

# REVISED DRAFT REPORT

## **Technical, financial and social assessments of forestry development projects in Ra Province, Fiji:**

Establishment of teak plantations by Future Forests Fiji Limited

and

Reforestation of degraded forest land by Conservation International



**2 June 2013**

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## Executive summary

Future Forest Fiji Limited (FFF) is pioneering the establishment of sustainable teak plantations in Fiji in association with several indigenous communities in Ra and Nadroga-Navosa provinces delivering economic, social and environmental benefits to investors and local communities. The FFF business model comprises a small nucleus estate of 122 hectares of teak on freehold land, a commercial-scale nursery, a sawmill and wood processing enterprise and several individual plantations on land leased from local land-owning groups (mataqali). FFF has specialist expertise in plantation management and proficiencies in nursery management and community relations. FFF plans to build its estate to 3000 hectares over 30 years by leasing land from mataqali through the iTaukei Land Trust Board (TLTB). In 2009 FFF received a grant of \$A190,000 from the AusAID funded Enterprise Challenge Fund for the expansion of its tree nursery, which is a critical element in the FFF business model. Seedling sales are an important source of income for the company. In 2011 the company listed on the South Pacific Stock Exchange to raise capital to finance plantation expansion and management. In 2013 FFF will invest in a sawmill to process trees thinned from its own plantations and mature pine and mahogany logs from plantations owned by mataqali in Ra province until mature teak resources come on stream. Preliminary financial analysis of the FFF sawmill indicates that it is likely to provide a reliable source of capital for the company to invest in plantation development.

The most limiting resource for FFF is finance. Due to financial constraints the rate of plantation establishment has been well below target. Despite substantial investment by FFF in expanding the capacity of its nursery, revenues from seedling sales have not met the company's ambitious targets. Capital raised from listing on the South Pacific Stock Exchange was less than the target amount. A challenge for FFF is that it is the first adopter of teak plantations in Fiji. Prospective investors and local land owners are reserving their decision to adopt until they see evidence of the viability of FFF's teak plantations in Ra province. Financial analyses indicated that plantation teak is profitable, generating a net present value of F\$5216 per hectare. However, there are risks and uncertainties, many of which are associated with number of years before net cash flow becomes positive, which typically occurs with the final harvest, after 22 years. Investors need to be patient or have alternative sources of income to sustain them during the long cash deficit period.

The mataqali that lease their land to FFF receive short-term and long-term benefits from their involvement. The company makes lease payments to the mataqali every six months for the term of the lease which ranges from 30 years to 75 years. FFF contracts landowners to prepare the land, plant trees and maintain plantations for up to five years. Income received from these contracts is used to meet community needs in the villages where the mataqali members reside. Examples include connecting the village to the electricity grid, providing clean water supply, building or renovating community facilities and paying school fees. Village communities receive a share of the value of the final teak harvest after 20 to 25 years and a share of the sales of timber from trees that are thinned from plantations after year nine. Based on the average lease area planted by FFF of 13.25 hectares, the estimated average income received by a village community over five years is approximately F\$20,250. Mataqali are motivated to lease their land to FFF by the prospect of their children and grandchildren sharing in future benefits from teak plantations, as well as the short-term benefits for their village community from contract work and lease payments.

International non-government organisation Conservation International (CI) is facilitating the reforestation of degraded forest land in association with indigenous communities from three districts (Tikina) within the catchment of FFF's nursery and sawmill in Ra province. The CI community-based reforestation model comprises a financial backer, commitments of land from several mataqali and CI's coordination and technical expertise. CI is planting a mix of native and exotic tree species that address environmental, economic and social objectives. Reforestation is funded by FIJI Water LLC to offset 280,000 tonnes of carbon emissions from every stage in the lifecycle of its bottled water operations including packaging, bottling, transport, refrigeration and disposal of packaging waste, for a 30 year crediting period. CI must aggregate 1135 hectares by 2014 from mataqali to produce sufficient forest biomass over 30 years to retire FIJI Water's carbon emissions. The reforested land also provides enhanced habitat for endangered species and improved water quality and quantity for local communities. CI provides contracts to participating mataqali to clear the land, plant trees and cut grass around the trees in the early years. Income from contracts is used to meet community needs. Communities also benefit from the harvest of fruit and other edible produce from perennial food crops planted in buffers to protect the reforested lands. Unlike the lease agreements between mataqali and FFF, land owners participating in the CI project own the trees including exotic timber species such as teak and mahogany. To prevent premature harvesting of timber species, CI seeks an assurance from each mataqali as part of a memorandum of agreement that the reforested land remains intact for the full length of the carbon crediting period. CI also provides livelihood alternatives to communities to remove their need to harvest teak or mahogany trees.

In 2009 when the CI community-based reforestation model commenced exotic tree species represented 75% of the species planted. In 2013 the share of exotic species was 28%. CI excluded teak from the species mix in 2012 because the harvest age of 22 years, as promoted by FFF, was assessed to be incompatible with the 30 year crediting period required to retire FIJI Water's carbon emissions. If teak is harvested and replanted within the 30 year period, the target level of carbon to be sequestered would not be achieved. Therefore, in later plantings teak has been replaced by sandalwood and native species which are less threatening to the security of the carbon stock. However, a downside of this change is that the incentive for mataqali to participate has been reduced as the prospect of financial and social benefits for future generations has diminished. To aggregate sufficient land by 2014 CI offers mataqali alternative long-term incentives to attract their participation including training on how to establish and manage a commercial tree nursery and how to market seedlings.

### **Lessons from the reforestation experiences of FFF and CI in Fiji**

Private investors, government agencies and NGOs interested in forestry development in Fiji and other Pacific Island countries can learn from the experiences of FFF and CI. Important lessons or principles for successful forestry projects include the following.

#### **Build enduring partnerships with village communities**

The success of a forestry project in Fiji is based on an enduring relationship with local communities. This is essential for private investors, NGOs and donors because 85% of the land in Fiji is owned by native Fijians. An enduring partnership with landowners in Fiji is based on common awareness and understanding of the

conditions of the agreement and the responsibilities of the partners and ensures that there is regular communications between the partners including attendance at village and tikina (district) meetings or visits to company or project facilities. The agreement must be accessible to all mataqali members and be on display for them to see. The use of a community liaison officer by a company or NGO is beneficial to establishing and maintaining the partnership.

### **Access land with secure tenure for the term of the partnership agreement and land that is best suited for the intended forestry purpose**

Under a lease agreement the lessee owns the trees, controls their management and makes regular lease payments to the mataqali for use of the land. This is the situation of FFF. Tenure of the land and trees are secure. Under an agreement without a lease, the mataqali owns the trees and land and controls their management. This is the situation of CI. Tenure of the land and the trees are not secure. However, security may be guaranteed if annual payments can be made to the mataqali or if adoption of alternative income-generating activities can deter premature harvesting of timber species. Villages should be advised that acceptance of land plots is subject to assessment of their physical and economic suitability.

### **Confirm availability of financial resources before setting plantation and reforestation targets**

The cost of plantation establishment coupled with the long period of time before a positive cash flow is generated presents major challenges for investors and project owners. Plantation and reforestation area targets should be set according to secure and certain sources of finance. Reliance on seedling sales as a source of income is risky especially where particular forest plantations are new to a region or country (such as teak in Fiji). Such a strategy must be based on detailed market research. Some particular costs may be covered through grants, in-kind assistance, collaboration or participation in projects and programs. Mixing short-rotation timber species or agricultural crops with long rotation timber species, such as teak, can provide a source of short- and medium- term income.

### **Source suitable germplasm and apply appropriate nursery management practices to meet desired seedling survival rates and tree growth rates after planting**

Decisions are required on species mix, numbers of seedlings required and the source of germplasm (e.g. seeds or cuttings). An integrated forestry business such as FFF requires large numbers of high quality seedlings for a limited number of species propagated in a permanent nursery where quality control, innovation, cost and seedling survival rates are important. Germplasm is selected to meet desired tree characteristics and wood properties. The nursery is an integral part of the business, requires substantial capital investment and relies on in-house technical expertise. A permanent nursery should be located on a site that is central to plantation areas, where electricity and water supplies can be readily connected, accessible via a road that is trafficable in all weather conditions and close to a settled area from which labour can be sourced. Government or NGO sponsored projects such as the CI reforestation project require seedlings for a range of species that can be easily propagated from locally available seeds in low-cost, temporary nurseries. Small-scale nurseries can be established in villages near sites to be reforested with training and supervision provided by project specialists. Projects may purchase seedlings from village nurseries and from commercial nurseries.



### **Engage specialist skills to guide establishment, maintenance and management of reforested land**

Private companies should employ, or at least seek advice and training from, specialists with skills and experience in the areas of tree genetics and plant propagation, species-site matching and silvicultural practices including pruning, thinning and harvesting. The value of employing a local person to liaise with village communities is as important as employing technical and financial experts. CI's international network of specialists is an efficient and effective alternative for sponsored projects to access technical advice. Knowledge and expertise can be strengthened through participation in government, donor and NGO funded projects and programs, a strategy that FFF has used effectively.

### **Labour intensive work contracted to local villages delivers short-term community livelihood benefits, meets essential project and company tasks and enhances community relations**

The expected benefits of labour contracts are delivered when companies, NGOs and other project owners are aware of and understand the intricacies of the relationship between the mataqali and village communities, especially in situations where mataqali members reside in more than one village and where all remaining members of a mataqali reside away from the ancestral village.

### **Provide mataqali with a share of the long-term benefits from investments in plantations and reforestation**

The prospect of their children and grandchildren receiving a share of the value of trees thinned from plantations and of the final harvest is a major incentive for mataqali to offer land for reforestation. Constraints on extraction of timber species before a particular time, such as the 30 year carbon crediting period of the CI project, may reduce the incentive for mataqali to participate, even though after 30 years the mataqali are entitled to 100% of the value of recovered timber resources. The lack of interim payments is a further deterrent. Regular payments to mataqali will attract land offers, secure reforested land and contribute to community livelihood improvements over the long term.

### **A guaranteed market for forest resources is an essential pre-requisite for attracting investors and mataqali commitment to plantations and reforestation**

The existence of a sawmill or timber buyer is a critical factor in the success of a forestry business model such as the FFF model, because it removes a source of uncertainty for potential investors or adopters, it ensures value adding to plantation timber resources and it provides a potentially valuable source of income for the company.

### **Satisfy market requirements for timber resources**

Export markets for timber resources and timber products increasingly demand environmental certified resources and products, such as Forest Stewardship Council (FSC) certification. Without verification of the legal origin (VLO) forest resources and products cannot enter markets in the US, EU and Australia. Forest production and processing must comply with the requirements for FSC certification and VLO from the first stage of forest establishment for own resources and resources sourced from other owners.

## **Strengths and weakness of the FFF and CI models**

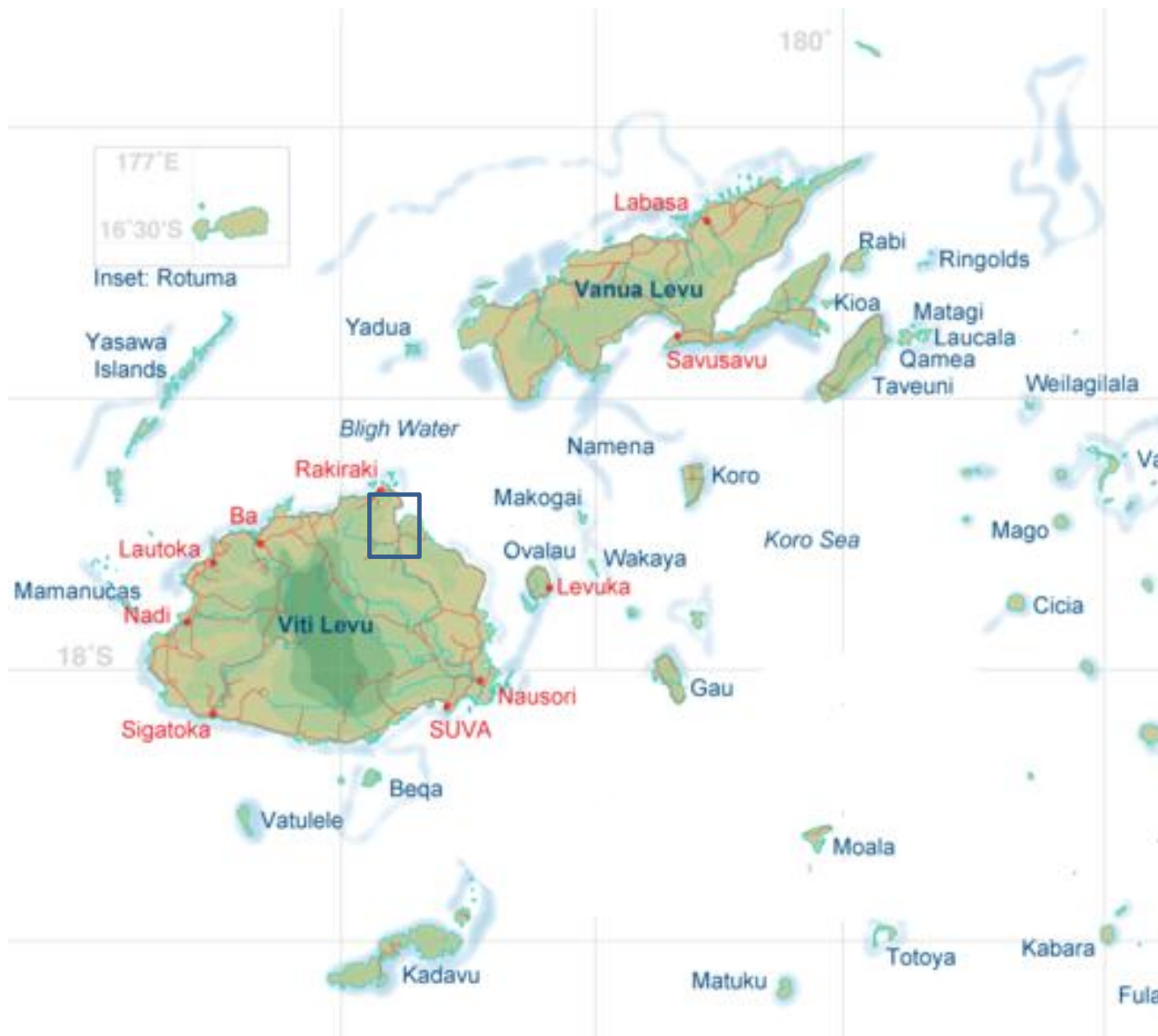
Strengths of the FFF business model include the company's community liaison strategy, although it is experiencing problems emanating from poor community relations in the past; land lease agreements with mataqali although the planned establishment of plantations and associated contracts for villages have been delayed because of company financial constraints; the physical and economic assessments of land plots offered by mataqali; seed sourcing, seedling propagation, nursery management and innovation to reduce seedling costs; employment of qualified forestry specialists with extensive plantation experience in Fiji; provision of labour contracts in the first five years of a plantation although limited knowledge of internal relations within some villages has resulted in the receipt of fewer benefits than expected; the arrangement for sharing of the proceeds of timber sales with the mataqali and the establishment of a sawmill. The major weaknesses of the FFF model are its ambitious plans to raise capital through seedling sales. The company failed to appreciate that a teak plantation is new land management system for land owners and investors in Ra province. Adoption, which can be measured in seedling sales, is likely to be gradual until potential investors receive credible information on the likely performance of teak in the province, after which uptake should increase, assuming positive results. As a consequence, FFF has excess capacity in the nursery. It was unable to convince investors to subscribe to shares to the extent that it expected. The establishment of a sawmill in 2013 will reduce uncertainty about markets for some potential investors and may prove to be a more reliable source of capital for the company. This latter benefit is a consequence of the existence of large areas of mature pine and mahogany within reach of the sawmill which FFF can process independently of the development of a teak market, before mature teak resources are ready. The FFF business model is based on a plantation establishment rate that cannot be matched by the company's capacity to raise financial capital. The plantation rate should be based on a certain and secure supply of financial resources.

The greatest strength of the CI model is that it has a secure source of funds, although the amount may be less than that necessary to ensure that reforested areas remain intact for the entire carbon crediting period. CI also offers labour contracts to mataqali, although they generally end after three years. The fact that mataqali retain ownership of the land and the planted trees, is a strength for the mataqali but a vulnerability for CI testing its capacity to ensure the security of the reforested land. The removal of teak from the plantation mix in 2012 is likely to reduce the incentive for mataqali to offer their land, as the long term benefits for future generations are diminished. CI's access to the organisation's international network of experts is a strength, although the NGO has just one person on the ground in Ra province to address technical and social aspects of project implementation. The major weakness of the CI reforestation model is that it does not have secure tenure over the land and the planted trees putting at risk the carbon offsets contract for FIJI Water. If landowners receive an annual payment to retain all trees, harvesting may be averted. The removal of teak from the species mix for the CI reforestation project and the lack of tenure security indicate the vulnerability of the model to failure. There are insufficient incentives for mataqali to offer their land and ensure the security of the planted trees for the duration of the partnership agreement with CI.

# 1. Introduction

The purpose of this report is to assess the technical, social and financial aspects of two reforestation projects in Fiji and to establish if the projects are suitable models for promoting in other areas of Fiji and in other Pacific countries. The first project is the establishment of teak plantations by Future Forests Fiji Limited (FFF). FFF is pioneering teak plantations in Fiji in association with several land owning units in Ra province and Nadroga province. The second project is a reforestation project planting native and exotic tree species on deforested land to offset the carbon emissions of FIJI Water and to restore degraded land. The project, which commenced in 2008, is funded by FIJI Water and facilitated by Conservation International (CI), a non-government organisation. Both projects are located in Ra province in the remote north of the island of Viti Levu, as shown in Figure 1.

**Figure 1: Location of FFF and CI forestry projects, Ra province Fiji**



Source: <http://mappery.com/Fiji-Islands-Map-3>

There is great potential in Ra province in Fiji to restore degraded grasslands and abandoned sugar cane fields in remote upland areas and establish sustainable timber production that is profitable for investors and environmentally and socially beneficial to local communities. However, gaining access to these lands depends on cooperation from the landowning units or mataqali which own 85% of all land in Fiji. The iTaukei Land Trust Board (TLTB) acts on behalf of mataqali to establish lease agreements with investors to use the land for an agreed purpose over an agreed term. FFF and CI must work in close partnerships with mataqali and the villages in which the mataqali members reside. In the case of FFF the conditions of the relationship with mataqali are documented in lease agreements overseen by the TLTB. CI establishes a Memorandum of Agreement (MOA) with partnering mataqali to define the terms of their association. The efficiency and effectiveness of lease agreements between FFF and mataqali and MOAs between CI and mataqali are addressed in this report.

Access to leasehold land for a term that ensures an economic return is one of a number of factors critical to the success of a forestry investment project. Other important factors include the physical condition of the land (such as soil fertility, slope and rainfall), access to appropriate technology, knowledge and skills, access to financial capital especially to sustain the project in the period until a positive cash flow is generated, access to a reliable supply of labour to support forest operations, access to infrastructure especially roads and utilities and access to a market. Policy settings and regulations governing land tenure, land use, forest operations, forest product processing, labour management, environmental management, finance, trade and marketing are also important influences on the success of forestry investments. These factors are addressed in the assessment of each forestry model.

A primary motivation for private investment and land owner participation in tree planting is the potential financial returns that can be achieved relative to alternative uses of the resources committed to the project including land, labour and capital. Both projects offer short-term and long-term financial benefits and significant social and environmental benefits. FFF and CI provide short term benefits to village communities in the form of labour contracts to prepare land, plant trees and tree and tend the trees during the first five years after establishment. FFF offers participating land owners a share of the income from the sale of trees thinned from plantations after year 6, income from a share of the sale of logs from the final harvest at about year 22 and regular lease payments. Financial aspects of the FFF and CI tree models are included in the assessments.

## **1.1 *Plantation development, land ownership and forest governance in Fiji***

### **1.1.1 *Plantation development***

The total area of forest cover in Fiji is 1.1 million hectares which is equivalent to 60.9% of the total land area of the country. The forest area comprises 950,000 ha of natural forest and 163,000 ha of plantation forests. The area of forest plantations is over 14% of the total forest area. Further details can be found in Appendix 1.

### 1.1.2 Land tenure

Land tenure in Fiji comprises three main types – freehold land which is owned by individuals or shareholding entities, native land which is owned by native Fijians (called the *iTaukei*) and the *mataqali* (land owning group), with the *iTaukei* Land Trust Board (TLTB) as the trustee, and State land which is owned and administered by the government. In 2007, 85% of land in Fiji was held by the *mataqali* or *iTaukei* land. Details on the distribution of land between by ownership can be found in Appendix 1.

Indigenous Fijians, *iTaukei*, traditionally lived in villages. Many of them still do today. Land ownership in *iTaukei* communities is generally held by *mataqali*. These are groupings of related families linked through a patrilineal lineage and usually with an acknowledged traditional role in the village. Every village has several *mataqali*. The head of a *mataqali* is accountable to the *mataqali* members and to the head of the chiefly *mataqali*, the chief of the village. Land inheritance is commonly patrilineal, with male and female offspring having equal inheritance rights. A woman who marries into another *mataqali* or other village retains the rights to her father's land. If that land is the subject of a lease proposal the woman must sign the lease consent together with other owners. Before a lease can be granted it requires the consent of at least 67% of the *mataqali* members.

### 1.1.3 Fiji forest policy

The 2007 Forest Policy recognises the importance of sustainable forest management for the rural community, especially for land and resource owners, the restoration of grasslands (*Talasila*) and degraded forest land, and the expansion of productive plantations for high value timber and rural development<sup>1</sup>. The Policy Statement acknowledges the potential of plantations to supply high quality raw material and provide income and employment opportunities for landowners. The Policy Statement proposes that certification of forest plantations and wood products could align sustainable forest management objectives and economic interests to create new export market opportunities. However, these potential benefits are unlikely to be realised unless various reforms are implemented. Challenges include lack of coordination at all levels in the industry, the low level of technical and management skills in the timber industry, the lack of adequate land use planning, sub-standard management of publicly-owned plantations, small scale operations and inadequate public funding of planning, monitoring and regulation of forest management.

