective of stimulating local processing. A ban on circular sawmills was imposed in 1997, to help boost recovery rates and strengthen incentives for good management (FAO, 1996; FAO, 1998b; Swarup, 2000). Fiji has also expressed strong interest in the development of an internationally accepted certification system for Pacific Islands forest products (EFI, 2000).

3.5 Forestry policy and institutions

3.5.1 Legal framework for forest management

The principal piece of forestry legislation in Fiji is the Forest Decree 1992, which replaced the Forest Act 1953 (amended in 1990). The Forest Decree 1992 largely legislates to support the objectives specified in the Fijian Forestry Sector Review 1988, namely:

> *"to maximise the sustainable contribution of the sector to the development and diversification of the economy whilst bringing the Fijian people into fuller and more active participation in sectoral development of all levels and stages and, at the same time, protecting and enhancing the effectiveness of the country's forest in environmental conservation"*.

Amended Forest Regulations 1990 (associated with the Forests Act 1953) also remain in force. A number of other forestry specific regulations also guide forestry development, including the following:

- Forest Sawmill Regulations 1968;
- Forest Guard Regulations 1955; and
- Forest (Fire Prevention) Regulations 1972.

Legislation and regulations creating specific forestry institutions also have relevance, in particular the following:

- Fiji Pine Commission Act 1976;
- Commission Forests (Maintenance and Protection) Regulations 1987; and
- Fiji Pine Decree 1990.

A variety of legislation relating to land, environment and conservation has been enacted, with implications for forests. Relevant pieces of legislation include the following:

- Native Land Trust Act 1940;
- Land Conservation and Improvement Act 1953;
- Nature Reserves Act 1956; and
- Native Land (Leases and Licences) Regulations 1984; and
- Native Land (Forest) Regulations 1984.

3.5.2 Forest institutions and forest managers

The Fijian government's principal forestry agency is the Forestry Department, which is a part of MoFF. The Forestry Department has a primary role in enforcement of logging regulations. It also has a significant role in management in natural forests, particularly to support management decision-making by assembling a database for the natural forest resources, including: maps; inventories; and GIS. Most of Fiji's plantation forests are managed by FHCL and FPL. Hardwood plantation forests established by the Forestry Department were transferred to the newly formed FHCL in 1998. FPL was corporatised in 1991 and is,

eventually, expected to be privatised. It manages most of the country's softwood plantations. Forestry research is primarily under the auspices of the Silvicultural Research Division of the Forestry Department.

Eighty-three percent of land in Fiji is under customary (*mataqali*) ownership, with 10 percent alienated freehold land and the remaining 7 percent of land under government ownership. Almost 90 percent of the unexploited production forests and 84 percent of all Fijian forests are in *mataqali* ownership. Fijian *mataqali* do not have any corporate authority to deal in land and all negotiations for the use of timber grown on *mataqali* lands must be conducted through the NLTB.

3.5.3 Current forestry policy

The Government of Fiji recognizes the potential of the forestry sector to provide rural employment, income and economic development, to promote rural stability, to improve rural living standards and to act as a major source of foreign exchange.

MoFF has responsibility for most aspects of the forestry sector in Fiji, although NLTB is also an important stakeholder within Government, in view of their responsibilities related to the administration of native land. The mandate of the Ministry is to ensure that forest resources are managed sustainably and developed for the optimal benefit of all stakeholders. To achieve this, the core roles and responsibilities of MoFF are: research and development; provision of extension services and training; forest law enforcement, monitoring and surveillance; and the provision of supporting infrastructure (where economically viable).

The overall aim of government intervention is to create and provide wherever possible the social and economic environment in which the private sector can flourish and develop forest resources. The intervention policy and strategy of the Ministry is selective and relates only to areas where the private sector should not or cannot invest. More active and direct intervention (e.g. in commercial activities) is only carried out in order to stimulate investment by the private sector and to provide a sound foundation on which the private sector can build. This includes affirmative action programs that are necessary to encourage the direct participation of indigenous Fijians and Rotumans in the development of the sector.

Government policy and strategy for the forestry sector over the period 2002-04 is as follows (MoFF, 2003):

- to maximise the sector's contribution to the economy and develop the sector to its fullest potential through the encouragement of value-adding and the provision of necessary infrastructure;
- to promote environmental conservation and management as the basis for the sustainable development of the sector, through the enforcement of the National Code of Logging Practice and certification and branding;
- to promote the utilisation of the forest resource in a way that benefits the resource owners and the community at large;
- to develop and maximise the mahogany resource, including the development of a major downstream processing industry that will benefit the Fijian economy;
- to continue the management and establishment of hardwood plantations through FHCL;
- to develop the marketing and competitive pricing of mahogany relative to international market prices (which are to be ascertained before harvesting); and
- to assess the correct share for landowners of the benefits from the harvesting of the mahogany resource.

3.6 Trends and current status of production and trade of forest products

Statistics on the trends in production and trade of forest products have been collected from the Forestry Department's Annual Reports (Forestry Department, 1998 and earlier) and FAO (FAOSTAT, FAO's on-line statistical database, available at: http://apps.fao.org/page/collections?subset=forestry). A brief description of the main trends is given below and more details of the statistics available are given in Appendix 1.

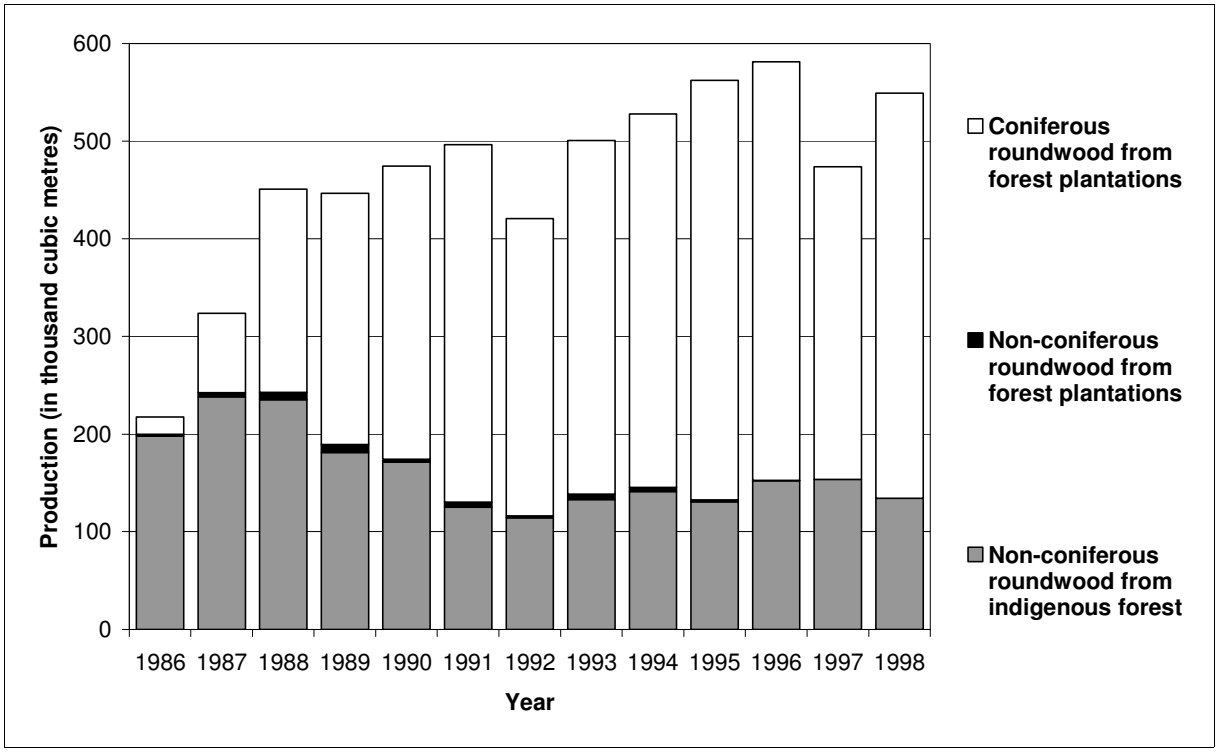
3.6.1 Roundwood

Trends in total roundwood production since 1986 are given in Figure 6 (and Table 25 in Appendix 1). The figure shows that annual non-coniferous roundwood production from the indigenous forest has declined from around 200 thousand cubic metres in 1986 to around 130 thousand cubic metres in 1998. Production of non-coniferous roundwood from forest plantations has not amounted to much so far, although it is expected that production will increase significantly, as these plantations reach an appropriate age for felling over the next few years.

The figure also shows the tremendous increase in the annual production of coniferous roundwood from forest plantations over the last decade. This has increased from under 20 thousand cubic metres in 1986 to over 400 thousand cubic metres in 1998. The majority of this production comes from the plantations managed by FPL, which have started to reach maturity. It is expected that this production will also continue to increase in the future.

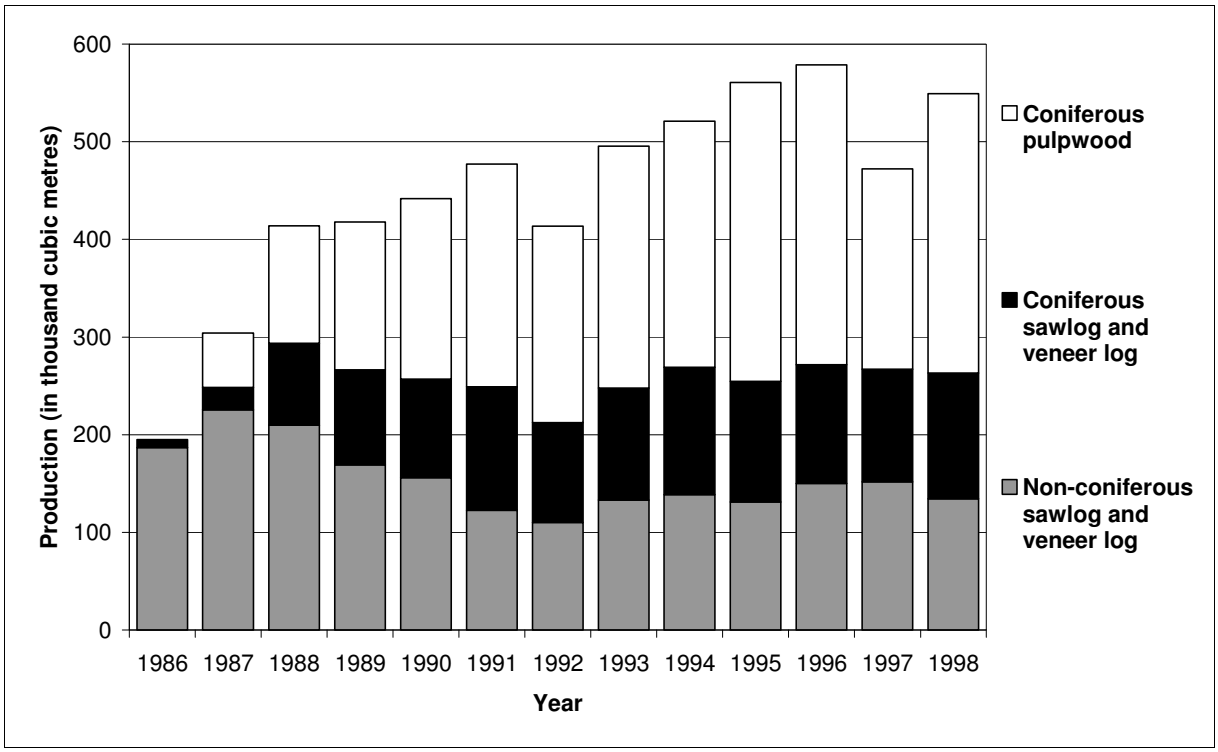
Total annual production has increased from around 120 thousand cubic metres in 1986 to over 550 thousand cubic metres in 1998, with the majority of production shifting from the indigenous forest to forest plantations. This trend can be expected to continue as more of the pine plantations reach maturity and harvesting starts in the mahogany plantations.

Figure 6 Roundwood production in Fiji by forest type and species group 1986 - 1998, as reported by the Forestry Department



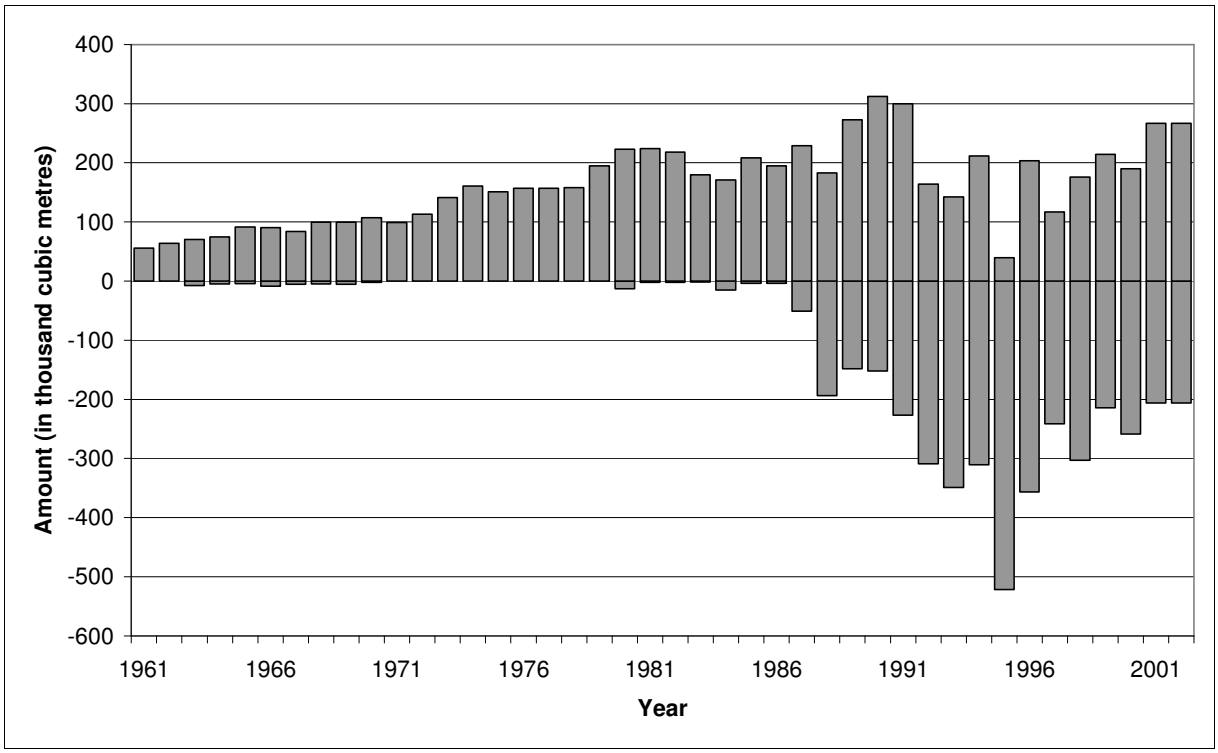
Source: Forestry Department (1998 and earlier).

Figure 7 Industrial roundwood production in Fiji by product type and species group 1986 - 1998, as reported by the Forestry Department



Source: Forestry Department (1998 and earlier).

Figure 8 Industrial roundwood production, consumption and trade in Fiji 1961 - 2002, from FAO



Source: FAO (FAOSTAT). Note: the size of the shaded bar equals production and the height equals consumption.

Figure 7 shows the trends in annual industrial roundwood production since 1986, divided into sawlog and veneer log production (coniferous and non-coniferous) and pulpwood production.[9] The figure shows that non-coniferous sawlog and veneer log production has declined from around 190 thousand cubic metres in 1986 to around 130 thousand cubic metres in 1998. This trend mirrors that of the production from indigenous forests. In contrast, production of coniferous sawlog and veneer logs has increased from around 10 thousand cubic metres to around 130 thousand cubic metres over the same period. Thus, the production of coniferous sawlog and veneer logs (all from the forest plantations) has increased to about half of the total annual sawlog and veneer log production over the last decade. The annual production of coniferous pulpwood has also increased from nothing in 1986 to around 290 thousand cubic metres in 1998.

The long-term trend in annual industrial roundwood production and trade since 1961 (as reported to FAO)[10] is shown in Figure 8 (and Table 33). In this figure, the total length of the shaded bar represents total production. The amount below the zero-line represents exports and the height of the bar (i.e. the amount of the bar above the zero-line) represents domestic consumption. Imports of industrial roundwood into Fiji have always been negligible and are not shown in the figure.

This figure shows that the domestic market for industrial roundwood has increased only modestly over the last two decades (if at all), implying that the domestic forest processing sector has not grown significantly. Rather, the huge increase in production since the mid-1980s has been accommodated by an increase in exports. Almost all of these exports are coniferous wood chips produced from the forest plantations, which are exported to Japan.

3.6.2 Sawnwood

Trends in the annual production of sawnwood since 1961 are shown in Figure 9 (and Table 34 in Appendix 1). This figure shows that production increased until the mid-1970s. Since then, production has remained at around 80 thousand cubic metres to 100 thousand cubic metres in most years and has not grown significantly. In terms of species mix, the figure shows that annual production of coniferous sawnwood has increased since the mid-1980s, following the start of significant harvesting in the pine plantations. Over the last decade, coniferous sawnwood production has remained roughly constant at around 40 thousand cubic metres and now accounts for about half of all production. Conversely, the annual production of non-coniferous sawnwood has fallen from about 60 thousand cubic metres to 40 thousand cubic metres over the same period.

The figure also shows the tremendous variability in production from year to year. This can be possibly be attributed to the cyclical nature of the tourism sector (resort development is one of the main markets for local sawnwood) and, in recent years, political instability.

Figure 10 shows the trend in annual sawnwood production, trade and consumption since 1961. Over the period until the mid-1970s, consumption increased to around 80 thousand cubic metres. Exports of sawnwood were negligible and some of this consumption was satisfied by imports of sawnwood. Since the mid-1970s, imports of sawnwood have almost vanished and exports have increased to around 20 thousand cubic metres per year. Both production and exports are split roughly equally between coniferous and non-coniferous sawnwood. The most striking feature of this figure is that domestic consumption appears to have fallen over the last two decades, from around 80 thousand cubic metres per year in the early-1980s to around 60 thousand cubic metres in recent years.

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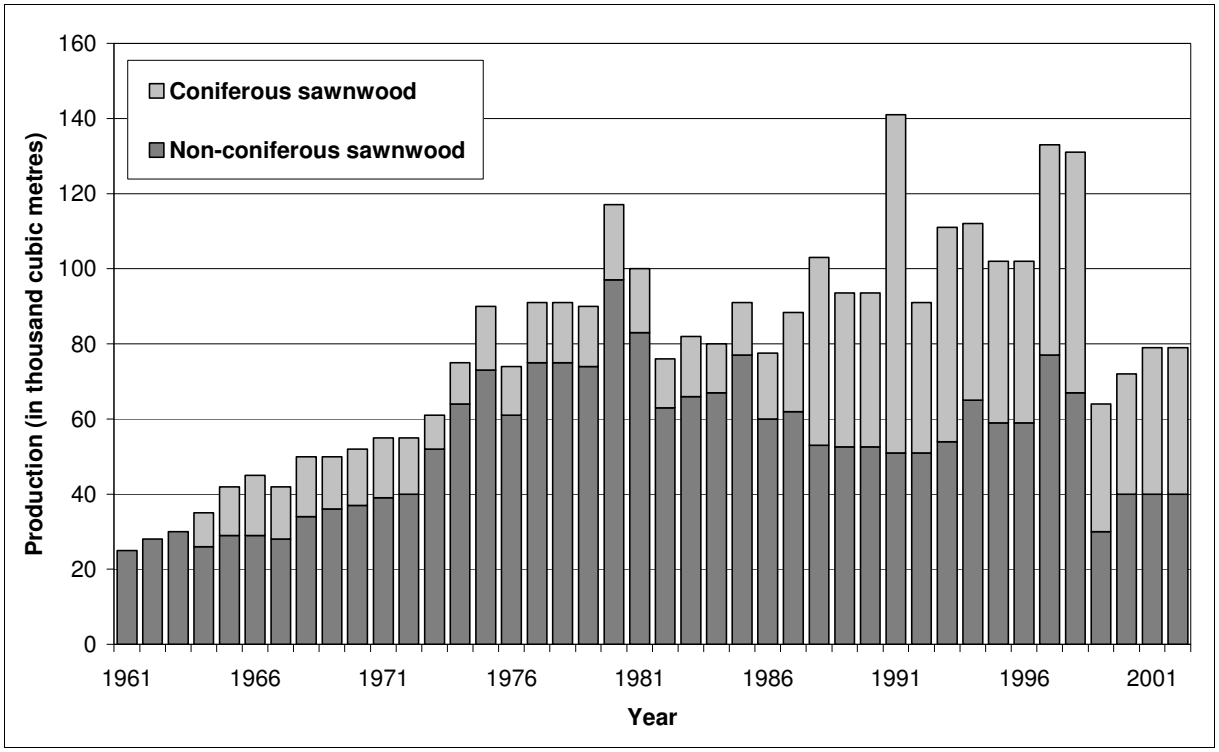
[9] Industrial roundwood production excludes the production of woodfuel (fuelwood and charcoal). It includes the production of other industrial roundwood (i.e. roundwood used without further processing for uses such as posts and poles), but recorded production of these other products in Fiji is negligible and is excluded here.

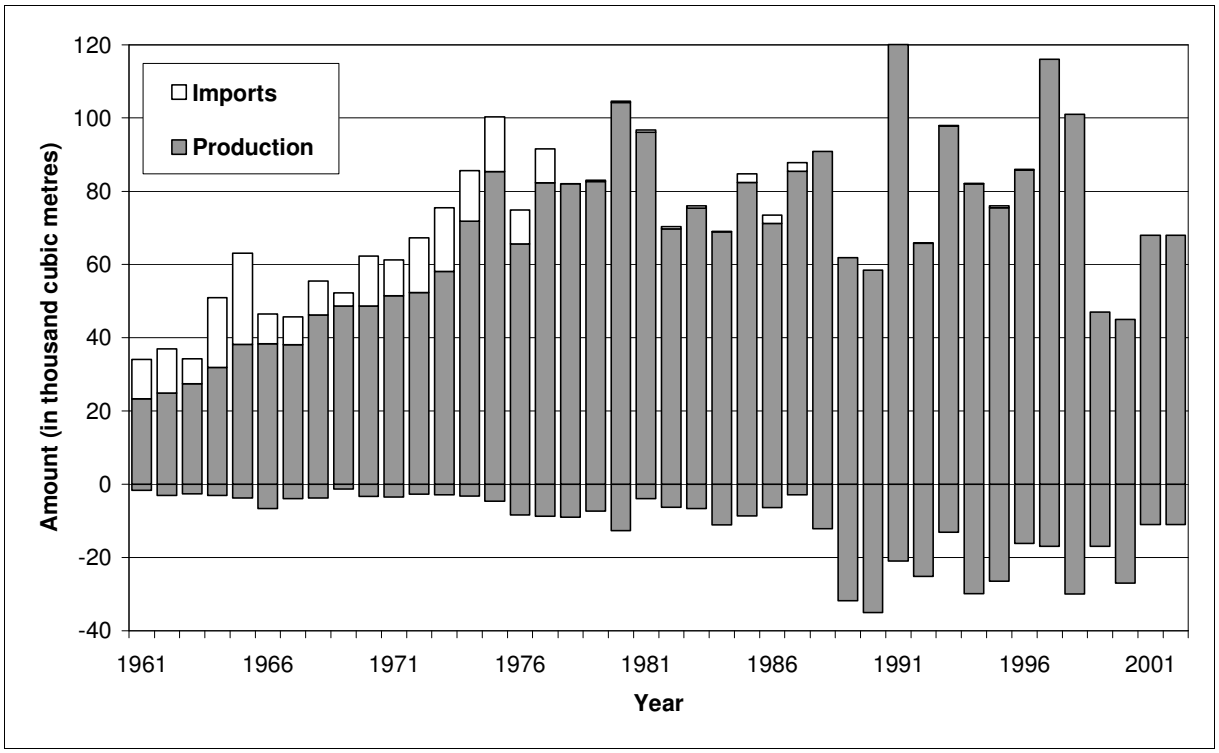
[10] Due to differences in definitions and measurement conventions, the statistics reported by FAO differ slightly from those presented by the Forestry Department, but these differences are usually small.

Figure 9 Sawnwood production in Fiji 1961 - 2002 by species group, from FAO



Source: FAO (FAOSTAT).

Figure 10 Sawnwood production, consumption and trade in Fiji 1961 - 2002, from FAO

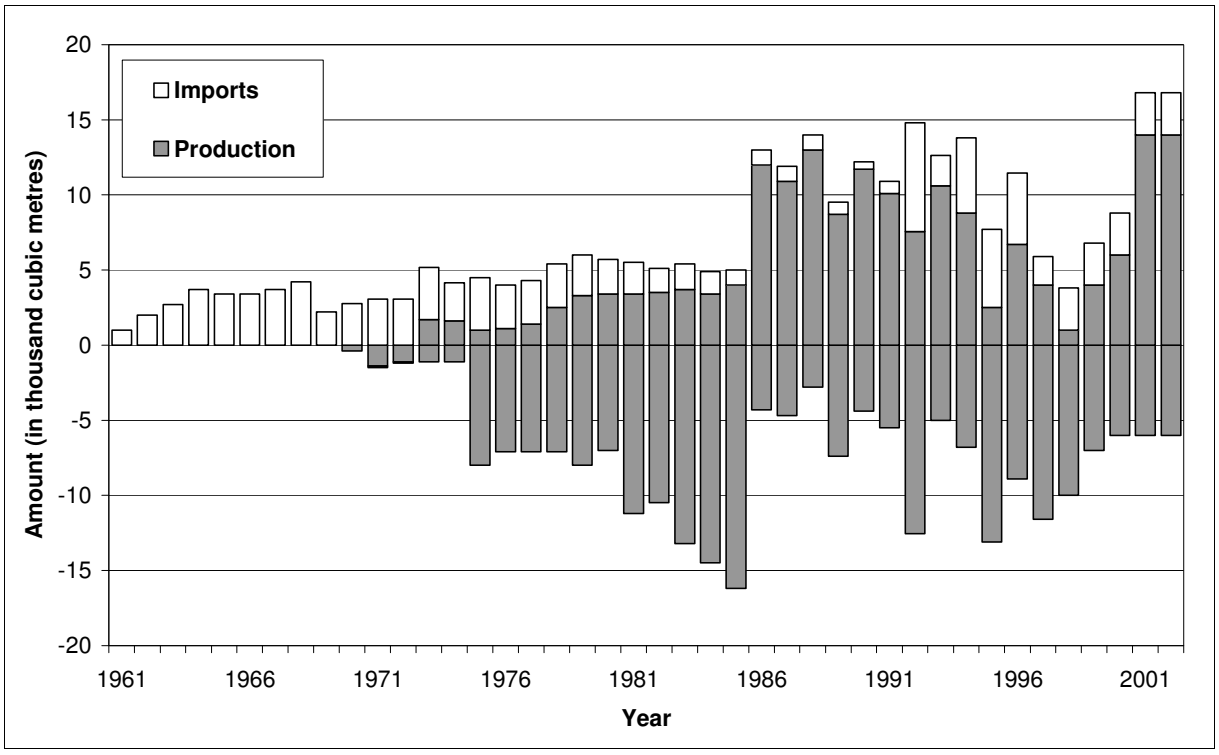


Source: FAO (FAOSTAT). Note: the size of the shaded bar equals production and the height of both bars equals consumption.

3.6.3 Wood based panels

Trends in the annual production, trade and consumption of wood based panels since 1961 are shown in Figure 11 (and Table 35 in the appendix). Until the early-1970s, consumption of wood based panels in Fiji was entirely satisfied by imports. Wood based panel production started in the early-1970s with the production of plywood and veneer sheets (the only two wood based panels that are manufactured in Fiji). Production increased to around 15 thousand cubic metres in the mid-1980s and has remained at around this level ever since. The majority of this production is manufactured from logs from the indigenous forest and each of these two products accounts for approximately half of the total.

Figure 11 Wood based panel production, consumption and trade in Fiji 1961 - 2002, from FAO



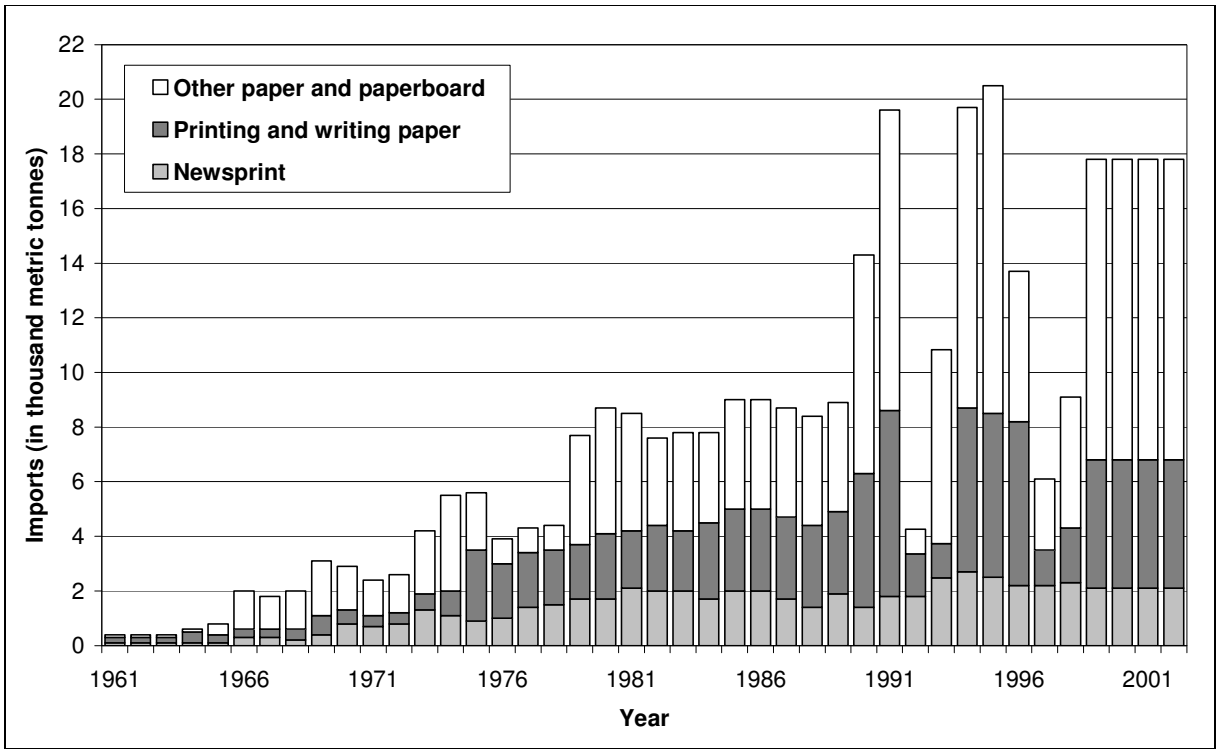
Source: FAO (FAOSTAT). Note: the size of the shaded bar equals production and the height of both bars equals consumption.

Total consumption of wood based panels has varied greatly from year to year, but has remained roughly constant at around 10 thousand cubic metres per year since the mid-1980s. To some extent, this consumption could account for the fall in sawnwood consumption noted earlier (i.e. product substitution). A small amount of wood based panel consumption is satisfied by particleboard and fibreboard imports into the country, but the majority is satisfied by domestic veneer sheet and plywood production. In addition, exports of veneer sheets and plywood have amounted to slightly over 5 thousand cubic metres per year over the last two decades.

3.6.4 Paper and paperboard

Fiji does not produce any paper or paperboard, so domestic consumption is entirely satisfied by imports. The trend in imports of paper and paperboard since 1961 is shown in Figure 12 (and Table 36), along with the division of imports into the three main paper product categories.

Figure 12 Paper and paperboard imports into Fiji 1961 - 2002, from FAO



Source: FAO (FAOSTAT).

The figure shows that imports increased steadily up until the early-1990s, since when they increased more rapidly to reach a level of around 18 thousand metric tonnes (MT) per year. Newsprint imports and consumption have remained constant for the last two decades at around 2 thousand MT per year and all of the growth in consumption has occurred in the other two product categories. Paper consumption increases rapidly when countries reach a certain level of development and the trends shown here are very similar to those found in other countries at the same level of development as Fiji.

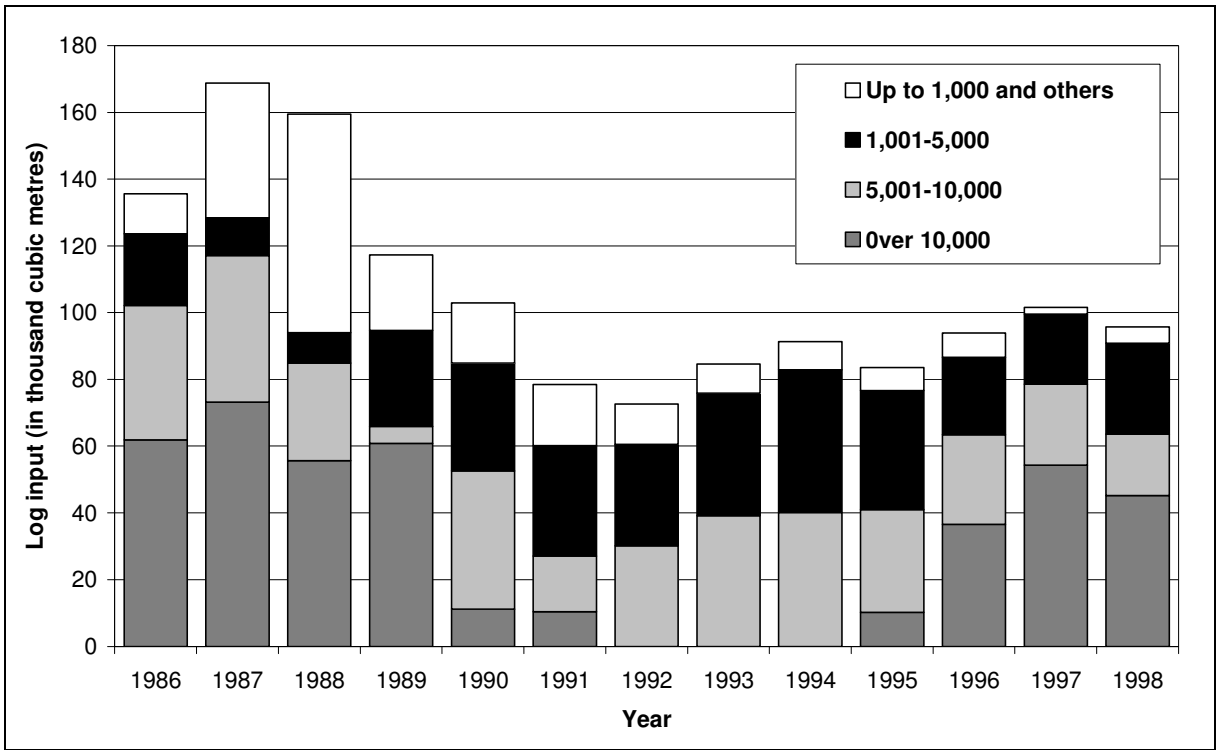
3.6.5 Forest processing industry structure

The structure of the forest processing industry (size and number of mills) is important for the calculation of economic rent, as the average size of processing facilities affects the profitability of the sector and the amount that forest processors can afford to pay for the raw material.

The forest processing industry in Fiji is dominated by two large companies: Fiji Forest Industries (FFI) and Tropik Wood Industries (TWI). Together, these two companies consume about 150 thousand cubic metres of sawlogs and veneer logs each year (or roughly 40% of total production). TWI mostly processes pine sawlogs and consumes almost all pine sawlog production. The production of pine woodchips is also a major activity of TWI. FFI includes sawnwood and plywood production and is supplied by one of the few long-term forest concessions operating in Fiji (and by far the largest). FFI consumes about 50 thousand cubic metres of non-coniferous sawlogs and veneer logs or about one-third of production from the indigenous forest.

