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ESTABLISHMENT OF A PROTECTED AREA IN VANUATU

ACIAR Project 9020

Centre for International Economics
July 1998

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1. Summary

The Australian Centre for International Agricultural Research (ACIAR) project ANREI/90/20 assisted in the establishment of a number of protected areas in Vanuatu by improving information flows and by establishing appropriate institutional structures. The total research benefit from this project is estimated to be

- A$1.89 million divided up as follows.$0.14 million is the present value to landowners, based on estimates of the surplus—return on land above logging returns foregone. For most areas, the benefits to the landowners exceeded the returns from logging and the landowners were willing to establish the area without compensation arrangements.

- $1.07 million is the project's contribution to improving the net returns on logging activities—assuming that only 10 per cent of the actual change can be attributed to the project. The project significantly improved the economic outcomes for logged areas through (i) training and (ii) the establishment of institutions that improved control by the Department of Forests (Vanuatu) and strengthened the landowners' rights. This enabled Vanuatu to negotiate for higher royalties on timber harvests, the acceptance of codes of practice for harvesting, and lower the environmental costs of logging.

- $0.67 million is the net present value of tourist payments, assuming a growth in tourism of 1 per cent a year. A willingness-to-pay survey of Australian tourists to Vanuatu, which was part of the project, put a value on protected areas of $20 per tourist. This benefit accrues to Australian tourists unless a charge is levied on tourists. Such a charge is a potential source of income for the Vanuatu economy.

When the contributions of the project to the affected landowners, the broader community and Australian tourists are added, the net present value of the project is estimated at just under $1.5 million, a benefit–cost ratio of 4.5:1, at a discount rate of 5 per cent. The internal rate of return is 22 per cent.

The project also estimated Australian households were willing to pay, on average, $3 per household to protect forests in Vanuatu. While it was revealed that payment is more likely to be the value placed on forest conservation in the Pacific Islands rather than just in Vanuatu, it provides a basis for justifying assistance by Australia of around $0.5 million a year for improving conservation practices in the region.

2. Project Description

The Australian Centre for International Agricultural Research (ACIAR) project ANREI/90/20 sought to assess and to assist in establishing protected areas (PAs) of forest in Vanuatu. It had two main aims:

- to establish and measure the extent of demand for preservation of the forests by Vanuatu communities in the local area and by the international community; and
- to explore institutional and compensation arrangements to ensure appropriate trade-offs are made between preservation and use of the forests.

The project had three elements to address these aims. The overarching framework used for the assessment was a benefit–cost framework. This had economic theory and information collection components. The second element was to explore some activities that could provide alternative income sources consistent with forest preservation. The third element was to develop the institutional arrangements to assist in the development and maintenance of PAs.

Once the project was underway, the inherent problem of putting values on something that is not amenable to comparative valuation was recognised. This created an additional element to the project, which was to examine the theoretical underpinnings of ecological economics. While of academic interest, and acting as the underpinnings for the approaches adopted, the contribution to the theoretical literature is not considered here. The project was reviewed in 1996. The review team pointed out that in the South Pacific the relevant focus is on conservation rather than preservation. In this assessment, PAs are treated as synonymous with conservation areas.

2.1 Motivation for the Project

Prior to the log export ban in 1994 in Vanuatu, and around the Pacific Islands in general, there has been considerable concern about the exploitation of the forest resources. Many logging practices in the past have been detrimental to the environment and imposed unexpected costs on the local communities. Decisions about logging were often made without seeking the views of the people who would be affected. In addition, increased awareness of the scarceness of the forest resources and

their potential store of diverse flora and fauna has led to calls from the international community for protecting some of those resources.

In Vanuatu, the landowner has full rights to harvest the resources from their land and marine area. There was considerable concern in the international community that the forests of Vanuatu would be exploited because of the short term income generated from logging royalties. There was also concern within the country that decisions on logging did not take into account the environmental costs of logging, including the value of the forest resource that is foregone. The Department of Forests was largely powerless to control the logging activities, due to lack of resources and lack of knowledge.