Public infrastructure and services to encourage and support private investment in reforestation and plantation development in Fiji are limited. The pine and mahogany plantations were created by the Department of Forests following decisions by government. These plantations and associated processing facilities and subsidiaries have been corporatized and are now under the management of government-owned enterprises (Fiji Hardwood Corporation Limited, Fiji Pine Limited and Tropik Wood Industries Limited). Parallel investment in plantations by private companies or land-owning units did not eventuate to the extent expected. The Government of Fiji has not provided subsidies, taxation concessions or other direct incentives to encourage private investment in forestry as has been done by governments of other countries. The Department of Forestry extension services are limited by resource constraints, geographical location and a dominant focus on agro-forestry systems.

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<sup>1</sup> Department of Forestry. 2007. *Fiji Forestry Policy Statement*. Ministry of Fisheries and Forests, Suva Fiji. November.

Conditions for private investment in forestry in Fiji are challenging compared to those in other countries. The success of a private forestry investment initiative in Fiji depends on the skills, knowledge and experience available to the organisation (technical capabilities), the effectiveness of the investor's relationships with landowning units, village communities and the TLTB (social capabilities), the investor's capacity to finance a plantation for several years before a positive cash flow is generated (financial capabilities) and the investor's ability to access a reliable market (economic capabilities). The status of these capabilities will be assessed for FFF and CI in relation to their respective forestry investments.

### **1.2 Method**

Assessments of the technical, financial and social aspects of reforestation operations of FFF and CI were guided by terms of reference which are included in Appendix 1. Information and data were collected through interviews with individual staff from FFF and CI and through group discussions with staff of FFF and members of village communities. Interviews with individuals and groups were guided by set questionnaires. The information and data collected through the interviews were analysed to identify particular themes and issues. The financial assessments combine primary data collected during interviews and secondary data from various sources to estimate financial performance using discounted cash flow analysis. All interviews took place over a period of five days from 5 February to 8 February 2013. A total of 15 individuals were interviewed and discussion sessions were held in six villages including separate meetings with women where they attended. The programme of visits and interviews is attached as Appendix 2.

### **1.3 Outline**

Assessments of the technical, social and financial aspects of the Future Forests Fiji teak plantation business model are presented in the next section. This is followed by similar assessments of the Conservation International reforestation project. Lessons learnt from the two projects are presented and summarised in the form of a checklist that can be used by prospective investors in forestry projects in Fiji and other Pacific countries. A number of conclusions are drawn and recommendations made for the promotion of similar forestry investment projects.

## **2. Future Forests Fiji Limited – teak nursery, plantations and processing**

Future Forests Fiji Ltd was incorporated in October 2004 with the intention of establishing sustainable teak plantations on deforested land in Fiji. The first plantations were established in 2006 on private land in Ra province in Viti Levu. Plantings on leasehold land commenced in 2009. By 2013 the company had established 203 ha of plantations with teak as the main species and other species planted on sites where teak is unlikely to perform well. The company has seven lease agreements with mataqali in Ra province comprising 197.4 ha and 2 leases in Nadroga-Navosa province comprising 308.5 ha. Plantations have been established on 128 ha of leased land (79.49 ha in Ra and 48 ha in Nadroga-Navosa). The company's vision is 'to be a dynamic, internationally recognised and environmentally responsible plantation company in Fiji that consistently produces high quality teak to maximise returns to shareholders'. The company was listed on the South Pacific Stock Exchange in 2011 which raised F\$1.84 million, with net proceeds of F\$1.35 million after placing future interest payments on

Convertible Notes in term deposits. These funds have been used for plantation establishment and managing existing plantations. In 2009 FFF received a grant of A\$190,000 from the AusAID-funded Enterprise Challenge Fund (ECF) to improve its teak seedling nursery and expand annual capacity to 300,000 seedlings from 50,000 in 2008.

## **2.1 The FFF business model**

The FFF business model comprises a nucleus plantation estate on freehold land, a commercial scale nursery, a sawmill and wood processing enterprise and individual lease agreements with several mataqali located within economic reach of the sawmill. The structure of the FFF business model is influenced by two main factors: land access to establish plantations and market access for teak wood and wood products. It is not possible to build a viable plantation estate on freehold land alone in Fiji where at least 85% of land is owned by mataqali. Alternatives include leasing land from mataqali or partnering with mataqali to supply FFF as contracted outgrowers or mini estates. The land leasing option is preferred by the company and the mataqali. FFF has a core plantation estate of 121.8 ha of freehold land and plans to progressively expand over 30 years to a minimum estate of 3,000 ha (Future Forests Fiji Prospectus 2011, p.19). Independent landowners have purchased teak seedlings from the FFF nursery to establish plantations on their land with intentions to sell teak logs to the company. The existence of a market or buyer for teak logs is a critical factor in attracting mataqali to enter into a lease agreement with FFF and in influencing the decisions of independent land owners to grow teak. The establishment of a sawmill and wood processing operations by FFF in 2013 will provide a local market for teak

The mataqali and the company are key stakeholders in the FFF business model. The mataqali contribute their land and labour in return for which the company makes regular lease payments, offers short-term labour contracts for plantation operations and provides a share of the proceeds from plantation outputs. However, the motivations of the company and the mataqali to commit resources to a teak plantation differ. The Company's vision is to maximise returns to shareholders, whereas a mataqali is interested in maximising short-term cash returns to meet village needs as well as providing a long-term asset which can provide benefits for future generations in the village. The Company has an annual planting target based on future timber resource flows to sustain the timber processing operation, while the mataqali are concerned about risks to food security and meeting community obligations that may arise from the extra labour demands of the plantations. The villages in which members of the mataqali reside and the iTaukei Land Trust Board (TLTB) are important stakeholders as well. The interests of the village generally align with those of the mataqali. The TLTB is in a position to ensure that there is alignment among the interests of the mataqali and the company and that an appropriate balance of power is struck. This is reflected in the mission of the TLTB which includes ensuring that landowners receive a fair market value for their land resources, land use practices are economically, environmentally, socially and culturally sustainable, partnerships are mutually beneficial and the intended land use complies with relevant laws<sup>2</sup>. The FFF business model attempts to achieve a balance of stakeholder interests within a mutually beneficial arrangement. It is critical in reaching agreement that the needs and objectives of all parties involved

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<sup>2</sup> See the TLTB website: <http://www.tltb.com.fj/>

are identified and understood and that the interests of the parties are aligned through an appropriate balance of power.

## **2.2 Technical aspects of FFF operations**

In the initial stages of development FFF assessed several long-established stands of teak trees in Fiji that were established by the British Colonial Administration. Following extensive research and development including germination trials three stands were selected as suitable sources for seed collection (plus trees<sup>3</sup>). In 2006 nursery operations commenced in Ra province and the first seed batch was germinated for later planting on the company's own land. This section assesses the technical aspects the company's nursery operations and plantation practices, including current approaches, changes that have been made since establishment and future plans.

### **2.2.1 Nursery operations**

The FFF nursery is located at Tova settlement on a one hectare block of leased land adjacent to one of the company's freehold plantation sites. Access to the site is via six kilometres of unsealed road from the Kings Road which provides a sealed route to Suva in the south and Rakiraki, Lautoka and Nadi in the west. The nursery is located approximately 14 kilometres from the company's office at Savulu. There are six permanent employees attached to the nursery including the nursery manager who reports to the General Manager. The nursery supervisor reports to the nursery manager and two nursery officers report to the nursery supervisor. The maintenance technician and handyman report to the nursery manager, although a portion of their time is spent on plantation activities as well. Casual labourers are hired as needed for watering, weeding and filling pots.

The nursery was set up in 2006 with germination tables, outgrow tables and a water tank to produce 30,000 seedlings per year. The investment in the original nursery was about F\$10,000. In 2008 the number of outgrow tables was increased and annual capacity grew to 50,000 seedlings. In 2009 the ECF grant allowed the nursery to expand to its present capacity of around 400,000 seedlings per year. The investment of F\$190,000 was for two green houses, additional germination and outgrow tables, watering system, electricity generator, large concrete slab, nursery equipment and root trainer pots and trays. This scale allowed the company to commence seedling sales as well as meet its own demand for seedlings. The company has a selection of species available for sale to local buyers at its Savulu office, which is located on the Kings Road which is more accessible and visible than the actual nursery site. FFF also advertises seedling sales on its website.

Seeds from selected plus trees of teak and native species are collected by local village people under the supervision of FFF staff. Up to 600 kilograms of teak seed are collected annually, which yields about 360 kilograms of seed for germination. The seeds are prepared and germinated in two igloo-style greenhouses, each housing 40 germination tables. Each germination table is sown with 6000 teak seeds and produces about 3000 seedlings on average for transplanting to root trainer pots or poly bags. Potted seedlings are hardened-off on outgrow tables before planting in the field. Details on nursery operations by FFF are presented in Table 1. An assessment of each operation is made relative to best practices for teak seedling propagation.

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<sup>3</sup> A 'plus tree' is an individual tree judged to be superior in one or more qualities such as growth rate, stem straightness, lack of low branching or resistance to pests and diseases.



Current nursery capacity is around 100,000 seedlings per year, as only one of the greenhouses is available while the other one is being use for vegetative propagation trials. The current capacity is sufficient to meet the seedling needs of the company for plantation establishment. In 2011-12, the nursery supplied almost 89,000 seedlings to FFF for establishing 87 hectares. Seedlings sales were just under 17,000 with total production of 106,000 seedlings. Expansion of the nursery in 2009 was driven in part by the prospect of seedling sales. However, seedling sales have been less than expected. Consequently, revenue from seedling sales has been below expectations and plantation establishment has been below target levels. This has encouraged the company to seek other sources of revenue. to finance plantation establishment.

**Table 1: Assessment of nursery operations for propagating teak seedlings from seed**

<b>Operation</b>	<b>Responsibility</b>	<b>Assessment</b>
<b>Seed is collected at 4 locations from 25 plus trees which are &gt; 50 years old. Tree selection was based on stem form and lack of branching, buttressing and fluting (May to August)</b>	Members of mataqali on whose land plus trees are located collect seeds with supervision from permanent nursery staff to ensure quality. FFF supports mataqali by providing ladders and bags for seed collection. Nursery staff record seed batches in a computer database. Seed collection must occur between May and July. FFF pays \$5/kg with a 50kg bag converting to 30kg teak of seed for germination	<ul style="list-style-type: none"> <li>Local seed supply sources are limited. Plus trees are selected based on tree form characteristics and growth rate. The shift by FFF to vegetative propagation will overcome seed supply constraints and enhance long-term productivity of plantations. Propagation material will be sourced from established hedges of superior trees.</li> <li>The FFF practice of collecting seed from several plus trees over a broad geographical area ensures genetic diversity among the seeds which is critical for robust progeny.</li> <li>FFF's experience reveals that it is difficult to predict seedling demand. The area of suitable land available and the level of finance available are the main drivers of own demand. Seedling sales especially for a new species such as teak are subject to several factors including knowledge, finance, risk and uncertainty.</li> <li>FFF uses seed that is up to 1 year old. The company's seed storage strategy is inadequate. There is no contingency to cover years when seed supply is low and limited capacity to store collected seed when seedling demand is less than expected. FFF should maintain a store of teak seed and other seeds. Clean, dry teak seed can be stored in a sealed container for up to 2 years, preferably in an air-conditioned room. The nursery should maintain a store of other popular species as well, as their demand increases</li> <li>FFF is aware of the risk associated with teak seed collected outside of the optimal period - 10% seed yield loss.</li> </ul>
<b>Seed is cleaned and then soaked for 24 hours before sowing</b>	Permanent nursery staff	Teak seed is difficult to germinate and a specific treatment must be applied to the seed to allow air and water to penetrate the seed coat before it is sown to ensure rapid and uniform seed germination. There are several treatment options available to treat the seed coat <sup>4</sup> . The FFF approach is short and simple and germination rates are comparable with rates achieved elsewhere (50%).
<b>Prepare germination tables – seed-raising mix comprises sand, pig manure and fertilizer</b>	Permanent nursery staff	<ul style="list-style-type: none"> <li>Germination rate is comparable to rates achieved in other countries (50%)</li> <li>Sand is sourced locally. Manure is purchased from a piggery in Lautoka. The medium is used for three germinations and re-used in seedling bags and pots. Fungicide is used only when needed. FFF operations are frugal, but effective.</li> <li>Experts advise that teak seeds should be germinated in sand which is free of soil or organic material<sup>5</sup></li> </ul>
<b>Germinate seed on germination tables in greenhouse (7-10 days) (September to March/April)</b>	Nursery permanent staff Casual labour responsible for weeding and watering seedbeds	<ul style="list-style-type: none"> <li>5 kg of seed provides 6000 seeds sown on each germination table; 50% germination rate – 3000 seedlings;</li> <li>Only fresh seed up to one year old is used. Some specialists advise not to use seed younger than one year old.</li> </ul>

<sup>4</sup> See for example: Pramono, A.A., Fauz, M.A., Widyani, M., Heriansyah, I. and Roshetko, J. 2011. Managing smallholder teak plantations: field guide for farmers. CIFOR, Bogor, Indonesia.

<sup>5</sup> See the above document.

Operation	Responsibility	Assessment
		<ul style="list-style-type: none"> <li>Less than 50% of nursery germinating capacity is being used at present with second greenhouse used for propagating cuttings. However, current seedling demand can be met by one greenhouse.</li> </ul>
<b>Transplant germinants to bags or pots 1 week after germination and put on outgrow tables under shade for 2 weeks.</b>	Permanent nursery staff Fungicide not used unless needed Casual labour fills pots and bags, and waters and weeds seedlings.	<ul style="list-style-type: none"> <li>Under current seedling demand the capacity of outgrow tables is adequate.</li> <li>Use recycled germination medium in pots and bags.</li> <li>Transplanting is avoided when it is very hot. 20 to 50 seedlings are lifted and transplanted in 5 to 10 minutes. Seedlings with “j” roots are cut.</li> <li>Company has invested in root trainer pots, while seedling buyers prefer seedlings in poly bags.</li> <li>Weekly report prepared on numbers of transplants completed</li> </ul>
<b>Harden off over 6 weeks on open outgrow tables</b>	Permanent nursery staff and casual labour	The nursery follows standard watering practices to prepare seedlings for planting out.
<b>Transfer to planting site (November to April)</b>	Permanent staff coordinate transport to the site by truck, 4-wheel drive ute or tractor	<ul style="list-style-type: none"> <li>The main issue is seedling desiccation. Seedling losses in transit to the planting site are minimal.</li> <li>Access to difficult sites are facilitated by the 4-wheel drive tractor, although most sites are readily accessible by the truck or 4-wheel drive ute.</li> </ul>



**Figure 2: Nursery Manager Reshmi Chand inspects seedling germination tables (left).**

**Hardened seedlings raised in poly bags ready for sale (right)**

The nursery operates in an ad hoc fashion responding to short-term demand for seedlings rather than in accordance with a long-term plan. The nursery manager is not provided with an annual budget nor is there an annual work plan. The relatively remote location of the nursery is not only a disadvantage for promoting local seedling sales, but the site is not connected to the electricity grid and road access is difficult. Power is supplied to the nursery by a diesel generator. Water is pumped from a permanent creek into four 10,000 litre tanks and is purified before being used in the nursery. The nursery also serves as a base for the company's plantation operations with equipment stored in sheds and on the ground at the site. The nursery manager lives on the site which ensures that the facility, seedlings and equipment are under constant protection.

**Box 1: Root trainer pots versus poly bags**

After germination seedlings can be raised in root trainer pots or poly bags. Root trainer pots have the advantages that they occupy less space than poly bags and so more seedlings can be accommodated on outgrow tables and more can be transported to the field per trip. A root trainer pot requires 60% less potting mix and produces a strong seedling with a well-formed, straight root system that enhances establishment and growth after planting in the field. Root trainer pots can be re-used several times. The advantages of seedlings in poly bags include faster growth and higher survival rates as they are less likely to dry out in the nursery or when being transported to the field. Seedlings in poly bags are preferred by external buyers because they look attractive and buyers don't have to return the bags. Root trainer pots have to be returned to the nursery. By using root trainer pots FFF has reduced its seedling production costs by 60%. FFF will continue to use root trainer pots for its own seedlings and trainer pots and poly bags for seedling sales. The company has 220,000 root trainer pots.



Teak seedlings in root trainer pots      Teak seedlings in poly bags

Although none of the nursery staff have formal tree genetics or nursery management qualifications, they have acquired knowledge and skills on the job through trial and error, working with visiting forestry specialists and from colleagues. However, this has not limited FFF's performance which is comparable with that of other nurseries raising teak from seed. The Nursery Manager learnt from the company's original directors and from trials conducted in the early years. Technical guidance is provided to nursery staff by the General Manager and the internet is a useful resource. For example, the company is adapting vegetative propagation techniques recommended in a field guide for managing smallholder teak plantations published by CIFOR<sup>6</sup>. The staff and the company benefited from the specialist advice and assistance of Murray Keys under the Australian Business Volunteer program in 2009. Murray assisted the company establish nursery and

plantation trials, prepare nursery and plantation manuals and train staff in silviculture, chemical tending and fire control.

<sup>6</sup> Pramono, A. A., Fauzi, M. A., Widyani, M., Heriansyah, I and Roshetko, J.M. 2011. *Managing smallholder teak plantations: field guide for farmers*. CIFOR, Bogor, Indonesia)

FFF has pursued improvements in operational efficiency of the nursery by evaluating and adopting advanced systems and techniques. In 2009 the company adopted the root trainer pots for growing out germinants in an effort to reduce costs and improve survival of seedlings. During 2012 and 2013 the company has been trialing vegetative propagating techniques to improve the form and productivity of teak trees planted in the future. Details on these initiatives are presented in boxes 1 and 2.

**Box 2: Vegetative propagation**

FFF understands the long-term benefits of vegetative propagation or clonal forestry over seed-based propagation. Cuttings taken from shoots of the best quality tree produce seedlings that are genetically identical. FFF is in the early stages of evaluating propagation of teak by vegetative means, conducting trials to determine the best approach. Selected plus trees have been established in a hedge garden to provide cuttings. Strike rates of 65% have been achieved, although seedling survival rates on shade-covered outgrow tables have not reached acceptable levels. Trials have been conducted on potting media mixes to improve strike rates. If the FFF shifts to vegetative propagation on a large scale, then current nursery operations will have to be modified substantially.



Teak shoot cuttings



Teak cuttings hedge

Should vegetative propagation prove to be more profitable than propagation from seed it will be necessary to redesign the nursery and revise nursery operations. In this situation it would be opportune to consider relocating the nursery to a site closer to the FFF office on the Kings Road where it is more visible and accessible to potential seedling buyers and Company, where it can connect to the electricity grid and where it is close to other Company operations.

**2.2.2 Lessons learnt for nursery best practice**

This assessment of the technical aspects of FFF nursery operations and the propagation of teak seedlings has identified a number of lessons which may benefit organisations and individuals considering establishing teak plantations elsewhere in Fiji or in other Pacific Island nations. Suggested actions towards achieving best practice for key nursery operations are presented in Table 2.

**Table 2: Lessons learnt from the operations of the FFF nursery**

Operation	Lessons towards best practice
Nursery planning	<i>The scale of a nursery should reflect the company's financial capacity to establish plantations and realistic assessments of the adoption of plantation forestry by land owners and larger investors where seedling</i>



Operation	Lessons towards best practice
	<p data-bbox="499 250 967 280"><i>sales are a component of the operation</i></p> <p data-bbox="499 309 1355 416">The FFF nursery has been developed in stages to its current capacity. While this is good practice, current capacity is twice the level of seedling demand. FFF's seedling sales forecasts were optimistic and the company's planting rates have been well below target because of financial shortfalls.</p> <p data-bbox="499 448 1350 636">A realistic balance should be struck between the scale of the nursery, the annual area of land to be planted with trees and the annual level and pattern of financial inputs. If external demand for seedlings is unpredictable, then it should be factored into the plan at conservative levels. If seedling sales are an important source of financial capital then the plan should include a complementary seedling marketing strategy (see appendix 4 on estimating seedling sales).</p> <p data-bbox="499 667 1267 692">The number of seedlings required for planting depends on the following:</p> <ol data-bbox="549 694 1129 801" style="list-style-type: none"> <li>1. The area to be planted in one year</li> <li>2. The spacing between the trees</li> <li>3. The expected seedling survival rate in the nursery</li> <li>4. The expected seedling survival rate in the field.</li> </ol> <p data-bbox="499 804 1350 992">The number of seedlings required for one hectare planted at 3m X 3m spacing with 10% losses in the nursery and 10% after planting is 1333. If spacing is closer, more seedlings will be needed. The number of seeds required depends on the germination rate. For teak 45 to 50% is a reasonable estimate. Therefore, for one hectare around 2700 seeds are required, which is equivalent to approximately 2.25 kilograms of germinating seed. This would be derived from about 3.75 kilograms of seed collected from plus trees.</p>
<p data-bbox="188 1001 459 1055"><b>Nursery location and accessibility</b></p>	<p data-bbox="499 1001 1355 1086"><i>The nursery should be centrally located relative to plantation areas, with access to utilities and readily accessible by local land owners, especially where seedling sales are part of the operations</i></p> <p data-bbox="499 1120 1313 1227">The FFF nursery is poorly located. It is distant from a major sealed road and potential buyers and it is not connected to the power grid. However, it is well located in terms of access to labour and the manager lives on site which provides constant security.</p> <p data-bbox="499 1229 1355 1337">Locate the nursery where road access is reliable at all times of the year, there is ready and reliable access to electricity and water and there is exposure to potential customers, especially if seedling sales are part of the revenue strategy.</p> <p data-bbox="499 1339 1278 1417">The nursery should be centrally located relative to plantation sites. Other important considerations are proximity to a settled area for labour supply, security and a source of basic materials.</p>
<p data-bbox="188 1426 459 1480"><b>Nursery design and capacity</b></p>	<p data-bbox="499 1426 1342 1480"><i>Design nursery operations to remove bottle necks, maximise efficiency and produce seedlings at lease cost</i></p> <p data-bbox="499 1512 1342 1644">The layout of the FFF nursery is modern and efficient, although its capacity exceeds demand. FFF is experimenting with vegetative propagation. A change from seeds to vegetative propagation would require significant changes to the nursery. If that occurs the opportunity to relocate the nursery should be considered. Lessons gained from the FFF experience include:</p> <ul data-bbox="549 1646 1342 1868" style="list-style-type: none"> <li>• The nursery should be designed to ensure efficient workflow, maximum productivity and scope for expansion</li> <li>• There should be balance between the capacities of the germination tables and outgrow tables</li> <li>• There should be sufficient area within the nursery compound to allow for establishment of a cuttings orchard to support vegetative propagation and to expand capacity in response to increased seedling demand.</li> </ul> <p data-bbox="499 1870 1313 1955">The scale of the nursery should align with the target annual plantation establishment rate (and level of seedling sales, if relevant). A planting target rate of 40 hectares per year dictates the following capacities:</p> <ol data-bbox="549 1957 1334 2038" style="list-style-type: none"> <li>1. If each hectare requires 1333 seedlings, allowing for losses, then the total number of seedlings is 53,320 per year.</li> <li>2. A germination table produces 3000 teak seedlings (from 6000 seeds),</li> </ol>