Other than these two companies, the remainder of the forest processing sector in Fiji is quite small. One other company produces both sawnwood and plywood - Valebasoga Tropikboard - but this company was in receivership at the end of 2003. All other mills only produce sawnwood and obtain nearly all of their supplies from the indigenous forest.

Figure 13 Consumption of sawlogs and veneer logs by mill size (excluding Fiji Forest Industries and Tropik Wood Industries) 1986 - 1998



Source: Forestry Department (1998 and earlier).

Trends in the structure of the forest processing industry are shown in Figure 13 and Table 26 to Table 29 in Appendix 1. Despite the decline in sawlog and veneer log production from the indigenous forest, the forest processing industry has not consolidated very much. Excluding FFI and TWI, around half of all production was processed in mills with an annual log intake of less than 5,000 cubic metres in 1986 and the same was true in 1998. However, the overall number of mills declined from 53 to 29 over the same period and the estimated number of mills operating at the end of 2003 was 21. In addition, the average mill size increased slightly from an annual log intake of 2,500 cubic metres in 1986 to 3,500 cubic metres in 1998.

The imposition of a ban on the use of circular saws in 1997 has led to some new investments in sawmilling technology. Site visits revealed that many sawmills are using new technology (e.g. modern bandsaws, some with computerised controls) and the overall condition of processing technology is relatively good compared with other tropical wood producing countries of a similar size and level of development. In addition, there have been a number of investments in kiln drying technology and machinery to produce higher value products (e.g. profiled boards and mouldings).

Table 6 Number of new entrants to the sector and exits from the sector 1986 - 1998

Size of mill (by annual log intake in cubic metres)	Total 1986-98			Annual average		
	Entry	Exit	Total	Entry	Exit	Total
0ver 10,000	3	5	8	0.2	0.4	0.6
5,001-10,000	9	7	16	0.7	0.5	1.2
1,001-5,000	20	20	40	1.5	1.5	3.1
0-1,000	49	73	122	3.8	5.6	9.4
All sizes	**81**	**105**	**186**	**6.2**	**8.1**	**14.3**

Source: Forestry Department (1998 and earlier).

The sector also suffers from a high level of turnover, in terms of the number of mills starting up or closing down each year. Table 6 shows the number of new entrants and exits from the sector over the period 1986 to 1998. In a few cases, these entries/exits represent temporary shutdowns, but in the majority of cases they represent permanent closures of mills or changes in investors and/or management. Given that the average number of mils operating during this period was 38, the average annual level of turnover - 14 - is somewhat high, representing over one-third of the total number of mills. Turnover in the smaller mill size category is particularly high, suggesting that the long-term viability of these operations is quite low. It is also worth noting that, in 1998, only 12 of the 29 mills operating at that time had been operating for five years or more and almost all of these were in the larger size categories.

3.6.6 Summary of forest products production and trade

Recent trends in the production of industrial roundwood in Fiji have shown a decline in production from the indigenous forest as production from the pine plantations has increased. Apart from the production and export of woodchips from the pine plantations, most industrial roundwood is converted into sawnwood and a small amount is converted into plywood. Total production of these two products increased greatly during the 1970s, but has not increased by much since then.

The domestic market for sawnwood and plywood is almost entirely satisfied by domestic production, but there are small amounts of imports of other types of wood based panel. In addition, Fiji imports all of its paper and paperboard requirements. The domestic market for sawnwood and wood based panels has not grown at all in recent years. About one-third of sawnwood production is exported along with one-quarter of plywood and veneer sheet production. These export markets have also not expanded in recent years.

The forest processing industry comprises a small number of large to medium sized mills and a number of very small mills. Given the limitations of the domestic market, sluggish growth and fierce competition in export markets and the foreseen increases in industrial roundwood production from the forest plantations, the challenge for the sector will be to develop export markets to utilise this potential production.

4 TRENDS AND CURRENT STATUS OF FOREST CHARGES

As in most forest revenue systems, the charges paid to the Government in Fiji can be grouped into three main types:

- charges for the use of the forest resource;
- charges to cover the cost of services provided by the Government; and
- general taxes paid by all companies and individuals.

In addition, a number of informal or unofficial charges have also been introduced in recent years.

These charges vary according to the type of forest, ownership and location. In addition, different parts of the government administration have responsibilities for fixing, assessing and collecting these different charges. This section of the report describes the trends and current status of the first two types of charges outlined above. The payment of taxes is noted here (for completeness), but will be discussed in more detail in Section 6 of this report.

4.1 Current levels of forest charges

4.1.1 Charges for harvesting roundwood in the indigenous forest

A summary of all of the different forest charges currently paid for harvesting roundwood in the indigenous forest in Fiji is given in Table 7 and a brief description of each of them is given below. The first five charges (royalty, premium, commission, goodwill and land rent) represent charges for the use of the resource. With the exception of the land rent (which is relatively small) they account for the majority of total charges paid. The other charges are charges paid for services provided by the Forestry Department and NLTB.

Table 7 Summary of forest charges in Fiji in 2003

Type of charge	Amount by species class (in FJD per m^3)			
	Class 1	**Class 2**	**Class 3**	**Class 4**
Royalty				
Zone 1 (Viti Levu)	40.00	30.00	10.00	6.50
Zone 2 (Vanua Levu)	40.00	30.00	9.30	6.00
Zone 3 (elsewhere)	32.00	32.00	8.00	6.00
Premium				
Zone 1 (Viti Levu)	4.00 - 6.00			
Zone 2 (Vanua Levu)	nil			
Zone 3 (elsewhere)	nil			
Commission				
Zone 1 (Viti Levu)	20.00 - 45.00	10.00 - 20.00	10.00 - 15.00	10.00 - 12.00
Zone 2 (Vanua Levu)	15.00 - 25.00	10.00 - 15.00	10.00 - 15.00	10.00 - 12.00
Zone 3 (elsewhere)	data not available			
Goodwill	0.50-12.00			
Land Rent	varies			
Scaling Fee	3.50			
Map Fee	varies (charged on the basis of cost recovery)			
Application Fee	varies (charged on the basis of cost recovery)			
Renewal Fee	varies (charged on the basis of cost recovery)			
Processing Fee	varies (charged on the basis of cost recovery)			

Source: various documents, interviews and field visits.

Royalty: royalties are official charges that are fixed by Ministerial Decree and charged per cubic metre. For the purpose of fixing the royalties, Fiji is currently divided into three zones to reflect the differences in operating costs between the different islands. Royalties are also divided into four species classes to reflect the different qualities and values of products that can be manufactured from each species. A list of the species currently included in each royalty class is given in Table 8.

Table 8 Species distribution by royalty class

	Royalty class			
	Class 1	**Class 2**	**Class 3**	**Class 4**
Species	Amunu Buabua Dakua Makadre Dakua Salusalu Kuasi Rosawa Vesi Yaka	Bauvudi Dabi Damanu Dilo Kauceuti Kaudamu Kaunicina Kauvula Mavota Nawanawa Sagali Raintree	Doi Dogo Laubu Qumu Rosarosa Sacau Sausauira Tivi Vaivai-ni-veikau Yasiyasi	All native species not included in Classes 1-3, with the exception of Yasidina (Sandalwood - Santalum yasi) to which special conditions apply.

Source: Forestry Department.

Premium: premiums have been recently introduced by NLTB and are charged per cubic metre. Currently, premiums are only charged in Zone 1 (Viti Levu). The standard premium rate is FJD 6.00/m^3, although one sawmiller said that they paid FJD 6.00/m^3 for harvesting in primary forest and only FJD 4.00/m^3 in secondary forest. Premiums are paid in advance on the volume that will be harvested and are distributed amongst landowners immediately. NLTB stated that the original intention of these charges was to give landowners some immediate revenue once a harvesting licence has been approved.

Commission: commissions are payments (usually per cubic metre) that are negotiated directly between the producer and landowners. A range of figures was quoted in documents and during interviews with sawmillers and landowners. Table 7 gives the range of figures quoted, although the consensus was somewhere nearer the lower end of the ranges given above. Commissions vary by species class. In particular, much higher commissions are usually paid for species in Class 1. Commissions in the lower valued species classes may not vary by very much. Commissions may also be higher in Zone 1 than Zone 2, although this could be as a result of the particular individuals that were interviewed rather than a reliable statistical estimate. Commissions have no formal legal status, but are often codified in the contracts that are made directly between producers and landowners.

Goodwill: goodwill is another benefit to landowners that is paid for by producers. Goodwill payments can be in cash or in kind and can include activities such as building or improving roads in the community, providing free forest products or other goods and building other types of infrastructure for the local community. Once the cost of goodwill is spread across the volume harvested, a wide range of payments (per cubic metre) was quoted in documents and interviews. Goodwill payments have the same legal status as commissions. Commissions and goodwill payments are both recent innovations, which apparently started when producers wanted to encourage more landowners to allow harvesting in their forests.

Land Rent: land rent is paid each year by those producers that hold long term forest concessions. Land rent varies and it was not possible to collect information about the level of land rents. However, the most that can be charged as land rent is six percent of the unimproved capital value of the land (USDC, 2000), so forest land rent is likely to be quite low. Land rent assessed every five years by NLTB, who have the legal power to do this.

Scaling Fee: the Forestry Department collects a scaling fee on every cubic metre of roundwood that is harvested. This fee does not vary by species or location and is supposed to cover the Forestry Department's costs of production monitoring and control.

Map Fee: the Forestry Department also charges for the production of a harvesting map and plan, which is a necessary part of any licence. The charge reflects the cost of production and is generally quite small. Amounts of FJD 100 to FJD 200 (in total) were quoted during interviews.

Application, renewal and processing fees: these fees are charged by NLTB to cover their administrative costs of processing and approving licences. Figures quoted were in the range of FJD 1,000 to FJD 1,500 in total (for a first application) and less for a renewal.

4.1.2 Charges for harvesting roundwood in forest plantations

The majority of forest plantations in Fiji are the pine plantations managed by FPL and the mahogany plantations managed by FHCL. However, there are also some small areas of forest plantations owned and managed by private individuals (extension plantations). Most of the above charges do not apply to harvesting in the extension plantations (although a proportion of the total land rent of an agricultural landholding would be attributable to any forest plantations therein, if the landholding was on native land). In addition, the Forestry Department was somewhat uncertain about whether production monitoring and control would be required in such areas and, therefore, whether the Scaling Fee would be charged.

For the other forest plantation areas, the Government has devised a different system for assessing and collecting forest charges. For example, in the mahogany plantations, charges will be assessed as follows:

- landowners will receive land rent for the lease of the land covered by the forest plantations;
- landowners will receive 10 percent of the stumpage value of all harvested roundwood; and
- landowners will hold a share in the equity of FHCL through the Fiji Mahogany Trust (FMT).

The first two benefits above are similar to the land rents and royalty payments that landowners currently receive from harvesting in the indigenous forest. The equity share in FHCL has yet to be decided (Government of Fiji, 2002) and the dividends from this will be used to acquire further shares in FHCL or to pay for other services for the benefit of landowners.

4.1.3 Other forest charges

There are some small charges for the production of other forest products (e.g. posts, poles and fuelwood), but the volumes harvested and amounts collected are relatively small. In addition, the Forestry Department charges user fees for entry to some forest parks and to recover the cost of some other services provided. A small amount of money is also collected from fines for forest offences. Further details of the amounts collected from these charges are given in Table 30 in Appendix 1.

There are no specific forest charges on the processing of forest products or the trade and sale of forest products, other than general taxes (e.g. income tax, value-added tax (VAT), import and export duties).

4.2 Trends in forest charges

Premiums, commissions and goodwill are relatively recent charges that have been introduced by the NLTB and landowners. Apart from these developments, forest royalties have been raised on three occasions in the last two decades. Table 9 shows the forest royalties charged since 1982 and compares them to changes in general prices (GDP inflation) and sawnwood export prices over the same period.

As the table shows, since 1982, forest royalties in Fiji have been simplified, with the reduction in the number of royalty classes from five to four. In addition, the number of different zones has been reduced from four to

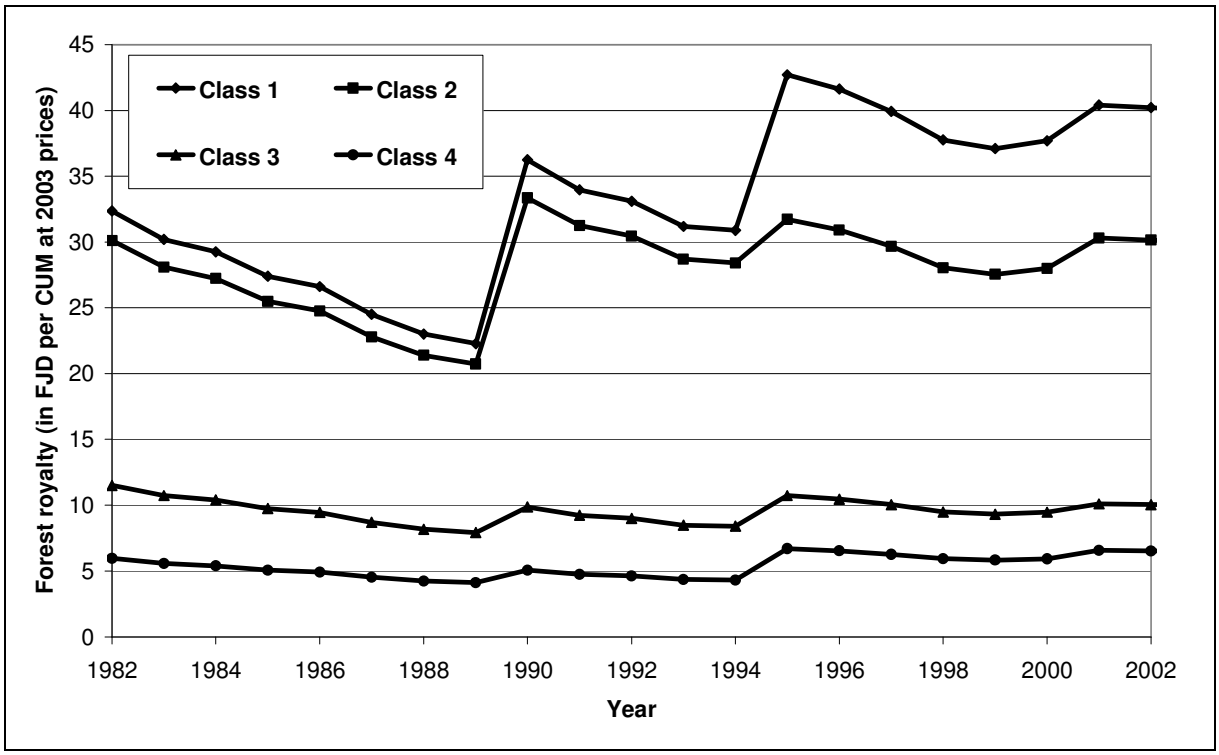
three. Originally, the two main islands were split into two different zones for the purpose of setting forest royalties. These zones have been merged on both of the islands and a third zone has been created to accommodate harvesting on the other islands. It should also be noted that although the two main islands are in different zones, the royalties in these two zones have been the same in the top two species classes since 1990 and differ only slightly in the other two classes.

Table 9 Levels and changes in royalty rates in Fiji compared with changes in prices 1982 - 2001

Year	Royalty class	Amount by location (in FJD per m^3)					Increases with revisions			GDP inflation over the same period	Change in sawnwood export prices over the same period
		Viti Levu		Vanua Levu		Elsewhere	Viti Levu	Vanua Levu	Elsewhere		
1982	Class 1	15.70	13.00	12.90	10.60	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Class 2	14.70	12.00	11.90	9.60	n.a.	n.a.	n.a.	n.a.		
	Class 3	5.80	4.40	4.30	3.00	n.a.	n.a.	n.a.	n.a.		
	Class 4	3.00	2.30	2.20	1.60	n.a.	n.a.	n.a.	n.a.		
	Class 5	1.60	1.50	1.30	1.00	n.a.	n.a.	n.a.	n.a.		
1990	Class 1		25.00		25.00	18.00	74%	113%	n.a.	56%	51%
	Class 2		23.00		23.00	16.00	72%	114%	n.a.		
	Class 3		6.80		6.10	5.00	33%	67%	n.a.		
	Class 4		3.50		3.15	3.00	32%	66%	n.a.		
1995	Class 1		35.00		35.00	28.00	40%	40%	56%	19%	10%
	Class 2		26.00		26.00	19.00	13%	13%	19%		
	Class 3		8.80		8.10	7.00	29%	33%	40%		
	Class 4		5.50		5.15	5.00	57%	63%	67%		
2001	Class 1		40.00		40.00	32.00	14%	14%	14%	21%	84%
	Class 2		30.00		30.00	22.00	15%	15%	16%		
	Class 3		10.00		9.30	8.00	14%	15%	14%		
	Class 4		6.50		6.00	6.00	18%	17%	20%		

Source: Forestry Department.

Figure 14 Royalty rates in Fiji (Zone 1) after adjustment for inflation 1982 - 2002

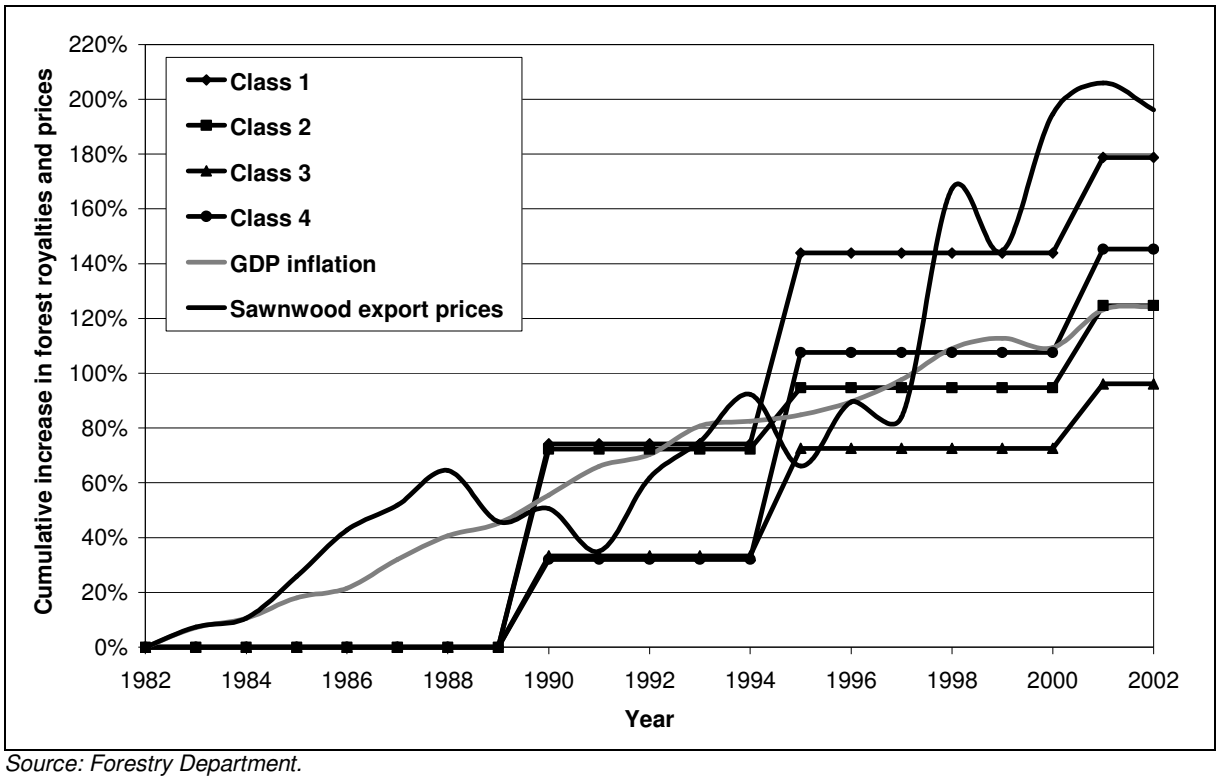


Source: Forestry Department.

Figure 14 shows the trends in royalty rates in Zone 1 (Viti Levu) for each of the four species classes since 1982 after adjustment for inflation (i.e. the figures are all converted to 2003 prices using the GDP deflator for Fiji). This shows that increases in royalty rates have fallen slightly behind inflation for Class 3 species.

Increases in royalty rates for Class 2 species have matched inflation and increases for Class 4 species have been slightly higher than inflation. Increases in royalty rates for Class 1 species have been well above inflation, although the last increase (in 2001) did not return the real level of the royalty to the level achieved with the previous increase (in 1995). The real increase in royalty rates for Class 1 species amounts to about 25 - 30 percent on average over the period. This high increase is presumably justified by increases in the selling prices of sawnwood manufactured from these species.

Figure 15 Cumulative increases in royalty rates and prices in Fiji (Zone 1) 1982 - 2002



Source: Forestry Department.

Figure 15 presents this information in a slightly different way and shows how the cumulative increases in royalty rates (not adjusted for inflation) compare with increases in general prices (GDP inflation) and sawnwood export prices. This confirms that increases in royalty rates for Class 1 species have been broadly in line with increases in sawnwood export prices.

4.3 Revenue collection and administration[11]

4.3.1 Process of setting forest charges

The harvesting and extraction of forest products in Fiji is controlled by a number of licensing requirements that fall under the control of the Forestry Department and NLTB. Specifically, the following legislation refers to licensing and the payment of fees:

Sec. 33 - 1984 Native Land (Leases and Licences) Regulations, Cap 134:

> *Reg. 10* *"The Board may, by licence, grant such rights in, on, under or over native land, for such purposes and subject to such terms, conditions and covenants as the Board shall determine."*

Sec. 33 - Native Land (Forest) Regulations, Cap 134:

> *Reg. 8(1)* *"All forest produce cut, sawn, converted, collected or removed under a licence in Forms 1 or 2 shall be liable to royalty at the rate laid down in the royalty rate list in the Second Schedule:"*

Forest Decree, 1992:

> *Sec. 16(1)* *"A licence shall be subject to the payment of such fees as may be prescribed."*
>
> *Sec. 38(2)* *"prescribe -*
>
> *(i) in the royalties due on produce cut or collected under licence on State land or on native land in forest reserves;*
>
> *(ii) the fees and any other charges due to the State on produce cut or collected under a licence on any land."*

The above legislation states that both the Forestry Department and the NLTB have the power to award licences and set forest charges.

Current practice is for the Forestry Department and NLTB to consult with the forestry industry and to agree between themselves what the level of forest royalties should be. There is no formal system of formulae and/or calculations for the revision of forest charges, although it appears that past revisions have been broadly in line with inflation and changes in sawnwood prices. Revisions in the past have taken place infrequently, but the aim now is to revise the forest royalty rates every 2.5 years.

For the informal charges (commissions and goodwill payments), the level of charges are negotiated directly between forest operators and landowners. In addition to the official licences from NLTB and the Forestry Department, most harvesting operations are also governed by a legal contract between the operator and landowners, which specifies the payments that should be made.

[11] The discussion here is restricted to charges on harvesting of natural forest on native land. NLTB are not involved in harvesting on private land or crown/state land. (In the latter, royalties are charged but are retained by the Government). Although the Forestry Department are responsible for the supervision of harvesting on private land, very little production comes from private land and it is unclear what charges, if any, would be levied. The charges collected from operations in private forest plantations on native land are restricted to the land rents levied by NLTB on agricultural land and are arranged accordingly. Arrangements for setting, collecting and distributing charges from operations in the mahogany and pine plantations are also organised differently (see Section 4.1.2).

4.3.2 Collection and distribution of forest charges

The collection and distribution of forest charges is closely tied to the awarding of licences and the monitoring of forest operations by the Forestry Department.

In order to harvest forest products, landowners must first apply for a licence from NLTB. This is relatively easy for native land outside reserves, but is quite difficult for native reserve land (where the applicant(s) must get the majority agreement of all of the relevant landowners). The licence from NLTB is awarded in the name of the applicant(s) (i.e. landowners), but the producer or *"contractor"* is usually specified on the licence. At the time that the licence is issued, NLTB collects the application or renewal fee and processing fee, plus an advance payment for royalties and premium (where applicable). These fees are normally paid by the producer.

In addition to this, the producer must also obtain a Forestry Right License. This is awarded by the Forestry Department and is subject to the producer submitting a forest management or harvesting plan and abiding to all forestry regulations. The licence is free, but requires a map and the Forestry Department collects a small charge for this. The Forestry Department also usually collects an advance payment for some of the Scaling Fees that will be due.

When production starts, the producer must obtain a permit to cut and remove the harvested forest products. Forestry Department staff visit production areas to record and mark production, usually in the presence of both the producer and a landowners representative. Permits are time-bound, so the frequency of inspections is dependent on the level of production and the times at which producers wish to take their products to the mill. This information is then entered into the Forestry Department's management information system, which is used to record production and calculate the royalties and scaling fees due. The Forestry Department invoices producers for the Scaling Fees and sends the royalty information to NLTB. NLTB is now (since October 1996) responsible for the invoicing and collection of royalties and premiums.

NLTB distribute 90 percent of the royalties collected in each *mataqali* to the landowners registered in that *mataqali*, according to a formula. NLTB are encouraging landowners to accept payments directly into bank accounts, otherwise NLTB have to visit landowners to pay them in cash. There was some debate about the length of time it took for NLTB to distribute this money, with some stakeholders complaining that it could take up to six months (or more) for money to be distributed.

The other ten percent of the royalties collected is retained by NLTB to cover their administration costs. This proportion has fallen from 25 percent (and then 15 percent) in recent years. NLTB believe that the current figure is too low to cover all of their costs, which is why they have introduced higher application and processing fees. In contrast, discussions with the Forestry Department suggested that they believe that the Scaling Fees and Map Fees that they collect are sufficient to cover their costs of monitoring and administration.

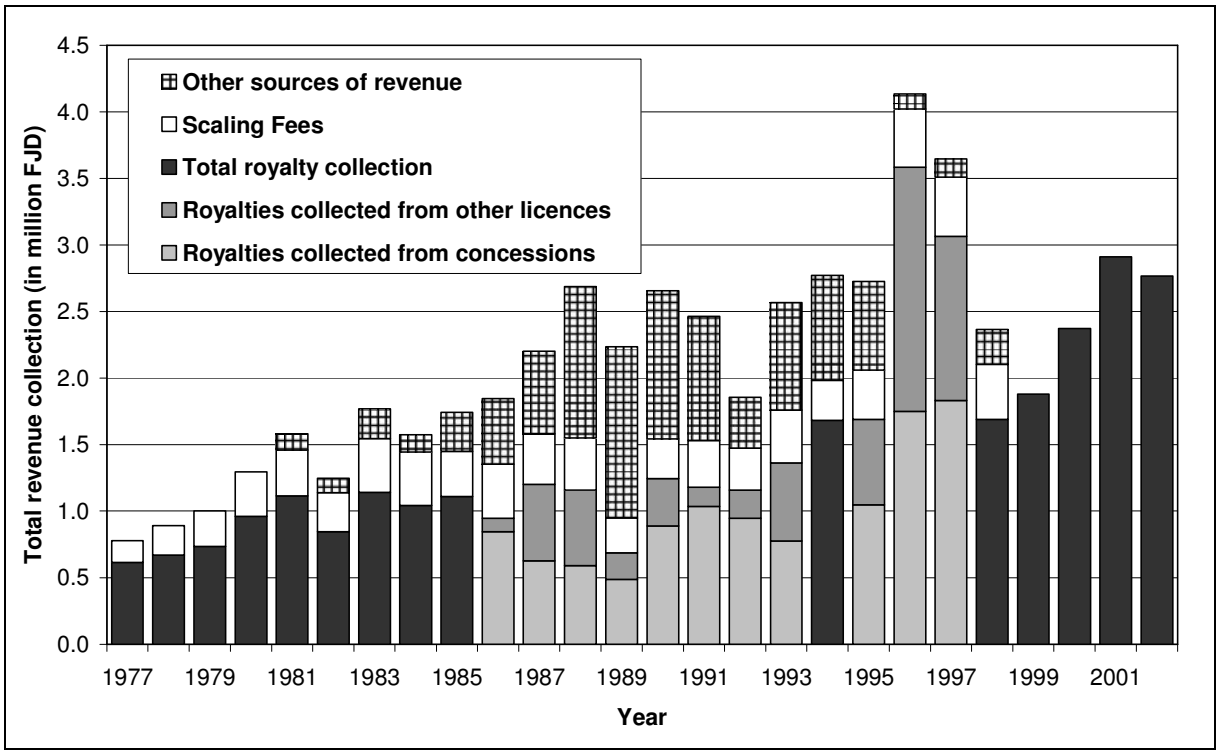
Commissions and goodwill payments are paid directly by producers to landowners (or their representatives) according to whatever they have agreed. Interviews with stakeholders suggested that these payments are preferred by landowners because this money is distributed far more quickly than the royalties are. For example, one landowner said that they got their commissions within one week of the logs leaving the forest. It should be noted that there are no rules governing the distribution of this money and it is unclear whether these payments benefit all landowners. However, one producer did say that they pay commission and goodwill into a community fund, which is controlled and used by the community for social projects.

4.4 Trends in total revenue collection

4.4.1 Structure and composition of forest revenue

Trends in the structure and composition of forest revenue are shown in Figure 16 and further details are available in Table 30 in Appendix 1. This figure shows that total revenue collection increased from around FJD 750,000 in 1977 to around FJD 3 million in 2002. The majority of forest revenue is collected from the few long-term forest concessions still operating in the country, although revenue from other types of licences has been significant in some years (e.g. 1996 and 1997) and is believed to be growing in importance. Other sources of revenue include miscellaneous charges (user fees, map fees, fines, etc.) and revenue from commercial operations (most of which were hived-off from the Forestry Department in 1996).

Figure 16 Trends in the structure and composition of forest revenue collected by the government in Fiji 1982 - 2002

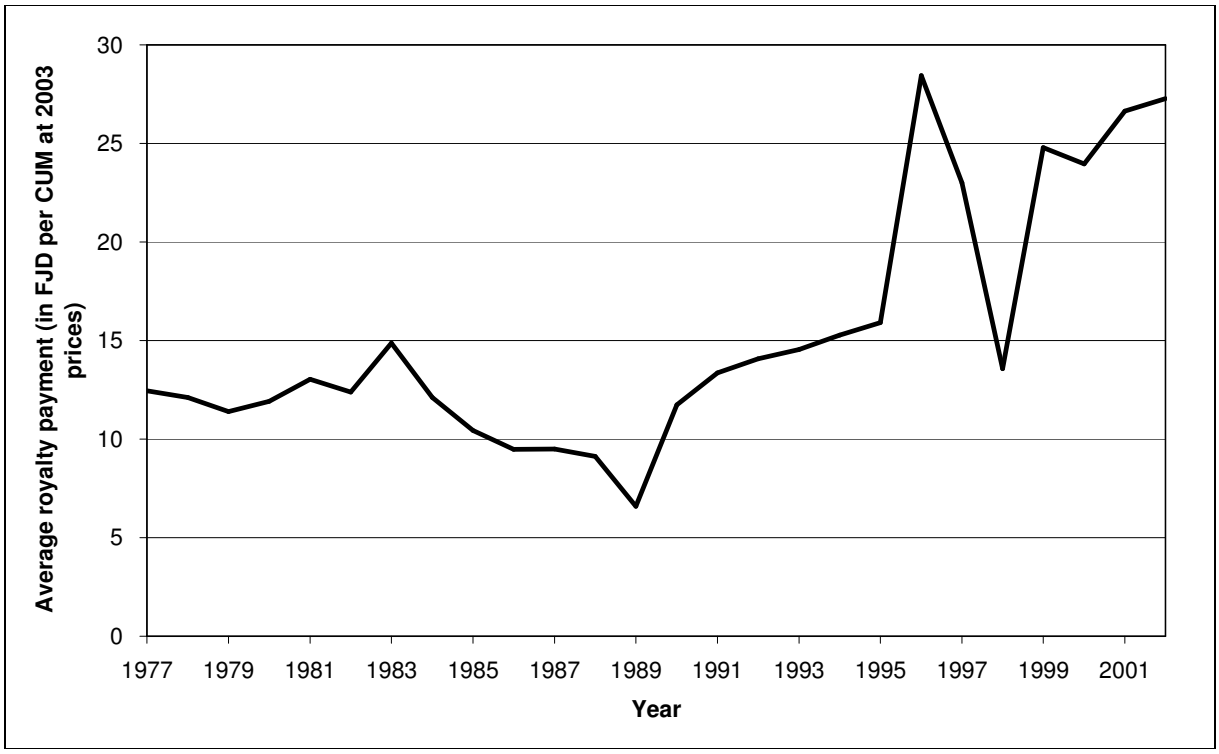


Source: Forestry Department. Note: the figures for 1977-1980 and 1999-2002 exclude other sources of revenue and revenue from scaling fees is excluded for the latter period as well. These figures also do not include revenue collected from operations in the pine and mahogany plantations.

Figure 17 shows the average level of royalty payment adjusted to 2003 prices over the period 1977 - 2002. This shows that the average payment has more than doubled from around FJD 12.50 to FJD 27.00 over the period. Given that the royalty rates in Classes 2 to 4 have increased broadly in line with inflation and the rate for Class 1 species has increased in real terms by only about 25 percent, this implies that the composition of harvesting has tended towards Class 1 and Class 2 species in recent years.[12] The importance of these species is confirmed by Figure 18 (and Table 31 in Appendix 1), which shows that species in Classes 3 and 4 accounted for about one-quarter of production and less than ten percent of royalty payments in 1999 and 2000. In contrast, species in Class 2 accounted for 55 percent of production and 61 percent of total royalty payments.

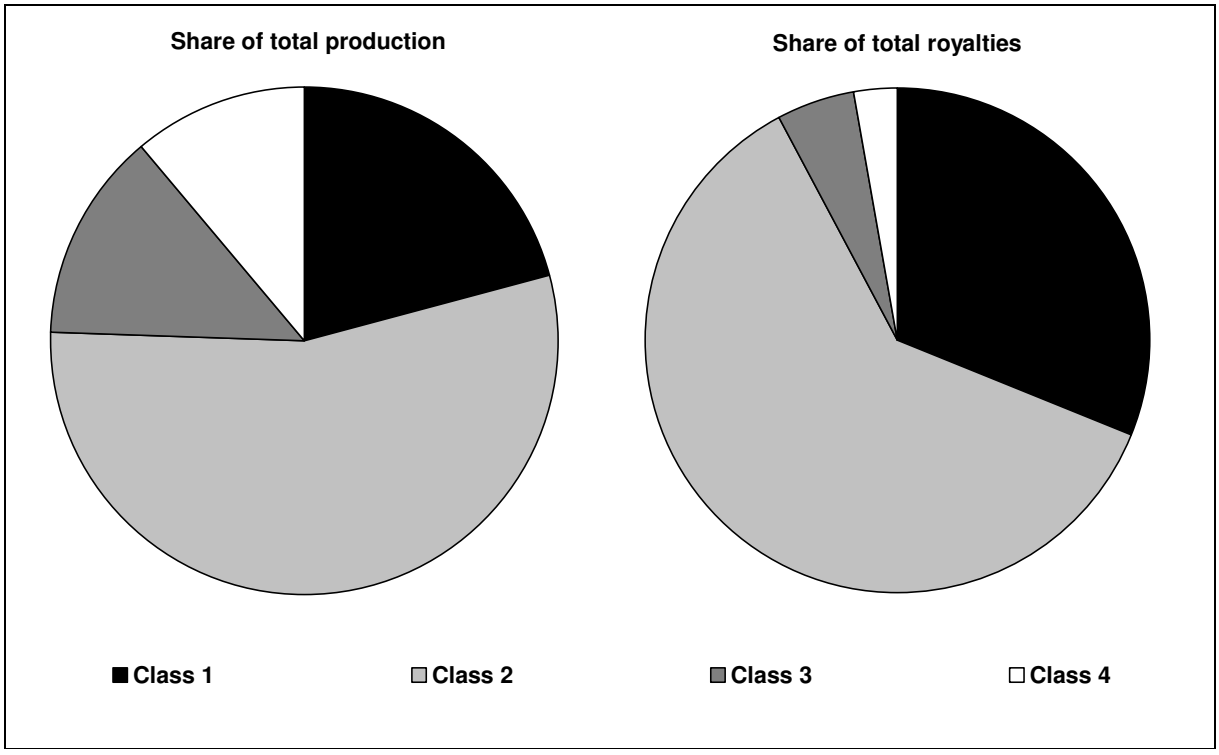
[12] An alternative interpretation is that the most commonly harvested species have been reclassified into higher value species classes over the period, but this seems unlikely.