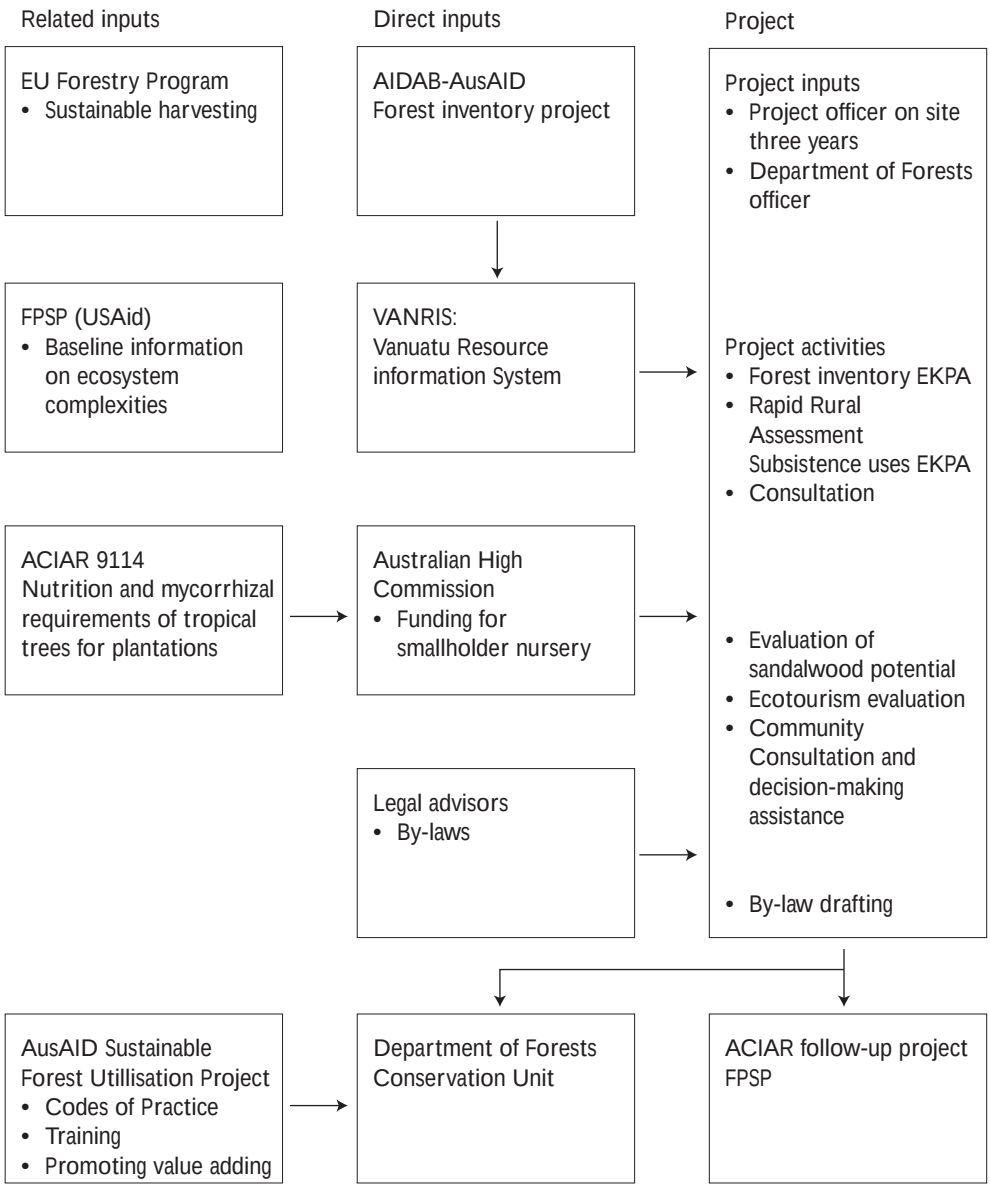
3. Project Activities and Related Projects

A forest inventory (VANRIS—Vanuatu Resource Information System) was undertaken in 1991–1992 as part of an Australian Agency for International Development (AusAID; formerly the Australian International Development Assistance Bureau [AIDAB]) project. The project included a review of the existing studies and additional information collection on the traditional uses of the forests.