Operation	Lessons towards best practice
	<p>which converts to 18 tables, if all seedlings are required at about the same time. If two rotations can be applied, then 9 or 10 tables are needed.</p> <p>3. The number of outgrow tables depends on type of pots used (root trainer or poly bag), the space each pot occupies and the time it occupies the space. The number of germination rotations per year is relevant as well.</p>
<b>Seed collection</b>	<p><i>Ensure diversity among seed collected from plus trees</i></p> <p>FFF source seed from several plus trees and several locations. Seed collection is supervised by skilled FFF staff to ensure quality. These are best practices. Seed should be from at least 15-25 plus trees spread over a wide geographic range on sites with similar growing conditions to the plantation sites.</p>
<b>Seed contingency and storage</b>	<p><i>Establish a seed store to insurance against seed supply shortages</i></p> <p>FFF germinate seed collected within the same year. Experts advise that seed should be at least one year old. However, germination rates attained by FFF are comparable with rates in other countries.</p> <p>Implement a seed contingency strategy for years when seed supply is low to ensure that there is always sufficient seed available to meet annual seedling demand. A contingency of one year's seed supply is advisable, replaced each year. Seed can be stored in airtight containers at 12% moisture for up to two years in a dry, shaded and cool place.</p> <p>Sow one-year old seed and place fresh seed into storage.</p>
<b>Seedling pots</b>	<p><i>The costs and benefits of alternative potting arrangements should be factored into nursery design and financial assessments</i></p> <p>FFF invested in root trainer pots, which is a common choice for large-scale nurseries. The company reduced seedling costs by 60% when it shifted from poly bags to root trainer pots. However, FFF also uses poly bags, especially for seedlings sold to others.</p> <p>A consideration in nursery design is the choice of pot for raising seedlings: plastic pots, poly bags or root trainer pots. Each system involves a unique management regime. The benefits and costs of each system should be evaluated not just in terms of costs and performance but also including impacts on long-term productivity of the plantation.</p>
<b>Expertise</b>	<p><i>Investment in qualified specialists with local knowledge and experience is essential and valuable</i></p> <p>FFF does not have qualified staff working in the nursery. It has relied on short-term inputs of advice and assistance from volunteer specialists and guidance from the General Manager.</p> <p>Lack of relevant knowledge and expertise may constrain the consistent production of quality seedlings. Investment in skilled management and staff training are as important as nursery design. Trained and experienced staff are able to quickly identify and correct problems when they arise, as well as ensuring the operational efficiency of the nursery.</p>

### 2.2.3 Plantation establishment and management

The FFF silvicultural system comprises several functions associated with plantation establishment and management including land aggregation from mataqali, preparing the land for planting, planting tree seedlings raised in the FFF nursery, weed control during the first five years, pruning, singling and thinning, and harvesting the trees for their timber resources at the end of the rotation. The silvicultural system provides short-term financial benefits for mataqali through labour contracts during the first five years of the plantation and regular lease payments and longer-term income from timber harvests which are shared by the mataqali (10%) and the company. Technical inputs to the FFF silviculture are underpinned by a solid understanding of the science of teak plantation establishment and management and of the physical environment in Ra province and awareness of

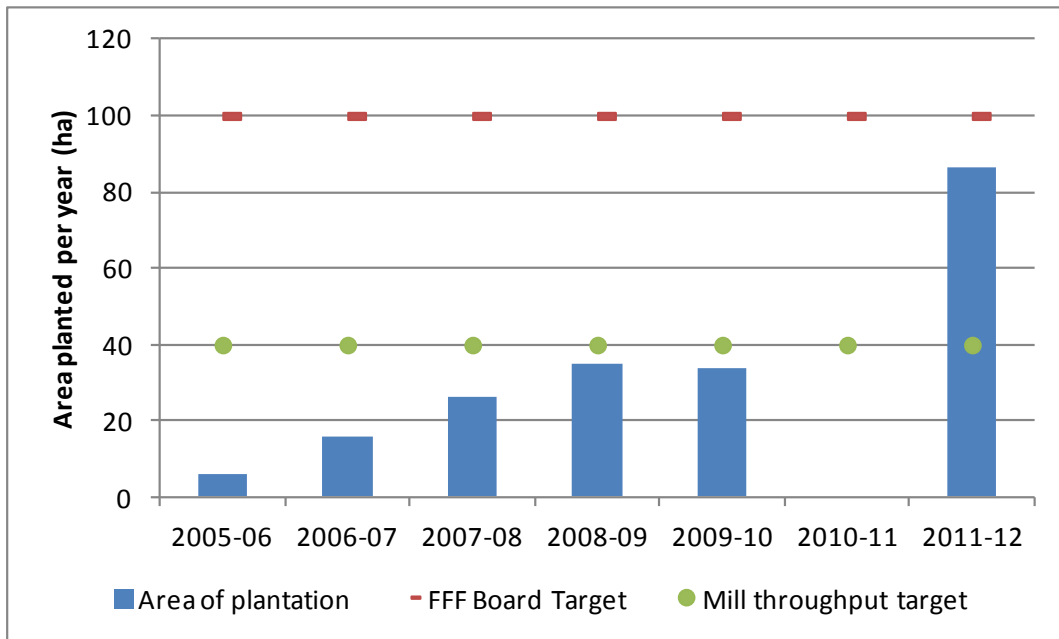
laws and conditions governing the use of land for forestry and the satisfaction of market requirements, such as those for forest certification. This is built on investment in qualified and experienced staff.

There are seven full-time employees in the FFF plantation group and two casual employees. The Plantation Manager/Senior Forest Ranger reports to the Company General Manager. The Plantation Supervisor, who is a GIS specialist, reports to the Plantation Manager. There are five plantation workers supervised by the senior staff. The General Manager, Plantation Manager and Plantation Supervisor/GIS Surveyor between them have 65 years of forest management experience in Fiji and other Pacific Island nations. The benefits of their skills and experience are evident in improvements in land assessment procedures before committing to a lease agreement, matching the right species to site conditions (teak will not grow everywhere), acquiring suitable land for lease from mataqali (fertility, accessibility, slope), accurate site mapping and silvicultural practices.

As at February 2013 FFF had planted an area of 203.68 ha since the first plantations were established in 2006, including 128 ha of leased land. The annual pattern of planting has been variable and below the target level of 100 ha per year as advised in the 2011 FFF Prospectus, as revealed in Figure 3. The establishment of plantations is influenced by a number of factors including gaining access to suitable land, the availability of funds to finance lease arrangements and plantation establishment, technical assessment of the land and the availability of seedlings. According to the FFF 2012 Annual Report, the total area of land held by the company at 30 June 2012 was 628 ha, with 320 ha in Ra province and 308 ha in Nadroga-Navosa province. During 2011-12 an additional 442 ha were leased from local communities and are ready for planting. During 2011-12 the Company assessed 773 ha as suitable for growing teak. This land was offered to FFF for lease by twelve land owning units in Ra province. Land availability and land assessment capacity are not constraining plantation expansion by FFF. Furthermore, plantation expansion is not constrained by nursery capacity, as indicated in section 2.2.1. The biggest constraint on plantation expansion has been availability of financial capital for land preparation and planting.

**Figure 3: Area of plantation established by FFF relative to annual targets**





Source: FFF Annual Report 2012; FFF Prospectus 2011; personal communication with FFF General Manager, 6 February 2013

### 2.2.3.1 Land aggregation

Land aggregation which is a major function of the FFF business model as is the first stage in the silviculture system. It involves identifying and accessing land from local communities that is suitable for teak plantation establishment. The steps involved in land aggregation and the current practices adopted by FFF are presented in Table 3.

**Table 3: Current practices of FFF in aggregating land for plantations**

<b>Steps</b>	<b>Current practice</b>
<b>1. Contact villages in areas identified as potentially suitable for teak plantations</b>	<ul style="list-style-type: none"> <li>• FFF representatives attend <i>tikina</i> meetings to maintain informal relations with local communities<sup>7</sup></li> <li>• Write to the village chief seeking a meeting with the village community to talk about land use options including tree planting</li> <li>• Representatives of FFF visit the village at the invitation of the chief to discuss options for reforestation.</li> <li>• FFF has a contract with a local community leader to liaise with villages on behalf of FFF. Pastor Aporosa Vunivola communicates sensitively and openly with communities establishing a sound base for building a trusting relationship. He listens to their concerns and aspirations and demonstrates how tree planting could address their needs. It is a realistic approach balancing the needs of the community with FFF's interests and avoids creation of unrealistic expectations.</li> </ul>
<b>2. Inform the village of teak plantation operations and potential benefits</b>	<ul style="list-style-type: none"> <li>• The community liaison person and one of FFF's professional foresters provide the village community with information on the benefits of growing teak and other tree species on their land</li> <li>• The decision to lease the land to FFF is left with the respective mataqali to discuss.</li> </ul>
<b>3. Expressions of interest received</b>	<ul style="list-style-type: none"> <li>• FFF receives expressions of interest from individual mataqali in the village offering to lease land plots for reforestation</li> </ul>
<b>4. Assesses the suitability of land offered for lease</b>	<ul style="list-style-type: none"> <li>• Plots offered to FFF are assessed by specialists for fire risk, the extent of water courses, ease of access and soil conditions.</li> <li>• Soil samples are collected at 20 sites within a plot and then mixed to get an average assessment for the whole site. Samples taken at depths of 0-20cms and 20-40cms. Tests are conducted for pH, Ca, P and K by FFF staff using specialist soil-testing equipment.</li> <li>• Site boundaries are mapped using GPS by an FFF forester.</li> <li>• FFF determines which sites within a plot are optimal for teak and which should be planted with other species. The aim is to maximise the area planted to teak.</li> </ul>
<b>5. Inform mataqali of sites suitable for lease</b>	<ul style="list-style-type: none"> <li>• FFF advises the mataqali of the sites that they would like to lease and a series of three meetings are arranged to discuss the arrangements relating to the leased land.</li> <li>• A letter of consent is prepared for submission to TLTB with support from at least 67% of mataqali members</li> </ul>
<b>6. Prepare lease agreement with the TLTB</b>	<ul style="list-style-type: none"> <li>• The mataqali choose a representative as their spokesperson, open a bank account and nominate two or three trustees to care for the lease money</li> <li>• The FFF Board is advised of the mataqali's consent and a letter of offer is prepared for the TLTB. The lease agreement is drafted in accordance with the requirements of TLTB (<a href="http://www.tltb.com.fj/">http://www.tltb.com.fj/</a>)</li> <li>• FFF signs lease with the TLTB and TLTB counter signs on behalf of the mataqali. FFF makes required payments to the TLTB.</li> </ul>

Table 4 presents details on the status of lease agreements between FFF and mataqali.

<sup>7</sup> A *tikina* is a combination of *koros* or villages

**Table 4: Details of FFF lease agreements**

No	Lease name	Mataqali	Koro	Province	Start date	Area (ha)	Area planted (ha)	Area planted as at Feb-2013 (%)	Lease term (years)	Status of lease at February 2013
1	Namolau	Namolau	Nakorovou	Ra	Jan-08	34.40	20.49	60%	50	Signed copy in file
2	Nukutabua	Nukunitabua	Burenitu	Ra	Jan-10	10.00	14.42	144%	30	Agreement done but holding to offer until an existing lease on same area is properly sorted
3	Nabau	Nabau	Burenitu	Ra	Jan-10	10.00	6.44	64%	75	Directors have signed and await TLTB signed copy
4	Nasogosoqo	Navolivoli	Navuniivi	Ra	Jan-11	9.90	7.74	78%	30	Directors have signed and await TLTB signed copy
5	Nabubu	Navunivesi	Nausori	Ra	Jan-11	34.40	21.00	61%	50	Received agreement 26/09/12 and awaits directors' signature
8	Nakorotubu	Nakorotubu	Nausori	Ra	Jan-12	99.10	9.40	9%	50	Received agreement 26/09/12 and awaits directors' signature
9	Makodragu	Makodragu	Nausori	Ra	Feb-13				50	Directors have signed and await TLTB signed copy
6	Teuvewa	Noisigarua	Nadralla	Nadroga	Jul-11	203.50		0%	30	Directors have signed and await TLTB signed copy
7	Qeleiyalayala	Koroinasau	Sovi/Baravi	Nadroga	Jul-11	104.90		0%	30	Directors have signed and await TLTB signed copy
<b>Total</b>						<b>506.20</b>	<b>79.49</b>	<b>16%</b>		
<b>Average</b>						<b>63.28</b>	<b>13.25</b>	<b>52%</b>	<b>42</b>	
<b>Ra Total</b>						197.80	79.49	40%		
<b>Ra Average</b>						28.26	11.36	40%	45	

Source: FFF data

The following points emerge from the data in Table 4:

- Since 2006 FFF has signed 9 lease agreements, with 7 in Ra province and 2 in Nadroga-Navosa province.
- In Ra province the average lease area is 28 ha which is relatively small especially considering the high fixed costs associated with establishing each lease
- Recent land acquisitions are significantly larger: 773 ha acquired from 12 mataqali, which is equivalent to 64 ha per lease.
- 40% of the area leased in Ra province has been planted. If the Nakorotubu lease is excluded the ratio of the area planted to the area leased is 71%.
- The average term for existing leases in Ra province is 45 years and 30 years in Nadroga-Navosa. The most common lease term is 30 years which allows just one teak rotation.

### 2.2.3.2 Land preparation, tree planting and other silvicultural practices

Table 5 describes each of the main operations of the FFF silviculture systems and presents an assessment of the company's practices compared to those used in other countries.

**Table 5: Assessment of FFF's plantation operations**

<b>Operation</b>	<b>Responsibility</b>	<b>Assessment</b>
<b>Land assessment</b>	FFF staff	Specific details of this operation are described in Table 3. FFF has always conducted thorough assessments of the soil properties for prospective plantation sites. Since 2012 assessments have been conducted in-house, because it is quicker than using an external analytical laboratory. GPS mapping of boundaries is a valuable addition to FFF's capabilities and ensures that lease plots are accurately determined and planted. Before FFF had access to GPS to map plots, they planted outside leased boundaries in a couple of places which is costly.
<b>Land preparation – clear vegetation</b>	People from the village where the mataqali whose land is being planted reside FFF staff supervise	Vegetation cover and slope are key determinants of the time taken and the cost of preparing land for tree planting. FFF has developed a payment schedule based on the time it takes to clear land with light, moderate and heavy vegetation cover and land that is gently sloping, moderately sloping or steep. The company did this to ensure that they were paying a fair price for labour intensive tasks such as land clearing. FFF contracts the mataqali to provide labour for clearing. An FFF staff member instructs the workers on what to do and how to do it and they provide supervision while the work is being done.
<b>Tree planting, fertilizing</b>	People from the village where the mataqali whose land is being planted reside with FFF staff supervision	FFF contracts workers for tree planting from the village where the mataqali members reside. They are paid according to the number of trees planted per hectare which is determined by the tree spacing. FFF spaces trees at 3m X 3m which results in 1111 stems per hectare. FFF plantation staff members supervise the workers. Trees are sourced from the FFF nursery. Fertilizer and other soil treatments are applied at planting as required such as lime on poorer sites. Native species are planted on sites that are unsuitable for teak including wet sites, sites with shallow soil and steep sites which will be difficult to access at harvest time.
<b>Weeding</b>	People from the village where the mataqali whose land is being planted reside with FFF staff supervision	Weeding is done under contract to FFF by workers from village communities to which the mataqali members belong. It is the most intensive silvicultural activity occurring 5 times in the first year, 4 times in the second year, 3 times in the third year, twice in the fourth year and once in the fifth year. The trees should be well established and able to compete with the grass by year 5. Workers use their own bush knives for weeding and grass cutting.
<b>Tree growth rate monitoring</b>	FFF staff	Monitoring of tree growth is conducted in association with silvicultural practices. For example, after the first weeding tree growth rates are monitored. Where a teak tree is performing poorly lime may be added to the soil and a native tree species planted on each side of the teak tree. If the teak tree has not recovered by the time of the next weeding, it is culled and the native species take its place. Approximately 5% of the seedlings planted do not survive to the first weeding. These trees are replaced after the first weeding. These loss rates are comparable with those experienced in other countries where teak is grown. FFF monitors 69 permanent sample plots to gauge tree growth. This is good practice. Measurements conducted by FFF in 2011 for trees aged between 2 and 6 years revealed growth rates ranging from 2m <sup>3</sup> /ha/year to 17 and 18 m <sup>3</sup> /ha/year which are comparable with yields in Africa and Asia. An average mean annual increment of 7.5 to 8.0 m <sup>3</sup> /ha/year across all FFF sites is a realistic yield figure to use for forecasting production.
<b>Pruning and singling</b>	FFF staff	Pruning and singling commence after the first year and continue until year 12 or 15. Singling is the practice of removing the stems from a multiple stemmed tree and leaving a single straight and vigorous stem. Pruning is the removal of lower branches to improve wood quality by minimising knots in the main stem. In year 2 there is one pruning and singling operation while in subsequent years the operation is conducted twice per year. The aim is to prune 40 to 50% of tree height up to 6 metres for trees 12 to 15 metres high. Pruning and singling are done in the dry season between July and December. The plantation team of seven persons is able to prune and single one hectare per day. Concurrent with this activity an inventory is also conducted. This is best practice for plantation management.

Operation	Responsibility	Assessment
<b>Thinning</b>	FFF staff	<p>Thinning is the removal of trees during the growing cycle of the plantation to enhance the productivity of the remaining trees. FFF plantation employees use chainsaws to remove weak trees (stress, unhealthy or slow-growing trees) and those with poor form. FFF commences thinning between year 6 and year 10 when 20% of the trees are removed. A second thinning occurs when trees are between 12 and 15 years of age, followed by a third and final thinning between year 18 and 20. The final thinning leaves a stand of around 500 to 550 stems per hectare for the final harvest. It takes the FFF team of three approximately 5 days to thin one hectare. The Company must submit an application for a logging licence to the Forestry Department before thinning operations can commence. Forestry Department officials visit the site to be thinned before and after the operations are completed to verify the volume of timber removed. The current licence fee is \$5/m<sup>3</sup> of timber removed. FFF's plan to recover merchantable timber at each thinning is ambitious. Recovery is likely to be low in the early thinnings and higher in the final thinning. Tree selection is critical to the overall financial return to the plantation.</p>
<b>Plantation protection and risk management</b>	FFF staff and village workers	<p>FFF takes a number of steps to ensure the protection of its teak plantations from threats such as fire, pests and diseases, wind and storms and flood including: clearing fire breaks around plantations, avoiding teak in water-logged sites where it is susceptible to fungal attack, excluding livestock from plantations to prevent stem damage to young trees and planting better-adapted and non-vulnerable species in high risk areas for teak. These are sound practices which have been developed based on FFF's experience and the knowledge of its silviculture specialists.</p>

**Box 3: Possible alternative silviculture systems for FFF**

The 3m x 3m spacing adopted by FFF is a conventional spacing for teak trees grown in a monoculture system. FFF has been trialing other spacings. Closer spacing such as 2m x 2m, allows trees to capture a great share of available light and soil nutrients which limits understorey vegetation growth and reduces the frequency of weeding. Trees produce straighter stems and height growth is faster. Wider spacing such as 3m x 4m, 2.5m x 4m or 2m x 4m produce larger stem diameters and allow for mixed species plantings or agroforestry, especially in the early years. Wider spacing between the rows of teak would allow village communities to plant annual food crops or FFF to inter-plant fast-growing species such as *Flueggea flexuosa* which can be harvested for construction poles and posts at 6 or 7 years of age. These options generate short-term income and help manage weed growth. However, once the short-rotation crops have been harvested the risk of weed growth increases. The viability of these alternative systems has not been fully assessed by FFF. Under some conditions, including environmental, social and economic factors, agroforestry or inter-cropping teak with a fast-growing species may be a preferred land use option. For example, teak has been planted with a number of other species to improve soil cover and stability, to increase biodiversity and to reduce commercial risks. The Conservation International reforestation program originally included teak in mixed plantations with native and other exotic species to achieve environmental and livelihood outcomes. Teak was planted on sites that are accessible for harvesting to provide a source of future income for communities. Inter-planting teak with a fast-growing species such as *Flueggea flexuosa* can provide a valuable source of short-term income to sustain plantation development. The financial returns from agroforestry in the first two or three years can be compared to labour contracts to weed plantation sites during the same time period. For village communities, the attraction of agroforestry depends on whether the proceeds from food crops are likely to be greater than payments received from labour contracts for weeding in the first two years of plantation establishment. The labour costs for weeding in years 1 and 2 of a plantation are F\$250 and F\$312 per hectare, respectively.

### 2.2.3.3 Plantation operations, community expectations and livelihoods

FFF and the village communities to which the mataqali members on whose land plantations are being established are in a mutually beneficial situation. The company relies on village labour for plantation establishment and the village welcomes the opportunity to earn income by supplying their labour. Income from labour contracts is pooled and used to meet important village needs such as building or repairing community facilities, connecting to the electricity grid, payment of children's school fees or providing a permanent supply of clean water for the village. The funds may be used for communal events such as weddings, funerals and other rites associated with village customs and traditions.