Figure 17 Trends in the average royalty payment in Fiji 1977 - 2002 (at 2003 prices)



Source: Forestry Department.

Figure 18 Distribution of production volumes and total royalty payments by species class in Fiji in 1999 and 2000

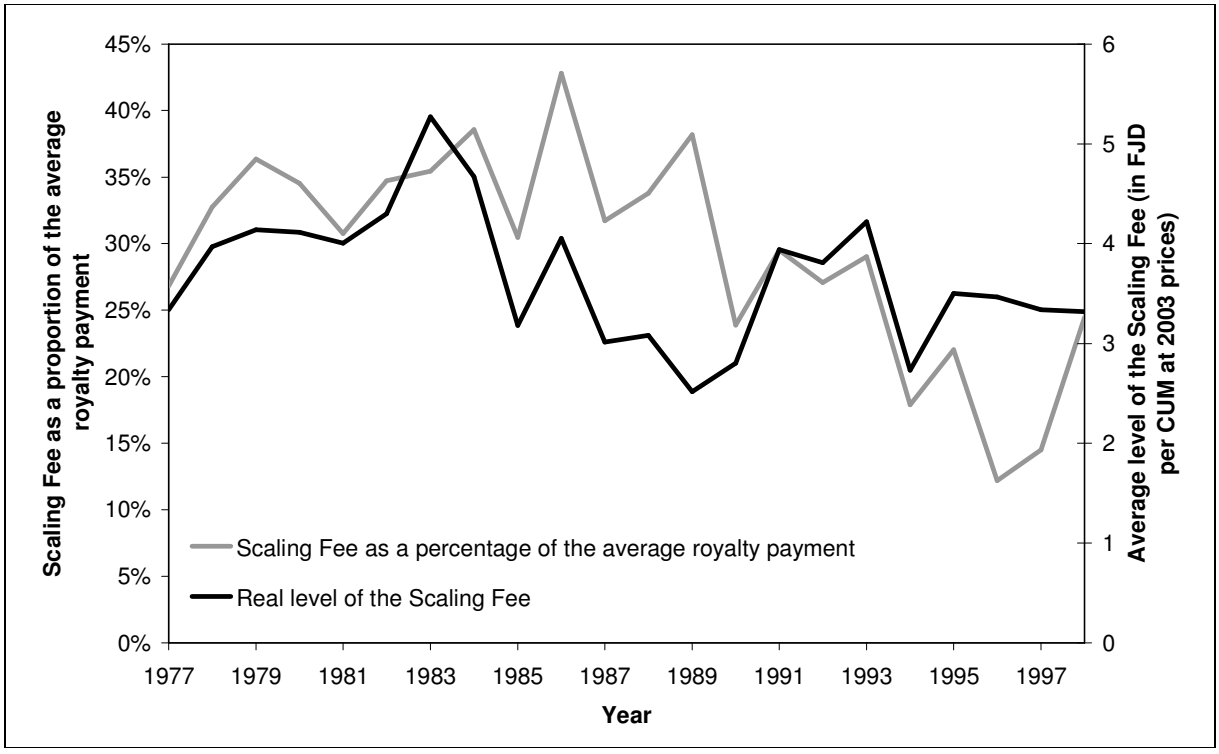


Source: Forestry Department (2001).

4.4.2 Administrative efficiency

An important feature of any forest revenue system is the administrative efficiency of the system or the costs of revenue collection compared to the total amounts collected. The trend in the real level of the Scaling Fee is shown by the black line (measured against the right axis) in Figure 19. This shows that, after adjusting for inflation, the level of the Scaling Fee has remained constant at about FJD 3.50 (at 2003 prices) over the last two decades. As the average level of royalty payments has increased in real terms, the level of the Scaling Fee relative to the average royalty payment has fallen over the same period. The grey line (measured against the left axis) in Figure 19 shows that Scaling Fees have fallen from an additional 30 percent on top of royalties throughout much of the 1980s to around 15 percent in more recent years. Assuming that the Scaling Fee does cover the Forestry Department's costs of monitoring and administration (as they seem to think it does), this figure is remarkably low compared with many other countries, suggesting that the forest revenue system is efficient.

Figure 19 Trends in the Scaling Fee charged by the Forestry Department in Fiji 1977 - 1998



Source: Forestry Department.

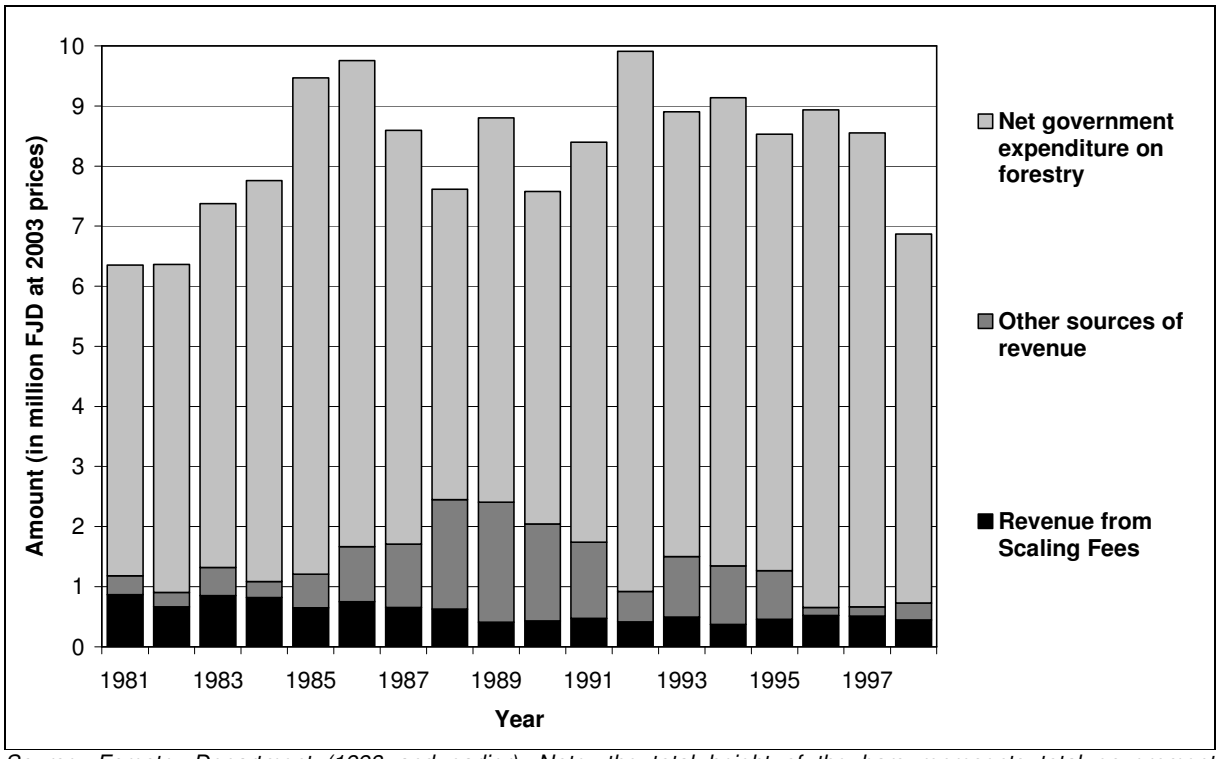
4.4.3 Contribution to government expenditure on the sector

Figure 20 shows the trend in total government expenditure on forestry from 1981 to 1998 (adjusted for inflation to 2003 prices), along with the contribution to expenditure from revenue collected and retained by the government (i.e. excluding royalties). As the figure shows, the total level of government expenditure on forestry in Fiji has remained roughly constant over the period at between FJD 7 million and FJD 9 million per year (at 2003 prices). Thus, there is very little correlation between expenditure and production from the natural forest, suggesting that production monitoring, control and revenue collection activities do not account for a significant proportion of government expenditure on the sector.

The amount collected from Scaling Fees has declined from just under FJD 1 million (at 2003 prices) in the early 1980s (around 10 to 15 percent of expenditure), to about FJD 500,000 (around five percent of expenditure) in recent years. Net government expenditure on the forestry sector has been about

FJD 7 million (around 80 percent of the total), showing that the implementation of forestry policy has been largely financed by the state.

Figure 20 Trends in net and total government expenditure on forestry in Fiji 1981- 1998 (at 2003 prices)



Source: Forestry Department (1998 and earlier). Note: the total height of the bars represents total government expenditure on the sector.

5 ECONOMIC RENT ANALYSIS

This section describes the data collected about production costs and product prices in Fiji and the methodology used to calculate economic rent. It finishes by presenting the results of the economic rent analysis and describing the implications of these results for the level of forest charges.

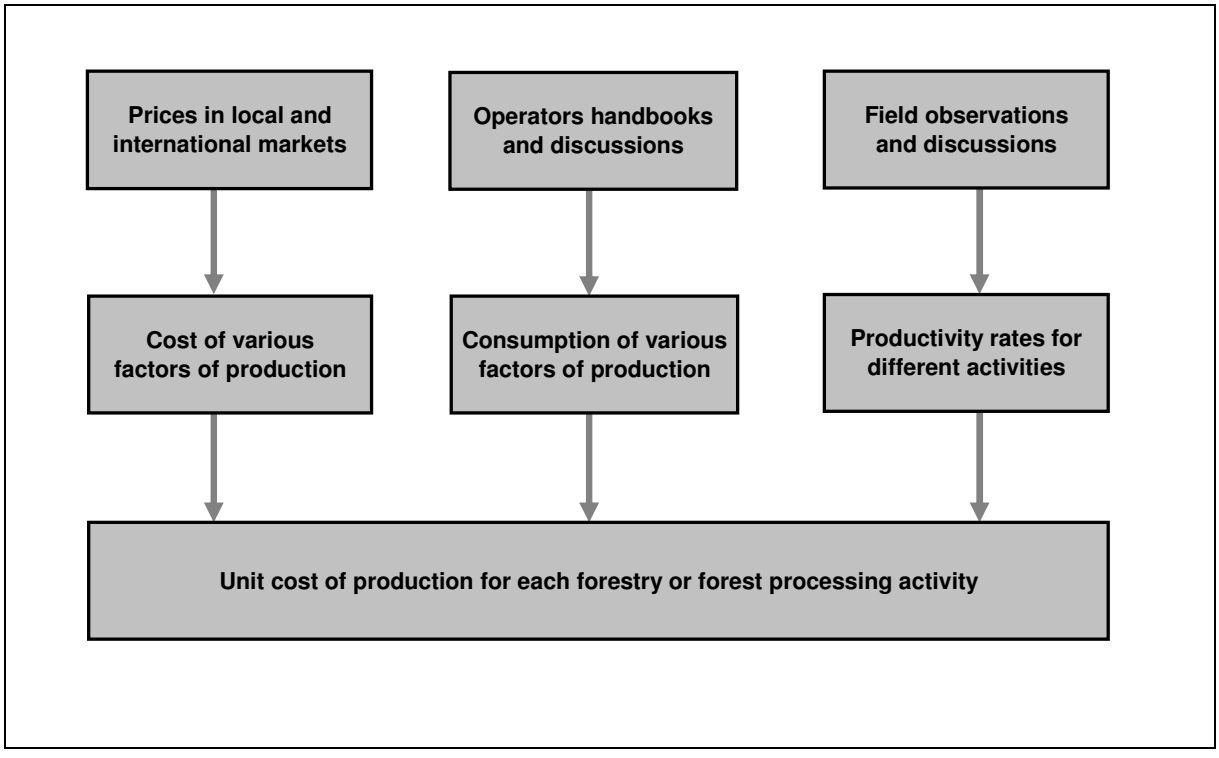
5.1 Data collection

In order to calculate the level of economic rent from roundwood production in Fiji, it was necessary to collect detailed information about the costs of forest operations. In addition, because there is no log export market and it is difficult to obtain reliable information about domestic log prices, the costs of forest processing were also estimated in order to subtract all of these costs from forest product prices to arrive at the economic rent.

5.1.1 Roundwood production and processing costs

Production costs were calculated *"from the bottom up"*. In other words, information about the costs of individual factors of production (e.g. labour, fuel, tools and machines) was collected and used, along with information collected about the consumption of materials and productivity rates, in order to calculate the unit costs of production for each activity (e.g. felling, road transport, kiln drying). A simplified picture of the process used to estimate the unit costs of production is given in Figure 21.

Figure 21 A simplified picture of the process used to collect cost data and produce unit costs of production for various forestry and forest processing activities in Fiji



The above information was collected from a variety of sources from both within Fiji and abroad.[13] The local information was collected as part of the two-week visit in October 2003, during interviews with Forestry Department staff and local producers. In total, interviews were held with 11 individuals from the forest industry, three Forestry Department staff, three landowners' representatives and a representative of the Fiji

[13] For example, see Whiteman (1999b) for details of internationally available sources of information about machinery and equipment costs

Sawmillers Association. In addition, eight forest processing facilities were visited and one forest harvesting site.

Information on wage rates and import tariffs was obtained from official statistics from the Bureau of Statistics (2000), Fiji Trade and Investment Bureau (FTIB, 2003) and US Department of Commerce (USDC, 2000). Other documents consulted included a submission on forest charges from the Fiji Sawmillers Association (FSA, 2003) and calculations by the NLTB (2003). Discrepancies between these documents, the interviews with individuals from the forest industry and the economic rent calculations were discussed with Forestry Department and, where appropriate, the calculations presented here were modified accordingly.

It should be noted that, throughout this process, figures were constantly checked, re-checked and updated after discussions with different stakeholders and taking into account experiences from other countries. Although this is never a precise process, it is believed that the figures presented here present a reasonable and unbiased picture of the cost and price structure of forest operations in Fiji.

Other types of information from international data sources were also used to check and validate the statements given during interviews. For example, information about materials consumption and productivity rates was collected from reference sources such as machine operator's handbooks and compared to statements from the industry. For a variety of reasons, the level of productivity and capital utilisation in Fiji is less than the maximum that could possibly be achieved, but it is probably higher than most other countries at a similar level of development. The analysis presented here is based on current harvesting methods and levels of productivity, although there may be some room for improvement.

5.1.2 Roundwood and product prices

Price information was collected from the main sources listed above. In addition, the Forestry Department supplied sawnwood export price data by species and grade for the period 1999 to 2002.

Most forest processors in Fiji harvest roundwood from their own licence areas, so it was not possible to gather much information about market prices for delivered roundwood. Table 10 presents the range of figures obtained from the data sources, along with estimates of product recovery rates. The individual number of observations is very small, so these figures should be treated with a great deal of caution. However, although the range for Class 1 species is quite wide, there was a remarkable convergence between the different data sources about the prices paid for roundwood in the other classes.

Table 10 Current (2003) prices for delivered (mill-gate) roundwood in Fiji

Royalty class	Mill-gate price (in FJD per m^3)		Product recovery rate (in percent)	
	Low	High	Low	High
Class 1 species	210	280	50	55
Class 2 species	130	150	48	51
Class 3 species	110	120	48	
Class 4 species	90		46	

Source: Field survey.

It is also interesting to note that the quoted mill-gate prices are much higher than the delivered roundwood production cost (including royalties and all other charges) calculated below. Where the majority of a commodity is processed in an integrated operation, is not unusual for *"spot"* prices to be much higher than production costs. However, these figures demonstrate the importance to forest processors of having a stable and secure source of supply. If all roundwood was harvested by independent loggers, the mill-gate price would probably be much lower, as it is unlikely that the industry could pay these prices for all of their raw materials. This divergence between mill-gate prices and delivered roundwood costs has profound implications for the Government's policy towards awarding harvesting licences.

Table 11 presents information about sawnwood prices by royalty class and grade and the average grade distribution. This information was obtained from the Fiji Sawmillers Association (FSA, 2003) and NLTB (2003). These figures are quite surprising, in that the FSA are quoting higher product prices than NLTB. The figures from the FSA also seem to contradict some of the other statements in their submission (e.g. where they highlight the fact that export prices for some Class 1 species have fallen dramatically in 2003 due to competition from other countries in major export markets).

Table 11 Current (2003) sawnwood prices in Fiji

Data source and grade	Grade distribution	Price by royalty class (in FJD per cubic metre)			
		Class 1	Class 2	Class 3	Class 4
FSA: FF Select and better	70%	1,200 [export]	900 [export]	480 [wholesale]	480 [wholesale]
FSA: FF Standard	25%	550 [wholesale]	480 [wholesale]	480 [wholesale]	480 [wholesale]
FSA: Commons	5%	250 [wholesale]	250 [wholesale]	250 [wholesale]	250 [wholesale]
FSA: Average of above	100%	990	763	469	469
NLTB: Average of all grades	n.a.	700	500	400	320

Source: FSA (2003) and NLTB (2003).

Table 12 Average sawnwood export prices 1999 - 2002 (at 2003 prices)

Species	Average price by grade (FJD per cubic metre at 2003 prices, FOB)			
	Select and better	Standard	Ungraded	All grades
Buabua	1,047	948	704	954
Dakua Makadre	1,053	n.a.	1,019	1,043
Dakua Salusalu	1,020	n.a.	1,220	1,105
Rosawa	874	727	773	825
Vesi	872	n.a.	849	862
Yaka	1,188	975	1,092	1,103
Average for Class 1 species	**1,009**	**883**	**943**	**1,007**
Bauvudi	803	n.a.	771	790
Damanu	792	865	673	771
Kaudamu	837	934	686	861
Kauvula	756	798	796	785
Average for Class 2 species	**797**	**866**	**732**	**805**
Rosarosa	1,407	509	570	749
Sacau	1,143	704	917	965
Yasiyasi	1,206	704	628	791
Average for Class 3 species	**1,252**	**639**	**705**	**845**

Source: Forestry Department.

Table 12 presents information about average sawnwood export prices by species and grade over the period 1999 to 2002 (more detailed statistics are available in Table 32 in Appendix 1). These figures have all been updated to 2003 prices using the GDP deflator. Unfortunately, the overall amount of exports from Fiji is so small that individual export consignments of unusually high or low value confound any attempt to draw conclusions from these figures about trends in prices or the relative value of different species and sawnwood product grades. It is, therefore, extremely difficult to identify any clear patterns in these figures or to comment on whether individual species should be moved from one royalty class to another. However, the general levels of prices recorded in these statistics would seem to confirm that the export prices given in the FSA submission seem a little on the high side.

5.2 Calculation methodology

The economic rent from forest harvesting was calculated using two simple spreadsheet models. Copies of these models, along with their associated manuals, were left with the Forestry Department and can also be found at: www.fao.org/forestry/finance.

First, the total delivered roundwood production cost was calculated using a model developed for an FAO Project in Suriname (see Whiteman, 1999a for further details of the roundwood production cost model used in this analysis). The model uses standard forestry costing techniques, such as those described in FAO (1977). The scale of harvesting operations in Fiji is similar to Suriname, so it was very easy to input the data collected in Fiji into the existing modelling framework. An example of the data used in the model and the outputs from the model is given in Appendix 2.

The results from this model were then entered into a forest industry cost model. This model was first developed for a DFID Project in Indonesia, but has been subsequently used in a number of other countries. Again, the model follows internationally accepted investment appraisal and accounting procedures used to measure profit and loss, deprecation and tax (see Scotland and Whiteman (1997), for details of how to use the model). Although the scale of operations in Fiji is relatively small compared with Indonesia, it was quite easy to input the data from Fiji into the model and to use it to examine the profitability of forest processing operations. An example of the data used in this model and the outputs produced by the model is given in Appendix 3.

It should be noted that this analysis uses a discounted cash-flow methodology to calculate the profitability of investments in the forestry sector (i.e. the ROC), or the level of *"normal profit"* required by processors and the residual economic rent from production. The submissions from the FSA and NLTB used the simpler approach of a required profit margin (or mark-up on non-capital operational expenditure) as a measure of the *"normal profit"* required by processors. While this is much simpler, it is not a very accurate or reliable indicator of the level of profits required to retain investment (or encourage new investment) in the sector. For harvesting operations, the two approaches give quite similar results.[14] However, for the analysis of investments in the processing industry, the amount of profit required for a 20 percent ROC will be very different (i.e. much higher) than a 20 percent profit margin, because of the capital intensive nature of production. This explains why a rate of 20 percent ROC may seem a little low in comparison with what forest processors might expect as an acceptable profit margin.

[14] Indeed, the harvesting cost model also calculates delivered roundwood cost including a profit margin or return on expenditure as an alternative calculation methodology - see Figure 31.

5.3 Delivered roundwood production cost

As already noted, roundwood production costs can vary due to a range of factors outside and within the forest managers' control. Therefore, as a starting point for this analysis, the production cost for a *"typical"* or *"representative"* forest operation was constructed. A sensitivity analysis then examined variations in the total roundwood production cost, due to variations in the two factors that are likely to have the greatest impact on costs: transport distance and harvesting intensity.

5.3.1 The total roundwood production cost for a *"typical"* forest operation

The four main factors that influence roundwood production costs are: the area being cut each year (i.e. scale of operations); harvesting intensity (and, thus, annual production from the area); harvesting, extraction and transport methods currently used to get timber from the forest to the mill; and the average transport distance. Information about each of these variables was collected during the field visits and discussions with forest managers.

Cutting area. The majority of forest operations in Fiji are small-scale logging operations managed by small to medium-sized sawmills under Annual Licences. Discussions with the industry and the Forestry Department revealed that the average licence area includes about 500 acres (or 200 ha) of forest. Therefore, an annual cutting area of 200 ha was used in the analysis as representative of a *"typical"* forest operation currently working in Fiji.

Harvesting intensity. Very little information is available about the sustainable yield from the natural forest in Fiji. According to the Forestry Department, first harvests may produce as much as 30 m^3/ha or more. Following this, it is believed that a cutting cycle of 20 years gives sufficient time for regeneration. However, the Forestry Department did express some concern that, after a second harvest, it may take a much longer time for the forest to reach a commercially acceptable stocking level. Assuming an annual harvest area of one-twentieth of the total productive area, the figures presented for Fiji's long-established forest concessions in Table 24 suggest an average harvesting intensity in secondary forest of 10 m^3/ha to 15 m^3/ha. The transition from harvesting in primary forest to secondary forest is only gradually starting to take place in Fiji, so the higher figure of 30 m^3/ha was used in this analysis. However, it must be recognised that this figure will fall in the future. By multiplying this figure by 200 ha, this would suggest that the current level of production in a *"typical"* forest operation in Fiji might be around 3,000 m^3/year. This figure would also be in line with the log input of most of the medium-sized sawmills in the country.

Production techniques. Harvesting in Fiji is quite expensive due to the terrain and the fact that logging only takes place for part of the year in most operations. In terms of their impact on production costs, the three most important aspects of current harvesting practices are the amount of road building required, skidding distances in the forest and the quality and age of equipment used. Most forest harvesting areas in Fiji require some road building in the forest and usually require the construction of access roads as well. Based on discussions with the Forestry Department and interviews with producers, it was assumed that an average of 2 km of access road would be built in a typical harvesting area, plus another 2 km of road in the forest, giving a roading density of 10 m/ha in the forest. From the roading density, it is possible to calculate the average skidding distance, assuming an indirectness factor (in this case, this was assumed to be 20 percent). This resulted in an average skidding distance of 300 m, which was confirmed during the field visit and interviews. This is probably close to the optimal roading density in forests with a stocking level of 30 m^3/ha. In terms of the equipment used in forest operations, most operators use bulldozers for road construction and skidding and medium-sized logging trucks. Most machinery is quite old, so the depreciated value of equipment is quite low but repair costs are relatively high.

Transport distances. Fiji is small, so most harvesting operations are quite close to mills. Discussions with sawmillers revealed that most of them can make one to two round trips from the forest to the mill in a day, suggesting a haulage distance of 50 km each way.

Table 13 shows the estimated cost of harvesting, extraction, loading and transport for a *"typical"* forest operation in Fiji, calculated by the model. Added to this was another small cost of FJD 2.00/m^3 to cover the cost of planning and surveying, to give a total delivered roundwood production cost (excluding forest charges) of FJD 64.24/m^3 (USD 32.12/m^3). This cost is broadly comparable with the total delivered roundwood production cost in many other countries with moist tropical forests, but is relatively high in view of the quite short transport distance. In part, this is due to the small scale of operations, quite low harvesting intensity and low level of machinery utilisation.

Table 13 Estimated cost of harvesting, extraction, loading and transport for a "typical" forest operation in Fiji

Type of cost	Cost by activity (in FJD per cubic metre)								
	Felling	Skidding with dozer	Skidding with skidder	Loading	Road transport	Unloading & reloading	Water transport	Road building	Total
Labour	3.57	2.50	NA	1.19	3.57	2.38	NA	1.07	**14.26**
Consumables	2.47	3.93	NA	1.04	6.96	2.07	NA	4.73	**21.19**
Capital	0.12	4.30	NA	1.14	4.11	2.29	NA	2.62	**14.59**
Total (excluding profit)	6.15	10.72	NA	3.37	14.64	6.74	NA	8.42	**50.04**
Return on capital	0.07	2.50	NA	1.86	2.99	3.71	NA	1.07	**12.19**
Total (including ROC)	**6.22**	**13.22**	**NA**	**5.22**	**17.63**	**10.45**	**NA**	**9.49**	**62.24**

Figure 22 Total delivered roundwood production cost in Fiji (by activity and type of cost)

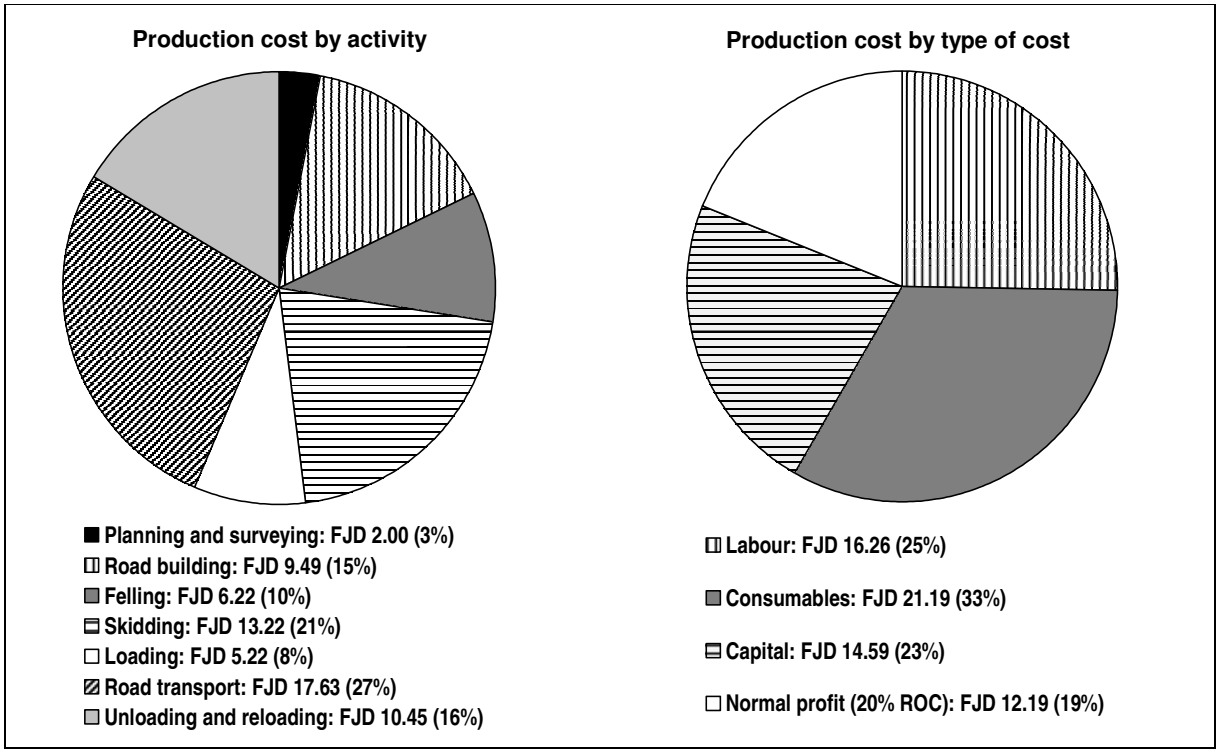


Figure 22 shows the composition of total delivered roundwood cost by production activity and type of cost. The figure shows that felling and extraction to the roadside accounts for about half of the total cost and loading, transport and unloading accounts for the other half. The largest individual component of production cost is road transport, which accounts for 27 percent of the total cost (FJD 17.63/m^3). Skidding is the next largest component, accounting for 21 percent of the total (FJD 13.22/m^3).

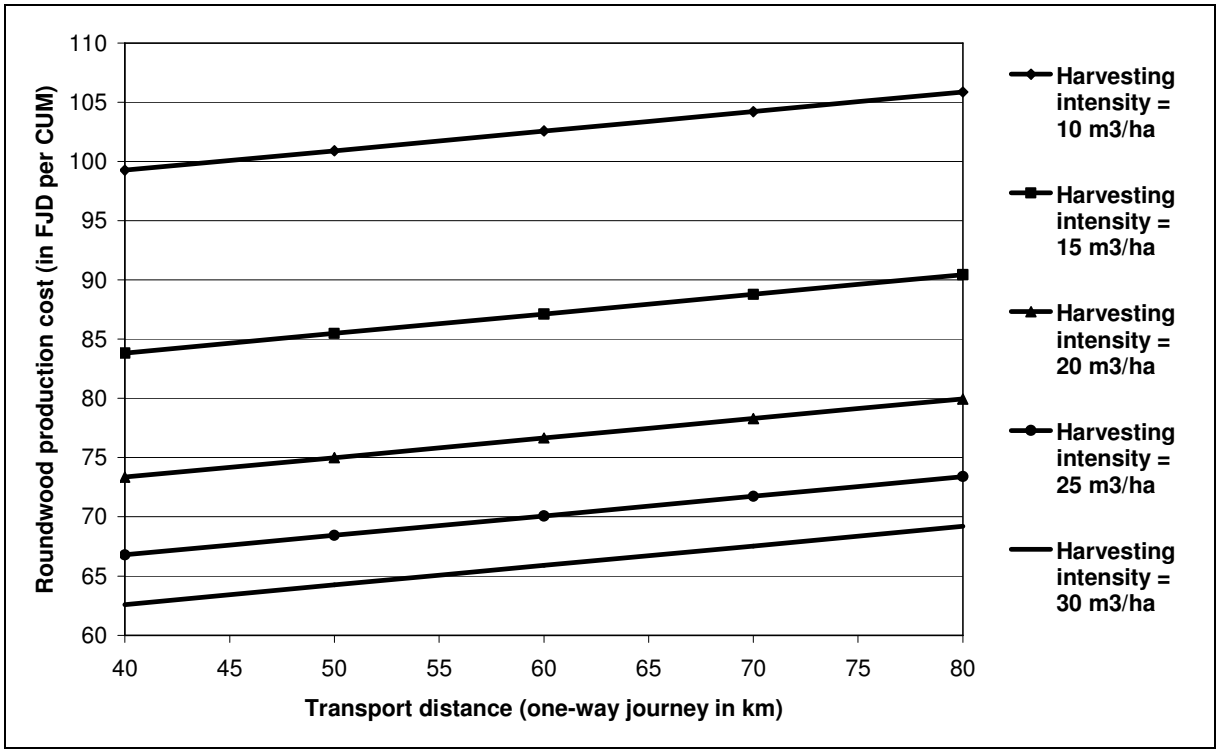
Labour costs account for about 25 percent of the total cost (FJD 16.26/m^3). This is relatively high compared with many other tropical developing countries and reflects the comparatively high labour costs in Fiji. Consumables (fuel, tools and spare parts) account for the largest share of production costs at 33 percent (FJD 21.19/m^3). This is quite high, but reflects the age of machinery (which requires a lot of expenditure on

maintenance and repairs). Conversely, the cost of capital is quite low (FJD 14.59/m^3 or 23 percent of the total). The cost of capital is the cost of depreciation of the machinery used in forest operations. As much of the machinery used in Fiji is quite old, it is already heavily depreciated and further depreciation costs are therefore quite low. The allowance for normal profit is the amount required to earn a 20 percent ROC on the money invested in machinery. This is also relatively low due to the age (and value) of machinery used in operations, accounting for about 19 percent of the total cost (FJD 12.19/m^3).

5.3.2 The impact of transport distance and harvesting intensity on the total roundwood production cost

The impact of transport distance and harvesting intensity on the total delivered roundwood production cost in Fiji is shown in Figure 23. The figures presented here have been calculated by varying the transport distance and harvesting intensity in the roundwood production cost model, while keeping the other variables the same except the cutting area, which has been increased to maintain a production level of 6,000 m^3 per year.

Figure 23 Impact of transport distance and harvesting intensity on the total delivered roundwood production cost in Fiji



The slope of the lines in Figure 23 shows that, as transport distances increase, the total delivered roundwood production cost becomes greater at a rate of roughly FJD 0.17/m^3 (or USD 0.08/m^3) per kilometre. Transport costs increase with distance not only because more fuel is consumed transporting roundwood over longer distances but also because, as distances extend, more trucks have to be used to keep-up with production. Only one truck would be required to deliver the volume of timber produced by the *"typical"* forest operation up to a distance of around 60 km. Beyond this point, overtime or contractors would have to be used to supplement the forest managers equipment up until a transport distance of around 100 km, at which point purchasing a second truck could probably be justified. Another option would be to stockpile logs in the forest and transport them all year round. The model assumes that harvesting only takes place for eight months of the year. However, it is likely that loading and transporting logs could take place for longer and a number of operators said that they stockpiled logs in the forest in order to maintain an even flow

of production. For this reason, the cost of a secondary loading and unloading is also incorporated into the calculations.

The difference between the curves in Figure 23 shows the impact of harvesting intensity on production cost. As harvesting intensity falls, production cost increases exponentially. Thus, with a 50 km transport distance, a fall in the harvesting intensity from 30 m^3/ha to 25 m^3/ha increases the production cost by FJD 4.20/m^3. A fall from 25 m^3/ha to 20 m^3/ha would increase the production cost by FJD 6.60/m^3 and a fall from 15 m^3/ha to 10 m^3/ha would increase the production cost by FJD 15.40/m^3

A lower harvesting intensity increases the production cost because the costs of road and skid trail construction are spread over lower production volumes as harvesting intensity falls. One bulldozer would be almost fully employed on road construction and skidding in the *"typical"* forest operation. If harvesting intensity falls and the cutting area is increased to compensate for this, more bulldozer time would be required to construct roads and skid trails in the larger area (i.e. with a harvesting intensity of only 15 m^3/ha, the cutting area would have to be twice as large to maintain the same level of total production and two bulldozers would be required).

This analysis has assumed that the cutting area each year can be increased in order to maintain production levels. If the cutting area was kept constant, the different curves would be even further apart (i.e. production cost would increase more for each reduction in harvesting intensity). This is because, in addition to the reason already noted above, the utilisation of the bulldozer would fall (i.e. the bulldozer would be used gradually less and less for skidding operations and would be idle for more of the time).

The above analysis suggests that production costs might increase significantly as harvesting moves from well-stocked primary forest to secondary forest areas. However, this will depend upon how much road building would be required on re-entry to a previously harvested area. For example, if harvesting in secondary forest did not require any new road building, a harvesting intensity of only 15 m^3/ha would result in a total production cost that is roughly the same as harvesting at an intensity of 30 m^3/ha in primary forest where road building is required.

5.4 Processing costs and profitability

In the forest industry model, the delivered roundwood cost is added to the cost of all forest charges, plus other fixed and variable operating costs, to arrive at a total operating cost at the current rate of capacity utilisation. This is subtracted from the value of product sales in the model to give net income. These figures are then projected forwards over the expected life of the investment (in this case, assumed to be 20 years) to form part of the projected cash-flow from the investment.