While drawing heavily on this work, detailed analysis of the use and non-use values of the forests by the local residents was also conducted. In addition, surveys of visitors to Vanuatu and the Australian community were undertaken to assess the value of Vanuatu forests to non-residents.

A project officer was located in Vanuatu for a period of three years and an officer from the Department of Forests was assigned to the project on a full time basis.

Figure 1. Project inputs and related projects.



Note: EU = European Union, FPSP = Foundation of People for the South Pacific, AusAID = Australian Agency for International Development, AIDAB = Australian International Development Assistance Bureau, EKRA = Erromango Kauri Protected Area.

3.2 Socioeconomic Assessment

The project applied economic assessment tools to inform the decision making process. The basic decision-making framework is described in Figure 2. The benefit–cost framework included the values at the local level and at the international level. The areas assessed were the Erromango Kauri Protected Area (EKPA) which had been established, and six areas on Malekula.

The structure of the benefit–cost approach adopted proved useful in setting out the decision-making criteria and identifying information gaps. However, it proved difficult to use where values were hard (impossible) to measure, such as intergenerational equity value (Box 1), and where techniques to estimate willingness to pay would not be free from bias.

For the EKPA, the notion of compensation for not logging had already been adopted and the focus was on the appropriate level of compensation. The project demonstrated a willingness to pay on the behalf of the international community for trust arrangements to support compensation. On Malekula there was concern that the whole island would be logged and the focus was on raising awareness of the benefits of not logging the forests relative to the returns from logging. The issue of intergenerational equity was an important component in making such assessments. The project team developed procedures to involve the local community and to make this issue explicit in decision-making.

The benefit–cost framework has been an effective tool in getting landowners and the government to recognise the totality of benefits and costs associated with logging.

3.3 Developing Alternative Sources of Income

There were two types of activities that were examined for providing alternative sources of income.

Assessment of the potential for sandalwood plantation development

The focus of the research was on the potential for sandalwood production to replace logging royalties in EKPA. Under a range of assumptions about growth rates and heartwood production, plantations were shown to return a positive net present value at an 8 per cent discount rate under all but the most conservative growth and seedling survival estimates. Additional funding from the Australian High Commission assisted the expansion of nursery operations. The outlook for sandalwood production is, however, limited for the following reasons.

- Extensive plantations require clearing forest.
- The payoffs are to future generations rather than the current generation.
- There are extensive but low intensity plantings in gardens and secondary forest, which have much lower capital and labour requirements.
- The initial capital requirements may prevent subsistence producers from establishing plantations.