Labour contracts between FFF and the mataqali are documented in the lease agreement. The village where mataqali members reside expect that FFF will engage them to help with plantation establishment, which is a reasonable expectation. However, there have been occasions when contracts were given to another village. For example, this can occur where the signatory to the consent for the lease agreement resides in a different village to the majority of the mataqali members. FFF seems powerless in these arrangements and accepts whichever group of workers turn up for a task. Villages that were expecting the work have become disillusioned about working with plantation investors and are not interested in additional leases with FFF. One village group suggested that they need a clear memorandum of understanding with FFF that details the short-term and long-term benefits and associated responsibilities of the company and the mataqali. The people in the villages are not fully aware of, or understand their entitlements under the terms of the lease agreement with FFF. They would

like more information, more documentation and more opportunity to meet face to face with company representatives. This would be helpful to FFF as well and help to keep relations between the company and the mataqali and the village in which its members reside harmonious. Technical and financial operations of plantation establishment and management are important to long-term success but they are secondary to the primary operation of establishing and fostering good relations with participating land owners and village communities.

#### 2.2.4 Lessons learnt for plantation establishment and management best practice

This assessment of technical aspects of FFF plantation establishment and management has revealed a number of lessons which may benefit organisations and individuals considering establishing teak plantations elsewhere in Fiji or in other Pacific Island nations. Table 6 presents suggested actions towards achieving best practice in plantation establishment and management based on assessments of FFF operations.

**Table 6: Lessons learnt from FFF teak plantation establishment and management operations**

<b>Operation</b>	<b>Lessons and actions towards best practice</b>
<b>Build relations with village communities</b>	<p><i>Establish and nurture good relations with the mataqali and the village communities to which they belong</i></p> <p>Initial contact with a village should follow local protocols. Attend village or tikina meetings to build relationships before raising land use proposals. Despite the interests of the company it is important to listen to the needs of people in the village and develop investment proposals that balance village and company interests. There is great credibility to be gained by employing a respected local person to make initial contact with villages and to explain the company's land use proposal in the context of the needs and aspirations of the village community.</p> <p>Offer realistic proposals to land owners and avoid making promises that cannot be delivered such as exaggerated financial returns, assistance to access infrastructure or provision of service contracts (e.g. seedling supply).</p> <p>Learn about the social structure within the village including the number of mataqali and the number of mataqali members that are resident in the village and in other villages. Provide details of each stage of a teak plantation to the village community including opportunities for village people to benefit financially and the ongoing responsibilities of land owners and the company.</p> <p>Make it clear to the community that selection of land plots is subject to the suitability of the land for teak which is based on various assessment criteria including slope, accessibility, fire risk, soil pH, soil fertility and drainage. The decision to consent to a lease must come from the mataqali, with support from a majority of members. Company representatives should be available to answer any questions that landowners have about the proposed land use and to assist them to prepare their consent to the TLTB.</p>
<b>Conduct land assessment and mapping</b>	<p><i>Assess the physical and economic suitability of land plots offered by land owners for the intended use</i></p> <p>Assess various physical properties of the land offered by mataqali before agreeing to a lease (fertility, pH, Ca, P, K, slope, aspect, vegetation cover, erosion, previous use). Assessments should be conducted by professionals who know the best growing conditions for the tree species to be planted. FFF found that in-house soil testing is cost effective and</p>

Operation	Lessons and actions towards best practice
	<p>results can be obtained more quickly than from external analytical service providers.</p> <p>Tree species should be matched to site conditions. Fertilizer and other soil treatments can correct deficiencies. Other species should be planted on sites not suited to teak. Initially FFF planted teak on several different sites, but as the company gained knowledge and experience they identified the best sites for teak and planted suitable native species on sites where teak will not perform well.</p> <p>Ensure that sites are accessible for harvesting and are located within economic reach of a sawmill or buyer.</p> <p>Map the boundaries of acceptable sites using GPS to establish an accurate record of each site and to avoid planting outside of the leased area. During site mapping buffer strips should be plotted along water courses for planting with native species (in line with forest certification requirements)</p>
<p><b>Choose an appropriate silvicultural system</b></p>	<p><i>The choice of silviculture system should align with the needs and objectives of the company and the landowners</i></p> <p>The FFF teak plantations are essentially monoculture plantings. Alternative silviculture systems include inter-planting teak with one or more other tree species or with annual food crops in the early years before the canopy closes. The choice of silviculture system depends on the business model, the relationship between the company and the local community and the availability of critical resources of land, labour and financial capital.</p> <p>If food security is an issue in an area, then an agroforestry system may be preferred by the landowners over a monoculture system. Where cash flow is limited or uncertain, the option of inter-planting teak with a fast-growing species may be more attractive. These options should be considered and evaluated where they satisfy the interests and needs of the landowners<sup>8</sup>.</p>
<p><b>Establish lease agreement</b></p>	<p><i>Minimize transaction costs involved in establishing a lease and honour the terms of the lease agreement</i></p> <p>Where feasible, maximise the area of land included in each lease to help spread the fixed costs involved in its establishment. The application fee is \$2000 and there are administration costs which tend to be the same regardless of the area of the lease.</p> <p>Agreement on the term of a lease should reflect the long-term intentions of the company and the mataqali. Current leases held by FFF range from 30 years to 75 years. A 30-year lease allows only one rotation, while a 50 year lease allows two without having to renegotiate the lease.</p> <p>Comply with TLTB requirements for a forestry land lease ensuring that payments are made on time and employment contracts are honoured.</p> <p>For the mataqali the relatively low lease payment of \$11 per hectare per year is supplemented by over F\$1200/hectare for basic operations over the first 5 years of the plantation.</p>
<p><b>Access financial resources</b></p>	<p><i>Align the plantation establishment plan with the availability of finance or the resource that is most limiting</i></p> <p>The rate of plantation establishment depends on several factors including access to suitable land, access to labour, access to knowledge and access to finance. When one of these is lacking progress is delayed. For FFF finance has been the most limiting resource.</p>

<sup>8</sup> For example, see ACIAR project FST/2007/020 Improving silvicultural and economic outcomes for community timber plantations in the Solomon Islands by inter-planting with *Flueggea flexuosa* and other Pacific agroforestry species. Teak is a major focus. <http://aciar.gov.au/project/FST/2007/020> accessed 10 April 2013.



Operation	Lessons and actions towards best practice
	<p>To meet a plantation establishment target a complementary flow of funds is needed. If it cannot be achieved, the target should be revised to match to the expected availability of funds. Based on FFF's experience it is better to set targets in accordance with realistic estimates of available finance or other limiting and uncertain resource than to set a plantation target that cannot be achieved because of financial limitations.</p> <p>There is a range of financing strategies available The choice should complement the plantation establishment strategy.</p>
<p><b>Access labour resources</b></p>	<p><i>Contracting basic silvicultural operations to the mataqali is cost effective for the company, provides valuable short-term income for village communities and contributes to the long-term protection of the company's plantations</i></p> <p>Basic silvicultural operations of land clearing, tree planting and weeding and grass cutting around planted trees are contracted by FFF to the village in which mataqali members reside. Workers are trained and supervised by skilled FFF staff. Pruning, singling and thinning operations are done by qualified and experienced FFF staff. This is an efficient and effective arrangement.</p> <p>FFF reviewed the time required for the basic operations under different conditions of vegetation cover and slope to determine how many labourers are required and the costs of each operation. FFF wanted to ensure that payments to local communities were reasonable for the company and acceptable to the village.</p>
<p><b>Establish a market linkage</b></p>	<p><i>The existence of a market for plantation resources within economic reach is essential to justify investment in a plantation</i></p> <p>FFF established plantations in Ra province with the intention of investing in a sawmill and wood processing after year 6 when resources from plantation thinning would commence. FFF will establish the sawmill in 2013. The existence of a sawmill or other buyer of plantation resources is an incentive to landowners and other plantation investors. It is a vital element in the business model.</p>
<p><b>Base forecasts on realistic yield assumptions</b></p>	<p><i>Financial estimates should be based on realistic yield assumptions</i></p> <p>FFF used conservative annual yields in their financial forecasts for the teak plantations. There is a risk of being overly optimistic about teak growth and yield assumptions which underpin estimates of financial returns, especially when trying to attract equity partners.</p> <p>An independent forestry specialist advised FFF that a timber yield for teak in Ra province of 9.4m<sup>3</sup>/ha/year was achievable. FFF has 69 permanent sample plots spread over a range of site classes, which it monitors for wood yield or mean annual increment (MAI). These have indicated MAIs ranging from 2 to 18m<sup>3</sup>/ha/year. Based on these data the company uses an MAI of around 8m<sup>3</sup>/ha/year.</p> <p>To enhance MAI, FFF selects the best seeds and seedlings, plants teak on sites with the best conditions including high residual fertility and applies the best silvicultural practices.</p>
<p><b>Access knowledge and expertise</b></p>	<p><i>Investment in qualified specialists with local knowledge and experience is essential and valuable</i></p> <p>In 2011 and 2012 FFF enhanced the quality and depth of its capabilities by employing 3 plantation forestry specialists with experience in Fiji.</p> <p>FFF provides on-going training to staff and accesses specialist skills in particular areas when needed, such as plant pathology or entomology. The company has been effective in accessing international skills through programs such as the Australian Business Volunteer Program.</p>

Operation	Lessons and actions towards best practice
	FFF benefits from its endeavours to understand the cultural norms and community obligations of the local communities. This has been facilitated by the employment of a local pastor to serve as a community liaison office for the company.

### 2.2.5 Teak processing

FFF plans to add value to its teak resources by establishing a sawmill and joinery operation in Ra province. While the domestic Fijian market will be an important focus of the company, FFF will be affected by developments and movements in international markets and will have to comply with product and processing standards of importing nations especially in relation to environmental sustainability and legal origin.

#### 2.2.5.1 Teak processing arrangements

A sawmill and wood processing capacity are integral elements of the FFF business model. The sawmill will be set up in 2013. The desired operating capacity of the sawmill is 5000 m<sup>3</sup> of logs per year. The area of teak planted each year to produce this level of resources from the final harvest depends on the annual yield or mean annual increment (MAI) and the length of the rotation. The data in Table 7 are estimates of the area planted each year to produce 5000m<sup>3</sup> of logs at the end of a given rotation for a range of MAIs.

**Table 7: Area planted per year to produce 5000m<sup>3</sup> of log per year to sustain the FFF sawmill (ha/year)**

Mean Annual Increment (m <sup>3</sup> /ha/year)	Rotation length (years)			
	18	20	22	25
2.0	277.8	250.0	227.3	200.0
7.5	74.1	66.7	60.6	53.3
9.4	59.1	53.2	48.4	42.6
17.0	32.7	29.4	26.7	23.5

The estimates account for the practice of removing 50% of the original trees planted as thinnings in earlier years. For example, with final harvest scheduled for year 25 and an average MAI of 7.5 m<sup>3</sup>/ha/year, FFF would have to plant 53.3 hectares each year for 25 years. This would create an estate of 1325 ha. For a shorter rotation length, or lower MAI the annual area planted would be higher. FFF's average annual planting rate has been 29 hectares, but indications are that the rate will increase in the future, subject to the availability of finance. Yields on new lease plots are expected to increase the average as the company selects sites with higher fertility.

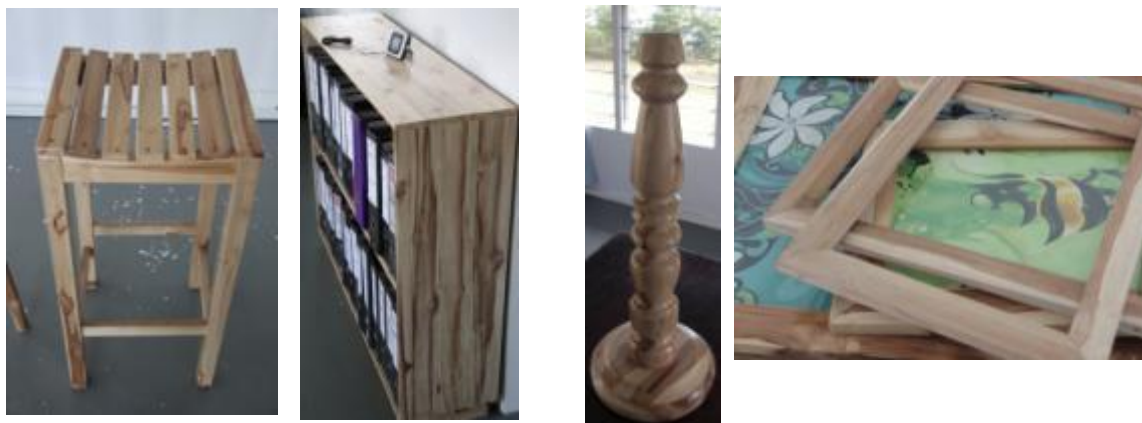
The sawmill configuration is based around two portable sawmills: A Wood-Mizer LT40 Super hydraulic band mill and a Petersen potable circular saw, in association with a Wood-Mizer EG200 twin blade edger (see **Error! eference source not found.**). This set-up is suitable for small-to-medium logs and can achieve a respectable recovery rate of 45% of sawn wood from logs. The other major item of equipment is a log loader which is used to transfer logs from the yard to the sawmill. The combination of these units is designed to process 20m<sup>3</sup> of logs per day. Facilities for seasoning sawn timber are not part of the initial plan but will be established later. Green

boards will be air dried in the timber yard at the mill site. A decision on the establishment of a complementary joinery operation will be considered at a later date.

The mill will be established at a site near the FFF office at Savulu on the King's Rd. The site is flat and was previously used to stockpile road materials while the King's road was being resurfaced. The configuration of the mill is designed to maximise operational efficiency. FFF expects to employ between 8 and 10 permanent staff including skilled sawyers and labourers. As it will be several years before any large dimension teak logs will be harvested from FFF plantations, the company will process other species for landowners including pine, mahogany and white teak. Pine is grown within 50 km of the mill site and mahogany within 60 km. Teak is grown within 35 km of the mill. FFF will rely on harvesting contractors within the province to cut and transport logs to the mill. The Company will take advantage of the portability of the sawmills and take them to the field to recover timber resources when it can be financially justified.

Initially the mill will produce rough sawn timber for the domestic and export markets. Over the longer term the plan is to produce joinery products including turned objects and other small items primarily for the domestic market. Early examples of teak products made from six-year old thinnings received positive feedback from a trade show in China and from exhibitions in Fiji. Figure 4 presents examples of products made using small-diameter teak from 6-year old trees. More details on market prospects for teak in Fiji and international markets are contained in Appendix 4.

**Figure 4: Examples of products made from six-year-old teak thinnings**



The proposed sawmill configuration is an appropriate set-up for FFF. The wood processing operation will be built in stages, commencing with the sawmill. The capital outlay is F\$450,000 including site preparation and equipment. The portability of the mill components allows the operators to travel to valuable resources more distant from the mill site. The initial capacity of the mill matches the expected availability of resources from teak plantations. However, individual components can be replaced with higher capacity units to meet an increase in supply. The bands of equipment chosen are world leading portable mills. They were selected because there are distributors in Fiji providing access to spare parts and servicing.

### 2.2.5.2 Meeting market requirements for certification and verification of legal origin

FFF has commenced preparations to achieve certification through the Forestry Stewardship Council (FSC). FSC certification is voluntary and is adopted by companies to ensure that their forest resources and forest products are sourced from sustainably managed forests and delivered and maintained in accordance with principles of sustainability as specified by FSC. The FFF business model is compatible with the requirements for forest management and wood processing. As at February 2013 there were no certified forests in Fiji and no chain of custody certificates (for wood processing operations) had been issued to processors<sup>9</sup>. FFF would be able to learn from experiences in the Solomon Islands where three certified forest and two chain of custody certificates have been issued by FSC.

Export markets for wood and wood products, especially in Europe, North America and Japan increasingly demand environmentally certified wood and wood products, such as FSC certification. FSC certification ensures access to international markets and price premiums are paid for certified wood and wood products in many markets. Therefore, to be competitive in international markets it will be essential to supply resources from certified forests and certified wood processing operations. FFF has been aware of this requirement and has established and managed its plantations broadly in line with the FSC principles on most sites. There are costs associated with certification including the cost of the initial assessment audit and annual compliance audits. Costs vary according to the complexity and scope of the audit and can be a burden for small-scale operations.

FFF has negotiated a project with the European Union Centre for Development of Enterprise (CDE) to fund a pre-assessment of the Company's qualifications for FSC certification. CDE will also assist the Company with market research for teak products and provide assistance to develop joinery expertise. This association provides a good opportunity for FFF to qualify for FSC chain of custody certification for its wood processing operation. Ideally, FFF plantations should be assessed simultaneously for FSC certification. As it will be some years before the FFF sawmill can process teak logs from certified plantations on a continuous basis, the Company will have to source resources from non-certified forests to remain viable. However, once FFF has COC certification it is required to verify that non-FSC certified wood (referred to as 'controlled wood') processed through the mill does not come from 'controversial sources' (i.e., it is not illegal, harvesting does not violate traditional or civil rights, harvesting does not threaten areas with high conservation values, harvesting is not from forests that are being converted to plantations or non-forest use, and logs are not from forests in which genetically modified trees are planted). Therefore, for the Company to retain its COC certificate all logs going through the FFF mill will have to be tagged to identify that they are controlled in accordance with the FSC standard<sup>10</sup>.

While certification is important in gaining access to some markets it is not as important as providing verification of the legal origin of wood. The US, EU and Australia have legislation in place to restrict entry of wood and wooden products unless the legal origin of the wood can be formally verified. This is a priority issue for FFF. Verification of legal origin (VLO) is a first step towards sustainable forest management certification. Various organisations such as the Rainforest Alliance (SmartWood) and the Tropical Forest Foundation provide

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<sup>9</sup> FSC 2013. Facts and Figures February 2013. Accessed at : <https://ic.fsc.org/facts-figures.19.htm> on 12 April 2013

<sup>10</sup> Forest Stewardship Council Controlled Wood: <https://ic.fsc.org/facts-figures.19.htm>; accessed 14 April 2013

independent verification in accordance with a generic standard. FFF recognises the importance of VLO as they prepare to supply teak wood to international markets. The Company advised that it will work with the Fiji Forestry Department in relation to legal origin and sustainability and will comply with VLO requirements by tagging their own logs and requiring owners of other logs processed through the FFF mill to be tagged appropriately.

## 2.2.6 Lessons learnt for processing and marketing of plantation teak

Although the experience of FFF in relation to teak processing and market development is limited, a number of important lessons emerge, as presented in Table 8. These lessons may be of value to other organisations considering investment in teak plantations and timber processing in Fiji and elsewhere in the Pacific Islands. For each lesson listed in Table 8 there are suggested actions or steps to take towards achieving best practice.

**Table 8: Lessons learnt from FFF teak processing**

<b>Operation</b>	<b>Lessons and actions towards best practice</b>
<b>Gather market information</b>	<p><i>Intelligence on market demand for plantation timber and timber products should underpin investment in plantations and wood processing</i></p> <p>FFF plans to sell teak and teak products on the domestic market, but has collected very little information on market logistics and likely consumer acceptance of teak products. The following steps should be followed before trees are planted and sawmills set up:</p> <ul style="list-style-type: none"> <li>• Conduct research to identify potential markets, consumer preferences, size of markets, competition, legal standards and procedures, costs of supply and potential returns</li> <li>• Develop a product range, prepare product samples and test their market acceptance – FFF has exhibited products at trade shows in Fiji and China with positive feedback</li> <li>• Determine product prices that will be acceptable to consumers</li> <li>• Investigate product distribution channels</li> <li>• Prepare a product promotion campaign</li> <li>• Develop export markets</li> </ul>
<b>Select sawmill scale</b>	<p><i>Scale and capacity of a sawmill should align with expected demand for plantation timber products which drives the volume of plantation resources and the area of trees planted each year (market driven)</i></p> <p>After some deliberation FFF abandoned plans for a large-scale mill and chose a set-up capable of processing 5000m<sup>3</sup>/year but which could be expanded as resource supplies increase. The scale chosen is largely supply driven rather than demand driven. Lessons learnt from FFF's actions include:</p> <ul style="list-style-type: none"> <li>• Match the scale of processing to expected market size – investment should be demand/market driven, not supply/resource driven</li> <li>• Consider the option of scaling up as the market expands and avoid over-capitalising in the initial years</li> <li>• Assess the relative net benefits of investing in processing equipment and facilities versus contracting to an existing processor where facilities are within economic reach of the resources</li> </ul>
<b>Allow flexibility in design</b>	<p><i>A flexible design is less risky and can change in line with changes in market demand or resource supplies</i></p> <p>The FFF sawmill can be transported to the field if necessary, scaled up to meet increased demand and does not a substantial capital outlay. FFF considered the following factors in deciding the design and operations of the mill:</p> <ul style="list-style-type: none"> <li>• Locate the sawmill and wood processing operation on an accessible site that is central to the majority of plantation resources</li> <li>• Establish arrangements with local harvesting contractors – FFF will not get involved in harvesting</li> </ul>

Operation	Lessons and actions towards best practice
	<ul style="list-style-type: none"> <li>• Portable sawmills that can be set up at a permanent sawmill site and when necessary can be transported to the field</li> <li>• Design the mill site to maximise operational efficiency and allow for the range of variation in resource supplies</li> </ul>
<b>Comply with market standards and requirements for products and processes</b>	<p><i>Plantation resources should comply with international market requirements for verification of legal origin of timber resources (VLO) and environmental certification of plantations and wood processing</i></p> <p>FFF is working towards FSC certification for its plantations and wood processing operations and will comply with market requirements to verify the legal origin of all forest resources it handles. Compliance requires:</p> <ul style="list-style-type: none"> <li>• Understanding legal and other requirements for accessing target markets, including product quality/property standards, requirements for environmental sustainability and verification of legal origin (VLO)</li> <li>• Complying with legal requirements for harvesting, processing, transport and marketing (forestry code of practice)</li> <li>• Complying with export market requirements for</li> <li>• Complying with certification requirements such as FSC principles for plantation management and chain of custody (COC) certification</li> <li>• Complying with standard requirements for controlled wood – i.e. non-certified logs processed through a COC certified sawmill</li> <li>• Include costs of compliance in financial assessments of sawmill and wood processing options, including initial assessment audit and annual compliance audits for both certification and VLO</li> </ul>
<b>Maintain resource throughput</b>	<p><i>The viability of a sawmill depends on maintaining a minimum level of throughput</i></p> <p>FFF aims to process 20m<sup>3</sup>/day to meet its annual target and will do this by processing other species including pine and mahogany located with economic reach of the mill. Key elements in mill viability are:</p> <ul style="list-style-type: none"> <li>• Keep above the minimum log throughput required to sustain sawmill viability and source non-teak resource supplies to fill throughput gaps (don't fall below the break-even throughput)</li> <li>• Ensure that tree planting rates are maintained at a level that will ensure the level of sawlogs required to ensure the viability of the saw mill and associated facilities</li> <li>• Establish protocols for ensuring that all logs processed have VLO tags and comply with 'controlled wood' requirements under FSC COC standard</li> </ul>
<b>Access appropriate skills, knowledge and expertise</b>	<p><i>Investment in qualified specialists with processing knowledge and experience is essential and valuable</i></p> <p>FFF has not employed any staff for the sawmill, but has intentions to attract experienced sawyers and will train locals for a range of task within the mill. The performance of the mill will benefit from:</p> <ul style="list-style-type: none"> <li>• A quality control procedure for mill operations and products</li> <li>• A experienced mill manager and skilled sawyers to ensure product quality and process efficiency and to maintain compliance with market standards</li> <li>• Investment in staff training to optimise overall operational efficiency</li> </ul>

### 2.3 Social aspects of FFF operations

Social aspects of reforestation and the activities of FFF centre on the relationships between the organisation and local communities. For FFF, developing effective relationships is important for gaining access to land and labour, while for the communities of landowners, association with the organisations such as FFF offer short-term and long-term financial benefits, environmental benefits and specific social benefits. Social impacts of FFF activities and operations are presented in the following sections.