Capital costs include the cost of all plant and machinery, replacement capital and working capital (e.g. stocks of products, raw materials and accounts due or receivable) and these are also entered into the cash-flow. Adjustments are made to the cash-flow to take into account allowances for depreciation and the calculation of interest payments and loan repayments (if applicable) and corporation tax payments.

The model calculates the net present value (or NPV) of the investment at three different discount rates (i.e. three different levels of ROC). As in the forest harvesting cost model, a central discount rate of 20 percent was chosen as the required ROC or level of *"normal profit"* expected from the investment. If the NPV from the investment is positive at the 20 percent discount rate, this would indicate that the rate of return on the investment is more than 20 percent (i.e. the required ROC) and that *"excess profit"* is being earned in the processing operation.

The model presents the NPV of the investment in three different ways:

- before financing and tax (i.e. this is a measure of the overall profitability of the investment);

- after financing but before tax (i.e. this is a measure of the return on the investors equity in the investment); and
- after financing and tax (i.e. this is the investors return after taxes have been paid).

For the purpose of this analysis, it is the last of these measures that is most important, as this takes into account the effect of borrowing and taxation on the investor's profits.

Using all of these calculations, the model also expresses the results in terms of the shares of product value that can be attributed to production costs (including capital costs and *"normal profit"*), fees and charges, taxes and *"excess profit"* (i.e. the NPV of the investment divided by the amount of production). Income and expenditure varies throughout the life of the investment due to requirements to replace machinery, so these figures represent the average shares of the product value over the life of the investment rather than the shares in any particular year.

5.4.1 Description of an *"average"* sawmill

The forest industry model is flexible and can be used to analyse the profitability of any type of investment in new or existing processing facilities in a country. However, as most indigenous roundwood in Fiji is converted into sawnwood, the calculations were restricted to analysing the costs of sawmilling. In addition, the analysis only examined the profitability of an existing sawmill rather than a new investment in the sector.

As in the case of forest harvesting, there is variation in the management, location and scale of operations in the processing sector in Fiji. However, for the purpose of this analysis, it was assumed that an *"average"* sawmill has the capacity to produce about 5,000 m^3/year, but is currently only operating at about 60 percent capacity (i.e. with an output of about 3,000 m^3/year). Most sawmills claim to be running at well-below full capacity and field visits confirmed that they have the capacity to produce more than they are, so this level of capacity utilisation seems appropriate. This level of production is representative of the medium-sized sawmills operating in the sector, which seems to be the most durable part of the forest processing industry.

The model used a product recovery rate of 50 percent across all product types, which is a reasonable working assumption. This gives a required log input of 6,000 m^3/year, which matches the output level assumed in the forest harvesting model. It was also assumed that all log inputs are obtained from the sawmiller's own licence area.

The model was constructed for a sawmilling operation on Viti Levu, but there is little reason to expect sawmilling costs to differ significantly between the two main islands. The only difference incorporated into the model due to this was the payment of premiums to NLTB.

The model assumes that the sawmill produces a range of products by grade and species group, with half of production for the export market and half for the domestic market (see below). It also assumes that 20 percent of the capital invested in the sawmill is financed by borrowing (at a real interest rate of 12 percent), with the remaining 80 percent financed by the sawmiller's own equity. If investment in a sawmill can earn an ROC of 20 percent or more, it is generally in the sawmiller's financial interest to borrow as much as possible if the interest rate is lower than this. However, interviews revealed that commercial lenders are wary of over-exposing themselves to the forest processing sector. Therefore, an assumption of a debt-equity ratio of 20:80 seems reasonable.

5.4.2 Operating costs

The total operating cost of a sawmill comprises the log input cost plus the fixed and variable processing costs such as fuel, labour, and consumables. The total log input cost calculated in the forest industry model is shown in Table 14. The first set of costs is the delivered roundwood production costs and these are taken directly from the results of the forest harvesting model (described above).

The second set of costs in the model is the forest charges paid to landowners and government. Payments made directly to landowners are the first component of these charges and have been calculated on the basis of average *"commission"* and *"goodwill"* payments to landowners, determined in interviews with the industry and landowners. The *"commissions"* paid vary according to the species group and the input mix shown here (by species class) is based on the submission on forest charges from the FSA (FSA, 2003) and discussions with sawmillers. The majority of Class 1 and Class 2 species are used for export while production for the domestic market tends to be more heavily weighted towards the lower value species classes. The second component of forest charges are the royalties and fees paid to NLTB and the last component of these charges are the fees paid to the Forestry Department for scaling and maps. Lump sum payments, such as the map fee and NLTB licence application fee, have been converted to charges per cubic metre, based on the assumed level of roundwood production of 6,000 m^3/year.

The total level of all of these forest charges amounts to around FJD 50/m^3 for roundwood used to produce sawnwood for the domestic market and FJD 75/m^3 for roundwood used to produce export grade sawnwood. These differences are due to the different mixture of species used to produce sawnwood for these two different markets and the different levels of charges paid for the different species.

Table 14 Total log input cost for an "average" sawmill in Fiji

Log production costs (FJD per m^3 of roundwood)	**Sawnwood for export market**		**Sawnwood for domestic market**	
Planning and surveying		2.00		2.00
Felling		6.22		6.22
Skidding		13.22		13.22
Loading, unloading and reloading		15.67		15.67
Transport		17.63		17.63
Road building		9.49		9.49
Total		**64.24**		**64.24**
Royalties, fees and other charges (FJD per m^3 of roundwood)	**Sawnwood for export market**		**Sawnwood for domestic market**	
	Proportion (%)	**Charge**	**Proportion (%)**	**Charge**
Class 1 Landowners commission	60	25.00	20	25.00
Class 2 Landowners commission	40	20.00	10	20.00
Class 3 Landowners commission	0	15.00	50	15.00
Class 4 Landowners commission	0	10.00	20	10.00
Landowners goodwill		5.00		5.00
NLTB Licence application fees		0.20		0.20
Class 1 Royalty		40.00		40.00
Class 2 Royalty		30.00		30.00
Class 3 Royalty		10.00		10.00
Class 4 Royalty		6.50		6.50
Premium		6.00		6.00
FD Scaling fee		3.50		3.50
FD Map		0.03		0.03
Total		**73.73**		**48.53**
Other roundwood variables				
Total log cost from licence area (FJD per m^3)		137.97		112.77
Proportion of logs from licence area (%)		100		100
Cost of logs from elsewhere (FJD per m^3)		150.00		130.00
Conversion factor (m^3 logs per m^3 of product)		2.00		2.00
First year of production		1		1
Last year of production		20		20
Total log cost (FJD per m^3 of product)		**275.94**		**225.54**

The last set of figures in Table 14 is used to account for purchases of logs from elsewhere (not used in this case) and the product recovery rate or conversion factor. With an average conversion factor of two to one, the total log input cost is simply the delivered roundwood cost plus total forest charges, all multiplied by two. This amounts to about FJD 225/m^3 for sawnwood sold in the domestic market and FJD 275/m^3 for exported sawnwood.

The other fixed and variable operating costs used in the model are shown in Table 15. Estimates of these costs were obtained from discussions with sawmillers, site visits and from the FSA submission. For example, labour costs were based on discussions about the numbers of employees in the mills visited, average wage rates and social costs and the cost of specialised labour such as sawdoctors. Differences in these costs can be attributed to differences in treatment, drying and packaging used when producing sawnwood for the domestic and export markets. However, the log cost accounts for over half of all variable costs and most of the difference in production costs between sawnwood destined for the two different markets.

Table 15 Fixed and variable operating costs for an "average" sawmill in Fiji

Variable costs (FJD per m^3 of production)	**Sawnwood for export market**	**Sawnwood for domestic market**
Log cost	275.94	225.54
Labour	78.96	78.96
Resins/chemicals/treatment	15.00	15.00
Fuel, energy and consumables	60.00	45.00
Packaging	32.00	6.00
Delivery	15.00	15.00
Total	**476.90**	**385.50**
Fixed costs (FJD per m^3 of capacity)		
Personnel: administration	12.00	12.00
Personnel: support staff	7.00	7.00
Personnel: maintenance staff	9.73	9.73
Sales cost	15.00	15.00
General overhead	30.00	30.00
Total	**73.73**	**73.73**
Total cost (FJD per m^3 of production)		
Total calculated at final level of utilisation	**599.79**	**508.39**

The last line in the table shows the total operating cost per cubic metre of sawnwood produced, which is estimated at around FJD 600/m^3 for export grade sawnwood and FJD 510/m^3 for domestic sawnwood. It should be noted that this figure could be reduced by up to 20 percent with higher levels of capacity utilisation (i.e. the fixed operating costs could be spread across a greater volume of production).

5.4.3 Capital costs

It is difficult to determine the value of the capital utilised in an *"average"* sawmill. As a starting point, the likely cost of plant and machinery seen during sawmill visits was estimated from international data sources, adjusted to cost and price levels in Fiji (e.g. allowing for import tariffs and shipping costs). Most forest processing machinery is imported, so this provides a useful starting point for the analysis. These estimates were then adjusted for depreciation, to take into account the age of machinery seen during sawmill visits (see Whiteman (1999b) for a description of how to do this). The results obtained were then compared with the results of discussions with sawmillers about machinery that they had just purchased or installed in their mills. Generally, the figures obtained by these two routes were broadly comparable and resulted in the estimates used in the forest industry model shown in Table 16 below.

The total capital investment in an *"average"* sawmill was estimated at about FJD 1.4 million, with a further FJD 573,000 invested in working capital. The figures for investment in stationary equipment (e.g. bandsaws and kiln drying units) and mobile equipment (e.g. loaders, trucks, etc.) are close to the figures quoted by sawmillers (adjusted for the different capacity levels of the different mills visited). The estimate of total investment in production plant capital is also close to what would be expected for a mill of this size in other similar countries. It is slightly below some of the figures quoted by some sawmillers, but is believed to be a more realistic estimate of the true capital value of the typical mill of this size currently operating in Fiji.

The figure for investment in working capital would be considered very high by international standards. This is due to the generally high levels of stock seen during sawmill visits (particularly stocks of unsold products) and the payment terms that seem to be common within the industry in Fiji.

All industry in Fiji benefits from generous allowances for depreciation (*"accelerated depreciation"*), such that most items of capital expenditure can be depreciated over five years. Although accelerated depreciation is more of a tax benefit than a measure of the true consumption of capital, it is only used in the model to calculate corporate tax liability, so a depreciation period of five years was used throughout the analysis for all depreciable assets. Various assumptions were also made about the replacement or overhauling of some capital items after three to five years (see Figure 34 in Appendix 3 for further details), based on typical replacement and renewal schedules for the types of sawmilling equipment used in Fiji.

Table 16 Capital cost of the investment in an "average" sawmill in Fiji

Production plant capital (FJD '000)	Amount	Depreciation period	
		Total	Remaining
Site and services	120	5	2
Structures	300	5	2
Stationary equipment	650	5	5
Mobile equipment	300	5	5
Mill stores and miscellaneous supplies	30	5	5
Owner's construction overhead	0	5	5
Engineering	0	5	5
Total	**1,400**		
Other capital (FJD '000)			
Pre-operating expense	0		
Working capital	573		
Capitalised interest	0		
Total	**573**		
Total capital (FJD '000)			
Sum of plant and other capital requirements	**1,973**		

Table 17 Product sales by market and grade of production for an "average" sawmill in Fiji

Product	Grade	Export tax (percent)	Output (percent)	Mill net price (FJD per m^3)	Real price change (percent/year)
Sawnwood for export market					
Class 1	FF Select	0	50.0	1,200	0.0
Class 1	FF Standard	0	7.5	900	0.0
Class 1	Ungraded	0	2.5	900	0.0
Class 2	FF Select	0	30.0	800	0.0
Class 2	FF Standard	0	7.5	800	0.0
Class 2	Ungraded	0	2.5	750	0.0
Total/average			**100**	**1,009**	**0.0**
Sawnwood for domestic market					
Class 1	FF Select	0	15.0	750	0.0
Class 1	FF Standard	0	5.0	550	0.0
Class 2	FF Select	0	5.0	580	0.0
Class 2	FF Standard	0	5.0	480	0.0
Class 3	FF Select	0	35.0	480	0.0
Class 3	FF Standard	0	12.0	480	0.0
Class 4	FF Select	0	15.0	480	0.0
Class 4	FF Standard	0	3.0	480	0.0
Class 3 and 4	Ungraded	0	5.0	250	0.0
Total/average			**100**	**518**	**0.0**

5.4.4 Product mix and selling price

The composition of sawnwood produced by an *"average"* sawmill (by species class and grade) and the selling prices of each of the different products are shown in Table 17. The output mix was based on the FSA submission, discussions with sawmillers and discussions with the Forestry Department. The prices were based on the same sources, but were reduced slightly in some cases in light of the export statistics produced by the Forestry Department (see Table 12).

The above figures resulted in an average selling price of FJD 763/m^3, which is in the region of the average product prices revealed in discussions with sawmillers.

5.5 Estimated economic rent

Based on the cost and price information presented above, the complete cost structure and the level of economic rent generated from forest processing in Fiji was calculated and is presented below.

Box 3 Composition of sawnwood production costs for an "average" sawmill in Fiji

Delivered roundwood cost (excl. charges, incl. ROC of 20% on harvesting operation)	128.47	17%
Forest charges	122.27	16%
Other fixed and variable operating costs	303.35	40%
Total: operational costs	**554.09**	**73%**
Capital costs	85.17	11%
"Normal profit" (i.e. ROC of 20% on sawmill investment)	82.35	11%
Corporation tax	35.25	5%
"Excess profit"	6.27	1%
Total: capital costs, taxes and profit	**209.04**	**27%**
Average product value (FJD per cubic metre of sawnwood produced)	**763.13**	**100%**

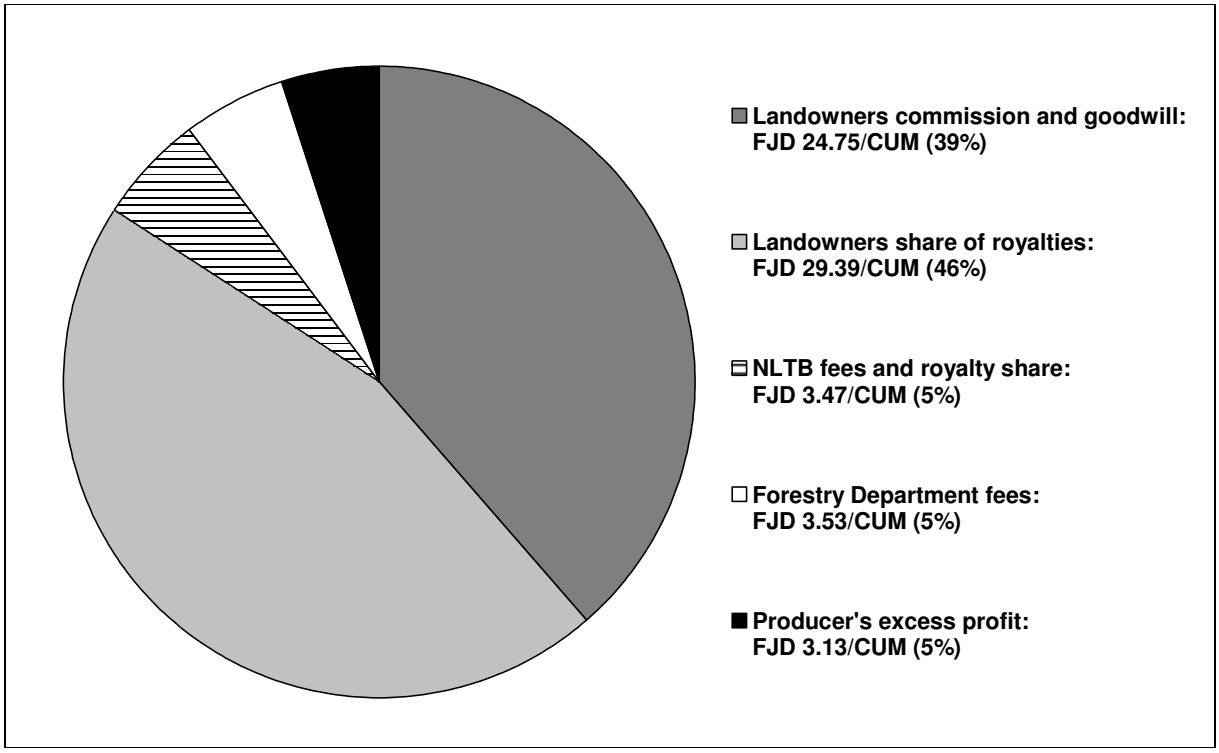
Box 3 shows how the average (sawnwood) product value is distributed between operational costs, capital costs, taxes and profit. The delivered roundwood cost includes an allowance for *"normal profit"* in the harvesting operation, but excludes the payment of forest charges. Forest charges include the payment of all official and unofficial charges (i.e. *"goodwill"* and *"commissions"*). Capital costs represents the consumption of existing and replacement capital throughout the life of the sawmill investment (assuming zero residual value), while *"normal profit"* represents the amount required for the sawmill operator to earn a 20 percent ROC (after tax) on their equity investment in the sawmill. Corporation tax is the estimated average annual tax liability divided by annual sawnwood production.

The economic rent from production is equal to forest charges plus *"excess profit"* and amounts to FJD 128.54 per cubic metre of sawnwood produced, or about 17 percent of the average product value. With the assumed product recovery rate of 50 percent, this implies that the economic rent is equal to FJD 64.27 per cubic metre of roundwood consumed by the sawmill.

Figure 24 shows the distribution of economic rent from production (per cubic metre of roundwood) between landowners, the Government and industry. The figure shows that total forest charges currently capture 95 percent or almost all of the economic rent from production. Fees paid to the Forestry Department and NLTB each account for a further 5 percent of the economic rent. Landowners receive the remaining 85 percent of the economic rent. Of this, slightly more than half of this comes through the official system of royalty payments as opposed to the unofficial system of *"commissions"* and payments for *"goodwill"*.

It should also be noted that, in addition to the payments of charges to the Government, the *"average"* sawmill should be paying corporation taxes to the Government of around FJD 35.25 per cubic metre of sawnwood produced (equal to about FJD 17.63 per cubic metre of roundwood).

Figure 24 Distribution of the economic rent from production in Fiji between landowners, government and industry per cubic metre of roundwood (CUM)



5.5.1 Comparison with the FSA submission

Although this analysis has used some of the information from the submission on forest charges by the FSA (FSA, 2003), it has also incorporated a lot of other data and information from experiences in other countries, information from international data sources and statistics held by the Forestry Department in Fiji. In addition, the calculation methodology used differs significantly from the approach taken by the FSA.

The estimate of delivered roundwood costs produced by the FSA is somewhat higher than the figures presented here. Their figure of FJD 94/m^3 (excluding forest charges) is higher than the estimate presented here of FJD 64/m^3. This could be due to the amount for *"cartage"* in their calculations (which is not explained in their submission). Another difference between the two approaches is that their figures include an amount for overheads in the harvesting operation, while the calculations here have assumed that all overheads would be covered in the forest processing operation.

On the processing side, the estimate of processing costs calculated here is somewhat higher than the FSA estimate. The differences in the calculation methodologies are so large that it is not possible to identify what might be the cause of these differences.

Although there are some differences between these figures and those from the FSA, when both parts of the production operation are combined, the figures calculated here are remarkably close to the figures from the FSA. For example, they quote figures for total sawnwood production costs (excluding a profit margin) in the range of FJD 570/m^3 to FJD 720/m^3. The figure calculated here for total operational costs plus capital costs amounts to FJD 640/m^3 (see Box 3), which is roughly in the middle of this range.

As noted earlier, it is always difficult to estimate production costs and economic rent with any degree of accuracy, because of the difficulty of collecting reliable information about costs and prices in the industry. This is particularly difficult when the time available for interviews, field visits and data collection is very limited. This analysis has tried to bring some international experiences and a rigorous analytical approach to

the forest charging issue, in order to provide the Forestry Department with an independent estimate of the economic rent from production. As the figures calculated here are not markedly different from those provided by the FSA, it is suggested that this might be taken as an indicator of their reliability.

5.5.2 Species variation

The level of economic rent from production undoubtedly varies by species, as higher valued species can be sold for more profit in the market place. However, when considering the adjustment of forest charges by species group it is important to take into consideration the different grades of product quality that can be manufactured and the acceptability of each species in local and export markets. For example, Class 1 species produce a mixture of high, medium and lower quality sawnwood grades, which are sold in both the local and export markets. Furthermore, forest operators are required to take the lower valued species (and to pay for them) in their licence areas. Added to this, there is the problem already noted of collecting information about the selling prices of different species and product grades in different markets. This makes it very difficult to come to any conclusion about what changes, if any, should be made to the relative levels of forest charges between different species groups.

It is not proposed here to present any firm recommendations about revising the relative levels of the different royalty classes or changes in the species included in each of the classes. Rather, the analysis below presents a simple methodology that could be used to explore this issue further (if desired).

Figure 25 The relationship between the selling price of sawnwood and the economic rent from roundwood production in Fiji

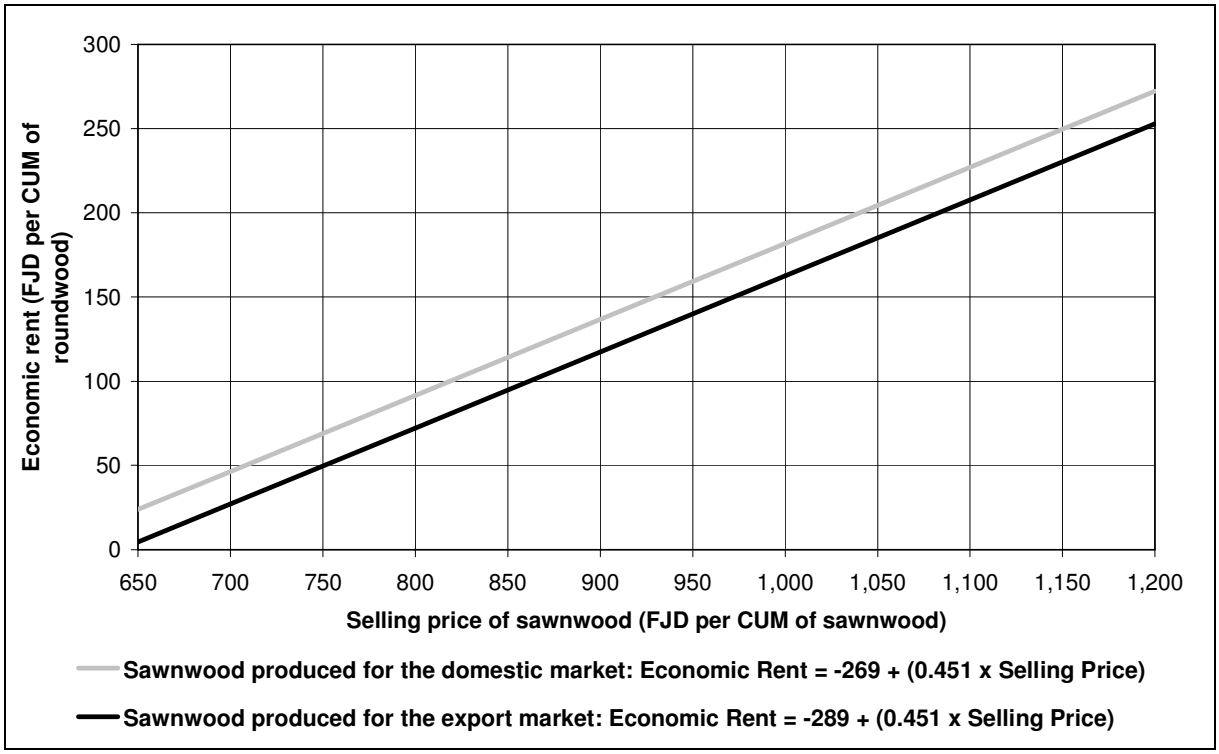


Figure 25 presents the relationship between the selling price of sawnwood and the economic rent from roundwood production, based on the cost data collected and used in the forest harvesting and forest industry models. The relationship for exported sawnwood was derived by assuming that all sawnwood production would be sold in this market and assuming that only one species would be used for production. For any given sawnwood price, the royalty payment for this species was then adjusted until the NPV of the sawmill equalled zero. The economic rent from roundwood production was then taken from the summary table

presented in the forest industry model. This process was repeated for different levels of sawnwood prices and under an alternative assumption that all production would be sold in the domestic market, to arrive at the two curves and equations shown in the figure.

The curve for sawnwood sold in the domestic market is higher than the curve for exported sawnwood, because the operational costs are lower for the former (e.g. due to lower packaging, drying and treatment costs). If costs are lower then, for a given sawnwood price, the economic rent will be higher. The difference between these two curves is FJD 20/m^3, which is equal to the differences in these costs (see the figures in Table 15 and divide the differences by two to convert from sawnwood to roundwood). It must also be remembered that, although the relationship is higher for sawnwood sold in the domestic market, the selling price for sawnwood of a given species and grade will generally be lower in the domestic market than in the export market, leading usually to a lower level of economic rent.

Table 18 Calculation of the average level of economic rent by species class

Royalty class	Market	Grade	Proportion of total production	Selling price (FJD per m^3)	Economic rent (FJD per m^3)	Contribution to total economic rent (FJD per m^3)	Average level of economic rent by market and royalty class (FJD per m^3)	
Class 1	Export	FF Select	25.00%	1,200	252.80	63.20	230.23	161.28
Class 1	Export	FF Standard	3.75%	900	117.39	4.40		
Class 1	Export	Ungraded	1.25%	900	117.39	1.47		
Class 1	Domestic	FF Select	15.00%	750	69.02	10.35	50.97	
Class 1	Domestic	FF Standard	3.75%	550	-21.24	-0.80		
Contribution to the economic rent from the whole operation						**78.63**		
Class 2	Export	FF Select	1.25%	800	72.25	0.90	67.24	37.24
Class 2	Export	FF Standard	7.50%	800	72.25	5.42		
Class 2	Export	Ungraded	2.50%	750	49.69	1.24		
Class 2	Domestic	FF Select	2.50%	580	-7.70	-0.19	-30.27	
Class 2	Domestic	FF Standard	2.50%	480	-52.84	-1.32		
Contribution to the economic rent from the whole operation						**6.05**		
Class 3	Domestic	FF Select	17.50%	480	-52.84	-9.25	-52.84	-52.84
Class 3	Domestic	FF Standard	6.00%	480	-52.84	-3.17		
Contribution to the economic rent from the whole operation						**-12.42**		
Class 4	Domestic	FF Select	7.50%	480	-52.84	-3.96	-75.40	-75.40
Class 4	Domestic	FF Standard	1.50%	480	-52.84	-0.79		
Class 3 and 4	Domestic	Ungraded	2.50%	250	-156.64	-3.92		
Contribution to the economic rent from the whole operation						**-8.67**		
Average level of economic rent from the whole operation						**63.59**		

Note: the sawnwood selling price is per cubic metre of sawnwood, all of the economic rent figures are expressed in terms of the economic rent per cubic metre of roundwood.

Table 18 shows how these relationships might be used to examine the relative levels of economic rent produced from harvesting different species. The figures in the first five columns in the table are the same as those presented in Table 17, re-ordered by species (Royalty class).[15] The economic rent shown in the sixth column is calculated from the equations given in Figure 25. The contribution to total economic rent (column seven) is the economic rent for each individual product (i.e. row) multiplied by its contribution to total production (i.e. the figures in columns six multiplied by the percentages in column four).

As the subtotals for each species class show, at the given selling prices, Class 1 species account for the majority of economic rent, with a modest contribution from Class 2 species. Class 3 and Class 4 species have a negative economic rent and are unprofitable (i.e. production costs exceed the sawnwood prices used here, even before forest charges are taken into account). The sum of the four subtotals - FJD 63.59/m^3 - is very close to the average level of economic rent presented above (FJD 64.27/m^3), indicating that these two equations are quite accurate.

[15] Note: the percentage contributions to total output are half of the amounts shown in Table 17, because they take into account that half of production is sold in the export market and half is sold in the domestic market.

The figures in the last two columns of the table are the most interesting, as they show the average level of economic rent by market and species class. These are calculated as weighted averages for each market and species class, using the percentages and estimates of economic rent (columns four and six) for the respective sub-sets of species class and market. For example, the weighted average level of economic rent for Class 1 species sold in the export market is calculated as follows:

$$\frac{(25 \times 252.80) + (3.75 \times 117.39) + (1.25 \times 117.39)}{(25 + 3.75 + 1.25)} = 230.23$$

These figures show that, under the given assumptions about selling prices and distribution of sales by market and grade, the economic rent for Class 1 species is about FJD 160/m^3 and about FJD 40/m^3 for Class 2 species. Again, Class 3 and Class 4 species have a negative level of economic rent. This would suggest that the relative levels of the royalties should be much higher for the top two species classes with, possibly, a zero royalty for the bottom two classes.

The above analysis has only served to demonstrate how this issue might be investigated further. A table such as the one above could be completed with more reliable data about prices and the composition of outputs by species (market and grade) in order to examine the relative differences in economic rent between the different species.

In the interest of maximising the potential production from the forest, it is desirable to have producers remove all commercial species from the forest. To encourage this, there will probably always be a certain amount of cross-subsidisation in forest operations, where processors are allowed to take high valued species at sub-optimal prices in return for also having to take the lower valued species. However, this simple analysis suggests that there may be scope to widen the difference in royalty payments between the lowest and highest royalty classes in order to encourage the harvesting of the lower valued species and the development of markets for them.

6 TAXATION OF THE FORESTRY SECTOR

The previous report by Rizer (1988) referred to a number of subsidies and tax incentives that were then in place to encourage investment in the forestry sector and recommended that these should be examined to see if they were in the best interests of the Fijian economy. Discussions with the Fiji Islands Revenue and Customs Authority revealed that all of the schemes referred to earlier had been closed and they suggested that the forestry sector is now generally taxed in the same way as other sectors in the economy.

However, there remain a number of incentives to encourage foreign and domestic investment (and some quite significant incentives specifically for the forestry sector). These fall into the following three categories: general tax incentives; industry specific tax incentives; and subsidies to the forestry sector. In addition, there is some evidence that the administration of foreign trade might be providing another implicit incentive to the domestic forest processing industry (see below).

6.1 General tax incentives

The Fiji Government introduced a new Investment Incentives Package in January 2001. The main thrust of this new package is to make incentives transparent, easily available, automatic and non-discretionary. It encompasses eight principles aimed at stimulating economic growth through increased investments (FTIB, 2003). The Investment Incentives Package includes the following:

- an attractive rate of income tax: Corporate Tax of 31 percent (or lower for some types of business) and Income Tax in bands up to 31 percent (down from 32 percent in 2003 and with the intention of eventually reducing this to 30 percent);
- no Withholding Tax on dividends (provided these are distributed to the shareholders after a company's profits are fully taxed at corporate level);
- exemption from income tax on income from exports (with a declining percentage of exempted export income from 2001 to 2009);
- a generous depreciation allowance;
- a carry-forward of losses (allowing losses in one year to be offset against taxable income in up to the next eight years, subject to continuity of ownership or carrying on of the same business); and
- relatively low import duties (and duty free imports for goods that will be processed and re-exported under the new Duty Suspension Scheme).

As these incentives are available to all sectors of the economy, there is no specific advantage to companies and individuals working in the forestry sector and they do not distort the overall pattern of activities in the economy.

One or two of the companies interviewed mentioned that the administration of the Duty Suspension Scheme was so complicated that it was difficult to take advantage of this incentive (e.g. to import cloth, fixtures and fittings to manufacture value-added wood products for re-export). This is likely to be only a minor problem affecting a few companies in the sector, but it could be investigated further if the Government wishes to strengthen the promotion of an export-orientated wood processing sector.

6.2 Industry specific tax incentives

Companies in the forestry sector (along with some others) are also eligible for the following two specific incentives:

- **Investment allowances:** a business entity or taxpayer may claim as a deduction an investment allowance of 40 percent of the purchase of capital assets of not less than FJD 50,000 per annum.

Such capital assets can not include land, buildings, passenger motor vehicles or trading stock. This investment allowance can be claimed between 2001 and 2005 (both years inclusive) for expenditures incurred during this period. Businesses in the forestry sector are eligible for this incentive if they undertake substantial transformation of the natural resource (meaning unprocessed or raw natural produce, including timber, wholly derived in or from Fiji). Substantial transformation means that the process applied to the natural resource results in a product having a different classification under the Harmonised System (HS) codes from that of the raw materials and excludes the logging of timber.

- **Further reductions in import duties:** companies involved in logging and sawmilling operations qualify for 5 percent fiscal duty plus VAT on the importation on all sawmilling and logging equipment including skidders, dozers and logging trucks (provided that the automobiles are equipped with boosters and perforated trays).

Considering the likely levels of profit and capital expenditure in the forestry sector in Fiji, the investment allowance described above could be quite significant and result in reductions in the Corporate Taxes paid by sawmills.

For example, the calculations for an "*average*" sawmill (described in Section 5.4 above) suggest that such a sawmill should pay Corporate Tax of around FJD 130,000 per year (on average). However, the sawmill would also be spending an average of around FJD 150,000 per year on equipment that is eligible for the investment allowance tax exemption. By offsetting 40 percent of the cost of this investment - FJD 60,000 - against their Corporate Taxes (which is quite feasible), their Corporate Tax bill could be reduced by 15 percent (i.e. an allowance of FJD 60,000 would result in a reduction of Corporate tax of FJD 19,200 (FJD 60,000.x 32 percent), which is equal to about 15 percent of their original tax bill). Smaller and less profitable sawmills could probably also claim a similar amount in investment allowances, resulting in a greater reduction in their Corporate Tax bill. This could partly explain the relatively low levels of Corporate Tax payment admitted by some sawmillers that were interviewed.

6.3 Subsidies to the forestry sector

There are no specific subsidies for forest management and forest operations in Fiji (e.g. to support tree planting, harvesting and processing). However, certain companies and individuals operating in the forestry sector are eligible to apply for subsidised loans from the Seed Capital Revolving Fund (SCARF).

6.3.1 Seed Capital Revolving Fund

As part of the affirmative action for indigenous Fijians and Rotumans, the Fijian Government has provided FJD 4.5 million for the SCARF program to assist the tourism, fisheries and forestry industries. The fund began in 2002 and is administered by the Fiji Development Bank (Fiji Development Bank, 2005).

Loans under this scheme cover investments in logging, sawmilling, further processing of wood products and the acquisition of working capital (for operation or establishment of eligible enterprises and limited to 30 percent of the total loan amount). Eligible investments include the purchase of fixed assets such as: land; buildings; machinery; and equipment, for existing or established business.

Eligibility criteria for loans are as follows:

- applicants are at least 21-years old and are a Fiji-Citizen registered in the *Vola ni Kawa Bula* or the Rotuman's Birth Register;
- applicants are either an individual, part of a partnership, co-operative or corporate entity;
- the project is situated within 1 km of a government feeder road (if on *Viti Levu* or *Vanua Levu*) or situated within 3 km of the nearest inter-island port of call if on an outer island; and

- if applying as part of a joint venture or partnership, the business at least 51 percent owned by a Fijian/Rotuman.

The maximum loan amount is 65 percent of the total project cost and is not to exceed FJD 162,500, while the equity contribution of the borrower must be at least 35 percent of the total project cost (with the possibility of 25 percent provided by the Government and the balance provided by the applicant in cash or kind) and should not be more than FJD 87,500 per applicant. The (nominal) interest rate for the loan is eight percent per year, with repayment periods depending on the type of asset purchased.

The provision of subsidised loans from SCARF is not likely to have much of an impact in the processing sector, except for very small-scale operators. For example, the "*average*" sawmill described and analysed in Section 5.4 above would involve an investment of around FJD 2 million, so the maximum total project cost that can be submitted for SCARF funding (FJD 250,000) would only cover about 12.5 percent of the total investment. With the modest difference between commercial interest rates (around 15 percent in nominal terms) and the SCARF interest rate of eight percent, the subsidised loan available from SCARF would have only a marginal impact on productions costs and the sawmill owner's rate of return.