#### 2.3.7 Social impacts of the FFF business model

Village communities identified the following benefits of their association with FFF:



- Permanent employment opportunities with FFF for skilled and unskilled workers
- Temporary employment via labour contracts for land preparation and plantation operations and casual employment in the FFF nursery
- Short term and long term sources associated with land leases
- Skill development for men and women
- Enhanced social relationships within the village
- Positive changes to the natural environment.

### 2.3.7.1 Permanent employment

FFF has 14 permanent employees many of whom were recruited. The General Manager and seven other permanent employees were interviewed for this review - four women and four men. Three professional foresters, including the General Manager, were recruited from outside the region while the others are all residents of the region. Permanent employment with the company has brought many benefits for these people. Two of the professional foresters live within the company compound with their families. They have not only enhanced their incomes and standards of living, but they have also improved opportunities for their children's education and strengthened family relations and cohesion by living much closer to their place of work. Other employees interviewed included three women who work in the FFF nursery, a woman forester/surveyor who collects tree seeds and a male forest supervisor. These all expressed satisfaction with the opportunity they have had as permanent employees of FFF. Through their employment with FFF three staff members have extended and improved their homes or built a new home. Two have purchased a tractor. One has implemented more efficient farming through tractor hire. All have improved their standards of living through purchase of furniture and home appliances and goods. Two employees have purchased life insurance and one entrepreneurial employee has established a family business in Rakiraki town. All of them identified benefits of ensuring the education of their children and the children of extended families, meeting community obligations for church and community services such as drinking water supply, and village customary obligations. All FFF employees are happy with their conditions of employment provide by the company and none of them have intentions to leave the company in the foreseeable future.

### 2.3.7.2 Casual employment

The FFF nursery employs casual labour for basic tasks such as watering, weeding and filling pots when demand is high. Casual labourers are paid F\$115 per week plus 8% to the Fiji National Provident Fund (FNPF), the principal pension fund for Fiji workers. The company employs up to 15 casuals per year for about 2 months each, injecting up to F\$14,000 into the local community annually. The company also pays local people for collecting teak seed from plus trees. FFF requires up to 600 kg per year and pays villages F\$5.00 per kilogram. Seed purchases injects up to F\$3000 per year into village communities.

**Table 9: Payments by FFF to villages for labour contributions to plantation operations**

Operation	Labour input (person days/hectare)	Labour payment F\$/person day	Total payments	
			F\$/ha	F\$
Land clearing	9.52	22.41	213.34	2826.80
Tree planting	5.56	22.41	124.60	1650.95

<b>Weeding year 1</b>	3.17 (5 times)	22.41	355.20	4706.38
<b>Weeding year 2</b>	3.17 (4 times)	22.41	284.16	3765.10
<b>Weeding year 3</b>	3.17 (3 times)	22.41	213.12	2823.83
<b>Weeding year 4</b>	3.17 (2 times)	22.41	142.08	1882.55
<b>Weeding year 5</b>	3.17	22.41	71.04	941.28

Source: Estimates based on FFF payment rates for the average area planted per lease of 13.25 hectares

FFF contracts casual labour from villages where the mataqali, whose land that they have leased for teak plantations, reside. FFF offers labour contracts to villages for up to five years. The Company once paid 20c/tree which was rate used by Conservation International. However, following a review of the time taken for particular operations under different conditions of vegetation cover and slope, FFF now pays according to land condition. The review revealed that 20c/tree was equivalent to the highest rate - heavily vegetated and steep land. One village interviewed indicated that payments by FFF for contract work ranged from \$109 to \$146/ha. Table 9 presents an example of revenue received by a village based on current FFF payment rates. This example is for a plot of land that previously had a medium level of vegetation cover and is undulating. The estimates are based on the average area planted per lease as at February 2013 of 13.25 hectares.

The total income generated for a village community over five years based on the data in Table 9 is approximately F\$20,250. This income enables villages to meet community as well as individual household needs such as children's education. Communities in the villages visited in the course of this review indicated that income earned from labour contracts for FFF plantation activities would be used primarily for community needs and not individual needs. In Table 10: Benefits identified by villagers from their association with FFF and teak plantations examples are presented of income received and how it has been used by village communities to improve community assets and living standards. Table 10 indicates benefits of relationships between village communities and FFF for four villages that were visited for this review. The table also details some of the problems that have been encountered by mataqali and villages as recounted by village representatives in group meetings held in the course of this review.

The details of individual villages and leases in Table 10 indicate that relations between the mataqali and FFF are not necessarily harmonious. There are problems on both sides with the key issues being:

- Creation of unrealistic expectations among the mataqali
- Poor communications between the company and the mataqali or village community leading to limited awareness and understanding of particular matters by both FFF and the village communities

Village members indicated that FFF managers had offered them benefits in the form of payments, contracts or material assistance but they had not occurred. In some cases the perceptions of village communities are unrealistic and based on misunderstandings or limited knowledge of the facts. Unrealistic expectations, uninformed perceptions and misunderstandings can harm the relationship between the company and the community and may threaten the security of a plantation. A solution to these problems is documentation of agreements and promises in a format and language that is understandable by communities. This should overcome misinformation and misunderstandings. Coupled with this is the need for regular communication



between the mataqali and their villages and FFF. Community relations by FFF have improved with visits to participating villages by FFF staff and the FFF community liaison officer. FFF must respect the needs and aspirations of each village community to which it is connected through lease agreements with mataqali. FFF must factor community expectations into company decisions regarding plantation establishment and management and the ongoing protection of plantations. Underpinning this could be a set of principles to which the parties to the lease agreement agree.

**Table 10: Benefits identified by villagers from their association with FFF and teak plantations**

Village, Mataqali Numbers interviewed	Lease details	Community benefits	Household benefits	Comments
<b>Nausori, Navunivesi</b>  <b>9 men</b> <b>5 male youths</b> <b>1 woman</b>	Area of lease: 34.4 ha Area planted: 21.0 ha Term of lease: 30 years 1.5 hectares was previously used for sugar cane; 33 ha was not used - sloping land with heavy vegetation cover Plot is more than 16 kilometres from village	Community expectations: education of future generations; electricity connection; water supply, roads and bridges	Minor gains from one three-week contract. The burden on individuals to meet community and household obligations is increased as a consequence	Navunivesi is one of 3 mataqali that have leased land to FFF, although only two leases have been signed. Some labour contracts were given to another village unexpectedly. The village received few short-term benefits from the Navunivesi lease. They are dissatisfied with FFF as their short-term expectations have not been met The mataqali whose lease is unsigned would like to plant teak independently but is limited by finance The village is 16 kilometres from a good road. They are negotiating a lease with another entity to graze cattle.
<b>Narikoso, Namolau</b>  <b>14 men</b>	Area of lease: 34.4 Area planted 20.49 Term of lease: 50 years Land previously used for gardens Only 4 of 45 households in the village belong to the mataqali that leased their land to FFF	Church and provincial contributions; urgent community needs; funds for village connection to electricity grid. Village nursery and buyers of tree seedlings	Education expenses met. Individual households are able to plant and sell tree seedlings at F\$1 each to CI and FFF.	A village nursery was established with assistance from FFF and an NGO (Global Greengrants Fund). FFF supplied 5000 teak seeds and about 1500 seedlings to the village. Earnings from FFF labour contracts generated \$19,000 towards connection to the national electricity grid. However, the village is expecting \$5,000 more from FFF to enable the connection. Village participated in the sheep grazing trial which FFF stopped. The village expected FFF to give them more sheep but it did not occur. They continue to graze sheep. The village supplies water to downstream cane growers. It believes that the FFF nursery is accessing some of that water without permission. There is dissatisfaction with FFF based on misunderstandings and false expectations which may be associated with poor communications between FFF and the village. This village is located close to the FFF nursery and has a long and mixed relationship with the company.
<b>Navuniivi, Navolivoli</b>	Area of lease: 9.9 ha Area planted: 7.74 ha Term of lease: 75 years	About 5 men were involved in contract work for two	Limited benefits to households from only	Village has pine plantations up to 50 years old. The absence of a resident land owner with legitimate authority to decide on contracts has caused some

Village, Mataqali Numbers interviewed	Lease details	Community benefits	Household benefits	Comments
12 men <sup>11</sup>		days only. No direct gains to the community. Indirect benefits included knowledge on teak planting	two days contract work. Some households have established teak plantations	misunderstanding and friction between the village and the company. They have planted teak trees independently. Individuals buy teak seedlings at F\$3 each from the FFF nursery. The number of trees planted trees per household varies from 100 up 500, with between 100 and 200 being typical. They have not received any training but have learnt by observing FFF activities. They plant food crops between the young teak trees. Some villagers raise native tree seedlings which they sell to CI at F\$1 each. They plan to sell their teak to FFF when the trees mature. Road access is difficult, although access by boat is good.
<b>Burenitu,</b> Nakunitabua and Nabau  <b>3 men</b> <b>2 women</b>	Area of lease: 10 ha and 10 ha Area planted: 6.44 ha and 14.42 ha Term of lease: 30 years Sites are 2 hours walk from village Not previously used	The village was contracted to work on land leased from 2 mataqali. Funds were used for church and community customary functions which average 3 to 4 per year. Road upgrading to teak plots has benefited the community. Funds for electricity connection	Individual household heads were relieved from meeting community obligations to focus on family welfare needs.	2 leases associated with 2 different mataqali in the village This village has white teak groves that it harvests for its own construction needs. Many of its members are cane farmers who have recently abandoned cane farming and are looking for alternative sources of income. The village has land leased to the Fiji Pine Commission for pine plantations. Burenitu is a large village with a population of over 900 and probably the largest land holding in Ra province.

<sup>11</sup> In this village there is one mataqali that leases land to FFF and only one household in the mataqali. Members of the household do not reside in the village. Therefore, the people that we met with essentially were independent teak growers.

### 2.3.7.3 New Sources of Income

The majority of the land leased to FFF was previously unused land covered in grasses, reeds and shrubs. The opportunity to lease this land and earn an income from it is attractive to the owners. Income is made up the following components:

- **Key payment** on the signing of the lease: this is a one-off payment of F\$30 per hectare. Landowners received 75% of the key payment with 25% taken by the TLTB.
- **Annual lease payments:** The annual payment to landowners for forest land is F\$11 per hectare, less the 25% fee to the TLTB. Payments are made every 2 months. FFF makes all payments to the TLTB which distributes the money to the mataqali after taking its percentage.
- **Labour contracts:** FFF offers each mataqali work contracts to assist with plantation establishment. Payment rates vary with vegetation cover and slope of the land. Contracts are offered for the first five years. The example in the previous section indicated that for a planted area of 13.25 hectares, a village community can earn around F\$20,000 over five years.
- **Share of sales** from thinnings and final harvest. FFF pays mataqali 10% of the stumpage value of thinnings after year 9 and 10% of the stumpage value of the final harvest. Stumpage value is the value of the timber in the standing tree less the costs of harvesting and transport to a mill or buyer's yard. It is based on the estimated volume of timber in the standing tree.

**Table 11: Estimated income received by a village community from FFF**

Income source	When received	Payment rate F\$/ha	Total F\$ for 13.25 hectares
<b>Key money</b>	Year 1	F\$30/ha less 25% to TLTB = F\$22.50/ha	F\$298.13
<b>Annual lease payment</b>	Years 1 to 30	F\$11/ha less 25% to TLTB = F\$8.25	F\$109.31
<b>Labour contracts (based on average planted area of 13.25 ha)</b>	Years 1 to 5	Clearing: F\$213.34	F\$2826.76
		Planting: F\$124.60	F\$1650.95
		Weeding:	
		Year 1: F\$355.20	F\$4706.40
		Year 2: F\$284.16	F\$3765.12
		Year 3: F\$213.12	F\$2823.84
		Year 4: F\$142.08	F\$1882.56
		Year 5: F\$71.04	F\$941.28
Share of sales from thinnings	Years 12 and 18	Year 12: F\$3261.60	F\$4321.62
		Year 18: F\$6353.10	F\$8417.86
Share of sales from final harvest	Year 25	F\$44118.75	F\$58457.34
Total income in net present value terms	2013		F\$30203.25
Annual Equivalent Value (F\$/year)	Annual		F\$2983.19

Source: Based on FFF labour rates, MAI of 7.8 m<sup>3</sup>/ha/year, a final harvest in year 25 and an average planted area of 13.25 hectares. The price received for year 18 thinnings and final harvest logs is F\$500/m<sup>3</sup> and for year 12 thinnings F\$250/m<sup>3</sup>.

Table 11 presents an example of the flow of income to a village community from a lease arrangement between FFF and the mataqali whose members reside in the village. For each hectare leased to FFF a mataqali could expect to receive the equivalent of F\$2279 in net present value terms for a rotation of 25 years. The annual equivalent value (AEV) for one hectare is F\$225. The AEV can be compared to annual returns from alternative

uses of the land which is leased to FFF. Guaranteed income for communities is difficult to forecast - key money and lease payments are secure; labour contracts may be given to other villages unless there is mutual understanding between the company and the mataqali; income from thinnings and final harvest vary with MAI or yield and the price of teak. The data are indicative and based on conservative assumptions for key variables.

**Figure 5: Village nursery at Narikoso (Mataso)**



All persons interviewed valued the long term benefits of timber tree planting for future generations, as Table 11 indicates. Most villages have been involved in pine plantations and are aware of the value of trees for timber. They appreciate the value of the plantations for their children and grandchildren. Many expressed a preference for planting teak trees independently on their own land so that they can gain more from the harvest of trees. However, the cost of seedlings at \$3.50 each is a major hindrance for them.

#### 2.3.7.4 New skills for men and women.

The association between village communities and FFF has introduced new skills to men and women. New knowledge and skills on raising seedlings of native and exotic tree species is widely appreciated. Many villagers established nurseries in the hope of selling seedlings to FFF or CI or to other villagers.

Permanent staff of FFF who come from local communities have gained various skills including the proper use of weedicide, vegetable gardening, nursery establishment and care and soil sampling and testing. One of them was given 40 sheep by the Company before they were taken away again. He bought some of the sheep and now has a flock of 35 head. He has learnt to care for sheep and has begun to sell live animals to supplement his family income. This person also learnt to inter-plant young teak saplings with quick growing crops such as water melons.

New skills gained have been shared with others in the villages whenever opportunities arise. For example, one young female FFF staff member taught men and the youth rugby team in her village to identify plus trees of native species and how to collect seeds and grow seedlings for sale to CI. They were able to sell 2,500 seedlings at F\$1 each.

### 2.3.7.5 Enhanced social relationships within the village

A village chief-to-be observed that the association with FFF had enhanced social relations within the village. The mataqali whose land was leased to FFF was a minority in each village visited, yet the members of the mataqali shared the labour contracts with the whole village in order to meet village community needs. All village household heads were grateful to be relieved of the burden of community contributions. This has fortified community cohesion. Income received from labour contracts is not captured by the individuals who do the work or by the village chief. It is used for community needs. The capacity for individuals to meet their community obligations declined significantly with the collapse of the sugar cane market in Fiji. The opportunity to earn income from trees especially in the short-term was seen as a substitute for sugar cane income. The community spirit of the mataqali whose land is leased to FFF was the catalyst for using funds communally rather than keeping them within the individual mataqali. This approach was not influenced by FFF. Examples of some of the community facilities that have benefited for village association with FFF are presented in Figure 6 and Figure 7.

### 2.3.7.6 Positive changes to the natural environment

Many of the people interviewed itemised perceived and actual benefits to the natural environment from the introduction of trees including: cooling of the weather, fuller flow of streams with an increase in numbers of freshwater fish, prawns and eels, and growth of small trees and scrub associated with tree plantations. The latter has particularly benefited the women who claim that tree plantations have enabled them to collect firewood closer to the villages from the associated scrub growth. In addition, those living close to the FFF teak plantations are able to collect prunings from teak trees for use as firewood. The majority of households in villages use firewood for cooking. People generally appreciated the introduction of tree plantations to vegetate their unused land which was previously covered with unproductive grasses and reeds.

### 2.3.8 Lessons learnt from social aspects of reforestation

While benefits of tree planting activities of both FFF and CI have been appreciated and the attempts by both to actively involve land owners in the process are laudable, it is obvious that good relations established at the beginning have not been nurtured and constantly maintained in all cases. Dissatisfaction has arisen through misunderstanding resulting from lack of accurate information relayed to all involved. Villagers proposed that the agreement between FFF and the mataqali should be in writing and displayed in village meeting places for all to read. As activities progress villagers need to be able to seek answers to their questions through regular visits from agents of the external partner be it FFF or CI. In both cases a (part-time) community liaison person who regularly keeps both sides informed is necessary. Table 12 presents lessons learnt from social relations between land owners and FFF.

**Table 12: Lessons learnt from social relations between FFF, mataqali and village communities**

Operation	Lessons and actions towards best practice
<b>Build relationships first</b>	<i>Establish and nurture good relations with the mataqali and the village communities to which they belong</i>
	Not all of FFF's relations with mataqali are harmonious. Some need



Operation	Lessons and actions towards best practice
	<p>reconciling to ensure the long-term security of the plantation. The FFF community liaison office is a valuable company and community asset. Regular visits to villages by FFF staff build understanding of the respective needs and motivations of mataqali and FFF.</p>
<b>Nurture the relationship</b>	<p><i>Maintain and respect the relationship for the term of the lease</i></p> <p>FFF maintains regular contact with villages through senior staff and the community liaison officer. FFF should keep the mataqali and their village communities informed of plans for the development of their land and take an interest in the welfare of the community and its development. Interest in communities should extend beyond the period when they are contracting village labour for plantation activities</p>
<b>Avoid creating false expectations among community members</b>	<p><i>All promises and agreements should be documented, agreed and honoured by the parties to the agreement</i></p> <p>In an attempt to gain the consent of mataqali FFF senior staff made offers that was not be able to fulfil at a later date such as providing assistance with connection to utilities or providing a specific number of labour contracts. Mataqali may have unrealistic expectations based on hopes rather than agreed promises. Best practice is to prepare a written agreement between FFF and the mataqali/village on the specific requirements from the people of the village and the respective responsibilities of the company and the community. Display the agreement in the village meeting house or other suitable place where it is accessible to all community members.</p>
<b>Maintain communications</b>	<p><i>Communications between the parties to a lease agreement should be regular and open</i></p> <p>Some communities believe that FFF has not kept them fully informed of its operations and the company has not treated them well. FFF is not aware of how some mataqali feel about the relationship. FFF often puts business targets above community needs. A communication channel should be established to facilitate two-way exchange between FFF and each community from which it leases land. This involves visiting villages, attending village and tikina meetings and being open and receptive to the concerns of village members. FFF does this when it wants to establish a lease, but it must keep up village visits over the term of the lease.</p>
<b>Skills development</b>	<p><i>Training local people has spillover benefits in other areas</i></p> <p>FFF provides training to workers who assist with plantation establishment and maintenance. Opportunities for local people to learn new skills are valued by communities and can be transferred to other village operations. Formal and on-the-job training for local people not only ensures that plantation management operations are implemented efficiently and correctly but that people can use the skills to benefit other activities.</p>



**Figure 6: Village meeting house rebuilt after floods with funds from labour contracts**

**Figure 7: Village connection to the electricity grid facilitated by income received from labour contracts**

**2.4 Financial aspects of FFF operations**

Financial aspects of the FFF nursery and the FFF teak plantations are analysed using discounted cash flow (DCF) analysis to provide an indication of the financial performance of the Company. A description of the financial measures used is included at Appendix 4.

**2.4.1 The FFF nursery**

After freehold land, the nursery and its attendant facilities and equipment comprise the Company’s biggest asset. The nursery is a key resource, providing both quality seedlings for FFF plantations and an important source of revenue from seedling sales. Key financial aspects of the nursery are revenue generated from seedling sales and the costs of seedling production, which involves fixed costs and variable costs. The fixed costs of seedling production reflect the scale of the nursery, while variable costs change with the level of seedlings produced. The level of seedling production depends on the area of plantations established by FFF and seedling sales. While the company has set targets for each of these, the actual situation has been below target in each case. Given the uncertainty surrounding seedling sales and plantation establishment rates the financial performance of the nursery is examined for a number of scenarios.

In 2006 the company established a rudimentary nursery to produce 30,000 seedlings annually. Over the years various upgrades have been made with the biggest change in 2009 following the ECF grant which increased capacity to around 400,000 seedlings per year. Table 13 reveals summarises the level of investment made in the nursery over its life.

**Table 13: Development of FFF nursery**

<b>Year</b>		<b>Investment (F\$)</b>	<b>Seedling capacity (number per year)</b>
<b>2006</b>	Establish nursery with tables and water tank only	F\$10,000	30,000
<b>2007</b>	Build office and storage area; lay concrete slab and generator shed	F\$35,000	30,000
<b>2008</b>	Additional growout tables	F\$10,000	50,000
<b>2009</b>	Two greenhouses, germination tables, watering system, genset, large concrete slab, machinery, trainer pots and trays	F\$190,000	350,000 - 400,000

Source: Personal communication with Roderic Evers, 16 May 2013.