Where SCARF could have a major impact is on companies and individuals engaged in logging operations. The delivered roundwood production cost for a "*typical*" forest operation (described in Section 5.3 above) assumed that an operator would not be able to obtain a commercial loan for such activities (which is often the case) and would have to finance the operation entirely from their own funds. It also assumed that they would require a 20 percent (real) ROC on their investment, so any loan at a real interest rate of less than 20 percent would reduce their total delivered roundwood production cost or could enable them to earn a higher ROC on their equity investment in the operation. Furthermore, the total investment required for such an operation would only be around FJD 215,000, so the entire project could be submitted for SCARF funding.

To examine the impact of SCARF funding on forest operations, the calculations described in Section 5.3.1 above were repeated assuming that 65 percent of the capital investment would be funded at the subsidised (nominal) interest rate of eight percent (equal to a five percent real rate of interest - i.e. after adjusting for inflation at three percent per annum) and with the repayment periods allowed under the SCARF scheme. The results of this recalculation are shown in Table 19 below.

Table 19 Estimated cost of harvesting, extraction, loading and transport for a "typical" forest operation in Fiji with a subsidised loan from the SCARF

Type of cost	Cost by activity (in FJD per cubic metre)								
	Felling	Skidding with dozer	Skidding with skidder	Loading	Road transport	Unloading & reloading	Water transport	Road building	Total
Labour	3.57	2.50	NA	1.19	3.57	2.38	NA	1.07	14.26
Consumables	2.47	3.93	NA	1.04	6.96	2.07	NA	4.73	21.19
Capital	0.13	4.47	NA	1.27	4.21	2.53	NA	2.70	15.31
Total (excluding profit)	6.16	10.90	NA	3.49	14.74	6.98	NA	8.50	50.77
Return on capital	0.04	1.55	NA	1.19	2.36	2.39	NA	0.66	8.19
Total (including ROC)	6.20	12.45	NA	4.68	17.10	9.37	NA	9.16	58.96

Comparing this with the original calculations (shown in Table 13 on page 44), this shows that that the total delivered roundwood cost with a (subsidised) SCARF loan would be about FJD 3.28/m^3 (or 5.3 percent) lower than without the loan. The total cost (excluding the allowance for profit) would increase because of the additional cost of interest repayments, but the additional amount required to provide a 20 percent ROC would be reduced by much more than this increase (because of the much lower level of equity invested in the project by the operator). Alternatively, if the roundwood was sold at the same price as the delivered roundwood cost from operators not eligible for a SCARF loan (the original FJD 62.24/m^3), the operator's ROC would be raised from 20 percent to 29 percent.

The above analysis shows that the subsidised loans available from SCARF would have only a very marginal impact on the total delivered roundwood production cost and, thus, the potential for SCARF to distort the

market for roundwood is quite limited. As this is likely to have little or no impact on average roundwood prices in the market as a whole, it provides a major inducement to investment by indigenous Fijians (by significantly raising their ROC) without introducing a major distortion into the market.

6.4 Other incentives to the domestic forest processing industry

One final incentive to the domestic forest processing industry concerns the way that foreign trade (specifically imports of wood products) is administered in Fiji.

Table 34 and Table 35 (on pages 90 and 91) show that, in recent years, there have been almost no imports of sawnwood into Fiji and very few imports of wood based panels. Strictly speaking, companies and individuals are free to import wood products into Fiji, subject to the payment of (quite modest) import duties. However, several people interviewed suggested that non-tariff barriers (e.g. requirements for phytosanitary certificates, etc.) were used to restrict the importation of wood products into the country.

A number of sawmillers commented that it would be much more profitable for them to sell imported sawnwood than to manufacture (and then sell) the same product locally. This is also confirmed by the domestic price statistics for sawnwood, where price levels in Fiji are somewhat higher than international market prices. Thus, it seems likely that the domestic sawmilling industry is protected from international competition, allowing it to charge relatively high prices for their products. Although this is not an explicit tax incentive or subsidy, such import protection is a significant incentive to the domestic industry.

There are two main economic problems with import protection. The first is that protection acts as a disincentive to increasing efficiency in domestic harvesting and processing operations, because the costs of any inefficiency can simply be passed onto consumers. The second is the effect of protection on the distribution of income in the economy, as the process of passing on costs to consumers protects the income levels of operators while increasing the costs of consumption to consumers.

Despite these two problems (economic efficiency and equity), the negative economic effects of import protection in Fiji may not be that great. In the first case, there appears to be significant competition for raw materials, which suggests that processors will be pressured into increasing efficiency due to limitations on the supply-side (i.e. availability of raw materials) even though they do not face the forces of international competition. In terms of equity, the effect of import protection may actually be beneficial, as many purchasers of wood in the country are relatively wealthy (e.g. hotel operators - often supported by foreign investors) and part of the benefits from the high domestic prices for wood products in the country are passed onto the poorer landowners in the form of official and unofficial forest charges. Thus, from a broad perspective, while these problems are worth noting, they may not be that great.

6.5 Overall assessment

The costs and benefits of the above incentives are as follows:

6.5.1 Costs to the Government (fiscal costs)

Investment allowance: The reduction in Corporate Tax estimated above (FJD 19,200) was based on an "*average*" sawmill, producing 5,000 m^3 of sawnwood per year. This implies an average Corporate Tax loss of FJD 3,840 per one-thousand cubic metres of production. At an average level of production of about 80,000 m^3 per year in recent years, this suggests that the total cost of this allowance (in terms of avoided Corporate Taxes) could be in the order of FJD 300,000 per year.

SCARF funding: The "*cost*" of SCARF funding is the difference between the interest that the Government would obtain if they lent this money at a commercial rate of interest (15 percent) and the interest that they will earn at the subsidised rate of interest (eight percent). For every FJD one-million lent, this amounts to

FJD 70,000 per year. The total subsidy to the forestry sector will depend upon how much of the FJD 4.5 million assigned to tourism, fisheries and forestry is used for forestry projects. Assuming that forestry projects account for about one-third of the SCARF funding, the total subsidy for forestry would amount to about FJD 100,000 per year.

6.5.2 Economic costs

Non-tariff barriers: The "*cost*" of the restricted level of forest product imports into Fiji depends on how much of the domestic production would be substituted by imports (if importing were easier) and the prices of those products (compared to the price of domestically produced wood products). Furthermore, the latter depends on how much product substitution would take place, as substituting domestic sawn hardwood with imported sawn softwood would result in significant savings to consumers (e.g. the regional trade price for sawn hardwood is quite similar to the domestic market price in Fiji, but regional trade price for sawn softwood is about FJD 100/m^3 lower). It is impossible to know how much would be substituted if importing wood products were to be made easier, but the benefits to consumers (in the form of lower wood product prices) could amount to about FJD 500,000 for every 5,000 m^3 of sawn softwood imports that might occur.

Other market distortions: As noted above, apart from the trade issue, the market distortions (in prices and investment) from the subsidies and incentives on offer in Fiji are quite modest and probably do not have a major impact on the overall economic efficiency of the sector.

6.5.3 Benefits

The main benefit of the incentives available to the forestry sector in Fiji is that these incentives probably help to create income and employment, contribute to poverty alleviation and play a small part in redistributing income towards the poor (i.e. native landowners) in the country.

A comprehensive cost-benefit analysis of these incentives would require considerable work to examine the number of jobs (and other benefits) created by these incentives and to compare these against the impact of government incentives for other parts of the economy. This would require a significant effort and is beyond the scope of this report. However, it appears that the costs of these incentives (to the government) are quite modest and probably worthwhile. The economic distortions are also quite small - with the exception of the implicit restrictions on trade - and the latter possibly have quite a significant impact on income distribution (by passing on some of the benefits of higher wood product process to landowners). Thus, in their totality, it seems likely that these incentives are worthwhile and justified.

7 COSTS AND BENEFITS OF THE FORESTRY SECTOR IN FIJI

The report by Rizer (1988) also referred to the need for a cost-benefit analysis of the forestry sector in Fiji and the development of an input-output model to explore the linkages between the sector and other parts of the economy. It should be noted that either of these exercises (especially the latter) would involve a considerable amount of work and expense, which may not be justified. However, based on the information contained in this report and discussions with stakeholders in Fiji it has been possible to make some comments on these subjects and suggest activities that may be considered as a priority for further follow-up activities.

This section starts by outlining (and, where possible, quantifying) some of the main costs and benefits of the forestry sector in Fiji. It then briefly discusses the linkages that are likely to be most important and their effects. Finally, it presents an overall assessment of the situation and recommendations for follow-up activities.

7.1 Cost-benefit framework

Cost-benefit analysis involves the assessment and calculation of all costs and benefits (both financial and non-financial) associated with any project, policy or sector. At the level of individual projects, policies or programmes, the flows of costs and benefits can be assessed and valued for the life of the intervention (or some other suitable timeframe) and the difference between total benefits and total costs (i.e. total benefits minus total costs - which can be negative) is the value of the intervention.

However, for the assessment of a sector as a whole, it is necessary to examine both the flows of costs and benefits associated with activities in the sector and changes in the stock or value of all assets used in the sector (including natural assets - such as soil, water and biological resources - which may not have a financial value). As in normal accounting, asset values are usually measured at the beginning and end of the year and changes in asset values are added to the value of cost and benefit flows within the year. Such an approach (usually called "*environmental income accounting*") is, therefore, somewhat more complicated than standard cost-benefit analysis, as it requires the quantification (and valuation) of asset stocks as well as valuation of the flows of costs and benefits through the sector.

A further complication in cost-benefit analysis of the forestry sector is the presence of a wide range of social and environmental costs and benefits associated with the sector. In order to include these in the analysis, it is necessary to quantify and, if at all possible, value these costs and benefits. Typically, the most important non-financial costs and benefits associated with the forestry sector are the value of flows and changes in the value of stocks of the following: soil, carbon and water; biodiversity; recreation and amenity; and the social and cultural benefits associated with forests. These are largely non-financial costs and benefits, which can be valued using a variety of economic techniques (see Table 20) although in some cases (e.g. recreation values) it is possible to convert some of these non-financial benefits into monetary income for the forest owner. In addition, the production of forest products for subsistence purposes (usually woodfuel and non-wood forest products) can have a high value that does not appear in the marketplace.

Table 20 The main costs and benefits associated with the forestry sector and methodologies often used to value different costs and benefits

Name of input, output or asset	Type of cost or benefit	Estimation methodology
Industrial forest products - industrial roundwood - sawnwood - wood based panels	Financial costs and benefits. These items are largely flows of costs and benefits (i.e. the value of production less production costs).	The gross or net flows in each year can be taken from national income accounts (gross or net value-added statistics).
Other forest products - woodfuel - non-wood products	Mostly non-financial costs and benefits (subsistence production). These items are largely flows.	Usually valued using market prices (where available) or the prices of similar goods (replacement costs).
Forest resource - forest stocking - forest health - forest yield (vitality) - stock of NWFPs - forest soil	This is a stock variable, which should be measured from year to year. If product harvesting is sustainable, the asset value of the forest resource should not change much.	Usually valued using an expectation value approach, which would estimate the monetary value of the future production of forest products for any given state of the forest resource.
Forest (and soil) carbon stock	This is a stock variable, which should be valued from year to year. It is closely related to the condition of the forest resource.	Market prices for carbon are now available. However, the value of carbon storage is still largely a non-financial value.
Water services - water quality - water quantity - off-site soil resources	Changes in the quantity and quality of water flowing from forest areas are largely flow values. In addition, changes in off-site soil resources as a result of forestry activities (e.g. erosion) can be considered as a non-financial cost (flow).	Changes in water quantity, quality and off-site soil resources are usually valued using a replacement cost (e.g. the cost of water treatment) or changes in production (e.g. changes in agricultural production due to changes in soil).
Biodiversity	Biodiversity is a non-financial benefit, which can be both a flow of benefits and a stock value (i.e. changes in the "*quality*" of the forest biodiversity.	Valuation of biodiversity can be estimated in terms of the potential financial benefits that might be realised (e.g. from bio-prospecting), but most of the value is from the general public and can only be estimated from surveys of "*willingness to pay*" for conservation.
Recreation and amenity	As above.	Some recreation and amenity value can be monetised (e.g. through user fees), but mostly this is estimated from surveys of "*willingness to pay*", travel cost analysis or analysis of changes in property prices that can be attributed to forest quality,
Other social and cultural functions	As above.	These benefits can only be estimated from surveys of "*willingness to pay*".

7.2 Assessment of some of the costs and benefits of the forestry sector in Fiji

7.2.1 Industrial forest products

The annual net flow of benefits from formal activities in the forestry sector in Fiji are already calculated by the Bureau of Statistics and reported to international organisations such as the United Nations Industrial Development Organization (UNIDO).[16] Table 21 shows the statistics produced by these sources since 1990. UNIDO only collects information about value-added in the processing sector and these figures are currently only available for Fiji up until 1994. The Bureau of Statistics produced estimates of value-added for forestry and processing activities in 1995 and has produced statistics for value-added in forestry activities (i.e. roundwood production) alone since then.

Table 21 Value-added in the forestry sector in Fiji since 1990 (in million FJD)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Forestry, logging and related service activities	n.a.	n.a.	n.a.	n.a.	n.a.	24.9	26.9	23.0	28.4	24.1	25.5	25.4
Woodworking	16.1	17.9	16.7	24.1	22.9	11.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Paper production and processing	7.0	7.0	9.0	9.0	9.0	8.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wooden furniture industry	4.6	5.7	6.6	5.2	4.5	14.6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: from 1990 to 1994 - UNIDO (2002); from 1995 - Bureau of Statistics (2002 and 2003).

As the table shows, the value-added in forestry (i.e. roundwood production) amounts to roughly FJD 25 million each year. Based on the economic rent calculations described earlier and recent production statistics, it is estimated that about half of this is value-added in indigenous roundwood production (i.e. production from the natural forest), with the remainder coming from the forest plantation sector. Furthermore, the value-added from indigenous roundwood production is probably shared roughly equally between: official forest charges; unofficial charges; operators' ROC; and payment of wages and salaries.

On the processing side, there is some value-added from the production of value-added paper products (i.e. packaging materials) but, as this is not based on the domestic forest resource, it can not really be considered as a benefit of the forestry sector in Fiji. Excluding this, the other two main industrial sectors (woodworking - sawnwood and wood based panel production - and the wooden furniture industry) account for a further FJD 25 million in value-added each year.[17]

Thus, the total net benefit from the production of industrial forest products in Fiji is probably around FJD 50 million per year. The total Gross Domestic Product of Fiji in 2000 was FJD 3.2 billion, implying that the formal forestry sector accounts for about 1.5 percent of national income.

7.2.2 Other forest products

Other forest products include woodfuel and a wide range of non-wood forest products that may be used by people (e.g. for food, medicine, plaiting materials and local building materials). Information about the level and value of production of these other products is not readily available in Fiji and it would probably be difficult to collect such information.

Given the remoteness of much of the forest, the level of urbanisation and the general level of economic development in Fiji, it seems unlikely that the collection of other forest products for subsistence purposes is of significant economic value. However, one area of informal forestry production (which may not be captured

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16 Value-added is defined as the total value of sales from a sector less the value of purchases from other sectors. Thus, it is the same as the net benefit from activities in the sector. Value-added is distributed as incomes to the owners of the factors of production as rents or forest charges (to landowners and government), ROC (to investors) and wages and salaries (to labour).

17 It should be noted that UNIDO and the Bureau of Statistics show very different figures for these two components of the forest processing sector, but this is probably due to differences in the classification of enterprises into the two different sub-sectors. What is encouraging is that there is no great difference in the totals for the forest processing sector given by these two different sources.

in official value-added statistics for the sector) is the production of handicrafts, such as wood carvings, souvenirs, mats and baskets. Considering the significant tourism sector in the country and the interests of tourists in purchasing such products, it is possible that these activities result in a modest amount of value-added in addition to that recorded in official statistics.

7.2.3 Forest resource and carbon stock

With respect to the value of the forest resource and the value of the stock of carbon held in the forest and forest soils, the situation in Fiji is likely to be markedly different in the natural forest and forest plantation sub-sectors.

In the **natural forest**, the Forestry Department's statistics suggest that the natural forest area may have declined by about 25,000 ha or 3.1 percent in total since 1986 (equal to an annual loss of around 1,500 ha or 0.2 percent per year). In addition, some Forestry Department staff suggested that, although current harvesting is sustainable in terms of retaining the regenerative capacity of the forest, they did not expect that current harvesting levels in the natural forest could be continued indefinitely (as it is becoming gradually more difficult to find trees that can be commercially harvested) and that a significant period of regeneration might be required in many areas at some time in the future. Thus, it seems likely that there is a modest and gradual depletion in the commercial value of the natural forest resource each year.

The commercial value of the natural forest resource in Fiji may currently be around FJD 250 million (assuming an annual level of value-added from forestry activities of FJD 25 million per year (in perpetuity) and a discount rate of 10 percent). Thus, the current annual loss of natural forest (0.2 percent) would be equal to a decline in the value of the commercial growing stock of around FJD 0.5 million per year. However, this is an absolute minimum. Considering that the current level of production probably can not be maintained in perpetuity, the gradual decline in the quality of the forest (in addition to changes in area) would suggest that the annual change in the value of the resource is probably several times (and possibly an order of magnitude) higher than this.

Based on data from various studies in other tropical countries, the non-market value of carbon held in forests is often roughly equivalent to the value of the stock of commercial timber.[18] Thus, the value of annual changes in the carbon held in Fiji's natural forests (due to changes in forest area and average growing stock) might be of a similar magnitude to those described above.

In Fiji's **forest plantations**, the opposite of the above is likely to be the case. The forest plantations have increased in area in recent years and they have matured. This has led to an increase in the stock volume and, more importantly, a considerable increase in the value of this stock (in terms of it being much closer to the age when trees can be harvested).

The current assignment did not involve a detailed investigation of the forest plantation sub-sector in Fiji, but it seems likely that the positive changes in the value of the forest plantation growing stock (in terms of both commercial timber value and the value of carbon stocks) would be larger than the losses in stock value in the natural forest. However, an analysis of the net effect of these changes would also have to take into consideration the current timber income and the costs of planting and managing this resource. Thus, it can not be determined whether the net change in this value is positive or negative (nor the magnitude of this change). This would require a more thorough investigation of the forest plantation sub-sector.

7.2.4 Water services

Forests can have a major direct impact on the quality and quantity of water from forested areas and, indirectly, on soil resources in neighbouring areas (e.g. as a result of their effects on soil erosion). The

[18] The value of carbon stored per cubic metre is much lower than the value of timber (per cubic metre), but this value can be applied to the entire growing stock volume and not just the commercial volume.

linkages between forests and water are varied and poorly understood. Furthermore, these linkages are believed to be limited to very small catchment areas and the effects of forests on large catchment areas are extremely difficult to assess.

For example, forests are believed to improve water quality, but this is only true under certain circumstances and there are many examples of how forestry activities can lead to a decline in water quality (e.g. through soil disturbance due to harvesting and afforestation). Forests may regulate the flow of water, resulting in a reduction in the negative effects of high rainfall (e.g. floods and soil erosion) but, again, this is not always the case. Furthermore, with respect to water quantity, a scientific consensus is gradually forming that forests reduce water quantity (due to high transpiration rates), which can be a significant cost in areas where water is scarce.

In small islands, water supply is often a crucial issue and Fiji is no exception. However, discussion with Forestry Department staff suggested that they believed that forest-water linkages may not be particularly important in Fiji, due to the location of the main forest areas in relation to the areas where water supply and demand are most critical. A complete evaluation of the costs and benefits of the forestry sector with respect to water resources would require a comprehensive and detailed analysis of where forest and water resources overlap, the explicit linkages between the two (in terms of water quality and quantity) and a study on the value of water. It seems unlikely that this would be a priority for resource managers in either the forestry or water sectors.

Based on the above, at first glance, it seems likely that the costs and benefits of the impact of forests on water resources in Fiji may be negligible.

7.2.5 Biodiversity

The value of forest biodiversity can be both a flow of value and a stock of value. The flow of value is the perceived benefit that people obtain each year from the conservation of biological diversity, which is poorly understood and very difficult to estimate. This is what economists refer to as a "*non-use*" value. In addition, there may be a use value if biodiversity from the forest is (or could be) used commercially (e.g. bio-prospecting for new chemical compounds that might be used as medicines or food additives). Currently, there are no known commercial bio-prospecting activities in Fiji, so the value of forest biodiversity is likely to be mostly a non-use value.

As with the value of the forest resource, the stock of biodiversity value is the sum of the future value of these flows that may be obtained from any given state of the forest resource. This can increase (if the amount of forest biodiversity or people's valuation of this increases) or it can decrease (if the opposite occurs).

In total, about one-third of Fiji's forests are protected (280,000 ha - see Table 23), but this includes areas protected for a range of different uses (biodiversity, soil and water protection). Of this, the formal protected areas network covers only 37,000 ha (or about five percent of the forest area). In addition to protected areas, there will also be biodiversity of some value in other forest areas, but the value of this biodiversity may be quite low.

Given Fiji's current level of economic development, it seems likely that the non-use value of forest biodiversity amongst the local population will be low. In terms of the global population's valuation of forest biodiversity, Fiji is internationally recognised as part of the Polynesia-Micronesia biodiversity hotspot, so there may be some value placed on the nation's biodiversity resources. This value is currently unknown, but might be quite significant.

7.2.6 Recreation and amenity

The use of forests for recreation can be a significant value in densely populated countries. The value of forest recreation can be estimated using a variety of economic techniques and it is sometimes possible to

capture some of this value through user fees (e.g. entry fees, car parking charges, fees for commercial tour permits and licence fees for other commercial recreation activities). In addition, studies have shown that an attractive natural environment (including trees and forests) can result in increases in property prices compared to similar properties in unattractive areas.

There are currently only a small number of formal forest recreation sites in Fiji and visitor numbers are unknown. However, in addition to the local population, Fiji is a major regional tourism destination, attracting around 326 thousand holiday visitors in 1999 (Bureau of Statistics, 2001). The average length of visit is just over one week and this part of the economy is growing strongly (e.g. holiday visitor numbers were only 256 thousand in 1995).

The majority of holiday visitors to Fiji probably do not visit the forest, so the current value of this use of the forest is probably quite modest. However, given the wealth of most visitors, their average length of stay and the availability of suitable sites, there may be potential for some development of forest recreation in the future.

7.2.7 Other social and cultural functions

Other social and cultural functions of forests include historical/traditional uses and the use of forests for educational purposes. These uses are very difficult to value and there is currently no readily available information about the quantity or value of these forest uses in Fiji. However, given the relatively small number of people living in or near the forest in Fiji, it seems likely that the value of these functions would be negligible.

7.3 Economic linkages

Analysis of economic linkages is used to show the total effect of activities in a sector on the national economy (usually in terms of the income and employment generated by activities). In addition to the direct effect of activities (e.g. value-added, as shown in Table 21), there are also usually indirect effects in terms of income and employment generated in industries that provide goods and services to the sector (e.g. transport, machinery suppliers, fuel retailers) as well as in industries that purchase goods and materials from the sector (e.g. retailing, construction, etc.). Furthermore, some of the income paid to workers in a sector is then spent locally, resulting in additional induced income and employment effects within the local economy.

Studies of economic linkages require the construction of an input-output table for the whole economy, with considerable detail of the purchases and sales of those companies operating in the forestry sector. This is a significant exercise, which usually builds upon existing general input-output tables for the economy as a whole (which may or may not be available for Fiji). Surveys of companies' expenditures and sales are used to construct the level of detail required for the analysis and the input-output tables can then be used to show how marginal changes in output in the sector lead to changes in direct, indirect and induced income and employment.

The few countries that have produced income and employment multipliers for the forestry sector (e.g. Canada and the United Kingdom) have reported multipliers in the range of two to three. In other words, for every one job created in the forestry sector, an additional one to two jobs are created in related industries and the local economy. Similarly, the total value-added that is linked to activities in the forestry sector is two to three times higher than the direct value-added reported for the sector.

In the case of Fiji, it seems likely that the income and employment multipliers for the sector may be somewhat lower than reported elsewhere. This is due to the nature of island economies and the capital intensity of forestry activities. For example, Canada reports a high forestry sector multiplier because there is a significant industry involved in producing chemicals, tools, equipment and machinery for the forestry

sector. In the case of Fiji, it is likely that the majority of equipment is imported. Furthermore, a significant proportion of the forestry sector's output in Fiji is exported (which would tend to limit downstream multiplier effects). On the other hand, the induced multiplier effects of forestry activities in Fiji could be quite high in areas where the local sawmill is the main employer.

In general, it seems likely that the income and employment multipliers related to forestry sector activities in Fiji would be low, possibly in the range of 1.5 to 2.0. Given the amount of effort required to produce such a study properly and the "*disappointing*" result that may be obtained, it is recommended that investing in such a study would not be a valuable use of resources.

7.4 Summary of the costs and benefits

A summary of the main costs and benefits of the forestry sector in Fiji is given in Table 22. Despite not being able to value many of the different functions of the forestry sector, this shows that the non-financial effects of the sector as a whole are probably slightly positive and that the annual change in the stock value is probably positive (due to the increase in the value of the forest plantation resources outweighing any decline in other values). In other words, annual activities in the sector have a positive net benefit and the value of the asset stock is increasing.

Table 22 Summary of the main costs and benefits of the forestry sector in Fiji

Name of input, output or asset	Annual net flow	Annual change in stock value
Industrial forest products	Gross value-added of about FJD 50 million.	Unknown, but probably slightly positive
Other forest products	Probably a very small amount of value-added in woodfuel production. Possibly a significant amount of value-added in handicraft production.	Negligible.
Forest resource	Not applicable.	In the natural forest, annual decrease of at least FJD 0.5 million, possibly several times this amount. Probably significant increase in the forest plantations.
Forest (and soil) carbon stock	Not applicable.	As above.
Water services	Probably negligible.	Not applicable.
Biodiversity	Possibly quite significant to the global conservation community.	Unknown, but likely to be negligible (and probably a small decrease).
Recreation and amenity	Probably negligible.	Unknown, but likely to be negligible.
Other social and cultural functions	As above.	As above.

A significant amount of further work to quantify and estimate all of these values could probably not be justified. However, if desired, it would seem most beneficial to examine the amount of value-added in handicraft production and the potential to increase the value of forest recreation through development of informal and commercial recreation activities.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Forest charges - some general principles

Most forest revenue systems have strengths and weaknesses. However, there are some broad principles that can be followed when analysing the forest revenue system in a country. For example, Gray (1983) lists the following five main principles that should be considered when designing a system of forest charges:

- **Forestry policy.** Forest charges should reflect the overall objectives of forestry policy (i.e. they should encourage forest concessionaires to carry-out activities that meet the objectives of forestry policy and discourage activities that work against the policy).
- **Administrative efficiency.** The charging system should aim to minimise the costs of implementation (to both the government and forest concessionaires) and reduce the scope for evasion.
- **Government revenues.** The charging system should aim to capture a significant proportion of the economic rent, unless there is a specific objective to allow forest concessionaires to obtain cheap wood for some reason (e.g. in order to promote a domestic forest processing industry).
- **Economic efficiency.** Forest charges should promote efficiency in the use of the forest resource and in the use of all other resources involved in the forestry sector.
- **Equity.** The charging system should take into account the impact of charges on different groups within the sector.

To a large extent, satisfying the last four principles outlined above would also meet the objectives of forestry policy in Fiji, which stresses the need for efficiency and the maximisation of benefits for landowners from the utilisation of their forest resources. Therefore, the appraisal below will focus on how well the current forest revenue system performs against these four principles. As the forest revenue system is closely related to the current licensing procedures, it will also comment on this as well where appropriate.

8.2 Appraisal of the current forest revenue system in Fiji

8.2.1 Administrative efficiency

There are three main costs of administering any forest revenue system:

- the cost of calculating the charges that are due;
- the cost of collecting these amounts; and
- the cost of policing the system (i.e. detecting and pursuing any individuals that have not paid their charges).

In addition to this, in the case of Fiji, there is also the cost of distributing to landowners the revenues collected by the Government on their behalf.

The Forestry Department calculates the official forest charges that should be paid and polices production, while the NLTB collects the charges and disburses revenue to landowners. The Forestry Department collects a Scaling Fee of FJD 3.50/m^3 for this from producers (plus a negligible Map Fee) and the NLTB collects a similar amount, partly from producers and partly by retaining a 10 percent share of all of the official charges collected by them. The above fees amount to about 10 percent of the total charges paid (including unofficial charges).

The Forestry Department believe that their fees are sufficient to cover their costs, but the NLTB expressed some reservations about this. Comparing these fees with other countries, this is a remarkably low

administrative cost. If this is a reflection of the efficiency of these two institutions, it is a remarkable achievement. However, it could reflect the fact that the true costs of administration are uncertain. In particular, for the Forestry Department, the amounts collected and retained by them seem very low considering the amount of work that must be involved in monitoring forest operations. For example, the revenue collected from fees covers only five percent of the expenditure of the department. This raises the question: is it true that production monitoring only accounts for five percent of the activities of the Forestry Department?

Another aspect of the administrative efficiency of the system concerns the procedures in place for recording production and calculating charges. In the field, roundwood leaving the forest is usually checked by the Forestry Department in the presence of representatives of producers and landowners. This approach, involving all three major stakeholders, is commendable and should reduce the scope for collusion, corruption and theft. Indeed, the Forestry Department's statistics for fines and penalties show that very little illegal production is recorded. In local offices, the Forestry Department has a computer system that records production and calculates the charges that should be paid. This was demonstrated during the field-visits. This also appears to be working well and is comparable with product recording systems in many developed countries. The quality of production statistics in Fiji is excellent and this system could have other long-term benefits should producers decide to try to obtain certification for their products.

One final consideration should be the costs of administration borne by the private-sector. In general, it appears that the requirements for monitoring and paperwork are not particularly onerous and are certainly not any worse than the requirements in many other countries. However, there is one potential problem and that concerns the nature of the licences issued by the Government. At the moment, the main licence establishing a harvesting area is issued in the name of landowners. A number of forest operators complained that they sometimes entered into agreements with landowners, paid for licences and started to pay some of the unofficial fees, only to have the landowners try to renege on the agreement at a later date. This usually occurs when a competitor comes along and offers the landowners a better deal. This is a very real cost to producers.

Many producers also have a separate legal contract with landowners to reinforce their agreements, but this is quite weak in comparison to the powers available to the Forestry Department and NLTB. In particular, the latter can revoke or refuse to reissue licences to landowners. Markets work most efficiently when they are governed by a secure legal framework and binding contracts and the cost of such problems might be reduced if the licences could be improved in this respect.

8.2.2 Total forest revenue collection

The above analysis has indicated that the current levels of official and unofficial charges collected from producers in Fiji accounts for about 95 percent of the economic rent from production. Given the level of precision in these calculations, it is probably reasonable to say that landowners are earning the maximum possible benefit from the use of their forest resources and there is little scope to increase charges.

This conclusion is not only confirmed by the calculations set-out above, but by other indications such as the fact that the availability of indigenous roundwood is probably declining, or at least becoming more difficult to access. Further evidence of increasing competition to access a diminishing resource is provided by the development of unofficial payments, which was recently initiated by producers as they competed to acquire harvesting rights. With so much competition for the resource and the widespread use of short-term licences, it is very unlikely that producers could earn any *"excess profit"* for very long.

Apart from the above, there is the issue of how much of the charges should be paid through the official system of Royalties and Premiums and how much should be paid through unofficial channels. The determining factor should be the equitability or *"fairness"* of the two alternative systems, although a mixed approach does have other advantages as well (see below). It should also be noted that landowners have

become used to the unofficial system of payments and seem to prefer it to the official system. The Government could simply try to redirect all of the unofficial charges through the official system by increasing Royalties by the amounts that are currently paid as unofficial charges. However, it seems likely that this would be unpopular with both landowners and producers. It could also lead to a situation where landowners continue to try to extract additional payments from producers. If such a situation occurred, it could reduce the availability of the resource even further and drive some producers out of business. This would not be in the interests of landowners, as it could lead to less production and a lower total amount of revenues collected for landowners overall (i.e. it is possible for forest charges to be set too high!).

One final point to consider is that the unofficial payments are not currently recorded anywhere. The Forestry Department and NLTB are both charged with the responsibility of making sure that landowners receive the maximum benefit from the use of their forest resources. They can not measure their performance in this respect as long as a major component of the charges collected are not recorded anywhere.

8.2.3 Economic efficiency

The above analysis of economic rent demonstrated how production costs can vary depending on a number of factors such as: location; terrain; forest stocking; technical, managerial and marketing skills; and scale of operations. Some of these factors are within the control of producers (e.g. managerial skills) and the forest revenue system should not allow poorly managed operations to survive at the expense of the better operators. However, some of the variation is due to factors beyond their control and they should not be penalised for this.

The problem with all analyses of economic rent is that they are often based on averages, which are then translated into recommendations about levels of charges that reflect these averages. There is no such thing as an average forest operation or average sawmill! Therefore, one of two outcomes usually occurs. In some cases, forest charges are set too low, so that no producer is penalised (but many benefit a lot from under-priced wood). Alternatively, the charges are set at a level close to the average level of economic rent, so that some unfortunate producers are penalised, while the lucky ones do rather well out of the arrangement. Either way, administratively fixed forest charges are never detailed enough to reflect the circumstances faced by each individual operator in the industry (whether within or beyond their control). Market forces can do a much better job of this, if competition for the resource can be guaranteed.

In terms of economic efficiency, the system that has developed in Fiji has several advantages in this respect. The official system of Royalties sets a baseline for the value of roundwood that landowners should expect to obtain. It also sends them market signals about the relative value of different species. On top of this, they are free to negotiate additional payments that, in effect, determine the market price of the standing roundwood. Unlike in many counties where the Government retains all forest revenue, Fiji's landowners seem able to negotiate very attractive prices, probably due the high level of competition for the resource.

Although there seems to be a lot of competition for the resource, one aspect that might be considered is the availability of market information. Landowners are at a disadvantage in this respect, as producers know a lot more about the forestry business than they do. Improved information should improve the functioning of the market and lead to greater economic efficiency. As noted in the analysis above, this might extend to a revaluation of the relative levels of the Royalties.

Another consideration concerns the awarding of licences. The FSA submission suggested that licences should only be awarded to processors. Such a move would be anti-competitive and should be resisted. Many countries have a vibrant and dynamic independent logging sector and if an independent logger can produce roundwood more efficiently than a sawmiller can, they should be allowed to do so. Indeed, it is in the sawmiller's interest to buy their roundwood from the cheapest source available, even if that means buying it from someone else rather than producing it themselves. In addition, processing is beyond the capacity of

most landowners, but some of them may be able to start businesses as independent loggers. Therefore, restrictions on the awarding of licences should be avoided as it might exclude landowners from the industry.

However, this argument applies in both directions. Competition requires a *"level playing field"* and the Forestry Department should ensure that independent loggers are competent and able to follow the same requirements for good harvesting practice that sawmillers have to comply with.[19]

A final consideration concerns the scale and duration of licences. Forest areas owned by different landowning communities are generally small and highly fragmented. Annual-licences are good for encouraging competition, but they discourage investment in the processing industry, which tends to be of a long-term nature and requires security of supply. The forest processing industry in Fiji could probably be more efficient with higher levels of capacity utilisation (and, maybe, some new investment in improved technology), but this is unlikely to occur under current circumstances. The combination of these factors tends to push up costs, lower profitability and reduce the amounts that processors can afford to pay landowners as forest charges.

It is not suggested here that the Government should try to encourage the industry to restructure into just a few small large mills. Indeed, the medium-sized sawmills in the sector appear to be quite well managed and have proved resilient to fluctuations in market conditions in the past. Furthermore, a small number of very large mills would probably reduce competition for the resource (leading to a completely new set of problems). Rather, it is suggested here that the Forestry Department might examine how they can encourage improved performance in the processing sector through the types of licences available to producers and by increasing the scale and security of wood supply.