In the village of Nakiroso in the Mataso district of Ra province, not far from the FFF nursery, a small nursery was established in 2011 with financial assistance from Global Greengrants Fund and in-kind assistance from FFF. The total investment in the nursery was F\$8000. It has an annual capacity of 10,000 to 12,000 seedlings.



This is a small scale nursery, comprising 5 germination tables and several growout tables, some with shade cover. It does not have a greenhouse. Teak germination rates would be less than the 45 to 50% achieved in the FFF nursery. The nursery produces teak and native species for sale. It is an example of a small-scale nursery similar to the original FFF nursery. It is a labour intensive operation, relying on village people to do key tasks. The FFF nursery is a sophisticated commercial scale nursery. As the demand for seedlings increases the scale and sophistication of the nursery increases to improve germination rates and seedling survival rates, reduce operating costs and produce seedlings with a better chance of survival once planted. The FFF nursery invested in greenhouses, water systems for germination and root-trainer pots as its scale increased. These improvements helped reduce the costs per seedling by at least 60%.

Four scenarios were analysed to establish the financial performance of the FFF nursery. The scenarios were based on two main variables: FFF plantation establishment rate and the pattern of seedling sales. Plantation establishment rates were 100 hectares per year and 40 hectares per year. Seedling sales patterns included: 4% annual growth which was the rate used in the FFF 2011 prospectus; two scenarios based on S-shaped technology adoption curves (recognising that the teak production system is a technology) – one gradual growth in sales and one rapid growth; and one scenario based on fluctuating demand for seedlings associated with reforestation projects (high sales in some years, low in others). Projecting seedling sales is challenging, especially given the novelty of teak plantations in Ra province. Many interested investors and landowners are waiting to see the financial results of FFF’s pioneering efforts before they decide to invest and purchase teak seedlings. FFF is the early adopter paving the way for others.

The other major element in the financial performance of the FFF nursery is cost. The fixed and variable costs of the nursery and seedling production are presented in Table 14 based on nursery operations which were described in section 2.2.1. Cost per seedling varies depending on the number of seedlings produced each year, which reflects the level of demand. The fixed costs have to be met whether or not there are any seedlings produced, while the variable costs vary with the number of seedlings produced. The costs in Table 14 are based on the nursery technical details as described in section 2.2.1 and Table 1. All costs are in 2013 values.

**Table 14: Annual seedling production costs**

Item	Variable costs (F\$/seedling)	Fixed costs (F\$/year)
Land rent		3500
Permanent labour		42500
Diesel for generator		8268
Teak seed	0.014	
Pig manure	0.044	
Sand	0.136	
Fertilizer	0.006	
Plastic bags	0.055	
Casual labour	0.033	
<b>Total</b>	<b>0.288</b>	<b>F\$54268</b>
<b>TOTAL COSTS</b>	<b>F\$54268+(F\$0.288*n)</b> where n = number of seedlings produced per year	

To cover annual fixed costs of the FFF nursery a minimum number of seedlings have to be sold. FFF seedling prices vary with the number sold. For sales less than 500 seedlings the price is F\$3.50/seedling, while for sales between 5001 and 10,000 the unit price is \$2.30. The company would have to sell 15,000 seedlings at \$3.50 to cover annual fixed costs or 23,600 at \$2.30. For individual sales greater than 10,000 seedlings the price is \$1.50 each. The company would have to sell over 36,000 seedlings per year at this price to cover the fixed costs.

Detailed results of the financial analyses are presented in Appendix 4. At a discount rate of 8.6%, which is a moderate risk adjusted discount rate, all four scenarios generated positive net present values and benefit-cost ratios greater than 1. Seedling sales volumes are the key to the financial viability of the FFF nursery. The financial analyses revealed that the timing as well as the level of sales is an important factor in financial performance. Efforts to increase sales will enhance the nursery's financial performance. However a key element in attracting sales is FFF's own production performance, as potential teak growers await FFF's results. The establishment of a sawmill and associated wood processing facilities is likely to provide an added stimulus to seedlings sales as landowners and private investors are provided with a local market or buyer for future teak resources. The high visibility of the sawmill and the opportunity to promote seedling sales at the mill site by should also stimulate sales.

#### 2.4.2 FFF teak plantations

The financial performance of a plantation is influenced by costs per hectare, yield per hectare, rotation length and prices received for timber including the final harvest and intermediate thinnings. Plantation costs are very high in the first five years and then decline as the tree canopy closes and the need for maintenance declines. Table 15 presents a summary of the unit costs and prices used in the financial analyses of plantations, the details of which are included in Appendix 4. These data were provided by the staff of FFF during interviews on 5 and 8 February 2013, and from the draft final report of a recent study on reforestation conducted for the European Union<sup>12</sup>.

**Figure 8: Landowner teak plantation adjacent to food crops and pine plantations near Mataso**



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<sup>12</sup> AGRER.2012. Preparation of a reforestation action plan for the degrading foothills of the sugar belt with the promotion of income generation activities. Draft Final Report to the European Union's External Cooperation Programme for Fiji, 28 June. A copy of this report was provided to the consultant by the FFF General Manager on 13 March 2013

**Table 15: Costs and prices used in financial analyses of FFF teak plantations**

Item	Unit	Input level	Unit price	Frequency	Total cost (F\$/ha)
<b>Labour inputs</b>					
<b>F\$/day</b>					
Land preparation	pd/ha	9.52	22.41	1	213.34
Planting	pd/ha	5.56	22.41	1	124.60
Replanting (infilling)	pd/ha	5.56	22.41	1	124.60
Weeding year 0 - establishment year	pd/ha	15.85	22.41	5	1775.99
Weeding year 1	pd/ha	12.68	22.41	4	1136.64
Weeding year 2	pd/ha	9.51	22.41	3	639.36
Weeding year 3	pd/ha	6.34	22.41	2	284.16
Weeding year 4	pd/ha	3.17	22.41	1	71.04
Pruning and singling year 0	pd/ha	7	28.57	1	199.99
Pruning and singling yr 1-4	pd/ha	14	28.57	2	799.96
Pruning and singling yr 5-11	pd/ha	11.2	28.57	2	639.97
Thinning @20% year 6	pd/ha	15	69.60	1	1044.00
Thinning @20% year 12	pd/ha	15	69.60	1	1044.00
<b>Lease costs</b>					
<b>F\$/ha</b>					
Annual lease payment to Landowners	F\$/ha/yr		11.00	annual	11.00
Lease admin charge TLTB	F\$/ha/yr		0.91	annual	0.91
Lease establishment costs	F\$/ha		215.56	Year 0	215.56
<b>Harvesting</b>					
<b>m<sup>3</sup>/ha      F\$/ha</b>					
Harvesting team	F\$/m <sup>3</sup>		27.50	yr 18 & 25	
Log transport to mill	F\$/m <sup>3</sup>		15.00		
Total harvesting costs	F\$/m <sup>3</sup>		42.50		
Logging Licence	F\$/m <sup>3</sup>		5.00		
<b>Material inputs</b>					
<b>F\$/unit      unit/ha      F\$/ha</b>					
Teak seedlings	seedlings/ha		1.50	1111	1666.50
Replanting (5%)	seedlings/ha		1.50	55.55	83.33
Chemical fertilizer Yr 0 (planting year)	kg/seedling		0.25	0.1	27.78
Plant protection chemicals	ltr/tree		0	0	0
<b>Teak production and income</b>					
<b>F\$/m<sup>3</sup>      m<sup>3</sup>/ha      F\$/ha</b>					
Thinnings year 6			60	9.36	561.6
Thinnings year 12			250	19	4680
Thinnings year 18			500	14.04	7020
Final harvest year 25			500	97.5	48750

Source: FFF data collected during interviews with FFF plantation staff. The labour input data for land preparation, planting and weeding are for land with medium vegetation cover and moderate slope

The financial performance of teak plantations was assessed for a range of land conditions (vegetation cover and slope) and discount rates. The net present value for teak plantations established on moderately sloping land that previously had a medium vegetation cover was estimated to be F\$5216 per hectare with a benefit-cost ratio of

1.59. The annual equivalent value (AEV) \$515 per hectare can be compared with annual returns from alternative land uses including annual crops, beef cattle, sugar and perennial food crops. While these returns are attractive, the challenge for forest plantations as evidenced by FFF in Fiji, is that cashflow is intermittent, unlike most other land uses and investors need other means of income generation to maintain viability until cashflow turns positive. For a teak plantation in Ra province, cash flow does not become positive until year 18. Investors need one or more alternative source of income or credit to sustain the investment during that period.

As discussed in section 2.2.3 many of physical and biological risks faced by FFF are well managed, including measures taken to protect plantations against fire, matching the right species to the right site and investing in technical skills. Risks associated with land access and land security are relatively low. Social risks are less likely under current liaison arrangements with local villages and land owner groups. The biggest risk FFF faces is with ongoing funding. While the results of the financial analysis indicate that teak plantations are profitable, accessing funds to sustain plantations is challenging. The establishment of a sawmill and wood processing facility provides a means of generating income from intermediate thinnings, subject to the success of market development in Fiji and attracting the interest of buyers. The success of this depends on sales, which depends on the marketing effort of FFF. Export markets are an option, but prices are likely to be lower and there is likely to be increasing requirements for resources from certified plantations and sawmills. The financial performance of a sawmill operation is presented in the next section.

Teak prices assumed for the analysis are conservative as are the annual growth rate (mean annual increment) of 7.8 m<sup>3</sup>/hectare. If the price of teak fell by 10%, the net present value of plantations on medium and moderate sites would fall in by 20% at the moderate risk adjusted discount rate (8.63%).

The break-even teak price for logs harvested in years 18 and 25 from teak plantations on medium and moderate sites is F\$283/m<sup>3</sup> at the moderate risk adjusted discount rate (8.63%). This is the price that equates costs and returns. If the price at the stump falls below this level then the plantation is unprofitable. The break-even harvest log price on light and easy land is slightly lower at \$264/m<sup>3</sup>, while on heavy and steep land the break-even price is \$294/m<sup>3</sup>. The price used in the analyses for harvested logs was F\$500/m<sup>3</sup>.

#### **2.4.3 FFF teak wood processing**

The investment by FFF in a sawmill and wood processing facility is critical to the company's long-term financial viability. The sawmill and associated processing activities add value to teak resources including intermediate thinnings and logs from the final harvest. The mill is also expected to serve as a means of revenue generation to sustain FFF's plantation development. FFF recognises that it may not earn enough from seedling sales and occasional consulting work to meet the financial needs of the plantations. The company hopes to generate net revenues of between F\$15,000 and F\$20,000 per month from the sawmill. In the years before sufficient teak resources are provided from the FFF plantations, the mill will source and process other species including pine and mahogany. There are mature stands of these species within economic reach of the mill, which is mutually beneficial for FFF and the owners of those plantations.

FFF has obtained finance for the sawmill from the Fiji Development Bank which offers a specific loan arrangement for ‘sawmilling, further processing and working capital’<sup>13</sup>. The total investment in the mill by FFF is F\$650,000 comprising F\$40,000 for site preparation and associated infrastructure development, F\$400,000 for the equipment and F\$200,000 working capital.

Key determinants of the productivity and profitability of a sawmill are the recovery rate and the level of utilisation (operating days). The recovery rate depends on nursery management through selection of quality germplasm, and plantation management through site selection, thinning and pruning which combine to determine log dimension and growth rate. Recovery also depends on the mill configuration, the equipment and the organisation and management of the mill site. Utilisation depends on ensuring adequate resource supplies on a sustained basis, markets/buyers for milled products, the skill levels of employees, the reliability and maintenance of the equipment and the ready availability of spare parts and service engineers.

A financial model of the sawmill configuration planned by FFF was developed and a number of simulations run to test the sensitivity of the mill’s performance under a range of possible conditions. Data for the model were obtained from the FFF General Manager, from manufacturers of sawmill equipment and from estimates and assumptions made by the consultants. Table 16 presents estimates and assumptions for inputs and outputs and costs and prices used in the baseline version of the sawmill model. The model is hypothetical and was developed to provide an indication of the sensitivity of the financial performance of the sawmill to variations in key inputs, costs and prices. The values used in the model can be adjusted to provide a more realistic representation of the sawmill set up.

**Table 16: Inputs, outputs costs and prices assumed for the sawmill model**

Item	Unit	Quantity	Value
<b>Capital costs</b>		Equipment life	
Band saw	F\$	1	7 yrs
Circular saw	F\$	1	7 yrs
Twin edger	F\$	1	4 yrs
Loader	F\$	1	10 yrs
Chain saws	F\$	4	2 yrs
Infrastructure	F\$		15 yrs
Safety equipment	\$F		2 years
<b>Sawlog recovery</b>	%		45%
<b>Operating days</b>	Days	5 days /week 250 days/year	
<b>Log inputs</b>	m <sup>3</sup> /day		20
	m <sup>3</sup> /year		5000
<b>Sawn timber</b>	m <sup>3</sup> /year		2250
<b>Sawn timber price</b>	F\$/m <sup>3</sup>		1200
<b>Operating costs</b>			
<i>Fuel</i>			
Band saw (diesel)	F\$/day		80.5

<sup>13</sup> Sue, Deborah. 2010. *Facilitating financing for sustainable forest management in small islands developing states and low forest cover countries*. An analytical report prepared by Indufor for the United Nations Forum on Forests. Country Case Study: Fiji. 26 July. See also: <http://www.fdb.com.fj/pages.cfm/our-products/agriculture-sme-loans/forestry-logging.html>

Item	Unit	Quantity	Value
Circular saw (petrol)	F\$/day		90.3
Twin edger (diesel)	F\$/day		40.3
<i>Repairs and maintenance</i>			
Band saw (diesel)	F\$/day		18.50
Circular saw (petrol)	F\$/day		16.65
Twin edger (diesel)	F\$/day		9.25
<i>Labour</i>			
Mill operator	F\$/day	3	30.00
Tally clerk / grader	F\$/day	2	28.00
Chainsaw operators	F\$/day	3	25.00
Labourers	F\$/day	2	22.41
<i>Logs</i>			
Stumpage	F\$/m <sup>3</sup>		500
Payment to mataqali	F\$/m <sup>3</sup> /yr	5000m <sup>3</sup> /year	50

Sources: FFF personal communication with General Manager; Peterson Portable Sawmills website: <http://petersonsawmills.com/mill-operations/running-costs/>; Wood-Mizer website: <http://www.woodmizer.com/us/PortableEquipment/HydraulicSawmills/LT40SHSawmill.aspx>

For a daily log throughput of 20m<sup>3</sup>, a recovery rate of 45% and a sawn timber price of F\$1200, the sawmill returns F\$8.27 million in net present value terms and an AEV of \$F882,342 per year, which is the NPV expressed as a series of equal cash flows over the period of the investment. This exceeds the company's goal of generating F\$15,000 to F\$20,000 per month. Benefits are 50% higher than costs and the internal rate of return greatly exceeds the discount rate. This is the baseline scenario and it is a profitable operation. If log throughput fell below 12.65 m<sup>3</sup> per day, or if the recovery rate fell below 30% or the price received for sawn timber fell below F\$800/m<sup>3</sup>, or if the number of operating days fell below 24 then the sawmill would not be financially viable, assuming that the other parameters remained at baseline levels.

This analysis of the financial performance of the planned sawmill indicates that it is a potentially profitable investment. The analysis also reveals the sensitivity of financial performance to a number of key parameters, especially recovery rate, log throughput, prices received for teak and the number of operating days. Of these, the company has greatest control over throughput, least control over price and some control over recovery rate. To maximise profits, the company must keep throughput close to capacity, ensure that recovery rates are on target and deliver a quality product that meets buyer specifications. If the annual rate of tree planting does not match the required throughput rate, the company will have to source resources from other landowners or operate the mill below capacity. To sustain a 45% recovery rate, the company needs to ensure quality at each stage of the supply chain from seed collection, nursery practices, site management, silvicultural regimes and harvesting practices. By supplying teak and teak products to different markets the company may be able to achieve higher average prices.

## **2.5 Sharing the benefits and risks**

Under the FFF business model the benefits and risks of teak plantations are shared between land owners and the company. While FFF may receive a larger share of the benefits from the plantation, it bears all of the costs and most of the financial risk. Alternative business models differ in the shares of risk and reward between the

partners. The choice of appropriate business model for a forestry project should consider the capacity of the respective partners to share the costs and risks of the project as well as how and when the benefits are shared.

#### 2.5.4 The company

The company carries all of the costs of the teak plantation enterprise and receives 90% of the returns from the final harvest and 90% of the returns from intermediate commercial thinnings after year 9. However, the challenge for the company is that the majority of the costs are incurred in the early years of the project while the revenues commence towards the end of the rotation. The plantation establishment strategy adopted by FFF is to build up the area gradually over several years, resulting in an estate of several individual stands of different ages. Once established this structure ensures that there is cash flowing from tree harvesting every year. However, for slow-growing species such as teak it can be 18 to 20 years before sawlogs are harvested and positive cash flows commence. The company needs a source of capital for the years before the cash flow turns positive.

Capital raising is a critical activity of the company. Options include investing in cash-generating activities such as seedling sales, professional consultancies and contract sawmilling. Each of these is subject to risk and if the venture is not successful it will add to the investor's overall financial burden, placing pressure on other capital sources. Seedling sales and wood processing services require substantial capital investment and they depend on regular demand for the products and services. If the market for seedlings or sawmilling is small, intermittent or highly competitive the investor may not generate sufficient revenue. For FFF seedling sales have not met expectations, which were optimistic and based on an unrealistic assessment of demand. On the other hand, the financial analysis of the sawmill indicates that it can generate income for the company. The availability of pine and mahogany within the mill's catchment will sustain the mill's viability until the teak comes on stream.

Other sources of capital include borrowing, grants and equity financing. Loans for forestry activities are difficult to acquire on terms that align with the cash flow pattern of a forest plantation. For example the Fiji Development Bank does not offer loan products suitable for the establishment of nurseries, woodlots or plantations<sup>14</sup>. FFF has made effective use of grant funding including a contribution to the capital costs of the nursery and other equipment from the Enterprise Challenge Fund of AusAID, access to specialist expertise and support through the Australian Business Volunteer program for nursery and plantation operations, and participation in funded projects such as the one being set up by CDE to assist FFF with teak marketing, preparation for certification and joinery expertise.

The Company raised equity capital through a share issue in 2011 and is planning for a second share issue in 2013. It borrowed capital to finance the initial stages of the sawmilling and wood processing operations and has borrowed for other operations. As a consequence of these, FFF's financial burden includes regular commitments to shareholders and loan repayments.

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<sup>14</sup> Sue, D. 2012. Facilitating financing for sustainable forest management in small islands developing states and low forest cover countries. An analytical report prepared by Indufor for the UN Forum on Forests. Country Case Study: Fiji. Helsinki, 26 July, p.21.

Private companies wishing to offset their carbon emissions can invest in reforestation with FFF thereby facilitating expansion of the plantation estate. The arrangement that CI has with Fiji Water is an example of this type of financing at work. FFF has not sourced any funds through carbon trading schemes.

FFF may generate revenue from its plantations sooner than that generated under the current business model by altering the species mix to include faster-growing species such as *Flueggea flexuosa*. There are local and export markets for the timber of this species which can be harvested commercially after six years. Inter-cropping teak with *Flueggea flexuosa* also helps with weed control and therefore reduces maintenance costs. It can be harvested without disturbing the productivity of the teak trees.

#### 2.5.5 Landowners

Landowners receive short-term financial benefits through key money at the signing of the lease, annual lease payments received at six-monthly intervals and labour contracts for site preparation, tree planting and maintenance during the first five years of plantations. These payments are not risk free as was discovered during field visits to village communities. Risk areas for landowners include:

1. Delayed payment of key money associated with delays in finalising the lease agreement and administrative delays with the TLTB
2. Delayed receipt of lease payments by land owners due to administrative problems in the TLTB and ineffective communication between FFF and the TLTB and the landowners. Landowners are not necessarily aware of the correct lease payments due to them.
3. Loss of labour contracts to other villages, which often is a consequence of the location of the primary residence of the mataqali leader or spokesperson. This can occur when the mataqali comprises a small number of households and none of them reside in their ancestral village where the lease land is located. Contributing to the likelihood of this occurring is the lack of a written agreement between FFF and the mataqali/village detailing the number and timing of labour contracts.

Dissatisfaction with FFF may arise due to misinformation and misunderstanding by the landowners which can have serious consequences. Landowners may destroy or damage a plantation as a protest against the company. To avoid this, FFF must maintain regular contact with the villages and mataqali and be prepared to listen to their concerns and needs. At the same time FFF must avoid creating unrealistic expectations in the minds of the villagers. Agreements and commitments should be documented.

In the majority of cases the landowners' financial rewards are used to meet community needs including payment for education, connecting to utilities (electricity and clean water), construction or refurbishment of community facilities, financing customary ceremonies and facilitating connections to markets. Landowners learn new skills which they can apply in other areas and in their own plantations. Some villages have benefited from grants to establish a village nursery to provide seedlings for their own land and for sale to other landowners and organisations such as CI and FFF.

The long-term benefits to landowners from their association with FFF and teak plantations include 10% of the stumpage value of thinnings (after year 9) and the final harvest, environmental benefits and social benefits. The



landowners bear some financial risk if the teak price falls, or if the trees cannot be accessed to harvest, or if the recovery rate is low. They share this risk with the company, although their incentive to take actions to prevent the likelihood of threats to the trees is much less than the company's, as they receive only 10% of the value of the trees at the stump. If FFF cannot maintain the target tree planting rate advised to landowners, not only are the short-term returns from labour contracts less than expected, but landowners may not receive the level of income from the final harvest at the time promoted by FFF during lease negotiations.

Landowners acknowledged that their participation in the establishment of teak plantations on their land in association with FFF was largely to benefit their children and grandchildren.

#### 2.5.6 Spillover benefits

Participating landowners share in a number of direct financial and social benefits and several indirect or spillover benefits associated with the establishment of plantations on their land. Landowners and community members that do not lease their land to FFF share some of the spillover benefits of the project. Plantations are established on deforested and degraded forest land which has a low opportunity cost but a potentially high environmental value. Trees have been planted on abandoned sugar cane land as well, some of which is in poor condition. Trees provide environmental benefits including stabilising land, enhancing stream water quality and quantity and encouraging biodiversity. Planted forests protect remnant natural forests as products previously taken from those forests can be sourced from plantations, such as fire wood.