Many countries struggle with the sorts of problems described above. They try to solve them by measures such as: organising landowners into co-operatives; offering landowners shares in processing operations; or guaranteeing a certain amount of supply from state owned forests. Crucial to the success of such initiatives is a meaningful dialogue between stakeholders about the strategic direction for the future of the sector. The forestry sector in Fiji has considerable potential and the Forestry Department may wish to consider this further.

8.2.4 Equity

An assessment of the level of equity or *"fairness"* inherent in the forest revenue system is a matter of whether some individuals are given an unreasonable advantage over others. Measures to improve the functioning of the market and competition for the resource (as described above) should ensure that producers and landowners are each given their fair share of the benefits from production. Furthermore, competition should ensure that all producers are treated equally. The question that remains is whether the landowners' benefits are distributed fairly amongst themselves.

Currently, the distribution of forest charges through official channels is arranged by NLTB according to a formula. This was not reviewed and it would, anyway, be beyond the scope of this exercise to comment on this. The procedures for distributing the unofficial charges is not clear, although almost everyone interviewed said that they felt that the unofficial system was working better than the official system, giving landowners more control over the benefits that they receive from the forest and usually more rapid payments.

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[19] This requirement for a *"level playing field"* should also apply to other areas of public policy. For example, during discussions with one sawmiller, it was claimed that a native landowner had won a public procurement contract that was tilted in their favour, but did not have the capacity to produce the volume required. The sawmiller (who did not win the contract) was supplying the native landowner at the slightly lower price he had bid, while the landowner was then selling this on to meet the contract at a higher price. It is questionable whether this arrangement satisfies the intention behind the policy to support business development by native landowners, but it serves as an example of how such policies have to be implemented with great care.

Ultimately, the decision about how much of the forest charges should go through official channels and how much should go through unofficial channels is a political decision. An impartial economic appraisal of the situation could conclude that, if landowners are capable of looking after their own interests, then there is no need for the NLTB to collect forest charges at all. However, the current system whereby NLTB are involved has two advantages:

- it provides a more formal and accountable system to ensure that everyone that is entitled to a share of the benefits from production is given a share; and
- it provides a safety-net to ensure that landowners receive the maximum possible amount of benefits from the utilisation of their resource.

NLTB have the responsibility to achieve the two objectives above on behalf of landowners. They could possibly achieve the latter without being involved in charge collection and disbursement, but it is unlikely that they could achieve the former. Furthermore, evidence from other countries that have given landowners more control over forest charges has shown that that they sometimes lose out in the long run. Therefore, this would support the argument that NLTB should continue to be involved in the administration of the forest revenue system.

As noted above, the economic arguments for increasing the share of payments that go through the official system are quite weak. If the issue is simply a problem that NLTB find it difficult to cover their administrative costs from their share of royalties, they should increase the share that they retain rather than increase the level of Royalties.

8.3 Recommendations for changes to the forest revenue system

Based on the above discussion and conclusions, the following recommendations are presented for further consideration by the Forestry Department:

Recommendation 1: Administrative costs. The Forestry Department should review their expenditure on forest monitoring, control and charge collection to assess whether their fees cover their costs. If not, they should consider increasing their fees. There is very little room for an increase in charges, but a modest increase in the Scaling Fee would probably do no harm. NLTB may wish to consider this issue as well.

Recommendation 2: Licences and security of wood supply. In consultation with interested stakeholders, the Forestry Department and NLTB should examine whether the problem of landowners and/or producers reneging on production agreements is a major problem and what, if anything, they should do about it. The aim should be to use licences to reinforce the agreement to supply roundwood in a harvesting area, to minimise the likelihood of broken contracts and the consequential costs to both landowners and producers.

Recommendation 3: Total charge collection. The Forestry Department should record the total amount of revenue collected from unofficial charges and publish this information along with the statistics on official revenue collection. The level of unofficial payments (lump-sums and per cubic metre) should be recorded in licence agreements.

Recommendation 4: Analyse the relative values of different species. The Forestry Department should collect some better information about product prices (in domestic and export markets) and the mixture of products typically produced from each species (by grade and market destination). This should be analysed to identify the relative levels of economic rent from different species and revise the composition of the species classes.

Recommendation 5: Revision of the Royalties. Royalties should not be increased by very much (if at all). For example, Royalties in the top two species classes could be increased in line with inflation and Royalties in the lower two species classes could be kept the same or even reduced. The relative levels of the different

species classes (and movement of individual species between the classes) should be determined from the outcome of Recommendation 3,

Recommendation 6: Average levels of unofficial charges. The Forestry Department should publish annually the average level of unofficial charges paid by producers (per cubic metre) by species class and zone.

Recommendation 7: Awarding licenses. Licences should continue to be awarded in an open and transparent manner without fear or favour, subject to the condition that all producers have to meet the same minimum standards of competence and comply with all forest regulations.

Recommendation 8: Long-term strategy. The Forestry Department should consult with all interested stakeholders about the feasibility of developing a long-term strategy for the sector. In particular, this should focus on improving the security of wood supply from the highly fragmented forest ownership, while maintaining the overall objective that landowners should continue to receive the maximum possible benefit from the use of their forest resources.

Recommendation 9: Revenue collection and disbursement. NLTB should continue to play a role in revenue collection and disbursement in order to provide a safety-net for landowners.

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GLOSSARY

CUM	Cubic metres.
FAO	Food and Agriculture Organization of the United Nations.
FFI	Fiji Forest Industries Ltd.
FHCL	Fiji Hardwood Corporation Ltd.
FJD	Fiji dollar.
FMT	Fiji Mahogany Trust.
FPL	Fiji Pine Ltd.
FRA 2000	FAO Global Forest Resource Assessment 2000.
FSA	Fiji Sawmillers Association.
FTIB	Fiji Trade and Investment Bureau.
GDP	Gross Domestic Product (note: the GDP deflator is a measure of price inflation that is based on the prices of all goods and services produced in the economy).
MoFF	Ministry of Fisheries and Forests.
MT	Metric tonnes.
NFAP	National Forests Action Plan.
NLTB	Native Land Trust Board.
NPV	Net Present Value: the surplus of total discounted benefits less total discounted costs of an investment, calculated at a specified discount rate.
ROC	Return on Capital: the expected rate of return on investments made in the sector, measured as the amount of profit earned expressed as a percentage of the total capital invested.
SCARF	Seed Capital Revolving Fund
TWI	Tropik Wood Industries Ltd.
UNIDO	United Nations Industrial Development Organization
USD	United States dollar.
VAT	Value-added tax.

APPENDIX 1: STATISTICAL TABLES

Table 23 Distribution of forest land in Fiji by forest type and land ownership 1986 - 1998, as reported by the Forestry Department

Year	Production forest												Protection forest	Non-commercial forest	Total
	Indigenous forest						Forest plantation								
	Crown or state land	Forest reserve	Crown or state lease	Native land	Private land	Total	Crown or state land	Forest reserve	Crown or state lease	FPC lease	Private land	Total			
1986	5.60	0.96	0.56	216.14	14.01	**237.27**	0.66	6.08	22.22	45.15	11.35	**85.46**	269.10	298.50	**890.33**
1987	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**
1988	5.60	0.96	12.04	194.35	14.01	**226.96**	0.66	6.08	29.04	47.06	12.79	**95.63**	269.10	300.86	**892.55**
1989	5.60	0.96	12.92	190.74	14.01	**224.23**	3.43	6.08	32.26	43.04	13.33	**98.14**	269.10	304.47	**895.94**
1990	5.60	0.96	0.85	187.84	13.96	**209.21**	5.03	6.08	35.39	43.63	13.77	**103.90**	268.13	309.24	**890.48**
1991	5.24	0.94	0.84	181.60	13.58	**202.20**	5.03	6.08	38.38	35.63	13.99	**99.11**	266.58	307.65	**875.54**
1992	5.24	0.94	0.84	178.52	13.54	**199.08**	5.18	6.08	40.80	37.57	13.99	**103.62**	265.46	310.45	**878.61**
1993	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**
1994	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**
1995	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**
1996	5.24	0.94	0.84	170.89	13.34	**191.25**	5.18	6.08	49.39	43.68	7.70	**112.03**	260.34	306.39	**870.01**
1997	5.24	0.94	0.84	167.34	13.34	**187.70**	5.18	6.08	49.85	43.68	7.70	**112.49**	260.33	309.94	**870.46**
1998	5.24	0.94	0.84	156.83	13.08	**176.93**	5.18	6.08	50.56	43.68	9.20	**114.70**	277.02	320.70	**889.35**

Source: Forestry Department (1998 and earlier).

Table 24 Amount of forest land in timber concessions and long term licences in Fiji and royalties collected from such areas 1986 - 1998

Year	Number of concessions and licences	Total area (in ha)	Productive area (in ha)	Estimated total standing volume (in m^3)	Annual allowable cut (in m^3)		Production (in m^3)	Royalties paid (in F$)	Average royalty payment (in F$/$m^3$)
					Maximum	Minimum			
1986	11	278,042	143,128	9,195,074	51,450	41,500	108,729	844,971	7.77
1987	11	279,977	144,737	8,541,959	51,450	41,500	103,611	626,971	6.05
1988	11	279,977	144,737	8,541,959	51,450	41,500	95,268	590,241	6.20
1989	10	278,042	143,128	9,195,074	51,450	41,500	68,788	485,449	7.06
1990	8	278,042	143,128	9,195,074	51,450	41,500	77,956	889,351	11.41
1991	8	279,002	144,722	9,411,845	n.a.	n.a.	45,823	1,034,639	22.58
1992	8	279,002	144,722	9,411,845	n.a.	n.a.	40,858	946,176	23.16
1993	9	282,177	144,722	9,411,845	n.a.	n.a.	37,493	776,758	20.72
1994	9	282,177	144,722	9,411,845	n.a.	n.a.	46,774	1,759,302	37.61
1995	7	262,948	132,209	8,628,445	n.a.	n.a.	46,892	1,046,033	22.31
1996	7	262,948	132,209	8,628,445	n.a.	n.a.	75,313	1,749,844	23.23
1997	9	262,948	132,209	8,628,445	n.a.	n.a.	79,729	1,829,573	22.95
1998	9	262,948	132,209	8,628,445	n.a.	n.a.	69,369	1,898,942	27.37

Source: Forestry Department (1998 and earlier).

Table 25 Timber production in Fiji by forest type and product type 1986 - 1998, as reported by the Forestry Department

Year	Forest type	Wood type	Type of forest product (and conversion factor to roundwood equivalent or RWE)							Total (in m^3 RWE)
			Logs (in m^3)	Sawnwood (in m^3)	Poles & posts (in m^3 or linear m)	Pulpwood (in m^3)	Fuelwood (in m^3 or stacked m^3)	Fuelwood licences (in m^3 or stacked m^3)	Charcoal (in kg)	
			1.00	2.00	1.00 or 0.011	1.00	1.00 or 0.75	1.00 or 0.75	0.006	
1986	**Indigenous**									
	Inland	Non-coniferous	185,475	33	529		7,227	4,888		**195,156**
	Mangroves	Non-coniferous			36		3,700	included above	3,280	**2,831**
	All indigenous forest		**185,475**	**33**	**565**	**0**	**10,927**	**4,888**	**3,280**	**197,987**
	Plantation									
	FPL	Coniferous	8,086		2,033		5,952			**16,071**
	Forestry Department	Coniferous	6		1,723					**1,729**
	Hardwood	Non-coniferous	1,411				237	39		**1,687**
	All forest plantations		**9,503**	**0**	**3,756**	**0**	**6,189**	**39**	**0**	**19,487**
	Total Production: coniferous		8,092	0	3,756	0	5,952	0	0	**17,800**
	Total Production: non-coniferous		186,886	33	565	0	11,164	4,927	3,280	**199,674**
	Total Production: all species		**194,978**	**33**	**4,321**	**0**	**17,116**	**4,927**	**3,280**	**217,474**
1987	**Indigenous**									
	Inland	Non-coniferous	221,757	26	293		15,355	3,095		**235,940**
	Mangroves	Non-coniferous			312		2,378	included above	3,600	**2,117**
	All indigenous forest		**221,757**	**26**	**605**	**0**	**17,733**	**3,095**	**3,600**	**238,057**
	Plantation									
	FPL	Coniferous	21,688			55,757	1,383			**78,828**
	Forestry Department	Coniferous	1,278		962					**2,240**
	Hardwood	Non-coniferous	3,815				561			**4,376**
	All forest plantations		**26,781**	**0**	**962**	**55,757**	**1,944**	**0**	**0**	**85,444**
	Total Production: coniferous		22,966	0	962	55,757	1,383	0	0	**81,068**
	Total Production: non-coniferous		225,572	26	605	0	18,294	3,095	3,600	**242,433**
	Total Production: all species		**248,538**	**26**	**1,567**	**55,757**	**19,677**	**3,095**	**3,600**	**323,501**
1988	**Indigenous**									
	Inland	Non-coniferous	203,578		307		12,052	24,983		**231,661**
	Mangroves	Non-coniferous			17		4,470		8,310	**3,419**
	All indigenous forest		**203,578**	**0**	**324**	**0**	**16,522**	**24,983**	**8,310**	**235,081**
	Plantation									
	FPL	Coniferous	79,379			118,992	2,403			**200,774**
	Forestry Department	Coniferous	4,495		1,530	1,195	59			**7,279**
	Hardwood	Non-coniferous	6,170				1,396			**7,566**
	All forest plantations		**90,044**	**0**	**1,530**	**120,187**	**3,858**	**0**	**0**	**215,619**
	Total Production: coniferous		83,874	0	1,530	120,187	2,462	0	0	**208,053**
	Total Production: non-coniferous		209,748	0	324	0	17,918	24,983	8,310	**242,647**
	Total Production: all species		**293,622**	**0**	**1,854**	**120,187**	**20,380**	**24,983**	**8,310**	**450,700**
1989	**Indigenous**									
	Inland	Non-coniferous	162,163		482		7,933	10,542		**178,485**
	Mangroves	Non-coniferous			16		2,502		13,767	**2,601**
	All indigenous forest		**162,163**	**0**	**498**	**0**	**10,435**	**10,542**	**13,767**	**181,085**
	Plantation									
	FPL	Coniferous	78,136		1,774	144,768	4,171			**228,849**
	Forestry Department	Coniferous	19,197		2,656	6,652				**28,505**
	Hardwood	Non-coniferous	6,964				1,312			**8,276**
	All forest plantations		**104,297**	**0**	**4,430**	**151,420**	**5,483**	**0**	**0**	**265,630**
	Total Production: coniferous		97,333	0	4,430	151,420	4,171	0	0	**257,354**
	Total Production: non-coniferous		169,127	0	498	0	11,747	10,542	13,767	**189,361**
	Total Production: all species		**266,460**	**0**	**4,928**	**151,420**	**15,918**	**10,542**	**13,767**	**446,715**
1990	**Indigenous**									
	Inland	Non-coniferous	153,820	276	416		7,476	9,874	9,900	**169,729**
	Mangroves	Non-coniferous			52		1,438			**1,490**
	All indigenous forest		**153,820**	**276**	**468**	**0**	**8,914**	**9,874**	**9,900**	**171,219**
	Plantation									
	FPL	Coniferous	77,367			170,458	5,289			**253,114**
	Forestry Department	Coniferous	23,132		8,820	13,652	156			**45,760**
	Extension	Coniferous	304		360	534				**1,198**
	Hardwood	Non-coniferous	2,331				745			**3,076**
	All forest plantations		**103,134**	**0**	**9,180**	**184,644**	**6,190**	**0**	**0**	**303,148**
	Total Production: coniferous		100,803	0	9,180	184,644	5,445	0	0	**300,072**
	Total Production: non-coniferous		156,151	276	468	0	9,659	9,874	9,900	**174,295**
	Total Production: all species		**256,954**	**276**	**9,648**	**184,644**	**15,104**	**9,874**	**9,900**	**474,367**

Table 25 Timber production in Fiji by forest type and product type 1986 - 1998, as reported by the Forestry Department (continued)

Year	Forest type	Wood type	Type of forest product (and conversion factor to roundwood equivalent or RWE)							Total (in m³ RWE)
			Logs (in m³)	Sawnwood (in m³)	Poles & posts (in m³ or linear m)	Pulpwood (in m³)	Fuelwood (in m³ or stacked m³)	Fuelwood licences (in m³ or stacked m³)	Charcoal (in kg)	
			1.00	2.00	1.00 or 0.011	1.00	1.00 or 0.75	1.00 or 0.75	0.006	
1991	**Indigenous**									
	Inland	Non-coniferous	120,077		326		2,837	662		**123,902**
	Mangroves	Non-coniferous			69		1,027		1,800	**1,107**
	All indigenous forest		**120,077**	**0**	**395**	**0**	**3,864**	**662**	**1,800**	**125,009**
	Plantation									
	FPL	Coniferous	119,055		2,755	224,828	8,082			**354,720**
	Forestry Department	Coniferous	7,020		674	3,474				**11,168**
	Hardwood	Non-coniferous	2,742				2,764			**5,506**
	All forest plantations		**128,817**	**0**	**3,429**	**228,302**	**10,846**	**0**	**0**	**371,394**
	Total Production: coniferous		126,075	0	3,429	228,302	8,082	0	0	**365,888**
	Total Production: non-coniferous		122,819	0	395	0	6,628	662	1,800	**130,515**
	Total Production: all species		**248,894**	**0**	**3,824**	**228,302**	**14,710**	**662**	**1,800**	**496,403**
1992	**Indigenous**									
	Inland	Non-coniferous	108,991		396		3,812	39	5	**113,238**
	Mangroves	Non-coniferous			83		971			**1,054**
	All indigenous forest		**108,991**	**0**	**479**	**0**	**4,783**	**39**	**5**	**114,292**
	Plantation									
	FPL	Coniferous	100,164		927	201,248				**302,339**
	Others	Coniferous	1,965							**1,965**
	Forestry Department	Non-coniferous	1,110				572			**1,682**
	Others	Non-coniferous	185							**185**
	All forest plantations		**103,424**	**0**	**927**	**201,248**	**572**	**0**	**0**	**306,171**
	Total Production: coniferous		102,129	0	927	201,248	0	0	0	**304,304**
	Total Production: non-coniferous		110,286	0	479	0	5,355	39	5	**116,159**
	Total Production: all species		**212,415**	**0**	**1,406**	**201,248**	**5,355**	**39**	**5**	**420,463**
1993	**Indigenous**									
	Inland	Non-coniferous	129,674	145	513			1,851		**132,183**
	Mangroves	Non-coniferous			43		512	85		**640**
	All indigenous forest		**129,674**	**145**	**556**	**0**	**512**	**1,936**	**0**	**132,823**
	Plantation									
	FPL	Coniferous	114,393			247,793				**362,186**
	FD Mahogany	Non-coniferous	3,267		1			1,872		**5,140**
	FD others	Non-coniferous	386							**386**
	All forest plantations		**118,046**	**0**	**1**	**247,793**	**0**	**1,872**	**0**	**367,712**
	Total Production: coniferous		114,393	0	0	247,793	0	0	0	**362,186**
	Total Production: non-coniferous		133,327	145	557	0	512	3,808	0	**138,349**
	Total Production: all species		**247,720**	**145**	**557**	**247,793**	**512**	**3,808**	**0**	**500,535**
1994	**Indigenous**									
	Inland	Non-coniferous	135,954		403		2,839			**139,196**
	Mangroves	Non-coniferous			1,262		707			**1,969**
	All indigenous forest		**135,954**	**0**	**1,665**	**0**	**3,546**	**0**	**0**	**141,165**
	Plantation									
	FPL	Coniferous	130,202			252,115				**382,317**
	FD Mahogany	Non-coniferous	2,762			1,367				**4,129**
	FD others	Non-coniferous								**0**
	All forest plantations		**132,964**	**0**	**0**	**253,482**	**0**	**0**	**0**	**386,446**
	Total Production: coniferous		130,202	0	0	252,115	0	0	0	**382,317**
	Total Production: non-coniferous		138,716	0	1,665	1,367	3,546	0	0	**145,294**
	Total Production: all species		**268,918**	**0**	**1,665**	**253,482**	**3,546**	**0**	**0**	**527,611**
1995	**Indigenous**									
	Inland	Non-coniferous	129,506		201		373			**130,080**
	Mangroves	Non-coniferous			24		450			**474**
	All indigenous forest		**129,506**	**0**	**225**	**0**	**823**	**0**	**0**	**130,554**
	Plantation									
	FPL	Coniferous	123,783			305,592				**429,375**
	FD Mahogany	Non-coniferous	1,603				539			**2,142**
	FD others	Non-coniferous	34							**34**
	All forest plantations		**125,420**	**0**	**0**	**305,592**	**539**	**0**	**0**	**431,551**
	Total Production: coniferous		123,783	0	0	305,592	0	0	0	**429,375**
	Total Production: non-coniferous		131,143	0	225	0	1,362	0	0	**132,730**
	Total Production: all species		**254,926**	**0**	**225**	**305,592**	**1,362**	**0**	**0**	**562,105**

Table 25 Timber production in Fiji by forest type and product type 1986 - 1998, as reported by the Forestry Department (continued)

Year	Forest type	Wood type	Type of forest product (and conversion factor to roundwood equivalent or RWE)							Total (in m³ RWE)
			Logs (in m³)	Sawnwood (in m³)	Poles & posts (in m³ or linear m)	Pulpwood (in m³)	Fuelwood (in m³ or stacked m³)	Fuelwood licences (in m³ or stacked m³)	Charcoal (in kg)	
			1.00	2.00	1.00 or 0.011	1.00	1.00 or 0.75	1.00 or 0.75	0.006	
1996	**Indigenous**									
	Inland	Non-coniferous	149,821		3,763		1,976			**151,838**
	Mangroves	Non-coniferous			6,432		371			**442**
	All indigenous forest		**149,821**	**0**	**10,195**	**0**	**2,347**	**0**	**0**	**152,280**
	Plantation									
	FPL	Coniferous	121,698			306,818				**428,516**
	FD Mahogany	Non-coniferous	235				98			**333**
	FD others	Non-coniferous	12							**12**
	All forest plantations		**121,945**	**0**	**0**	**306,818**	**98**	**0**	**0**	**428,861**
	Total Production: coniferous		121,698	0	0	306,818	0	0	0	**428,516**
	Total Production: non-coniferous		150,068	0	10,195	0	2,445	0	0	**152,625**
	Total Production: all species		**271,766**	**0**	**10,195**	**306,818**	**2,445**	**0**	**0**	**581,141**
1997	**Indigenous**									
	Inland	Non-coniferous	151,941		9,712		1,073			**153,121**
	Mangroves	Non-coniferous			399		399			**403**
	All indigenous forest		**151,941**	**0**	**10,111**	**0**	**1,472**	**0**	**0**	**153,524**
	Plantation									
	FPL	Coniferous	112,523		14	204,956				**317,493**
	Others	Coniferous	2,787							**2,787**
	All forest plantations		**115,310**	**0**	**14**	**204,956**	**0**	**0**	**0**	**320,280**
	Total Production: coniferous		115,310	0	14	204,956	0	0	0	**320,280**
	Total Production: non-coniferous		151,941	0	10,111	0	1,472	0	0	**153,524**
	Total Production: all species		**267,251**	**0**	**10,125**	**204,956**	**1,472**	**0**	**0**	**473,804**
1998	**Indigenous**									
	Inland	Non-coniferous	134,327							**134,327**
	Mangroves	Non-coniferous								**0**
	All indigenous forest		**134,327**	**0**	**0**	**0**	**0**	**0**	**0**	**134,327**
	Plantation									
	FPL	Coniferous	128,768		6,510	286,000				**414,840**
	Others	Coniferous								**0**
	All forest plantations		**128,768**	**0**	**6,510**	**286,000**	**0**	**0**	**0**	**414,840**
	Total Production: coniferous		128,768	0	6,510	286,000	0	0	0	**414,840**
	Total Production: non-coniferous		134,327	0	0	0	0	0	0	**134,327**
	Total Production: all species		**263,095**	**0**	**6,510**	**286,000**	**0**	**0**	**0**	**549,167**

Source: Forestry Department (1998 and earlier). Note: fuelwood from indigenous forest is recorded in stacked cubic metres from 1986 to 1990; sawnwood is recorded in product volume from 1986 to 1992; and posts and poles are recorded in linear metres from 1996 to 1998 except for the FPL figure in 1997.

Table 26 Number and size of forest processing facilities in Fiji 1986 - 1998

Company	Log input by year (in cubic metres)													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Fiji Forest Industries	55,971	56,901	46,515	43,834	50,900	44,285	39,230	35,076	46,501	47,588	55,735	53,116	49,330	48,076
Valebasoga								520	3,441	10,251	17,019	8,380	20,776	10,065
Waiqele Sawmill	6,151	5,524	5,388	5,016	5,092	4,420	6,582	5,346	8,536	8,659	8,880	9,265	10,591	6,881
Lumber Processors												1,208	4,830	3,019
CBM Timbers	5,278	5,346	436	813										2,968
Taiwan Timbers												1,936	2,212	2,074
Taveuni Woo IL						4,496	37	904	4,576	182				2,039
Vunimoli	5,053	5,664	1,181	2,220	1,599	1,584	1,408	1,857	2,387	828	176	1,088	119	1,936
Pacific Produce												2,963	444	1,704
Dongwoo/Sae Han Timbers					3,653	1,477	1,316	1,797	923	369	352			1,412
Santa Singh Sawmill	109	442	532	1,756	1,077	1,689	1,633	2,434	306	1,680	1,510			1,197
Savusavu								2,424	629		130			1,061
Rattan Singh												1,612	472	1,042
Jai Narayan									89			833	986	636
Joe Sam									294	654	901			616
Labasa Sawmill								276	769	792	246			521
Raviravi Sawmill													509	509
Hanif Industries								402	249					326
Northern Lumber									313					313
Mikaele Naqila Sawmill							302							302
Seaqaqa Sawmills							281							281
Wailevu	10	72	223	872	162									268
Bua Sawmills							241							241
Bua	27	136	254	393										203
Tuvamila	192	273	31											165
Seaqaqa Timber Industries	92	32	223	369	69									157
Naua	132													132
Seaqaqa Sawmill	22	32	71	12	496									127
Vermon									112	64				88
Luvuluvu	23	187	15	44	139	73	113							85
Soqulu	73													73
P Hazelman	21	114												68
Hermant Sawmill	78	29												54
Matasawalevu	29		31											30
Daku Sawmill	18	12												15
Others	3,054	25,071	51,382	7,337	440	191	224	204	204	81	979		138	7,442
Total: Northern Division	**76,333**	**99,835**	**106,282**	**62,666**	**63,627**	**58,215**	**51,367**	**51,240**	**69,329**	**71,148**	**85,928**	**80,401**	**90,407**	**74,368**

Table 26 Number and size of forest processing facilities in Fiji 1986 - 1998 (continued)

Company	Log input by year (in cubic metres)													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Tropik Wood Industries		22,966	83,874	102,315	100,803	126,075	100,164	114,393	130,202	123,783	121,854	112,523	117,507	104,705
Pacific Lumber Company	16,498	12,405	8,315	15,657	8,553									12,286
Fiji Pine Commission	8,086													8,086
Cabe Sawmill	9,690	7,044	2,344	3,753	3,695									5,305
Dayal Sawmill									4,834	5,866	4,562	4,946	4,906	5,023
K K Komove Logging													3,323	3,323
Arula Investment						758	5,643	7,331	5,432	3,284	1,299	1,448	71	3,158
Singh Enterprises	2,166	5,815	6,571	1,749	1,045	1,477	1,225							2,864
Best Industries				2,764	4,865	2,929	3,467	5,265	1,417	1,449	733	1,077	2,106	2,607
G P Reddy							3,442	2,909	2,705	3,316	262	1,393	2,054	2,297
Valley Timber	750	1,033	689	1,535	707	3,365	3,799	3,793	2,584	1,733	3,502			2,135
Jamac Timbers							1,902	3,072	4,285	765	326			2,070
Vitilevu Sawmill							540	1,931	4,594	1,071	49			1,637
Nasaucoka	2,465	1,949	959	2,000	1,680	685								1,623
Yarawa Sawmill							1,458	1,264	1,540	1,316	2,018			1,519
Olosara								1,857	1,630	1,272	637			1,349
Rewarani	907	898												903
Vueti & Ketewai						855								855
Navosa Sawmills							781	914	823					839
Wood Ranges								1,202	2,232	263	112		85	779
Waikataka Lumber	630													630
Gonesau Sawmill									568					568
Pacific Green												550		550
Ba Timber Industries	97	133	105	179	1,761	1,009								547
Wasal Khan	317	687												502
Prem Lotan							542	388	336	1,053	99			484
Vusena Forest Products Ltd.													379	379
Azmad Ali													368	368
Rup Industries								361						361
Fijana Timbers											319			319
Khan's Lumber	226													226
Waitamata							150							150
P A Nand							147							147
Local Timbers											99			99
TBS	75													75
Pacific Timbers								13						13
Others	457	535	343	4,083	10,541	7,339	618	332	93	463	86		4	2,075
Total: Western Division	**42,364**	**53,465**	**103,200**	**134,035**	**133,650**	**144,492**	**123,878**	**145,025**	**163,275**	**145,634**	**135,957**	**121,937**	**130,803**	**121,363**

Table 26 Number and size of forest processing facilities in Fiji 1986 - 1998 (continued)

Company	Log input by year (in cubic metres)													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Mohammed Ali Woodcraft	14,337	26,540	21,994											20,957
Pacific Lumber Company (Debua)	18,528	18,232	20,880	22,904	11,173									18,343
Fenning										7,535	19,579	24,622		17,245
TBS	12,470	16,056	12,775											13,767
Timbers (Fiji) Ltd													8,787	8,787
Mana Forest										1,666	5,128	18,516	4,494	7,451
Namosi Timber Co.				11,976	2,760									7,368
Dhannu Prasad	3,968	6,769	8,948	10,341	5,743	3,066								6,473
Timber and Building Supplies							8,904	7,835	6,820	3,692	3,621			6,174
Nur Ahmed & Sons/Yarawa Sawmill	6,041	7,703	3,572	599	6,037	6,894	9,055	6,097	6,932	3,918	4,986	6,636	9,603	6,006
South Pacific Sawmilling Co./Southern Forest		211	606	3,325	6,613	2,347	3,499	4,893	6,214	8,642	6,929	11,150	13,869	5,692
Pacific Timber Development				2,438	9,422	10,354	2,188	7,310	6,202	4,170	5,912		2,251	5,583
Sharma Sawmill				634	4,904	9,810								5,116
PUO Mill								2,762	1,732	1,641				2,045
Wood Rangers							935	2,112	2,791	2,981	1,649	1,714		2,030
Jamac	2,810	2,635	2,087	2,250	2,263	1,987	141							2,025
Veisari	3,459	1,348	106											1,638
Watabu							1,845	963						1,404
Waimanu	1,532	291	234	958	1,825	2,170	2,076	2,370	2,007	179				1,364
Ami Chand	2,370	1,839	712	599	440									1,192
Tropik Wood Industries													1,011	1,011
Nabukavesi	100	213	181	3,862	586									988
Vuniniudrovu	1,637	1,109	725	1,092	928	934	376		132					867
Nakoba Timber Milling	1,033	1,359	102											831
Wainivesi											449	1,580	434	821
Singh's Timber Milling/ B Singh and Sons					1,135	1,124	1,071	938	685	370	46			767
Kadavu Development Co.		727												727
Local Timber								914	748	638	342	695		667
Sam's Sawmill						677	621							649
Drotini								398	336	1,426	281			610
Pulled Logging							470							470
Rup Farms	835	652					46	435	106	29				351
Waitamata	945	213	39	159	215	669	300	192	104	588	351			343
Ram's	4	652												328
Shiu Govind	470	322	13	20	540									273
Namosi Sawmill	694	17	83											265
Waila	603	236	308	288	30	137	336	149						261
Baljit Singh		239												239
R P Chand											21		437	229
Green Timber									388	245	24			219
Fiji Sawmill	512	52	87											217
Match Factory									27	224	119		290	165
Fiji Sawmills							175	140						158
Douglas	77	189												133
Express Lumber	154	98												126
Nakaulevu (R Prasad)	163	97	7											89
TTR Sawmill									55	39	166			87
Nakaulevu (K Raj)		63												63
Achaibar Singh													60	60
Valley Timber								50						50
Balram	15	30												23
Suva Timber Supplies	15													15
Dominion Sawmills							25	5						15
Hira Lal/Mataitini											14			14
Others	125	7,495	6,869	5,331	2,743	6,018	4,675	256	127	165	17		77	2,825
Total: Southern Division	**72,897**	**95,387**	**80,328**	**66,776**	**57,357**	**46,187**	**36,738**	**37,819**	**35,406**	**38,148**	**49,634**	**64,913**	**41,313**	**55,608**
TOTAL: ALL DIVISIONS	**191,594**	**248,687**	**289,810**	**263,477**	**254,634**	**248,894**	**211,983**	**234,084**	**268,010**	**254,930**	**271,519**	**267,251**	**262,523**	**251,338**

Source: Forestry Department (1998 and earlier). Note: the "others" category includes some log exports in 1987 - 1988.

Table 27 Distribution of log consumption in Fiji by mill size 1986 - 1998

Size of mill (by annual log intake in cubic metres)	Year													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Over 10,000	117,804	153,100	186,038	207,027	162,876	180,714	139,394	149,469	176,703	181,622	214,187	219,927	212,073	176,995
FFI and TWI	*55,971*	*79,867*	*130,389*	*146,149*	*151,703*	*170,360*	*139,394*	*149,469*	*176,703*	*171,371*	*177,589*	*165,639*	*166,837*	*144,726*
Other	*61,833*	*73,233*	*55,649*	*60,878*	*11,173*	*10,354*	*0*	*0*	*0*	*10,251*	*36,598*	*54,288*	*45,236*	*32,269*
5,001-10,000	40,299	43,865	29,222	5,016	41,460	16,704	30,184	39,184	40,136	30,702	26,849	24,281	18,390	29,715
1,001-5,000	21,440	11,272	9,184	28,744	32,262	33,140	30,329	36,677	42,755	35,668	23,147	20,965	27,187	27,136
0-1,000	8,415	7,349	6,772	5,939	4,312	4,788	6,559	7,962	7,992	6,229	6,254	2,078	4,654	6,100
Others	3,636	33,101	58,594	16,751	13,724	13,548	5,517	792	424	709	1,082	0	219	11,392
Total	**191,594**	**248,687**	**289,810**	**263,477**	**254,634**	**248,894**	**211,983**	**234,084**	**268,010**	**254,930**	**271,519**	**267,251**	**262,523**	**251,338**

Source: Forestry Department (1998 and earlier). Note: the "others" category includes some log exports in 1987 - 1988.

Table 28 Number of mills in Fiji by mill size 1986 - 1998

Size of mill (by annual log intake in cubic metres)	Year													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Over 10,000	5	6	5	6	3	3	2	2	2	3	4	5	5	4
FFI and TWI	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Other	*4*	*4*	*3*	*4*	*1*	*1*	*0*	*0*	*0*	*1*	*2*	*3*	*3*	*2*
5,001-10,000	6	7	4	1	6	2	4	6	6	4	4	3	2	4
1,001-5,000	9	7	4	12	13	14	14	15	15	16	8	11	9	11
Up to 1,000	33	30	25	14	11	8	20	18	21	16	24	3	13	18
Total	**53**	**50**	**38**	**33**	**33**	**27**	**40**	**41**	**44**	**39**	**40**	**22**	**29**	**38**

Source: Forestry Department (1998 and earlier).

Table 29 Average mill size in Fiji (excluding FFI and TFI) 1986 - 1998

Mill statistics	Year													
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Total log input (in m^3)	131,987	135,719	100,827	100,577	89,207	64,986	67,072	83,823	90,883	82,850	92,848	101,612	95,467	95,220
Total number of mills	52	48	36	31	31	25	38	39	42	37	38	20	27	36
Average log input (in m^3)	**2,538**	**2,827**	**2,801**	**3,244**	**2,878**	**2,599**	**1,765**	**2,149**	**2,164**	**2,239**	**2,443**	**5,081**	**3,536**	**2,790**

Source: Forestry Department (1998 and earlier).