A number of landowners have followed the lead of FFF and invested in their own teak plantations. Landowners with first-hand knowledge of how to establish and manage teak trees are likely to achieve good results. On the other hand, landowners that lack technical knowledge may not achieve the same growth rates or wood quality as their informed neighbours. It is in FFF's interest to encourage planting of teak and other timber species by independent landowners to expand the potential stock of resources for the FFF mill. Providing interested landowners with information and training on how to manage a plantation will generate benefits for FFF and the landowners over the longer term.

Village nurseries and seedling sales have been beneficial for some communities. However, there are risks associated with seedling production which some communities have experienced. There needs to be regular demand for seedlings for a nursery to be viable. If seedlings cannot be sold or used they are discarded and the costs involved are borne by the village. There needs to be certainty about seedling demand to ensure nursery viability.

Strengthened community cohesion as a result of the land lease agreements with mataqali was mentioned in more than one village. The mataqali that leased their land to FFF share short-term and long-term rewards from the plantation with the whole village community and not just the households belonging to the mataqali involved in the lease.

Training and skill development acquired through association with FFF equips landowners to explore and engage in other land use activities or business ventures.

Community facilities, connection to electricity, access to potable water supply and improved roads linking villages to markets are benefits shared by current and future generations which have been facilitated by the injection of funds associated with investment in teak plantations.

Overall, the total benefits received by the landowners and village communities are significant.

#### **2.5.7 Benefits and risk sharing under alternative business models**

If independent landowners can access finance and relevant knowledge and technology, their demand for teak seedlings would increase considerably. However, finance and technology are difficult for landowners to access. By leasing their land to FFF they are able to overcome these limitations, although the rate of plantation growth is limited by the rate at which FFF can access land (transaction costs) and the finance to develop it. The FFF 2012 Annual Report indicated that 730 ha belonging to 12 mataqali has been assessed as suitable and is awaiting application for lease approval. The Report also indicated that the FFF had received requests from another 30 mataqali interested in leasing their land for teak plantations. Land is not limiting. Plantation expansion is constrained more by finance than by land. High transaction costs in lease establishment are also a factor. An alternative business model would need to overcome these constraints.

A possible alternative business model to encourage plantation establishment is a privately owned nucleus plantation estate with an integrated sawmill and processing facility linked to several contracted outgrowers to supplement the estate's resource supplies. The estate company provides seedlings and technical advice and training to the outgrowers in return for an agreed share of the returns from their harvest. The costs of seedlings and other inputs provided by the company to the outgrower are deducted from revenue earned from thinnings and the final harvest as part of the contractual agreement. This model is not constrained by leasing procedures, as the landowners manage their own land with technical guidance in the form of training and extension services provided by the company. The company has a contractual agreement with each landowning unit.

Landowners would share more of the production and market risk under this business model. They would not receive any labour contracts or lease payments. The costs of labour for land clearing, planting and weeding would be contributed by the mataqali (village community). The upfront costs to the company are less than under the leasing model, which allows the company to devote more of its financial resources to seedling production and training and extension services. Transaction costs are likely to be lower as well. If the level of interest among land owners is high, then the rate of plantation establishment would be higher than under the leasing business model. In some respects this model is similar to the CI model, discussed in section 3. The success of the model depends on the willingness of the mataqali to commit their land and to forego short-term gains for a larger share of the final harvest. The agreement between the mataqali and the company would specify the benefits sharing arrangement.

Under this business model the company has less control over the productivity and quality of teak resources produced by the outgrowers with all operations conducted by the members of the mataqali. The company supplies quality germplasm, technical advice and training for outgrowers. The company will need to employ

more technical supervisors or extension officers to monitor silvicultural operations and train villagers. The company can set strict standards governing log acceptance and provide instructive extension material and training programs to assist landowners meet these standards. There would be a much stronger business relationship or partnership between the company and the land owners.

The financial and social feasibility of this alternative model should be evaluated relative to the leasing business model.

### **3. Conservation International – reforestation project**

In 2008 Conservation International (CI) established a community-based forest restoration project with local communities and government stakeholders to conserve the rich biodiversity and prevent the spread of degradation in the interior highlands of Ra Province. The objectives of the Nakavaudra Forest Carbon project which initiated by CI in association with FIJI Water LLC are to:

- Generate real, measureable and verified offsets to meet FIJI Water’s carbon negative commitments from 2008-2010
- Create a buffer area around the Nakavaudra Range rainforest to expand critical habitat for endangered species such as the Giant Forest Honeyeater
- Establish a first of its kind community restoration project that would enable local community landowners the opportunity to participate in the emerging carbon market, and alternative livelihoods through jobs from restoration activities (in the short term) and sustainable harvesting of timber (in the long term).

Funding for the reforestation project is provided by FIJI Water. An area of 1135 ha of deforested and degraded land will be reforested to offset 280,000 tonnes of carbon emissions produced by FIJI Water. CI expects to plant 281 ha in 2013 and 2014, adding to the 573 ha already planted on land committed to the project by mataqali. CI is offering communities assistance to establish other income generating activities such as agroforestry, ecotourism and beekeeping as an additional incentive to attract their participation in the reforestation project. To this end, the FIJI Water Foundation is providing funds to CI to develop alternative livelihoods for the communities involved in reforestation activities. These extend participation and benefits to the wider village community outside the landowning units whose land had been planted with trees.

In addition to local communities CI has established links with a number of local and national government agencies to provide assistance with GIS mapping and plantation management. The Forestry Department, Agriculture Department and Regional Development Department have some involvement in the project. The purpose of the multi-stakeholder arrangement for the development of the project is to work together to build local capacity to benefit from the carbon offset mechanism and to build support for policy to ensure that offset rights are maintained and that the site is appropriately managed in perpetuity.

### 3.1 The CI reforestation model

CI does not have any land of its own or a core forest estate. It relies completely on the willingness of landowners in target areas to offer their land for reforestation. Therefore, the CI model includes incentives to attract landowner interest. The original community-based restoration model involved planting hardwood species (teak and mahogany) on accessible sites to provide a long-term income source for the landowners, and planting native species on steeper and less accessible sites. Surrounding each plantation are mixed plantings of perennial food crops including pineapples, coconuts, jack fruit, oranges and native fruit trees. These plantings provide a fire break to protect the main tree species in the event of a fire as well as providing a source of food and cash for the community. Other incentives include integration of agroforestry into the system, ecotourism and beekeeping.

The inclusion of timber tree species such as teak in the reforestation species mix and the presence of FFF as a potential buyer of teak sawlogs provide incentives for landowners to offer their land to CI for reforestation. Knowing that they have a source of long-term income from the sale of sawlogs to FFF is important. However, in 2011-12 CI revised the species mix to accommodate the 22-year teak rotation promoted by FFF. The original CI model was based on a 30 year rotation for teak, which coincided with the carbon crediting period for the reforested area<sup>15</sup>. Harvesting teak at 22 years and replanting with teak or native species or letting the stump coppice, will not achieve the target level of carbon to be sequestered under the project. Therefore, CI has gradually reduced the share of exotic timber species in the mix of tree species planted, as illustrated in Table 17. Teak has been replaced by sandalwood and native species since 2012. CI encourages households to plant sandalwood for the seeds from which seedlings can be raised for sale to local people. Sandalwood produces seed after 3 years of age. However, this will work only if there is a growing market for sandalwood in Fiji and seedling producers can readily access the market.

**Table 17: The ratio of native to exotic species planted in CI forests**

	2009	2010	2011	2012	2013	2014
<b>Area (ha)</b>	108.89	119.6	334.41	11	281	281
<b>Native species (%)</b>	25	50	50	50	72	72
<b>Exotic species (%)</b>	75	50	50	50	28	28

Source: Personal communication with Susana Waqainabete-Tuiese, CI Country Director for Fiji, 15 February 2013

There is less incentive for land owners to offer their land for reforestation under the revised CI reforestation model. To counter this, CI offers training to participating communities on how to establish and manage a tree seedling nursery, and they have offered to promote seedling sales on behalf of communities to NGOs and government agencies. The purpose of the nursery is to provide a source of additional income for a community that will reduce or remove the need to harvest the teak trees before year 30. CI's efforts to promote other enterprises are aimed at providing alternative livelihood options to keep reforested areas and the accumulated carbon stock intact. However these alternatives will work only where there are markets and the communities have good access to those markets. If CI also assists communities with market development and with market

<sup>15</sup> The crediting period is the period during which a carbon offset project can generate verifiable and/or certifiable emissions reductions credits

access, then there is a higher likelihood of success. There needs to be a market for tree seedlings for a nursery to be successful.

CI cannot stop landowners from harvesting teak trees from reforested sites, because they own the trees. For the CI model to work effectively the carbon price needs to be sufficient to encourage landowners to reforest their land for the full term of the carbon credit. Landowners should not only receive payments to plant and maintain the trees, but they should receive an annual carbon payment to maintain the vegetation for the crediting period, similar to the lease payment paid to a mataqali. This would provide an incentive for them to keep the trees to the end of the crediting period.

The three main functions of the CI reforestation model are:

1. Land aggregation
2. Reforestation
3. Harvesting and marketing

Land aggregation and reforestation are broadly similar to the equivalent functions in the FFF business model with differences associated with differences in outcomes or objectives. One notable difference is that FFF leases land which it then controls, whereas CI relies on the goodwill of landowners who retain control of the land to comply with its management. Differences in the harvesting and marketing function reflect a greater emphasis on environmental services over financial benefits in the CI model.

In relation to land aggregation, the scale of CI's reforestation project is smaller than FFF's teak plantation development, but the time period for implementation is much shorter making it a more intensive project. The aim is to aggregate 1135 ha by 2014, with 573 ha already established as at 31 December 2012. The area is derived from the need to offset FIJI Water's carbon emissions of 280,000 tonnes. CI must negotiate a memorandum of agreement (MOA) with each participating mataqali, covering the following elements:

- Landowners agree to commit their land for replanting with trees under the CI reforestation project
- Carbon generated from the planted trees is registered against a donor
- Employment opportunities for landowners are defined
- Alternative livelihood options are listed
- The age at which teak trees can be harvested is advised
- All revenue from harvested trees is retained by the landowners.

CI adopts the Free Prior Informed Consent (FPIC) principles in negotiating consent with the mataqali. At least 75% of the members of a mataqali must consent to the agreement for it to proceed to implementation. In relation to reforestation, the responsibilities of CI are very similar to those of FFF for plantation management. The availability of finance for land preparation, planting and weeding is not limiting, with payment made to CI from FIJI Water up front. The project has a life of 30 years (the carbon crediting period). Once the target area has been aggregated and planted and the trees managed through the first three to five years, there are few direct inputs to the reforested sites. During these years CI supports the participating mataqali with livelihood

improvement projects to diversify their sources of income and to protect the reforested sites from premature harvesting. Unlike the FFF business model, CI does not have ongoing interactions with the communities. At regular intervals after establishment CI will engage experts to monitor vegetation growth rates and the general performance of the reforested areas. In addition at some stage an independent monitor will verify that the project is performing in accordance with the emission reductions specified in the validated project design documents.

The harvesting and marketing function of CI differs significantly from the harvesting and processing function of FFF. CI is engaged in activities to prevent or delay tree harvesting rather than to promote it, in order to preserve the carbon for the full crediting period. To this end CI is involved with alternative land use options that provide alternative income sources for the participating communities.

For the CI model the biggest risk is land owners harvesting timber species before the end of project's 30 year term. The success of the CI model and the reforestation/carbon sequestration project rests on CI's success in attracting landowners to not only commit their land for reforestation but to protect all trees until 30 years has passed. In some cases this may involve land owners adopting additional land use or other activities (livelihood activities) to provide an alternative source of income until the end of the crediting period when the timber trees can be harvested.

Both tree planting activities and livelihood development activities are part of the land use plan for the three districts (Tikina) participating in the reforestation project. The core stakeholders in the CI model are the participating mataqali from the three Tikina, CI and FIJI Water. CI represents the interests of FIJI Water. CI also represents the public interest in restoring degraded land and improving the environmental services from it.

As with the FFF model the motivations of the mataqali and CI for tree planting differ. CI is focused on meeting a carbon sequestration target and restoring degraded forest land, while a mataqali is interested in generating short-term income to support community needs and obligations, and in developing a forest asset over the longer term to benefit their children and grandchildren. CI understands the need for communities to ensure their economic security before they will commit to protecting natural capital (Susana Warainabete-Tuisese, personal communication 16 February 2013).

All land and trees planted through CI activities remain the property of the landowners. CI provides contracts to villages to clear the land, plant tree seedlings and weed around the young trees under arrangements similar to those provided to village communities by FFF.

### ***3.2 Technical aspects***

Technical aspects of the CI's operations are broadly similar to FFF's operations. However there are some notable differences. First, the sites are planted with a mix of native and exotic species, although since 2012, the proportion of exotics in the mix has declined, as shown in Table 17. The trees are spaced at 6m intervals, which is equivalent to 278 stems per ha.

CI's total demand for seedlings is around 350,000. Seedlings have been sourced from village nurseries that CI helped to establish, its own nursery and from FFF. Communities are trained in how to identify plus trees, collect seed, prepare the seed for germination, germinate the seed and condition seedlings for planting in field sites. Species are matched to sites based on the results of past survival assessments. All restoration sites are monitored 6 months after planting and if losses are 30% or more then replacements are planted within 12 months so as to maintain same age category/class. CI prefers to work with communities that have compartment sizes of between 10 and 20 ha which tend to have low tree mortality rates. Average survival has been 80%. While the functions are similar to those conducted by FFF, the precision and intensity with which they are applied are less precise. This is associated with the greater commercial drive of the FFF plantations.

Participating villages benefit from short-term contracts to clear the land, plant the trees and tend the trees. They expected to tend the reforested site on three or four occasions per year for up to five years, but that did not eventuate. Once the trees exceeded the height of the grass, which usually occurred during the third year, tending contracts ceased. Villagers commented that they had limited knowledge of the species they were planting and knew little about the harvesting potential of the trees and they received fewer labour contracts than expected. According to one village the agreement with CI was verbal and was not documented

CI's association with landowners is more transient than the involvement of FFF. Once the planted trees extend beyond the grass, there is little further interaction between landowners and CI. This is evidenced by CI's efforts to interest the government in taking over ownership of the project. There is a risk to the project if there is no ongoing supervision and ownership. CI is working closely with the Department of Forestry / IAS USP Herbarium and is in discussion with the Forestry Department to adopt the project site as a long term monitoring site for native species. By doing this CI hopes that the community and the Government will take ownership of this intervention after 5 years and continue to monitor and support the sites.

### **3.3 Social aspects**

Developing effective relations is important for CI to gain access to land and labour. For landowners the association with CI includes short-term and long-term financial benefits, environmental benefits and specific social benefits. Feedback gathered from village communities on the social impacts of the relationship with CI relates to their experiences under the original CI model, under which communities expect to harvest teak and other timber species when they are commercially mature. Feedback on social implications of the recently revised CI model was not provided.

#### **3.3.1 Social impacts of the CI reforestation model**

Social benefits for local communities involved in the CI reforestation project are very similar to those identified by communities involved in lease agreements with FFF. They include:

- Casual employment (limited opportunity for permanent employment with CI)

- New sources of short-term and long-term income
- New skills
- Enhanced social relations within the village
- Improvements in the natural environment.

### 3.3.1.1 Casual employment

CI contracts casual labour from mataqali and their villages to clear land, plant trees and weed around the trees as they grow. CI has engaged 500 community members in such activities. CI provides minimal supervision of contract work, unlike FFF which closely supervises land and forest operations. This may reflect CI's primary interest in getting native trees back into the landscape, compared to FFF which is interested in maximising long-term commercial returns from teak. The different approaches may reflect the different staffing levels in the two organisations, with CI having only one permanent employee assigned to the project.

Rates paid for employment contracts by CI are higher than those applied by FFF. The rate of 20 cents per tree which was ascribed to CI, is similar to the highest rate paid by FFF for clearing heavily vegetated and steep land (F\$222). Despite differences in rates paid, similar benefits were identified by participating village communities. Contract work enables communities to pool their labour and the payments received to meet community as well as individual household needs. Benefits identified by interviewees in selected villages associated with the CI projects are summarised in Table 18.

### 3.3.1.2 New Sources of Income

Short-term benefits are dominated by labour contracts. Medium term income may be derived from the sale of surplus produce from perennial fruit trees, although the level depends on the scale of production. Village communities appreciate the long-term benefits of reforestation for their children and grandchildren. Selective harvesting of timber trees after 22 years will provide a long-term source of income for members of the participating communities, although it will put the carbon sequestration target at risk.

**Table 18: Summary of major benefits identified by villagers interviewed in CI associated villages**

Village interviewed	Community benefits	Household benefits	Comments
<b>Nayaulevu 8 men, 4 women</b>	This village paid for its connection to the national grid through contract payments of \$40,000 from CI which also donated two 10,000 litre water tanks for the dispensary. The village was able to build a new meeting hall to replace the old one destroyed by floods.	Households benefited through payment of children's education, contributions to church and improved family welfare. Acquisition of parts for a brush cutter was especially appreciated.	The village has planted 157.3 ha under the CI project. Villagers are unclear about long term uses of the trees – whether or not they can harvest all timber trees. They are unclear about which stands can be harvested and which are to be preserved. They would like training in harvesting skills. CI built a fish pond for the Tokaimalo District School next to the village. However, it has not been stocked with fish. CI established its base and nursery at the Methodist Church Centre outside Nayaulevu village.
<b>Raviravi</b>	Village benefits for contract	Households benefited	Only 2 of 6 mataqali gave land to CI



Village interviewed	Community benefits	Household benefits	Comments
9 men, 11 women	work include cash income that helped to meet community obligations such as a water connection and for church.	from payment of children's education, transport to hospital in Rakiraki, and expenses for family welfare.	for planting. The last contract was in November, 2012. CI encouraged women in the village to establish home nurseries but they had to throw away the overgrown seedlings as there were no buyers. Willingness to continue to work with CI in this village was low and security of the planted land is low.

### 3.3.1.3 New skills for men and women

The CI project has provided the opportunity for individuals to learn new skills and knowledge on raising seedlings of native and exotic tree species. CI has encouraged communities to establish nurseries to supply various native species for the reforestation project. CI purchases the seedlings from the communities, providing them with a new source of income. However, a concern for nursery owners is that CI's purchases of seedlings are not guaranteed.

### 3.3.1.4 Enhanced social relationships within the village

The enhanced social relations associated with sharing the benefits derived from labour contracts within the village are similar for villages working with CI as they are for those working with FFF.

### 3.3.1.5 Positive changes to the natural environment

Positive environmental impacts identified by communities associated with FFF are similar to those identified by communities participating in the CI project.

## 3.4 Financial aspects

The CI project is not challenged by financial limitations, as funds for the project were provided by FIJI Water. However, the actual payment made to CI to sequester 280,000 tonnes of carbon was not disclosed and therefore, it is not possible to indicate whether it was a fair and reasonable price. There are international carbon prices that can be used to benchmark the payment made by FIJI Water. There are indications that the amount of funds allocated to the reforestation project may not be enough to secure the reforested site for the entire crediting period. The funds paid to CI to reforest the area of land required to offset FIJI Water's carbon emissions could have been used more efficiently. For example, FFF indicated that CI paid villages at relatively high rates to clear land, plant trees and weed the planted areas compared to rates paid by FFF.

A challenge to the success of the CI project is adequate incentive for landowners to divert their attention from harvesting the teak trees in the reforested areas prematurely. There is a real risk to the project that these trees will be harvested, especially if communities have urgent needs for funds and alternative sources of income are less effective. Unless CI can find a way to pay land owners to retain the trees until they reach 30 years, the project is at risk. CI carries substantial risks associated with this project which in part related to the design of the reforestation model.

## 3.5 Environmental impacts

The villages interviewed during the field work identified the following environmental benefits:

- Improved rainfall patterns allowing tree species to be planted where previously it was too dry
- Climate change mitigation

However, village communities interviewed expressed more interests in the social and community benefits derived from short-term labour contracts including improvements to water supply and connection to the electricity grid.

### **3.6 *Lessons learnt from the experience of the CI reforestation project***

**Error! Reference source not found.** presents lessons learnt from the experience of the CI reforestation project which may be of value to project designers and managers preparing or considering similar projects for other sites in Fiji or in other Pacific Island countries.