Table 30 Revenue collection and government expenditure on forestry 1977 - 2002

Year	Revenue (in FJD)					Expenditure (in FJD)			Net government expenditure	Natural forest log production
	Collected for landowners	Fees for government	Commercial undertakings	Miscellaneous	Total for government	Annual recurrent	Capital	Total		
1977	614,700	164,802	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	166,900
1978	671,000	219,785	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	179,300
1979	734,700	267,024	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	193,100
1980	962,200	332,347	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	206,200
1981	1,115,237	342,816	100,231	23,253	466,300	2,290,978	221,995	2,512,973	2,046,673	216,200
1982	845,632	293,669	73,763	33,967	401,399	2,653,072	167,382	2,820,454	2,419,055	154,000
1983	1,140,068	404,177	180,399	42,652	627,228	2,918,435	585,899	3,504,334	2,877,106	161,300
1984	1,041,802	401,737	100,072	28,830	530,639	3,004,277	799,762	3,804,039	3,273,400	175,400
1985	1,111,105	338,629	267,299	25,755	631,683	3,233,351	1,722,122	4,955,473	4,323,790	203,300
1986	947,044	405,401	460,884	31,235	897,520	3,275,800	1,982,300	5,258,100	4,360,580	185,475
1987	1,200,982	380,907	597,393	20,590	998,890	3,185,300	1,846,000	5,031,300	4,032,410	215,780
1988	1,158,187	391,368	1,088,761	48,800	1,528,929	2,535,010	2,215,841	4,750,851	3,221,922	203,578
1989	687,555	262,622	1,266,807	19,007	1,548,436	2,934,862	2,734,318	5,669,180	4,120,744	162,163
1990	1,244,898	297,194	1,061,846	50,489	1,409,529	3,186,921	2,039,676	5,226,597	3,817,068	153,820
1991	118,106	348,341	885,406	48,712	1,282,459	3,535,733	2,646,739	6,182,472	4,900,013	120,077
1992	1,157,782	313,616	354,183	29,584	697,383	4,866,144	2,616,984	7,483,128	6,785,745	108,991
1993	1,362,472	395,518	762,685	45,002	1,203,205	5,008,662	2,129,320	7,137,982	5,934,777	116,929
1994	1,681,129	300,711	739,584	49,515	1,089,810	5,268,754	2,126,844	7,395,598	6,305,788	135,954
1995	1,688,244	371,846	629,566	35,371	1,036,783	4,979,976	2,010,669	6,990,645	5,953,862	129,506
1996	*3,582,851*	436,804	83,615	29,595	550,014	5,379,924	2,132,909	7,512,833	6,962,819	149,821
1997	*3,064,943*	444,300	93,987	44,000	582,287	5,454,846	2,038,998	7,493,844	6,911,557	151,941
1998	*1,689,458*	413,092	36,761	224,921	674,774	5,589,586	778,586	6,368,172	5,693,398	134,327
1999	*1,879,753*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	80,320
2000	*2,372,869*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	106,672
2001	*2,908,963*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	110,318
2002	*2,766,800*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	101,971

Source: Forestry Department (1998 and earlier). Note: NLTB have collected royalties since 1996 and the Forestry Department also hived-off some commercial undertakings in this year.

Table 31 Log production volumes by province and species class 1999 and 2000

Year	Royalty class	Volume by province (in cubic metres)											Total
		Ba	Bua	Cakaudrove	Macuata	Nadroga/ Navosa	Naitasiri	Namosi	Ra	Rewa	Senua	Tailevu	
1999	Class 1	2,173	1,373	3,661	7,482	2,024	5	149	0	417	2,411	319	20,014
	Class 2	1,321	3,006	5,871	16,026	3,793	707	463	666	2,406	9,851	2,116	46,225
	Class 3	554	550	2,337	5,102	278	31	83	1	570	1,894	222	11,622
	Class 4	383	458	975	2,380	121	11	11	10	139	328	355	5,171
	Mahogany	88	0	0	0	0	0	0	0	0	0	0	88
	Pine	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	All classes	**4,518**	**5,388**	**12,843**	**30,991**	**6,216**	**754**	**706**	**677**	**3,532**	**14,484**	**3,012**	**83,121**
2000	Class 1	638	907	2,775	8,861	2,451	0	126	118	231	3,707	81	19,894
	Class 2	701	5,474	6,109	25,059	3,876	28	132	1,313	1,234	14,018	674	58,619
	Class 3	364	952	1,924	6,819	312	1	58	93	454	2,946	53	13,974
	Class 4	336	1,411	2,163	11,156	124	2	17	102	55	617	45	16,028
	Mahogany	184	0	0	56	0	22	0	103	0	0	14	379
	Pine	35	0	0	0	0	113	0	0	0	0	0	148
	All classes	**2,258**	**8,743**	**12,971**	**51,952**	**6,764**	**164**	**334**	**1,728**	**1,974**	**21,288**	**867**	**109,043**

Source: Forestry Department (2001).

Table 32 Sawnwood export prices 1999 - 2002

Species	Royalty class	Grade	Moisture content	Treatment	Price by year (FJD per cubic metre, FOB)								Average (converted to 2003 prices)
					1999		2000		2001		2002		
					low	high	low	high	low	high	low	high	
Buabua	1	FF Sel+	KD	Untreated			1,080						1,163
		FF Sel	Wet	Untreated			760	968					930
		FF Stand	Wet	Untreated			760	1,000					948
		Shorts	Wet	Untreated			900	1,000					1,023
		Ungraded	AD	Untreated							400	1,000	704
Dakua Makadre	1	FF Sel+	KD	Treated					980	1,300	780	1,265	1,090
		FF Sel+	KD	Untreated					1,111		830	1,349	1,104
		FF Sel+	Wet	Treated			700	1,400			950	1,150	1,093
		FF Sel+	Wet	Untreated					860	1,050			965
		FF Sel	KD	Treated	1,130		750	1,000					1,027
		FF Sel	KD	Untreated	1,000		830	1,106			800	1,448	1,081
		FF Sel	Wet	Untreated	830		1,063						1,012
		Ungraded	KD	Untreated			800	995			900	1,222	1,016
		Ungraded	AD	Untreated			825	900			750	1,450	1,017
		Ungraded	Wet	Untreated			900	1,000					1,023
Dakua Salusalu	1	FF Sel+	KD	Treated					974	1,147	900	1,300	1,088
		FF Sel+	Wet	Untreated			720	950	860	886	750	1,100	904
		FF Sel	KD	Untreated	800	1,320					813	1,200	1,067
		FF Sel	Wet	Untreated			770	1,124					1,020
		Ungraded	KD	Untreated							684	1,840	1,268
		Ungraded	AD	Untreated							1,164		1,170
		Ungraded	Wet	Untreated							541	1,889	1,221
Rosawa	1	FF Sel (decking)	KD	Untreated					1,480				1,495
		FF Sel+	Wet	Untreated			514	900	671	786	700	1,100	801
		FF Sel	KD	Untreated							1,045		1,050
		FF Sel	Wet	Untreated			491	838			800	850	772
		FF Stand	AD	Untreated					620	820			727
		Ungraded	Wet	Untreated							594	944	773
Vesi	1	FF Sel+	KD	Untreated							650	930	794
		FF Sel	KD	Untreated							844	889	871
		FF Sel	AD	Untreated							800	950	879
		FF Sel	Wet	Untreated					985	1,028	714	1,020	944
		Ungraded	KD	Untreated							621		624
		Ungraded	AD	Untreated							750	1,060	910
		Ungraded	Wet	Untreated							550	1,464	1,012
Yaka	1	FF Sel+	KD	Untreated			800	1,300	980	1,300	900	1,550	1,171
		FF Sel	Wet	Untreated			1,068				1,100	1,350	1,204
		FF Stand	KD	Untreated							680	1,260	975
		Ungraded	KD	Untreated							1,070	1,261	1,171
		Ungraded	AD	Untreated							680	1,260	975
		Ungraded	Wet	Untreated			850				1,000		960
		Ungraded	Wet	Untreated							729	1,782	1,262

Source: Forestry Department.

Table 32 Sawnwood export prices 1999 - 2002 (continued)

Species	Royalty class	Grade	Moisture content	Treatment	Price by year (FJD per cubic metre, FOB)								Average (converted to 2003 prices)
					1999		2000		2001		2002		
					low	high	low	high	low	high	low	high	
Bauvudi	2	FF Sel+	KD	Treated			600	1,062	660	963			857
		FF Sel	KD	Treated					574	733	740	1,324	849
		FF Sel	KD	Untreated			613	618			780		703
		Ungraded	Wet	Treated			653				810		759
		Ungraded	Wet	Untreated							779		783
Damanu	2	F Prime	KD	Untreated			995	1,006					1,077
		FF Sel+	KD	Untreated					596	896			753
		FF Sel	KD	Treated	590								625
		FF Sel	KD	Untreated	830		619	889	611	906	619	1,023	812
		FF Sel	Wet	Untreated	500	690			727		650	800	690
		FF Stand	KD	Untreated							800		804
		FF Stand	Wet	Untreated			720	1,000					926
		Ungraded	KD	Untreated							497	557	530
		Ungraded	KD	Untreated							757	994	880
		Ungraded	Wet	Treated							505	710	611
Kaudamu	2	FF Sel+	KD	Treated					728	990	900	1,000	911
		FF Sel+	KD	Untreated					719	898			817
		FF Sel	KD	Treated	760	910					780	1,180	935
		FF Sel	KD	Untreated	890		540	739					773
		FF Sel	AD	Untreated							743		747
		FF Stand+	Wet	Treated			949						1,022
		FF Stand	KD	Treated							740	910	829
		FF Stand	KD	Treated							700	910	809
		FF Stand	Wet	Untreated			1,000						1,077
		Ungraded	KD	Treated							450	915	686
Kauvula	2	FF Sel+	KD	Treated			698		660	883	500	848	733
		FF Sel	KD	Treated	665	790	480	980			777		779
		FF Stand+	Wet	Untreated			820						883
		FF Stand	KD	Treated			500				740	850	712
		Ungraded	KD	Treated			650	966			680	937	841
		Ungraded	KD	Untreated							932		937
		Ungraded	Wet	Treated			520	600			560	673	611
Rosarosa	3	FF Sel	KD	Untreated					1,393				1,407
		FF Stand+	KD	Untreated					700				707
		FF Stand	Wet	Untreated	300				300				310
		Ungraded	Wet	Untreated	650				460	550			570
Sacau	3	FF Sel+	KD	Untreated					1,180				1,192
		FF Sel	KD	Untreated							1,089		1,094
		FF Stand+	KD	Untreated							700		704
		Ungraded	KD	Untreated							825		829
		Ungraded	Wet	Untreated							1,000		1,005
Yasiyasi	3	FF Sel+	KD	Untreated							1,200		1,206
		FF Stand	KD	Untreated							700		704
		Ungraded	AD	Untreated							700		704
		Ungraded	AD	Untreated							550		553

Source: Forestry Department.

Table 33 Industrial roundwood production and trade in Fiji 1961 - 2002, from FAO

Year	Production (in cubic metres)						Imports (in cubic metres)		Imports (in USD '000)	
	Coniferous sawlogs and veneer logs	Non-coniferous sawlogs and veneer logs	Coniferous pulpwood	*Chips and particles*	Other industrial roundwood	Total	Other industrial roundwood	Total	Other industrial roundwood	Total
1961	0	56,000				**56,000**				
1962	0	62,000			2,000	**64,000**				
1963	3,700	72,000			2,000	**77,700**				
1964	2,500	74,000			3,000	**79,500**				
1965	2,900	89,000			4,000	**95,900**				
1966	34,000	62,000			3,000	**99,000**				
1967	29,000	59,000			1,000	**89,000**				
1968	32,000	70,000			2,000	**104,000**				
1969	28,000	75,000			2,000	**105,000**				
1970	30,000	77,000			2,000	**109,000**				
1971	28,000	68,000 F			3,000	**99,000**				
1972	31,000	79,000 F			3,000	**113,000**				
1973	21,000	116,000			4,000	**141,000**	1,100	**1,100**	78	**78**
1974	24,000	135,000			2,000 F	**161,000**	1,000	**1,000**	72	**72**
1975	23,000 F	126,000 F			2,000 F	**151,000**	100	**100**	24	**24**
1976	23,000 F	132,000 F			2,000 F	**157,000**	100	**100**	19	**19**
1977	23,000 F	132,000 F			2,000 F	**157,000**	100 F	**100 F**	19 F	**19 F**
1978	23,000 F	132,000 F			3,000	**158,000**	100 F	**100 F**	19 F	**19 F**
1979	28,000 F	164,000 F			3,000	**195,000**				
1980	34,000 F	200,000 F			2,200	**236,200**				
1981	30,000 F	193,000			3,000	**226,000**				
1982	25,000 F	193,000 F			2,200	**220,200**				
1983	27,000 F	150,000			4,300	**181,300**				
1984	24,000	158,000			4,400	**186,400**				
1985	30,000	175,000			7,300	**212,300**				
1986	38,000	157,000			4,000	**199,000**				
1987	23,000 D	200,000	56,000 D		1,000	**280,000**				
1988	84,000 D	171,000	120,000 D		1,500	**376,500**				
1989	97,000	169,000	151,000 D		4,400 D	**421,400**				
1990	101,000 D	169,000 F	185,000 D		9,200 D	**464,200**				
1991	126,000 D	169,000 F	228,000 D		3,400 D	**526,400**				
1992	102,000 D	169,000 F	201,000 D		900 D	**472,900**				
1993	114,000	130,000	247,000		600	**491,600**				
1994	130,000	139,000	252,000		1,200	**522,200**				
1995	124,000	131,000	306,000		200	**561,200**				
1996	122,000 D	131,000 F	307,000 D		100 D	**560,100**				
1997	113,000	40,000 F	205,000 D		100 D	**358,100**				
1998	129,000	50,000 F	286,000 D	*269,000*	0	**479,000**				
1999	118,000	60,000	250,000	*266,000*	0	**428,000**				
2000	92,000	107,000	250,000 F	*259,000*	0 F	**449,000**				
2001	89,000	111,000	273,000	*273,000*	0 F	**473,000**				
2002	89,000 F	111,000 F	273,000 F	*273,000 F*	0 F	**473,000**				

*Source: FAO (FAOSTAT), updated with Forestry Department statistics. Note: F = FAO Estimate; D = Forestry Department Statistic; and * = unofficial estimate.*

Table 33 Industrial roundwood production and trade in Fiji 1961 - 2002, from FAO (continued)

Year	Exports (in cubic metres)							Exports (in USD '000)						
	Coniferous sawlogs and veneer logs	Non-coniferous sawlogs and veneer logs	Coniferous industrial roundwood	Tropical non-con. industrial roundwood	Total industrial roundwood	Chips and particles	Total	Coniferous sawlogs and veneer logs	Non-coniferous sawlogs and veneer logs	Coniferous industrial roundwood	Tropical non-con. industrial roundwood	Total industrial roundwood	Chips and particles	Total
1961														
1962														
1963	3,700	3,500			7,200		**7,200**	57	89	0	0	146		**146**
1964	2,500	2,200			4,700		**4,700**	60	63	0	0	123		**123**
1965	2,900	1,500			4,400		**4,400**	62	46	0	0	108		**108**
1966	7,300	1,500			8,800		**8,800**	140	37	0	0	177		**177**
1967	900	4,300			5,200		**5,200**	16	84	0	0	100		**100**
1968	500	4,300			4,800		**4,800**	10	100	0	0	110		**110**
1969	3,200	2,000			5,200		**5,200**	73	36	0	0	109		**109**
1970	800	1,100			1,900		**1,900**	19	19	0	0	38		**38**
1971	100	0			100		**100**	4	0	0	0	4		**4**
1972														
1973														
1974														
1975														
1976														
1977														
1978														
1979														
1980	13,100	0			13,100		**13,100**	1,534	0	0	0	1,534		**1,534**
1981	2,300	0			2,300		**2,300**	184	0	0	0	184		**184**
1982	2,300 F	0			2,300		**2,300**	184 F	0	0	0	184		**184**
1983	1,600	0			1,600		**1,600**	91	0	0	0	91		**91**
1984	15,500	0			15,500		**15,500**	972	0	0	0	972		**972**
1985	4,100	0			4,100		**4,100**	211	0	0	0	211		**211**
1986	4,100 F	0			4,100		**4,100**	211 F	0	0	0	211		**211**
1987	9,800 *	0 F			9,800	41,000 *	**50,800**	693 *	0 F	0	0	693	2,600 F	**3,293**
1988	9,800 F	0			9,800	184,000 *	**193,800**	693 F	0	0	0	693	12,500 F	**13,193**
1989	9,800	0			9,800	138,600 *	**148,400**	554	0	0	0	554	9,900 F	**10,454**
1990			0	8,228	8,228	143,700 *	**151,928**			0	1,281	1,281	14,319 *	**15,600**
1991			2,587	570	3,157	223,600 *	**226,757**			301	70	371	22,400 F	**22,771**
1992			6,665	62	6,727	302,232	**308,959**			571	16	587	15,221	**15,808**
1993			0	25	25	349,000	**349,025**			0	19	19	13,987	**14,006**
1994			700	1,200	1,900	308,700	**310,600**			483	443	926	10,810	**11,736**
1995			2,100	100	2,200	519,400	**521,600**			1,179	39	1,218	22,919	**24,137**
1996			200	400	600	355,800	**356,400**			16	208	224	15,700 F	**15,924**
1997			15 D	50 D	65 D	241,000	**241,065**			3 D	29 D	31 D	17,355	**17,386**
1998			0 D	0 D	0 D	303,000	**303,000**			0 D	0 D	0 D	17,326	**17,326**
1999			0 D	0 D	0 D	214,000	**214,000**			0 D	0 D	0 D	9,600	**9,600**
2000			0 D	0 D	0 D	259,000	**259,000**			0 D	0 D	0 D	12,202	**12,202**
2001			0 D	0 D	0 D	206,000	**206,000**			0 D	0 D	0 D	10,856	**10,856**
2002			0 D	0 D	0 D	206,000 F	**206,000**			0 D	0 D	0 D	10,856 F	**10,856**

*Source: FAO (FAOSTAT), updated with Forestry Department statistics. Note: F = FAO Estimate; D = Forestry Department Statistic; and * = unofficial estimate.*

Table 34 Sawnwood production and trade in Fiji 1961 - 2002, from FAO

Year	Production (in cubic metres)			Imports (in cubic metres)			Imports (in USD '000)			Exports (in cubic metres)			Exports (in USD '000)		
	Coniferous sawnwood	Non-coniferous sawnwood	Total	Coniferous sawnwood	Non-coniferous sawnwood	Total	Coniferous sawnwood	Non-coniferous sawnwood	Total	Coniferous sawnwood	Non-coniferous sawnwood	Total	Coniferous sawnwood	Non-coniferous sawnwood	Total
1961	0	25,000	**25,000**	10,000	800	**10,800**	550	75	**625**	0	1,700	**1,700**	0	110	**110**
1962	0	28,000	**28,000**	11,300	700	**12,000**	602	56	**658**	0	3,100	**3,100**	0	199	**199**
1963	0	30,000	**30,000**	5,900	1,000	**6,900**	314	97	**411**	1,800	800	**2,600**	118	54	**172**
1964	9,000	26,000	**35,000**	18,100	900	**19,000**	1,033	96	**1,129**	2,100	1,000	**3,100**	141	72	**213**
1965	13,000	29,000	**42,000**	24,200	700	**24,900**	1,368	82	**1,450**	2,700	1,100	**3,800**	235	79	**314**
1966	16,000	29,000	**45,000**	8,000	100	**8,100**	500	16	**516**	4,600	2,000	**6,600**	338	144	**482**
1967	14,000	28,000	**42,000**	7,400	200	**7,600**	484	19	**503**	700	3,200	**3,900**	50	235	**285**
1968	16,000	34,000	**50,000**	8,900	400	**9,300**	679	47	**726**	300	3,500	**3,800**	29	263	**292**
1969	14,000	36,000	**50,000**	3,200	300	**3,500**	230	38	**268**	1,300	0	**1,300**	94	0	**94**
1970	15,000	37,000	**52,000**	8,900	4,700	**13,600**	595	337	**932**	1,700	1,600	**3,300**	144	121	**265**
1971	16,000 F	39,000 F	**55,000 F**	9,500 F	300 F	**9,800 F**	725 F	40 F	**765 F**	2,300 F	1,200 F	**3,500 F**	239 F	115 F	**354 F**
1972	15,000 F	40,000 F	**55,000 F**	14,600 F	400 F	**15,000 F**	1,406 F	66 F	**1,472 F**	1,800 F	900 F	**2,700 F**	177 F	78 F	**255 F**
1973	9,000 F	52,000 F	**61,000 F**	8,800 F	8,600	**17,400 F**	1,048 F	1,032 F	**2,080 F**	1,600 F	1,300 F	**2,900 F**	157 F	169 F	**326 F**
1974	11,000 F	64,000 F	**75,000 F**	4,600 F	9,200	**13,800 F**	685 F	1,356 F	**2,041 F**	1,600 F	1,600 F	**3,200 F**	157 F	240 F	**397 F**
1975	17,000 F	73,000 F	**90,000 F**	5,700	9,200 F	**14,900 F**	827	1,356 F	**2,183 F**	2,700	1,900 F	**4,600 F**	483	320 F	**803**
1976	13,000 F	61,000 F	**74,000 F**	100	9,200 F	**9,300 F**	14	1,356 F	**1,370 F**	6,300	2,100 F	**8,400 F**	1,057	399 F	**1,456**
1977	16,000 F	75,000 F	**91,000 F**	100 F	9,200 F	**9,300 F**	14 F	1,356 F	**1,370 F**	6,300 F	2,400 F	**8,700 F**	1,057 F	480 F	**1,537 F**
1978	16,000 F	75,000 F	**91,000 F**	100 F	0	**100 F**	14 F	0	**14 F**	6,300 F	2,700 F	**9,000 F**	1,057 F	600 F	**1,657 F**
1979	16,000 F	74,000 F	**90,000 F**	0	400	**400**	0	169	**169**	4,300	3,100	**7,400**	1,114	839	**1,953**
1980	20,000 F	97,000 F	**117,000 F**	0	300	**300**	0	52	**52**	6,500	6,200	**12,700**	1,782	1,672	**3,454**
1981	17,000 F	83,000	**100,000 F**	300	300	**600**	55 F	52 F	**107 F**	3,400	500	**3,900**	997	130	**1,127**
1982	13,000 F	63,000 F	**76,000 F**	300 F	300 F	**600 F**	55 F	52 F	**107 F**	4,300	2,000	**6,300**	1,270	493	**1,763**
1983	16,000	66,000	**82,000**	300 F	300 F	**600 F**	55 F	52 F	**107 F**	5,400	1,200	**6,600**	1,382	278	**1,660**
1984	13,000 F	67,000 F	**80,000 F**	0	100	**100**	0	34	**34**	11,100	0	**11,100**	3,063	0	**3,063**
1985	14,000 F	77,000 F	**91,000 F**	2,300 *	0	**2,300 ***	400 F	0	**400 F**	8,600	0	**8,600**	2,180	0	**2,180**
1986	17,600	60,000	**77,600**	2,300 F	0	**2,300 F**	400 F	0	**400 F**	6,400 *	0	**6,400 ***	1,947 *	0	**1,947 ***
1987	26,400	62,000	**88,400**	2,300 F	0 F	**2,300 F**	400 F	0 F	**400 F**	2,900 *	0 F	**2,900 F**	1,176 *	0 F	**1,176 F**
1988	50,000	53,000	**103,000**	0	0	**0**	0	0	**0**	12,100 *	0	**12,100 ***	2,705 *	0	**2,705 ***
1989	41,000	52,600	**93,600**	0	0	**0**	0	0	**0**	31,800	0	**31,800**	7,959	0	**7,959**
1990	41,000 F	52,600 F	**93,600 F**	0	0	**0**	0	0	**0**	35,110 D	0	**35,110 D**	9,756 D	0	**9,756 D**
1991	90,000 F	51,000 F	**141,000 F**	0	0	**0**	0	0	**0**	20,959 D	0	**20,959 D**	5,226 D	0	**5,226 D**
1992	40,000 F	51,000 F	**91,000 F**	77	34	**111**	13	6	**19**	856	24,359	**25,215**	300	4,049	**4,349**
1993	57,000	54,000	**111,000**	64	9	**73**	26	4	**30**	9,300	3,802	**13,102**	3,427	1,830	**5,257**
1994	47,000	65,000	**112,000**	0	9 F	**9 F**	0	4 F	**4 F**	2,000	27,900	**29,900**	953	7,855	**8,808**
1995	43,000	59,000	**102,000**	0	500	**500**	0	47	**47**	15,000	11,500	**26,500**	4,421	3,744	**8,165**
1996	43,000 F	59,000 F	**102,000 F**	200	27	**227**	26	14	**40**	7,400	8,800	**16,200**	1,966	2,893	**4,859**
1997	56,000	77,000	**133,000**	0	0	**0**	0	0	**0**	8,000	9,000	**17,000**	3,259	3,958	**7,217**
1998	64,000	67,000	**131,000**	0 F	0 F	**0 F**	0 F	0 F	**0 F**	12,000	18,000	**30,000**	5,221	2,278	**7,499**
1999	34,000	30,000	**64,000**	0 F	0 F	**0 F**	0 F	0 F	**0 F**	13,000	4,000	**17,000**	4,441	1,584	**6,025**
2000	32,000	40,000	**72,000**	0	0 F	**0 F**	0	0 F	**0 F**	13,000 F	14,000	**27,000 F**	4,441 F	4,873 F	**9,314 F**
2001	39,000	40,000	**79,000**	0	0 F	**0 F**	0	0 F	**0 F**	6,000	5,000	**11,000**	2,000	1,950	**3,950**
2002	39,000 F	40,000 F	**79,000 F**	0 F	0 F	**0 F**	0 F	0 F	**0 F**	6,000 F	5,000 F	**11,000 F**	2,000 F	1,950 F	**3,950 F**

*Source: FAO (FAOSTAT). Note: F = FAO Estimate; and * = unofficial estimate.*

Table 35 Wood based panel production and trade in Fiji 1961 - 2002, from FAO

Year	Production (in cubic metres)			Imports (in cubic metres)					Imports (in USD '000)					Exports (in cubic metres)			Exports (in USD '000)		
	Veneer sheets	Plywood	Total	Veneer Sheets	Plywood	Particleboard	Fibreboard	Total	Veneer Sheets	Plywood	Particleboard	Fibreboard	Total	Veneer Sheets	Plywood	Total	Veneer Sheets	Plywood	Total
1961					1,000			**1,000**		170			**170**						
1962					190	1,800		**1,990**		33	133		**166**						
1963					700	2,000		**2,700**		107	137		**244**						
1964					500	3,200		**3,700**		85	188		**273**						
1965					200	3,200		**3,400**		75	228		**303**						
1966					300	3,100		**3,400**		116	203		**319**						
1967					500	3,200		**3,700**		148	247		**395**						
1968					1,000	3,200		**4,200**		224	294		**518**						
1969					1,000	140	1,053	**2,193**		228	13	166	**407**						
1970	400	0	**400**	0	1,600	100	1,053	**2,753**	0	348	33	204	**585**	400	0	400	58	0	**58**
1971	1,300	0	**1,300**	0	1,700 F	100 F	1,264 F	**3,064 F**	0	438 F	36 F	278 F	**752 F**	1,300 F	100	1,400	258 F	18	**276**
1972	1,000	0	**1,000**	0	1,600 F	300 F	1,158 F	**3,058 F**	0	483 F	95 F	294 F	**872 F**	1,000	100	1,100	263	24	**287**
1973	2,700	100	**2,800**	0	1,600 F	300 F	1,558 F	**3,458 F**	0	829 F	98 F	354 F	**1,281 F**	1,000	100	1,100	269 F	25 F	**294**
1974	2,600	100	**2,700**	0	1,000 F	300 F	1,242 F	**2,542 F**	0	704 F	119 F	557 F	**1,380 F**	1,000 F	100	1,100	269 F	25 F	**294**
1975	8,000 F	1,000	**9,000 F**	0	200	200	3,074	**3,474**	0	185	93	765	**1,043**	7,900	100	8,000	725	40	**765**
1976	7,000 F	1,200	**8,200 F**	0	200	300	2,401	**2,901**	0	124	228	732	**1,084**	7,000	100	7,100	706	22	**728**
1977	7,000	1,500	**8,500**	0	200 F	300 F	2,401 F	**2,901 F**	0	124 F	228 F	732 F	**1,084 F**	7,000 F	100 F	7,100 F	706 F	22 F	**728 F**
1978	7,000	2,600	**9,600**	0	200 F	300 F	2,401 F	**2,901 F**	0	124 F	228 F	732 F	**1,084 F**	7,000 F	100 F	7,100 F	706 F	22 F	**728 F**
1979	8,000	3,300	**11,300**	0	400 F	700 F	1,600 F	**2,700 F**	0	245	545	489	**1,279**	8,000 F	0	8,000	1,039	0	**1,039**
1980	7,000	3,400	**10,400**	0	300	1,300	700 F	**2,300 F**	0	137	930	264	**1,331**	7,000	0	7,000	980	0	**980**
1981	11,000 F	3,600	**14,600 F**	0	200	1,500	400 F	**2,100 F**	0	98	1,056	140 F	**1,294 F**	10,800	400	11,200	1,939	316	**2,255**
1982	10,000 F	4,000	**14,000 F**	0	100	1,400	3,169	**1,600**	0	71	1,015	1,103	**1,144**	9,500	1,000	10,500	1,891	684	**2,575**
1983	13,000 F	3,900	**16,900 F**	0	100 F	1,400 F	304	**1,700 F**	0	71 F	1,015 F	132	**1,195 F**	12,800	400	13,200	2,145	334	**2,479**
1984	14,000 F	3,900	**17,900 F**	0	200	1,200	250	**1,500**	0	95	685	89	**832**	13,800	700	14,500	2,658	477	**3,135**
1985	15,000 F	5,200	**20,200 F**	0	0	900	300	**1,000**	0	0	542	102	**601**	14,300	1,900	16,200	2,417	1,108	**3,525**
1986	10,400	5,900	**16,300**	0	0	900 F	300 F	**1,000 F**	0	0	542 F	89 F	**601 F**	2,400 *	1,900 F	4,300 F	2,060 *	1,108 F	**3,168 F**
1987	10,300	5,300	**15,600**	0	0 F	900 F	300 F	**1,000 F**	0	0 F	542 F	89 F	**601 F**	2,800 *	1,900 F	4,700 F	2,420 *	1,108 F	**3,528 F**
1988	10,600	5,200 F	**15,800 F**	0	0	900 F	300 F	**1,000 F**	0	0	542 F	89 F	**601 F**	900 *	1,900 F	2,800 F	514 *	1,108 F	**1,622 F**
1989	10,600	5,500	**16,100**	0	0	300	700 F	**800 F**	0	0	203	259 F	**432 F**	5,200	2,200	7,400	2,916	1,446	**4,362**
1990	10,600 F	5,500 F	**16,100 F**	0	0	300 F	400 F	**500 F**	0	0	203 F	259 F	**432 F**	3,800	600	4,400	2,128 F	1,446 F	**3,574 F**
1991	10,100	5,500 F	**15,600 F**	0	0	300	500	**800**	0	0	203 F	229 F	**432 F**	3,000	2,500	5,500	1,600 F	1,446 F	**3,046 F**
1992	10,100 F	10,000 F	**20,100 F**	1,370	161	200	2,437	**7,237**	5	72	118	706	**1,946**	4,274	8,271	12,548	2,278	3,668	**5,947**
1993	10,100 F	5,500 F	**15,600 F**	0	32	100	1,786	**2,022**	0	14	38	520	**595**	3,800	1,200	5,000	2,350	887	**3,237**
1994	10,100 F	5,500 F	**15,600 F**	0	2,300		2,700	**5,000**	0	362		835	**1,197**	4,600	2,200	6,800	2,955	1,539	**4,494**
1995	10,100 F	5,500 F	**15,600 F**	0	1,200		4,000	**5,200**	0	160		1,433	**1,593**	4,800	2,400	13,100	3,162	1,921	**5,288**
1996	10,100 F	5,500 F	**15,600 F**	0	1,200 F	600 F	2,800	**4,750 F**	0	160 F	165	942	**1,304 F**	6,000 F	2,900	8,900 F	3,945	2,111	**6,056**
1997	10,100 F	5,500 F	**15,600 F**	0 F	0	300 F	1,400 F	**1,900 F**	0 F	0	78	435 F	**556 F**	9,700	1,900	11,600	3,308	1,378	**4,686**
1998	6,000	5,000	**11,000**	0 F	0 F	400 F	2,200	**2,800 F**	0 F	0 F	83	615	**728 F**	5,000	5,000	10,000	3,414	2,903	**6,317**
1999	4,000	7,000	**11,000**	0 F	0 F	400 F	2,200 F	**2,800 F**	0 F	0 F	83	615 F	**728 F**	3,000	4,000	7,000	1,621	2,170	**3,791**
2000	3,000	9,000	**12,000**	0 F	0 F	400 F	2,200 F	**2,800 F**	0 F	0 F	83	615 F	**728 F**	2,000	4,000	6,000	1,400	2,146	**3,546**
2001	6,000	14,000	**20,000**	0 F	0 F	400 F	2,200 F	**2,800 F**	0 F	0 F	83	615 F	**728 F**	2,000	4,000	6,000	1,431	2,427	**3,858**
2002	6,000 F	14,000 F	**20,000 F**	0 F	0 F	400 F	2,200 F	**2,800 F**	0 F	0 F	83	615 F	**728 F**	2,000 F	4,000 F	6,000 F	1,431 F	2,427 F	**3,858 F**

*Source: FAO (FAOSTAT). Note: F = FAO Estimate; and * = unofficial estimate.*

Table 36 Paper and paperboard trade in Fiji 1961 - 2002, from FAO

Year	Imports (in metric tonnes)				Imports (in USD '000)				Exports (in metric tonnes)		Exports (in USD '000)	
	Newsprint	Printing and writing paper	Other paper and paperboard	Total	Newsprint	Printing and writing paper	Other paper and paperboard	Total	Other paper and paperboard	Total	Other paper and paperboard	Total
1961	100	200	100	**400**	25	72	81	**178**	100	**100**	15	**15**
1962	100	200	100	**400**	30	72	81	**183**	100	**100**	20	**20**
1963	100	200	100	**400**	34	88	77	**199**	100	**100**	23	**23**
1964	100	400	100	**600**	39	122	67	**228**	100	**100**	22	**22**
1965	100	300	400	**800**	21	135	139	**295**	100	**100**	29	**29**
1966	300	300	1,400	**2,000**	50	132	528	**710**	100	**100**	24	**24**
1967	300	300	1,200	**1,800**	64	150	437	**651**	200	**200**	51	**51**
1968	200	400	1,400	**2,000**	59	183	282	**524**	200	**200**	58	**58**
1969	400	700	2,000	**3,100**	83	155	854	**1,092**				
1970	800	500	1,600	**2,900**	121	199	720	**1,040**				
1971	700	400	1,300	**2,400**	148	210	595	**953**				
1972	800	400	1,400	**2,600**	198	269	647	**1,114**				
1973	1,300	600	2,300	**4,200**	340	443	678	**1,461**				
1974	1,100	900	3,500	**5,500**	459	685	1,162	**2,306**				
1975	900	2,600	2,100	**5,600**	349	598	978	**1,925**				
1976	1,000	2,000	900	**3,900**	337	428	454	**1,219**				
1977	1,400	2,000	900	**4,300**	611	428	454	**1,493**				
1978	1,500	2,000	900	**4,400**	730	428	454	**1,612**				
1979	1,700	2,000	4,000	**7,700**	857	1,990	2,759	**5,606**				
1980	1,700	2,400	4,600	**8,700**	990	2,564	3,887	**7,441**				
1981	2,100	2,100	4,300	**8,500**	1,310	2,795	3,713	**7,818**				
1982	2,000	2,400	3,200	**7,600**	1,166	2,675	2,778	**6,619**				
1983	2,000	2,200	3,600	**7,800**	1,183	2,236	3,092	**6,511**				
1984	1,700	2,800	3,300	**7,800**	1,005	2,747	2,928	**6,680**				
1985	2,000	3,000	4,000	**9,000**	1,177	2,925	3,347	**7,449**				
1986	2,000	3,000	4,000	**9,000**	1,150	2,925	3,347	**7,422**				
1987	1,700	3,000	4,000	**8,700**	960	2,925	3,347	**7,232**				
1988	1,400	3,000	4,000	**8,400**	800	2,925	3,347	**7,072**				
1989	1,900	3,000	4,000	**8,900**	1,100	2,925	3,347	**7,372**				
1990	1,400	4,900	8,000	**14,300**	935	1,293	6,462	**8,690**				
1991	1,800	6,800	11,000	**19,600**	1,325	5,650	8,619	**15,594**				
1992	1,800	1,557	900	**4,257**	1,300	1,555	721	**3,576**				
1993	2,475	1,257	7,100	**10,832**	1,235	1,461	5,542	**8,238**				
1994	2,700	6,000	11,000	**19,700**	1,927	6,079	9,355	**17,361**				
1995	2,500	6,000	12,000	**20,500**	1,920	7,493	10,921	**20,334**				
1996	2,200	6,000	5,500	**13,700**	1,591	7,493	4,933	**14,017**				
1997	2,200	1,300	2,600	**6,100**	1,591	1,989	1,959	**5,539**				
1998	2,300	2,000	4,800	**9,100**	1,419	2,187	3,855	**7,461**				
1999	2,100	4,700	11,000	**17,800**	1,300	4,121	6,522	**11,943**				
2000	2,100	4,700	11,000	**17,800**	1,300	4,121	6,522	**11,943**				
2001	2,100	4,700	11,000	**17,800**	1,300	4,121	6,522	**11,943**				
2002	2,100	4,700	11,000	**17,800**	1,300	4,121	6,522	**11,943**				

Source: FAO (FAOSTAT).