**Table 19: Lessons learnt from the CI reforestation project**

Activity	Towards best practice
<b>Technical aspects</b>	
<i>Encourage land commitment to the project by mataqali</i>	<p data-bbox="512 360 1402 421"><i>Mataqali offer their land voluntarily in response to short-term and long-term incentives</i></p> <ul data-bbox="512 454 1402 712" style="list-style-type: none"> <li>• Land is not leased to CI but land owners must commit their land to the project under the terms of a memorandum of agreement</li> <li>• CI provided financial incentives for land owners including short-term labour contracts and long-term income from the harvest of timber species including teak – this attracted land owners</li> <li>• Later CI excluded teak from the species mix because it did not complement the carbon sequestration requirements of the project</li> <li>• The needs/objectives of all stakeholders need to be factored into project design including land owners, the project owner (CI), and others FIJI Water</li> </ul>
<i>Source suitable seedlings</i>	<p data-bbox="512 712 1402 772"><i>Small-scale village nurseries provide a potential source of income for villages, so long as there is a market for seedlings</i></p> <ul data-bbox="512 806 1402 1043" style="list-style-type: none"> <li>• CI helped villages establish nurseries to propagate selected species in close proximity to the sites to be planted</li> <li>• CI trained local people in seed collection and nursery practices to ensure adequate supplies of quality germplasm</li> <li>• CI's purchase of seedlings did not always match its promises leaving villages to carry the costs of unsold seedlings raised for CI</li> <li>• Communities need to be informed of the risk and uncertainty associated with tree seedling nurseries</li> </ul>
<i>Reforest degraded and deforested land</i>	<p data-bbox="512 1043 1402 1104"><i>Reforestation meets multiple objectives – environmental, social and financial/economic</i></p> <ul data-bbox="512 1137 1402 1397" style="list-style-type: none"> <li>• The CI project is dominated by environmental objectives and offers short-term financial/social benefits to participating communities</li> <li>• Similarly to FFF, CI matched species to site conditions - exotic timber species were planted in accessible sites so that they can be harvested when mature – beyond carbon crediting period and natives on less accessible sites</li> <li>• CI incorporated fire protection buffers around reforested area comprising perennial fruit trees and other food crops – these can supplement community food needs</li> </ul>
<i>Manage reforested sites in accordance with required standards</i>	<p data-bbox="512 1397 1402 1435"><i>Comply with standards and regulations to ensure that targets met</i></p> <ul data-bbox="512 1469 1402 1639" style="list-style-type: none"> <li>• CI monitors tree growth and site productivity in accordance with relevant targets and in compliance with relevant standards (e.g. carbon emissions reduction); independent monitoring is conducted</li> <li>• CI replaces trees lost in the first 6 months</li> <li>• CI has only one full-time professional officer to monitor planted areas and oversee other operations which may lead to errors or problems</li> </ul>
<i>Acknowledge the commercial value of timber trees</i>	<p data-bbox="512 1639 1402 1700"><i>For carbon offsets projects the planted trees must be protected for the crediting period</i></p> <ul data-bbox="512 1733 1402 1993" style="list-style-type: none"> <li>• CI included timber species in the original species mix, but discovered that species such as teak could be harvested by land owners within the crediting period</li> <li>• CI developed livelihood options to deter landowners from cutting trees before the end of the crediting period</li> <li>• If CI could pay landowners not to harvest the trees then the project would not be vulnerable to loss of trees through individual harvesting – landowners could be paid an annuity based on the final value of the trees which CI would recover after the crediting period</li> </ul>

Activity	Towards best practice
<i>Access knowledge and technical expertise</i>	<p><i>Investment in qualified specialists with local knowledge and in appropriate technology is essential for project success</i></p> <ul style="list-style-type: none"> <li>• CI can access relevant technical expertise within the organisation to design reforestation projects and guide implementation</li> </ul>
<b>Social aspects</b>	
<i>Relations with village communities</i>	<p><i>Establish and nurture good relations with the mataqali and village communities to which mataqali members belong</i></p> <ul style="list-style-type: none"> <li>• CI negotiates a formal memorandum of agreement to record the consent of mataqali to participate in the proposed project and the respective responsibilities of the project owner and the mataqali</li> <li>• Villagers advised that they had not seen a written version of the agreement, which is signed by approved representatives of the landowners and the project owner; agreements should be accessible to participants</li> <li>• CI adopts the Free Prior Informed Consent (FPIC) principles when dealing with customary land owners</li> <li>• Seek provincial approval for intended project first, followed by approval at Tikina level and then present proposals to the mataqali and village in target areas</li> <li>• Project owners must respect local people and their land and always inform them of their intentions to visit project sites and the purpose for their visit – villagers complained that CI people visit their land without notice and without first speaking with the mataqali head or village head.</li> </ul>
<i>Capacity building</i>	<p><i>Training local people enhances project outcomes and equips people with skills and knowledge that they can apply in other situations</i></p> <ul style="list-style-type: none"> <li>• CI provides basic training to selected individuals from local communities for labour contracts so that they are informed and trained to do the required tasks</li> <li>• CI does not provide the intensity of training or supervision applied by FFF because of human resource limitations</li> </ul>
<b>Financial aspects</b>	
<i>Access financial resources</i>	<p>Ensure that project funds are sufficient to deliver the carbon offset target or other project target</p> <ul style="list-style-type: none"> <li>• CI provided short-term contracts to land owners but was not able to pay landowners to ensure that they would not harvest timber trees prematurely (i.e. within the carbon crediting period)</li> <li>• There should be sufficient funding to cover all costs of reforestation and carbon sequestration for the project period (the crediting period)</li> <li>• CI offered landowners alternative land use options including training and marketing assistance to deter the from premature harvesting of timber trees</li> </ul>

#### 4. Lesson learnt from the FFF Limited and CI experiences

This review has identified several lessons from the experiences of the FFF and CI forestry projects in Fiji that may be helpful to the developers of new forestry project and to the owners of these projects in the context of scaling up or rolling out their business models to new sites. Common or recurring lessons are likely to be most critical to successful implementation of forestry projects in Fiji and in other Pacific Island countries where similar conditions exist. **Error! Reference source not found.** presents a synthesis of lessons in the form of citions that project owners can take towards achieving best practice.

## 4.1 Learning from the differences

Similarities and differences between the two forestry-based development models provide useful lessons for private investors, government agencies and NGOs interested in forestry development in Fiji and other Pacific Island countries. Several functions are common to the models. Key differences relate to how the functions are conducted and differences in project objectives or motivations. The following table summarises common functions and differences in implementation.

Function or activity	FFF approach	CI approach	Key Differences
<b>Build and nurture relations with village communities</b>	<ul style="list-style-type: none"> <li>Engage a local person for community liaison on behalf of the company</li> <li>Attend tikina and village meetings</li> <li>Build gradually</li> <li>Listen to community needs</li> <li>Inform villages of proposed project</li> <li>Offer short-term and long-term incentives to land owners</li> </ul>	<ul style="list-style-type: none"> <li>Attend tikina and village meetings</li> <li>Align with community needs</li> <li>Inform villages of proposed project</li> <li>Offer short-term and long-term incentives for land owners</li> <li>Adopt principles of Free Prior Informed Consent in agreements</li> </ul>	<ul style="list-style-type: none"> <li>Use of a community liaison person by FFF is good for communities and the company</li> <li>Use of agreement principles by CI</li> <li>Both organisations made mistakes in their relations with communities largely related to poor communications and not ensuring a mutual understanding of the terms of the agreement</li> </ul>
<b>Access suitable land for reforestation</b>	<ul style="list-style-type: none"> <li>Land lease agreements with mataqali</li> <li>Regular lease payments to mataqali</li> <li>Short-term and long-term benefits for mataqali</li> <li>Conducts detail physical and economic assessments of land offered by mataqali</li> </ul>	<ul style="list-style-type: none"> <li>Memorandum of Agreement (MOA) with each mataqali</li> <li>Short-term benefits for mataqali</li> <li>Offer complementary livelihood options</li> </ul>	<ul style="list-style-type: none"> <li>FFF owns the trees and has control over their management</li> <li>FFF able to attract large areas of land</li> <li>FFF makes regular lease payments to land owners</li> <li>FFF land assessments ensure suitability before committing to a lease agreement</li> <li>Landowners control land and trees under the CI approach</li> </ul>
<b>Access finance</b>	<ul style="list-style-type: none"> <li>Shareholders' funds</li> <li>Loans</li> <li>Grants</li> <li>In-kind assistance</li> <li>Seedling sales</li> <li>Sawmilling proceeds</li> <li>Financial risk carried by FFF</li> </ul>	<ul style="list-style-type: none"> <li>Single source of funds – FIJI Water</li> <li>Land owners bear financial risk of final harvest of timber species</li> <li>Finances livelihood options for land owners to prevent premature harvest of timber trees</li> </ul>	<ul style="list-style-type: none"> <li>CI has a single, secure source of finance</li> <li>FFF unable to secure a continuous supply of funds; relies on multiple sources</li> <li>FFF has made effective use of grants and in-kind support</li> <li>Seedling sales a risky strategy for fund raising</li> </ul>
<b>Access seed and seedlings of suitable tree species for planting</b>	<ul style="list-style-type: none"> <li>Commercial-scale FFF nursery</li> <li>Follows sophisticated propagation techniques</li> <li>Propagates and plants teak and native species (teak dominant)</li> <li>Supervises seed collection from plus trees</li> </ul>	<ul style="list-style-type: none"> <li>Small-scale CI nursery</li> <li>Buys seedlings from FFF and local land owners</li> <li>Helps landowners establish tree nurseries</li> <li>Propagates native species</li> <li>Trains locals on seed collection and propagation methods</li> </ul>	<ul style="list-style-type: none"> <li>FFF achieves high seedling survival rates</li> <li>FFF reliance on income from seedling sales was ambitious given that teak is a new land use in Ra province</li> <li>FF invests in productivity improvements</li> <li>CI driven by the 30 year carbon retirement target</li> <li>CI excluded teak from species mix in 2012</li> </ul>
<b>Access specialist skills to guide plantation establishment, maintenance and management</b>	<ul style="list-style-type: none"> <li>Silviculture, forest inventory &amp; plantation management expertise</li> <li>Community liaison officer</li> <li>Accesses expertise through donor-funded programs and projects</li> </ul>	<ul style="list-style-type: none"> <li>One person to oversee all reforestation activities</li> <li>Can access expertise through CI's international network of specialists</li> </ul>	<ul style="list-style-type: none"> <li>FFF has employed specialists in key areas</li> <li>FFF builds and nurtures good community relations through liaison officer</li> <li>CI has access to an international network of specialists</li> </ul>

Function or activity	FFF approach	CI approach	Key Differences
			<ul style="list-style-type: none"> <li>• FFF accesses knowledge and expertise through donor-funded projects and programs</li> </ul>
<b>Access labour to establish and maintain planted trees</b>	<ul style="list-style-type: none"> <li>• Labour contracts with mataqali specified in lease agreement</li> </ul>	<ul style="list-style-type: none"> <li>• Labour contracts with mataqali specified in a memorandum of agreement</li> </ul>	<ul style="list-style-type: none"> <li>• FFF commits to terms of agreement to provide contracts for 5 years</li> <li>• CI labour contracts usually last just 3 years</li> </ul>
<b>Provide improved livelihoods for local communities</b>	<ul style="list-style-type: none"> <li>• Initial lease payment to mataqali (key money)</li> <li>• Annual lease payments over term of lease</li> <li>• Work contracts for mataqali in first 5 years</li> <li>• 10% of net income from trees thinned from plantations</li> <li>• 10% of net income from final harvest after 22 years</li> </ul>	<ul style="list-style-type: none"> <li>• Work contracts for mataqali in first 3 to 5 years</li> <li>• 100% of harvest income from exotic timber species after 30 years</li> <li>• Income from alternative livelihood options, if adopted</li> <li>• Perennial food crops from buffer strips around reforested land</li> </ul>	<ul style="list-style-type: none"> <li>• Regular payments by FFF to mataqali</li> <li>• FFF decides when trees are thinned and harvested</li> <li>• CI offers incentives to mataqali to prevent premature harvest of timber species</li> <li>• Landowners own land and trees under CI approach</li> </ul>
<b>Meet goals and targets set by key stakeholders</b>	<ul style="list-style-type: none"> <li>• Establish 100 hectares per year for 30 years</li> </ul>	<ul style="list-style-type: none"> <li>• Establish 1135 hectares by 2014 to offset 280,000 tonnes of carbon emissions for FIJI Water</li> </ul>	<ul style="list-style-type: none"> <li>• FFF target limited by availability of finance</li> <li>• FFF forecasts fail to recognise the typical path of adoption for a new technology</li> <li>• CI target challenged by ability to attract land and retain trees for 30 years – there is a risk of trees being harvested prematurely</li> </ul>
<b>Market development</b>	<ul style="list-style-type: none"> <li>• Invest in sawmill and wood processing</li> <li>• Pursue plantation and processing certification by FSC</li> <li>• Comply with verification of legal origin (VLO) of wood</li> </ul>	<ul style="list-style-type: none"> <li>• Comply with terms of the carbon offset contract</li> </ul>	<ul style="list-style-type: none"> <li>• FFF focused on developing a market for teak</li> <li>• CI compliant with terms of carbon offset contract from the beginning</li> <li>• Mataqali under CI not informed of market requirements for certification and VLO</li> </ul>

The experiences of FFF and CI in relation plantations and reforestation provide several useful lessons or principles that can help other companies, NGOs, government agencies and donors in the formulation and implementation of similar forestry projects. It is recommended that the following principles are adopted.

### **Build enduring partnerships with village communities**

The success of a forestry project in Fiji is based on enduring relations with local communities. This is essential for private investors, NGOs and donors because 85% of the land in Fiji is owned by native Fijians. Based on the experiences of FFF and CI successful partnerships with landowners in Fiji embrace the following elements:

- Engage a respected local person to provide community liaison services to assist with establishing links to villages and maintaining communication with villages for the term of the partnership
- Both parties are aware of and understand the agreed conditions of the partnership and their respective responsibilities
- Display the agreement where it can be accessed by village members

- Maintain regular communications - e.g. attend village and tikina (district) meetings, contact the village head when visiting the local area, invite village members to visit company or project facilities such as established plantations, a seedling nursery or a sawmill.

### **Access land with secure tenure for the term of the partnership agreement and land that is best suited for the intended forestry purpose**

In Fiji reforestation occurs on land that either is leased from a mataqali or offered by a mataqali in return for a share of the financial benefits from its use. However, not all land offered by mataqali is physically or economically suited for reforestation.

- Under a lease agreement the lessee owns the trees, controls their management and makes regular lease payments to the mataqali for use of the land. This is the situation of FFF. Tenure of the land and trees are secure.
- Under an agreement without a lease, the mataqali owns the trees and land and controls their management. This is the situation of CI. Tenure of the land and the trees are not secure. However, the security of the trees may be guaranteed if annual payments can be made to the mataqali or if adoption of alternative income-generating activities can deter premature harvesting of timber species.
- Advise the village communities that acceptance of land plots is subject to their physical and economic suitability.
- The physical and economic suitability of a plot offered by a mataqali should be assessed before committing to a partnership agreement to ensure that tree species to be planted are suited to the conditions of the plot and that the land can be accessed for final harvest.

### **Confirm availability of financial resources before setting plantation and reforestation targets**

The cost of plantation establishment coupled with the long period of time before a positive cash flow is generated present major challenges for investors and project owners. Lessons from CI's and FFF's experiences include:

- Set plantation and reforestation targets according to secure and certain sources of finance
- Seedling sales can be a risky source of income where particular forest plantations are new to a region or country (such as teak in Fiji) and potential purchasers have limited information on likely performance of the species and where inadequate market research has been conducted
- Explore opportunities for grants, in-kind support and collaborations such as the ECF grant, the Australian Business Volunteer program and the European Centre for Development of Enterprise.
- Consider the viability of inter-planting short-rotation timber species or short-term agricultural crops with long rotation timber species, such as teak, to provide a source of short- and medium- term income

### **Source suitable germplasm and apply appropriate nursery management practices to meet desired seedling survival rates and tree growth rates after planting**

Decisions are required on species mix, numbers of seedlings required and the source of germplasm (e.g. seeds or cuttings). Species mix depends on project objectives. Numbers of seedlings depends on annual planting targets. Source of germplasm depends on scale of operation, quality control requirements and costs.

- An integrated forestry business such as FFF requires large numbers of high quality seedlings for a limited number of species propagated in a permanent nursery where quality control, innovation, cost and seedling survival rates are important. Germplasm is selected to meet desired tree characteristics and wood properties. The nursery is an integral part of the business, requires substantial capital investment and relies on in-house technical expertise. A permanent nursery should be located on a site that is central to plantation areas, where electricity and water supplies can be readily connected, on a road that is trafficable in all weather conditions and close to a settled area from which labour can be sourced.
- Government or NGO sponsored projects such as the CI reforestation project require seedlings for a range of species that can be easily propagated from locally available seeds in low-cost, temporary nurseries. Small-scale nurseries can be established in villages near sites to be reforested with training and supervision provided by project specialists. Projects may purchase seedlings from village nurseries and from commercial nurseries.
- Where seedling sales are a part of the business model, sales projections should be based on market studies and recognise that seedling sales are one element in adoption of a land management system.

### **Engage specialist skills to guide establishment, maintenance and management of reforested land**

The experiences of FFF and CI demonstrate the positive impacts on productivity, costs, production and community relations of engaging specialists either through employment, collaboration, networking or participation in specific projects and programs.

- Specialists in tree genetics and plant propagation can oversee germplasm sourcing, plant propagation and nursery management. Qualified foresters ensure that the right species are matched to site conditions and that silvicultural practices including pruning, thinning and harvesting occur at the right time and in the right way with the right tools and skills. Operations similar to FFF should employ specialists with these skills and experience, or at least engage specialists on short-term missions to advise management and train permanent employees.
- Employing a person to liaise with village communities is as important for both companies and projects as acquiring technical and financial skills
- Accessing an international network of specialists is an efficient and effective alternative for sponsored projects to employing technical specialists directly
- Knowledge and expertise can be strengthened through participation in government, donor and NGO funded projects and programs

### **Labour intensive work contracted to local villages delivers short-term community livelihood benefits, meets essential project and company tasks and enhances community relations**

FFF and CI under the terms of their respective agreements with mataqali provide contracts to local people for land clearing, tree planting and grass cutting around young trees. The experiences of some villages have been less than expected resulting in dissatisfaction with FFF and CI and threatening the security of planted forests. The expected benefits of labour contracts will be delivered when:



- Companies, NGOs and other project owners are aware of and understand the intricacies of the relationship between the mataqali and village communities especially in situations where mataqali members reside in more than one village and where all remaining members of a mataqali reside away from the ancestral village.
- A written version of the partnership agreement, including specific details of labour contracts, is displayed in a public place for all mataqali and village members to access and appreciate.
- Companies, NGOs and other project owners comply with the contractual agreements.
- Companies, NGOs and other project owners respect their partners and keep them informed of all activities or events related to their land.

### **Provide mataqali with a share of the long-term benefits from investments in plantations and reforestation**

The prospect of their children and grandchildren receiving a share of the value of trees thinned from plantations and of the final harvest provides a major incentive for mataqali to offer their land for reforestation. The FFF and CI approaches differ in their satisfaction of this expectation in line with their different objectives and because the tenure of timber trees is not secure under the CI project.

- Providing partnering mataqali with a share of the stumpage value of trees thinned from plantations and of the stumpage value of the final harvest provides a strong incentive for mataqali to offer their land
- Constraints on extraction of timber species before a particular time, such as the 30 year carbon crediting period of the CI project may reduce the incentive for mataqali to participate, even though after 30 years the mataqali are entitled to 100% of the value of recovered timber resources. The lack of interim payments is a further deterrent. If project developers provide regular payments to mataqali they will attract land offers, secure the reforested area and contribute to community livelihood improvements over the long term.

### **A guaranteed market for forest resources is an essential pre-requisite for attracting investors and mataqali commitment to plantations and reforestation**

The establishment of the FFF sawmill in 2013 guarantees a market or buyer for forest resources in Ra province. Prior to this decision by FFF there was not a sawmill with economic reach of plantations and reforested land in the province which may have been a deterrent for some potential investors and mataqali. The existence of a sawmill or timber buyer is a critical component in the success of the FFF business model because:

- It removes uncertainty for cautious investors and mataqali
- It adds value to timber resources producing products for local and export markets
- It can provide a valuable source of income for the company by attracting logs of various species from other land owners.

### **Satisfy market requirements for timber resources**

Markets for imported timber resources and timber products especially in Europe, North America, Japan and Australia increasingly demand environmental certification for timber production and processing, such as Forest Stewardship Council (FSC) certification. Verification of the legal origin (VLO) of wood is a requirement of entry into export markets in the US, Europe and Australia. FFF has not formally addressed these market

requirements in its plantations but will ensure that its wood processing complies with FSC certification requirements. CI's interests are not on marketing but mataqali wishing to sell teak logs from reforested areas will have to comply with FSC and VLO requirements. Lessons include:

- Comply with the requirements for FSC certification and VLO from the first stage of forest establishment for own resources and resources sourced from other owners; establish protocols
- Budget for an initial assessment audit and annual compliance audits to maintain certification status
- FSC certification for wood products requires certification for plantation management and chain of custody which relates to wood processing. Chain of custody alone is not sufficient.
- Landowners in partnership with an NGO or donor agency will require advice and assistance on how to meet export market requirements where timber resources are expected to be harvested for sale.

### **Strengths and weakness of the FFF and CI models**

Strengths of the FFF business model include the company's community liaison strategy, although it is experiencing problems emanating from poor community relations in the past; land lease agreements with mataqali although the planned establishment of plantations and associated contracts for villages have been delayed because of company financial constraints; the physical and economic assessments of land plots offered by mataqali; seed sourcing, seedling propagation, nursery management and innovation to reduce seedling costs; employment of qualified forestry specialists with extensive plantation experience in Fiji; provision of labour contracts in the first five years of a plantation although limited knowledge of internal relations within some villages has resulted in the receipt of fewer benefits than expected; the arrangement for sharing of the proceeds of timber sales with the mataqali and the establishment of a sawmill. The major weaknesses of the FFF model are its ambitious plans to raise capital through seedling sales. The company failed to appreciate that a teak plantation is new land management system for land owners and investors in Ra province. Adoption, which can be measured in seedling sales, is likely to be gradual until potential investors receive credible information on the likely performance of teak in the province, after which uptake should increase, assuming positive results. As a consequence, FFF has excess capacity in the nursery. It was unable to convince investors to subscribe to shares to the extent that it expected. The establishment of a sawmill in 2013 will reduce uncertainty about markets for some potential investors and may prove to be a more reliable source of capital for the company. This latter benefit is a consequence of the existence of large areas of mature pine and mahogany within reach of the sawmill which FFF can process independently of the development of a teak market, before mature teak resources are ready. The FFF business model is based on a plantation establishment rate that cannot be matched by the company's capacity to raise financial capital. The plantation rate should be based on a certain and secure supply of financial resources.

The greatest strength of the CI model is that it has a secure source of funds, although the amount may be less than that necessary to ensure that reforested areas remain intact for the entire carbon crediting period. CI also offers labour contracts to mataqali, although they generally end after three years. The fact that mataqali retain ownership of the land and the planted trees, is a strength for the mataqali but a vulnerability for CI testing its capacity to ensure the security of the reforested land. The removal of teak from the plantation mix in 2012 is likely to reduce the incentive for mataqali to offer their land, as the long term benefits for future generations are diminished. CI's access to the organisation's international network of experts is a strength, although the NGO

has just one person on the ground in Ra province to address technical and social aspects of project implementation. The major weakness of the CI reforestation model is that it does not have secure tenure over the land and the planted trees putting at risk the carbon offsets contract for FIJI Water. If landowners receive an annual payment to retain all trees, harvesting may be averted. The removal of teak from the species mix for the CI reforestation project and the lack of tenure security indicate the vulnerability of the model to failure. There are insufficient incentives for mataqali to offer their land and ensure the security of the planted trees for the duration of the partnership agreement with CI.