APPENDIX 2: FOREST HARVESTING COST MODEL

The following figures show the spreadsheets containing the data used in the calculation of delivered roundwood cost for a *"typical"* forest harvesting operation. These follow standard production cost methodologies as set out in FAO (1977) and the "Caterpillar Handbook" (Caterpillar, 1996). Further details about how the model works can be found in Whiteman (1999a).

Figure 26 Prices and consumption of consumable items used in the forest harvesting cost model

			Fuel consumption (per machine)								
Fuel and lubricants	**Unit cost**		**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Petrol	1.00	**F$/litre**	3.00								**litre/hour**
Diesel	0.90	**F$/litre**		25.00	20.00	20.00	30.00	20.00	50.00	35.00	**litre/hour**
Oils	5.40	**F$/litre**	2.50	0.25	0.13	0.11	0.30	0.11	0.50	0.27	**litre/hour**
Grease	5.40	**F$/litre**	0.25	0.02	0.02	0.01	0.02	0.01	0.05	0.02	**litre/hour**
Other lubricants	5.40	**F$/litre**	0.25	0.04	0.08	0.05	0.02	0.05	0.02	0.05	**litre/hour**

	Cost of other minor parts and equipment (per machine)								
Other consumable items	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading**	**Water transport**	**Road building**	**Units**
Air filter	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	**F$ per hour**
Fuel filter	0.03	0.05	0.05	0.05	0.04	0.05	0.04	0.05	**F$ per hour**
Oil filter	0.03	0.08	0.08	0.08	0.05	0.08	0.05	0.08	**F$ per hour**
Other filters	0.00	0.03	0.03	0.03	0.00	0.03	0.00	0.03	**F$ per hour**
Tracks or tyres	0.00	8.00	5.75	6.25	18.25	6.25	0.00	13.50	**F$ per hour**
Other minor parts	0.40	2.50	2.50	0.25	0.10	0.25	0.22	2.50	**F$ per hour**
Tools	45	90	90	90	90	90	75	90	**F$ per year**
Clothing	0	0	0	0	0	0	0	0	**F$ per year**
Other consumable items	0	110	110	110	75	110	180	110	**F$ per year**

	Total consumable cost by activity								
Consumable cost	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Total consumable cost	**2.47**	**3.93**	**NA**	**1.04**	**6.96**	**2.07**	**NA**	**4.73**	**F$/m3**
Total consumable cost	**1.23**	**1.96**	**NA**	**0.52**	**3.48**	**1.04**	**NA**	**2.36**	**US$ per m^3**

Figure 27 Machine productivity and utilisation rates used in the forest harvesting cost model

	Machine productivity and utilisation								
Productivity information	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Number of working days	200	250	200	200	200	200	200	250	**days/year**
Number of working hours	8	8	8	8	8	8	8	8	**hours/day**
Average machine availability	80	80	80	80	80	80	80	80	**%**
Available working hours	**1,280**	**1,600**	**1,280**	**1,280**	**1,280**	**1,280**	**1,280**	**1,600**	**hours/year/unit**
Unproductive time		10	10		60		300		**minutes/trip**
Unproductive time	15	**10**	**NA**	10	**15**	10	**NA**	10	**minutes/hour**
Effective working hours	**960**	**1,345**	**NA**	**1,067**	**954**	**1,067**	**NA**	**1,867**	**hours/year/unit**
Output rate		6.0	5.0		20		200	**NA**	**m^3/trip**
Output rate	8.0	**6.8**	**NA**	25	**7**	25	**NA**	**NA**	**m^3/hour**
Number of machines/crews	1.00	0.70	1.00	0.33	1.00	0.67	1.00	0.30	**units**
Annual production per unit	**6,000**	**8,571**	**NA**	**18,000**	**6,000**	**18,000**	**NA**	**NA**	**m^3/unit**
Actual working hours	**750**	**1,257**	**NA**	**720**	**879**	**720**	**NA**	**1,905**	**hours/year/unit**
Average machine utilisation	**78**	**93**	**NA**	**68**	**92**	**68**	**NA**	**102**	**%**

Figure 28 Labour inputs and costs used in the forest harvesting cost model

	Labour inputs and cost (per machine)								
Labour information	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
No. of operators	1	1	1	1	1	1	1	1	**person(s)**
Operators wage	675	675	675	675	675	675	675	675	**F$ per month**
Operators wage									**F$ per m^3**
No. of assistants	1	1	1	1	1	1	3	1	**person(s)**
Assistants wage	468	468	468	468	468	468	468	468	**F$ per month**
Assistants wage									**F$ per m^3**
Social cost	30	30	30	30	30	30	30	30	**%**
Overhead	20	20	20	20	20	20	20	20	**%**

	Total labour cost by activity								
Labour cost	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Total labour cost	**3.57**	**2.50**	**NA**	**1.19**	**3.57**	**2.38**	**NA**	**1.07**	**F$/$m^3$**
Total labour cost	**1.78**	**1.25**	**NA**	**0.59**	**1.78**	**1.19**	**NA**	**0.53**	**US$/$m^3$**

Figure 29 Machinery costs used in the forest harvesting cost model

	Consumption of capital, major repairs and insurance (per machine)								
Machine information	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Machine type	Stihl 80	Cat D6	Cat 518	Cat 950	20t truck	Cat 950	Barge	Cat D6	
Purchase price (new)	1,200	230,000	175,000	190,000	165,000	190,000	135,000	230,000	**US$**
Depreciation rate	25.0	6.9	8.2	3.9	13.7	3.9	3.0	6.9	**%/year**
Current age	0	18	18	18	7	18	10	18	**years**
Current value	**1,200**	**63,507**	**37,515**	**92,848**	**58,825**	**92,848**	**99,552**	**63,507**	**US$**
Investment period	3	10	10	10	10	10	20	10	**years**
Residual value	**506**	**31,068**	**15,945**	**62,375**	**13,479**	**62,375**	**54,136**	**31,068**	**US$**
Loan financing	0	0	0	0	0	0	0	0	**%**
Repayment period	3	5	5	5	5	5	5	5	**years**
Repair cost - parts	0.12	10.75	9.84	8.95	8.52	8.95	3.65	10.75	**US$/hour**
Repair cost - labour	0.10	2.64	2.99	2.22	0.72	2.22	0.45	2.64	**F$/hour**
Annual insurance cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**%/year**

	Total capital cost by activity (without allowance for return to capital)								
Capital cost	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
Financing payments	**0.00**	**0.00**	**NA**	**0.00**	**0.00**	**0.00**	**NA**	**0.00**	**US$/$m^3$**
Investor's capital	**0.07**	**0.74**	**NA**	**0.52**	**0.98**	**1.03**	**NA**	**0.32**	**US$/$m^3$**
Residual value	**-0.03**	**-0.36**	**NA**	**-0.35**	**-0.22**	**-0.69**	**NA**	**-0.16**	**US$/$m^3$**
Repairs and insurance	**0.02**	**1.77**	**NA**	**0.40**	**1.30**	**0.81**	**NA**	**1.15**	**US$/$m^3$**
Total capital cost	**0.12**	**4.30**	**NA**	**1.14**	**4.11**	**2.29**	**NA**	**2.62**	**F$/m3**
Total capital cost	**0.06**	**2.15**	**NA**	**0.57**	**2.06**	**1.14**	**NA**	**1.31**	**US$/$m^3$**

	Allowance for return to capital								
Capital cost	**Felling**	**Skidding with dozer**	**Skidding with skidder**	**Loading**	**Road transport**	**Unloading & reloading**	**Water transport**	**Road building**	**Units**
After financing	**0.07**	**2.50**	**NA**	**1.86**	**2.99**	**3.71**	**NA**	**1.07**	**F$/m3**
After financing	**0.03**	**1.25**	**NA**	**0.93**	**1.50**	**1.86**	**NA**	**0.54**	**US$/$m^3$**

Figure 30 Miscellaneous variables used in the forest harvesting cost model

Forest details		
Annual cutting area	200	ha/year
Harvesting intensity	30.0	m^3/ha
Expected annual production	6,000	m^3

Miscellaneous variables		
Market exchange rate	2.00	F$/US$
Expected level of profit	20	%/year
Interest rate	18	%/year

Secondary loading		
Unloading	1	time(s)
Reloading	1	time(s)
Total	2	time(s)

Hauling details	Road transport			Water	Units
	Public	Access	In forest	transport	
Haul distance	43	2	5	0	km
Speed when loaded	35	15	15	4	km/hour
Speed when unloaded	45	25	25	5	km/hour
Duration of each trip			176	NA	minutes

Roading and skid trail construction	Existing roads		Road construction		Skid trail construction		Units
	Access	In forest	Access	In forest	by dozer	by skidder	
Roading and skid trail density	0	0	10.0	10.0	360	0	m/ha
Construction rate			7	7	100	120	m/hour

Skid trail details		
Skid trail indirectness factor	20	%
Average distance using winch	0	metres
Average skidding distance	300	metres
Total skidding + winching distance	300	metres

Skidding details	Skidding with dozer	Skidding with skidder	Units
Winching speed	35	35	m/minute
Speed when loaded	3	6	km/hour
Speed when unloaded	5	10	km/hour
Proportion of winching	100	0	%
Proportion of skidding	100	0	%
Duration of each trip	53	0	minutes

Total harvesting cost (inc ROC)	62.24	F$/m3
Total harvesting cost (inc ROC)	31.12	US$/$m^3$
Total harvesting cost (inc ROE)	59.32	F$/m3
Total harvesting cost (inc ROE)	29.66	US$/$m^3$

Figure 31 Delivered roundwood cost estimate produced by the forest harvesting cost model

Harvesting cost calculation workbook

FAO Temporary Assistance to the Ministry of Fisheries and Forests in Fiji

Type of cost	Felling	Skidding with dozer	Skidding with skidder	Loading	Road transport	Unloading & reloading	Water transport	Road building	TOTAL	Units
Labour	3.57	2.50	NA	1.19	3.57	2.38	NA	1.07	14.26	F$/m3
Consumables	2.47	3.93	NA	1.04	6.96	2.07	NA	4.73	21.19	F$/m3
Capital	0.12	4.30	NA	1.14	4.11	2.29	NA	2.62	14.59	F$/m3
TOTAL (excluding profit)	6.15	10.72	NA	3.37	14.64	6.74	NA	8.42	50.04	F$/m3
Return on capital	0.07	2.50	NA	1.86	2.99	3.71	NA	1.07	12.19	F$/m3
TOTAL (including ROC)	6.22	13.22	NA	5.22	17.63	10.45	NA	9.49	62.24	F$/m3
Return on other expenditure	1.22	1.99	NA	0.61	2.63	1.21	NA	1.62	9.27	F$/m3
TOTAL (including ROE)	7.37	12.72	NA	3.97	17.27	7.95	NA	10.04	59.32	F$/m3

Type of cost	Felling	Skidding with dozer	Skidding with skidder	Loading	Road transport	Unloading & reloading	Water transport	Road building	TOTAL	Units
Labour	1.78	1.25	NA	0.59	1.78	1.19	NA	0.53	7.13	US$/$m^3$
Consumables	1.23	1.96	NA	0.52	3.48	1.04	NA	2.36	10.60	US$/$m^3$
Capital	0.06	2.15	NA	0.57	2.06	1.14	NA	1.31	7.29	US$/$m^3$
TOTAL (excluding profit)	3.08	5.36	NA	1.68	7.32	3.37	NA	4.21	25.02	US$/$m^3$
Return on capital	0.03	1.25	NA	0.93	1.50	1.86	NA	0.54	6.10	US$/$m^3$
TOTAL (including ROC)	3.11	6.61	NA	2.61	8.82	5.22	NA	4.75	31.12	US$/$m^3$
Return on other expenditure	0.61	1.00	NA	0.30	1.31	0.61	NA	0.81	4.64	US$/$m^3$
TOTAL (including ROE)	3.68	6.36	NA	1.99	8.63	3.97	NA	5.02	29.66	US$/$m^3$

APPENDIX 3: FOREST INDUSTRY MODEL

The following figures and tables show the spreadsheets containing the data used in the calculation of profitability and economic rent for an *"average"* sawmill. This follows the discounted cash-flow approach, which is a standard accounting and investment appraisal methodology used in industry worldwide. The cash-flows produced by the model are given in the tables at the end of this appendix. Further details about how the model works can be found in Scotland and Whiteman (1997).

Figure 32 Miscellaneous details and roundwood costs used in the forest industry model

Mill and model details — Page 1

Name of mill	Average-sized sawmill
Location	Viti Levu
New or existing mill	Existing
Model's Author	Adrian Whiteman, FAO
Date of last revision	24th October 2003
Product 1	Sawnwood for export market
Product 2	Sawnwood for domestic market

Reference year	2003
Period of investment (years)	20
Utilisation coefficient (%)	60
Price base	2003
Exchange rate used - F$/US$	2.00

Annual production capacity ('000 m3/MT)

Sawnwood for export market	2.5
Sawnwood for domestic market	2.5

Roundwood costs — Page 2

Log production costs (F$ per m3 of roundwood)

	Sawnwood for export market		Sawnwood for domestic market	
Planning and surveying		2.00		2.00
Felling		6.22		6.22
Skidding		13.22		13.22
Loading, unloading and reloading		15.67		15.67
Transport		17.63		17.63
Road building		9.49		9.49
Total		**64.24**		**64.24**

Royalties, fees and other charges (F$ per m3 of roundwood)

	Sawnwood for export market		Sawnwood for domestic market	
	Proportion (%)	**Charge**	**Proportion (%)**	**Charge**
Class 1 Landowners commission	60	25.00	20	25.00
Class 2 Landowners commission	40	20.00	10	20.00
Class 3 Landowners commission	0	15.00	50	15.00
Class 4 Landowners commission	0	10.00	20	10.00
Landowners goodwill		5.00		5.00
NLTB Licence application fees		0.20		0.20
Class 1 Royalty	**60**	40.00	**20**	40.00
Class 2 Royalty	**40**	30.00	**10**	30.00
Class 3 Royalty	**0**	10.00	**50**	10.00
Class 4 Royalty	**0**	6.50	**20**	6.50
Premium		6.00		6.00
FD Scaling fee		3.50		3.50
FD Map		0.03		0.03
Total		**73.73**		**48.53**

Other roundwood variables

Total log cost from licence area (F$ per m3)		**137.97**		**112.77**
Proportion of logs from licence area (%)		100		100
Cost of logs from elsewhere (F$ per m3)		150.00		130.00
Conversion factor (m3 logs per m3/MT product)		2.00		2.00
First year of production		1		1
Last year of production		20		20
Total log cost (F$ per m3/MT product)		**275.94**		**225.54**

Figure 33 Capital and manufacturing costs used in the forest industry model

Manufacturing costs Page 3

Variable costs (F$ per m3/MT production)

	Sawnwood for export market	Sawnwood for domestic market
Log cost	**275.94**	**225.54**
Labour	78.96	78.96
Resins/chemicals/treatment	15.00	15.00
Fuel, energy and consumables	60.00	45.00
Packaging	32.00	6.00
Delivery	15.00	15.00
Total	**476.90**	**385.50**

Fixed costs (F$ per m3/MT capacity)

Personnel: administration	12.00	12.00
Personnel: support staff	7.00	7.00
Personnel: maintenance staff	9.73	9.73
Sales cost	15.00	15.00
General overhead	30.00	30.00
Total	**73.73**	**73.73**

Total cost (F$ per m3/MT production)

Total calculated at final level of utilisation	**599.79**	**508.39**

Initial capital requirements Page 4

Production plant capital ('000 F$)

	Amount	Depreciation period	
		Total	Remaining
Site and services	120	5	2
Structures	300	5	2
Stationary equipment	650	5	5
Mobile equipment	300	5	5
Mill stores and miscellaneous supplies	30	5	5
Owner's construction overhead	0	5	5
Engineering	0	5	5
Total	**1,400**		

Other capital ('000 F$)

Pre-operating expense	0
Working capital	**573**
Capitalised interest	**0**
Total	**573**

Total capital ('000 F$)

Sum of plant and other capital requirements	**1,973**

Working capital requirements Page 5

Inventories

	Number of weeks supplies held	Value (F$ per m3/MT production)	
		Sawnwood for export market	Sawnwood for domestic market
Inventories: logs	8.0	**42.45**	**34.70**
Inventories: product	4.0	**46.14**	**39.11**
Inventories: misc supplies	4.0	**8.23**	**5.08**
Total		**96.82**	**78.88**

Short-term liabilities

Accounts payable: salaries		2.0	**4.88**	**4.88**
Accounts payable: others		8.0	**30.31**	**24.00**
Total			**35.19**	**28.88**

Short-term assets

Accounts receivable		8.0	**92.28**	**78.21**

	Total value (in '000 F$)	
Cash reserve		150

Figure 34 Replacement capital requirements and sales details used in the forest industry model

Replacement capital requirements Page 6

Item	Year	Amount ('000 F$)	Depreciation period
Mobile equipment	6	200	5
Mobile equipment	11	200	5
Mobile equipment	16	200	5
Stationary equipment	3	300	5
Stationary equipment	6	400	5
Stationary equipment	9	400	5
Stationary equipment	12	400	5
Stationary equipment	15	400	5
Stationary equipment	18	400	5

Sales and other financial details Page 7

Product sales by market and grade of production

Product	Grade	Export tax (percent)	Output (percent)	Mill net price (F$ per m3/MT)	Real price change (percent/year)
Sawnwood for export market					
Class 1	FF Select	0	50.0	1,200	0.0
Class 1	FF Standard	0	7.5	900	0.0
Class 1	Ungraded	0	2.5	900	0.0
Class 2	FF Select	0	30.0	800	0.0
Class 2	FF Standard	0	7.5	800	0.0
Class 2	Ungraded	0	2.5	750	0.0
Total/average			**100**	**1,009**	**0.0**
Sawnwood for domestic market					
Class 1	FF Select	0	15.0	750	0.0
Class 1	FF Standard	0	5.0	550	0.0
Class 2	FF Select	0	5.0	580	0.0
Class 2	FF Standard	0	5.0	480	0.0
Class 3	FF Select	0	35.0	480	0.0
Class 3	FF Standard	0	12.0	480	0.0
Class 4	FF Select	0	15.0	480	0.0
Class 4	FF Standard	0	3.0	480	0.0
Class 3 and 4	Ungraded	0	5.0	250	0.0
Total/average			**100**	**518**	**0.0**

Debt/equity ratio (%)	Amount	Other costs (%)	Amount
Debt	**20**	**Interest rate**	12
Equity	80	**Corporate tax rate**	32

Figure 35 Production start-up and capital drawdown schedule used in the forest industry model

Production start-up schedule Page 8

Capacity installation	Proportion of annual capacity available(%)		Annual production: Sawnwood for export market	Annual production: Sawnwood for domestic market
Year 1		100	1,500	1,500
Year 2		100	1,500	1,500
Year 3		100	1,500	1,500
Year 4		100	1,500	1,500
Year 5		100	1,500	1,500
Year 6		100	1,500	1,500

Manufacturing costs	Payment of fixed costs (percent)		Annual fixed costs ('000 F$)	Annual variable costs ('000 F$)
Year 1		100	369	1,294
Year 2		100	369	1,294
Year 3		100	369	1,294
Year 4		100	369	1,294
Year 5		100	369	1,294
Year 6		100	369	1,294

Capital drawdown schedule Page 9

Drawdown (%)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total plant capital	0	0	0	0	0	0
Pre-operating expense	0	0	0	0	0	0
Working capital	0	0	0	0	0	0
Capitalised interest	0	0	0	0	0	0

Drawdown ('000 F$)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total plant capital	0	0	0	0	0	0
Pre-operating expense	0	0	0	0	0	0
Working capital	0	0	0	0	0	0
Capitalised interest	0	0	0	0	0	0
Total	0	0	0	0	0	0

Figure 36 Debt repayment calculation used in the forest industry model

Debt repayment calculation ('000 F$) Page 10

Existing debt and equity

	Existing	Total: years 1 to 5	Year 1	Year 2	Year 3	Year 4	Year 5
Debt	395	0	0	0	0	0	0
Equity	1,579	0	0	0	0	0	0
Total	1,973	0	0	0	0	0	0

Other loan details

Number of annual payments	10
Proportion of capacity required before repayments can be made (percent)	100
Annual principle repayment ('000 F$)	39
First year of repayment	1

Debt repayment by year ('000 F$) Page 11

Year	Opening balance		Closing balance		Loan payment	Interest payment	Total payment
	Equity	Debt	Equity	Debt			
1	1,579	395	0	355	39	45	84
2	0	355	0	316	39	40	80
3	0	316	0	276	39	36	75
4	0	276	0	237	39	31	70
5	0	237	0	197	39	26	66
6	0	197	0	158	39	21	61
7	0	158	0	118	39	17	56
8	0	118	0	79	39	12	51
9	0	79	0	39	39	7	47
10	0	39	0	(0)	39	2	42
11	0	(0)	0	(0)	0	(0)	(0)
12	0	(0)	0	(0)	0	(0)	(0)
13	0	(0)	0	(0)	0	(0)	(0)
14	0	(0)	0	(0)	0	(0)	(0)
15	0	(0)	0	(0)	0	(0)	(0)
16	0	(0)	0	(0)	0	(0)	(0)
17	0	(0)	0	(0)	0	(0)	(0)
18	0	(0)	0	(0)	0	(0)	(0)
19	0	(0)	0	(0)	0	(0)	(0)

Table 37 Depreciation calculation in the forest industry model

Initial capital (FJD '000)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Site and services	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Structures	150	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stationary equipment	130	130	130	130	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile equipment	60	60	60	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mill stores and miscellaneous supplies	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Owner's construction overhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Engineering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total initial capital	**406**	**406**	**196**	**196**	**196**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Replacement capital (FJD '000)																				
Mobile equipment	0	0	0	0	0	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0
Mobile equipment	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	0	0	0	0	0
Mobile equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40
Stationary equipment	0	0	60	60	60	60	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Stationary equipment	0	0	0	0	0	80	80	80	80	80	0	0	0	0	0	0	0	0	0	0
Stationary equipment	0	0	0	0	0	0	0	0	80	80	80	80	80	0	0	0	0	0	0	0
Stationary equipment	0	0	0	0	0	0	0	0	0	0	0	80	80	80	80	80	0	0	0	0
Stationary equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80	80	80	0
Stationary equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80
Total replacement capital	**0**	**0**	**60**	**60**	**60**	**180**	**180**	**120**	**200**	**200**	**120**	**200**	**200**	**120**	**200**	**200**	**120**	**200**	**200**	**120**
Total initial and replacement capital	**406**	**406**	**256**	**256**	**256**	**180**	**180**	**120**	**200**	**200**	**120**	**200**	**200**	**120**	**200**	**200**	**120**	**200**	**200**	**120**

Table 38 Projected sales volume in the forest industry model (in cubic metres)

Product	Species	Grade	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sawnwood for export market	Class 1	FF Sel.	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Sawnwood for export market	Class 1	FF Stand.	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Sawnwood for export market	Class 1	Ungraded	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Sawnwood for export market	Class 2	FF Sel.	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
Sawnwood for export market	Class 2	FF Stand.	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Sawnwood for export market	Class 2	Ungraded	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Sawnwood for domestic market	Class 1	FF Sel.	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225
Sawnwood for domestic market	Class 1	FF Stand.	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Sawnwood for domestic market	Class 2	FF Sel.	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Sawnwood for domestic market	Class 2	FF Stand.	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Sawnwood for domestic market	Class 3	FF Sel.	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525	525
Sawnwood for domestic market	Class 3	FF Stand.	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Sawnwood for domestic market	Class 4	FF Sel.	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225
Sawnwood for domestic market	Class 4	FF Stand.	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Sawnwood for domestic market	Class 3 and 4	Ungraded	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Total sales volume			**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**

Table 39 Projected sales price in the forest industry model (in FJD per cubic metre)

Product	Market	Grade	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sawnwood for export market	Class 1	FF Select	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Sawnwood for export market	Class 1	FF Standard	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
Sawnwood for export market	Class 1	Ungraded	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
Sawnwood for export market	Class 2	FF Select	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Sawnwood for export market	Class 2	FF Standard	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
Sawnwood for export market	Class 2	Ungraded	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Sawnwood for domestic market	Class 1	FF Select	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Sawnwood for domestic market	Class 1	FF Standard	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
Sawnwood for domestic market	Class 2	FF Select	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580	580
Sawnwood for domestic market	Class 2	FF Standard	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Sawnwood for domestic market	Class 3	FF Select	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Sawnwood for domestic market	Class 3	FF Standard	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Sawnwood for domestic market	Class 4	FF Select	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Sawnwood for domestic market	Class 4	FF Standard	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Sawnwood for domestic market	Class 3 and 4	Ungraded	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Average product price			**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**	**763**

Table 40 Projected sales revenue in the forest industry model (in FJD '000)

Product	Market	Grade	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sawnwood for export market	Class 1	FF Select	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
Sawnwood for export market	Class 1	FF Standard	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
Sawnwood for export market	Class 1	Ungraded	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Sawnwood for export market	Class 2	FF Select	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
Sawnwood for export market	Class 2	FF Standard	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Sawnwood for export market	Class 2	Ungraded	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Sawnwood for domestic market	Class 1	FF Select	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169	169
Sawnwood for domestic market	Class 1	FF Standard	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Sawnwood for domestic market	Class 2	FF Select	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Sawnwood for domestic market	Class 2	FF Standard	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Sawnwood for domestic market	Class 3	FF Select	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252	252
Sawnwood for domestic market	Class 3	FF Standard	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Sawnwood for domestic market	Class 4	FF Select	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
Sawnwood for domestic market	Class 4	FF Standard	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Sawnwood for domestic market	Class 3 and 4	Ungraded	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Total sales revenue			**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**
Other revenue																						
Total revenue			**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**	**2,289**

Table 41 Projected income in the forest industry model

Income (FJD '000)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total revenue	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289
Product manufacturing costs																				
Fixed	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369
Variable	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294	1,294
Subtotal	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662
Other manufacturing costs																				
Total manufacturing costs	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662
Other tax deductible costs																				
Depreciation	406	406	256	256	256	180	180	120	200	200	120	200	200	120	200	200	120	200	200	120
Interest expense	45	40	36	31	26	21	17	12	7	2	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	0
Export taxes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income before tax	176	181	336	340	345	426	431	495	420	425	507	427	427	507	427	427	507	427	427	507
Corporate tax	56	58	107	109	110	136	138	158	134	136	162	137	137	162	137	137	162	137	137	162
Net income after tax	120	123	228	231	235	290	293	337	286	289	345	290	290	345	290	290	345	290	290	345
Cumulative net income	**120**	**243**	**471**	**702**	**937**	**1,227**	**1,519**	**1,856**	**2,142**	**2,431**	**2,775**	**3,066**	**3,356**	**3,701**	**3,992**	**4,282**	**4,627**	**4,917**	**5,208**	**5,552**

Table 42 Projected cash-flow in the forest industry model

Cash flow (FJD '000)	Existing	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cash receipts																					
Net income	n.a.	120	123	228	231	235	290	293	337	286	289	345	290	290	345	290	290	345	290	290	345
Depreciation	n.a.	406	406	256	256	256	180	180	120	200	200	120	200	200	120	200	200	120	200	200	120
Total from operations	n.a.	526	529	484	487	491	470	473	457	486	489	465	490	490	465	490	490	465	490	490	465
Capital funds																					
Long term debt	395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity	1,579	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total from capital sources	1,973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total receipts	1,973	526	529	484	487	491	470	473	457	486	489	465	490	490	465	490	490	465	490	490	465
Cash expenditures																					
Plant capital	1,400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preoperating expenses	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working capital	573	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitalised interest	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement Capital	n.a.	0	0	300	0	0	600	0	0	400	0	200	400	0	0	400	200	0	400	0	0
Debt Repayment	n.a.	39	39	39	39	39	39	39	39	39	39	0	0	0	0	0	0	0	0	0	0
Total expenditures	1,973	39	39	339	39	39	639	39	39	439	39	200	400	0	0	400	200	0	400	0	0
Net cash flow	0	486	490	145	448	451	(170)	433	417	46	449	265	90	490	465	90	290	465	90	490	465
Cumulative net cash flow	**0**	**486**	**976**	**1,121**	**1,569**	**2,020**	**1,850**	**2,283**	**2,700**	**2,747**	**3,196**	**3,461**	**3,551**	**4,042**	**4,506**	**4,597**	**4,887**	**5,352**	**5,443**	**5,933**	**6,398**

Table 43 Adjusted cash-flow in the forest industry model

Adjusted cash flow (FJD '000)	Existing	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Inflow																					
Product Revenue	n.a.	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289
Other Revenue	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total inflow	n.a.	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289	2,289
Outflow																					
Manufacturing Costs	n.a.	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662
Payment of export tax	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in gross fixed assets	1,400	0	0	300	0	0	600	0	0	400	0	200	400	0	0	400	200	0	400	0	0
Change in net working capital	573	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preoperating expenses	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitalised interest	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total outflow	1,973	1,662	1,662	1,962	1,662	1,662	2,262	1,662	1,662	2,062	1,662	1,862	2,062	1,662	1,662	2,062	1,862	1,662	2,062	1,662	1,662
Net benefit before financing and tax	**(1,973)**	**627**	**627**	**327**	**627**	**627**	**27**	**627**	**627**	**227**	**627**	**427**	**227**	**627**	**627**	**227**	**427**	**627**	**227**	**627**	**627**
Financing (FJD '000)																					
Long term loans received	395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repayment of long term loans	0	39	39	39	39	39	39	39	39	39	39	0	0	0	0	0	0	0	0	0	0
Interest payments	0	45	40	36	31	26	21	17	12	7	2	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	0
Net financing	395	(84)	(80)	(75)	(70)	(66)	(61)	(56)	(51)	(47)	(42)	0	0	0	0	0	0	0	0	0	0
Net benefit after financing & before tax	**(1,579)**	**543**	**547**	**252**	**557**	**562**	**(34)**	**571**	**576**	**181**	**585**	**427**	**227**	**627**	**627**	**227**	**427**	**627**	**227**	**627**	**627**
Tax payment (FJD '000)																					
Corporate tax	n.a.	56	58	107	109	110	136	138	158	134	136	162	137	137	162	137	137	162	137	137	162
Net benefit after financing and tax	**(1,579)**	**486**	**490**	**145**	**448**	**451**	**(170)**	**433**	**417**	**46**	**449**	**265**	**90**	**490**	**465**	**90**	**290**	**465**	**90**	**490**	**465**
Royalties, fees and other charges (FJD '000)																					
Landowners commission and goodwill	n.a.	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149
NLTB Licence application fees	n.a.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Royalties and premium	n.a.	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196
FD scaling and map fees	n.a.	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Export taxes	n.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corporate tax	n.a.	56	58	107	109	110	136	138	158	134	136	162	137	137	162	137	137	162	137	137	162
Net benefit to landowners and government	**n.a.**	**423**	**425**	**474**	**476**	**477**	**503**	**505**	**525**	**501**	**503**	**529**	**503**	**503**	**529**	**503**	**503**	**529**	**503**	**503**	**529**

Table 44 Measures of financial performance in the forest industry model

Point of measurement	Total NPV (FJD '000)			Annualised NPV (FJD '000)			IRR
	Discount rate			Discount rate			
	15.0%	20.0%	25.0%	15.0%	20.0%	25.0%	
Before financing and tax	1,161	505	70	186	104	18	26.0%
After financing but before tax	1,212	607	211	194	125	53	28.7%
After financing and tax	515	92	(188)	82	19	(47)	21.4%

Note: NPV = net present value; IRR = internal rate of return.

Table 45 Calculation of the benefit distribution in the forest industry model

Point of measurement	Share of average product value (in FJD/m³) at a discount rate of: 15.0%							Economic rent	
	Producer		Landowners		NLTB fees & royalty share	Government		Producers excess profit	Forest charges
	Cost (inc. ROC)	Excess profit	Commission and goodwill	Royalty share 90%		FD fees	Taxes		
Before financing and tax	579	62	50	59	7	7	0	62	122
After financing but before tax	576	65	50	59	7	7	0	65	122
After financing and tax	576	27	50	59	7	7	37	27	122
Distribution of benefits	76%	4%	6%	8%	1%	1%	5%	18%	82%

Point of measurement	Share of average product value (in FJD/m³) at a discount rate of: 20.0%							Economic rent	
	Producer		Landowners		NLTB fees & royalty share	Government		Producers excess profit	Forest charges
	Cost (inc. ROC)	Excess profit	Commission and goodwill	Royalty share		FD fees	Taxes		
Before financing and tax	606	35	50	59	7	7	0	35	122
After financing but before tax	599	42	50	59	7	7	0	42	122
After financing and tax	599	6	50	59	7	7	35	6	122
Distribution of benefits	79%	1%	6%	8%	1%	1%	5%	5%	95%

Point of measurement	Share of average product value (in FJD/m³) at a discount rate of: 25.0%							Economic rent	
	Producer		Landowners		NLTB fees & royalty share	Government		Producers excess profit	Forest charges
	Cost (inc. ROC)	Excess profit	Commission and goodwill	Royalty share		FD fees	Taxes		
Before financing and tax	635	6	50	59	7	7	0	6	122
After financing but before tax	623	18	50	59	7	7	0	18	122
After financing and tax	623	(16)	50	59	7	7	34	-16	122
Distribution of benefits	82%	-2%	6%	8%	1%	1%	4%	-15%	115%

Table 46 Summary of results produced by the forest industry model

Point of measurement	Measures of economic performance				Share of average product value (in FJD/m³ at central discount rate)						
	IRR	Total NPV (FJD '000) at different discount rates			Producer		Landowners		NLTB fees & royalty share	Government	
		15.0%	20.0%	25.0%	Cost (inc. ROC)	Excess profit	Commission and goodwill	Royalty share		FD fees	Taxes
Overall	26.0%	1,161	505	70	606	35	50	59	7	7	0
After finance	28.7%	1,212	607	211	599	42	50	59	7	7	0
After tax	21.4%	515	92	(188)	599	6	50	59	7	7	35
Share of the average product value after tax (in percent)					79%	1%	6%	8%	1%	1%	5%
Share of the economic rent from production after tax (in percent)					n.a.	5%	39%	46%	5%	5%	n.a.