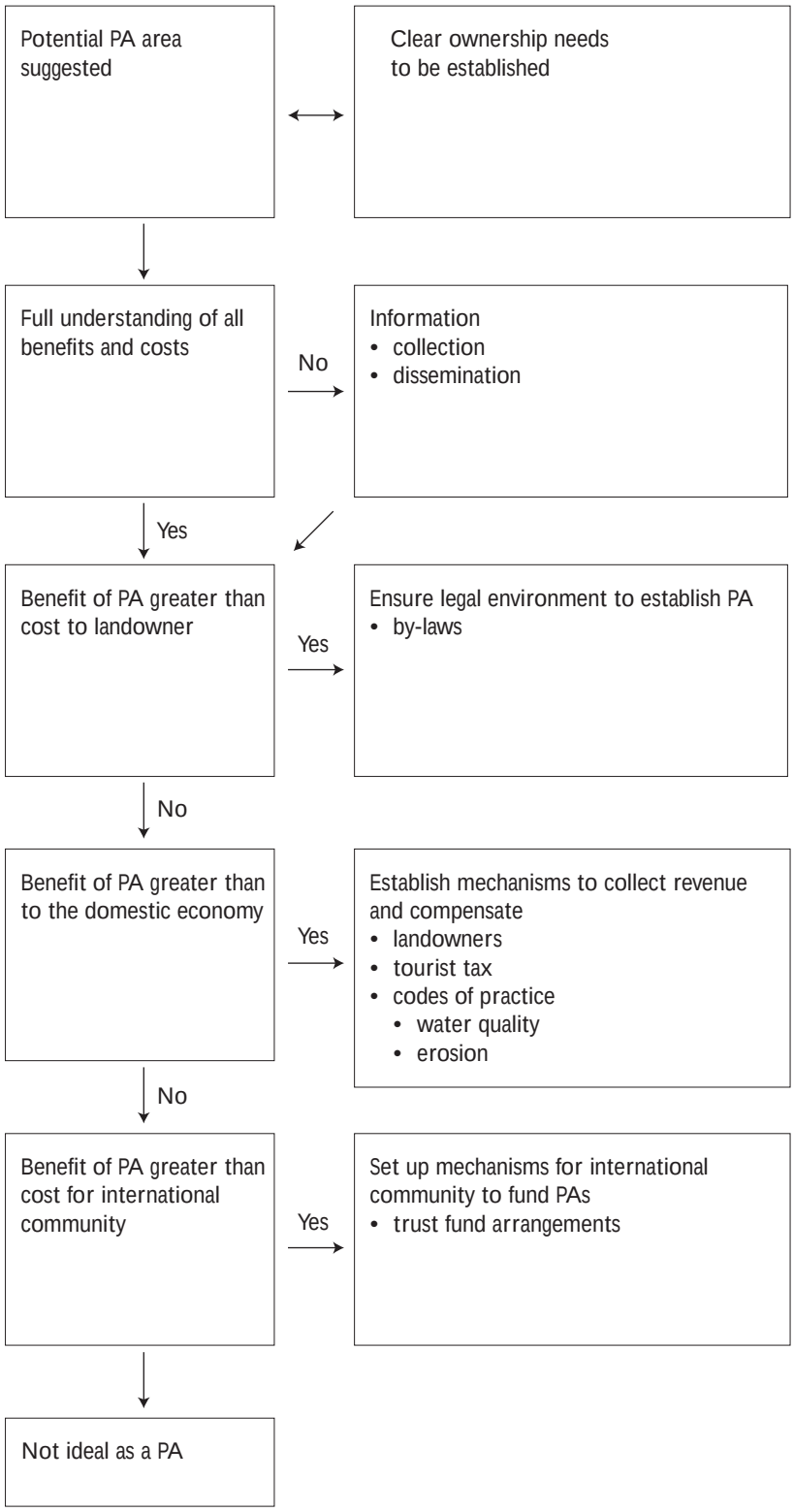
There is a by-product of the research that offers greater potential benefits. The Department of Forests was involved in the project, which included a review of prices received for sandalwood. Prices were found to vary greatly and were generally well below world prices. The scattered nature of the suppliers and the concentrated actions of the purchasers allowed the purchaser to extract the resource rent rather than the owners of the resource. The project officer suggested a tender sale system. Late last year this suggestion was incorporated into the Forestry Act, but has yet to be put into action. The Department of Forests has been undertaking an inventory of the resource, and the prices of sandalwood to the farmers have increased (Department of Forests, pers. comm.).

Ecotourism

The potential for ecotourism was explored for one PA on Malekula. The desire for ecotourism development was identified through consultation with the community. The project officer facilitated funding for developing infrastructure (funded by the New Zealand High Commission). The current level of ecotourism is unknown, although at the time of the review several bookings had been taken for 1997. This area, Naga mo Pineia, is identified as one that will definitely remain protected when the current agreements expire. An ecotourism area is being developed at the Vatthe Conservation Area at Big Bay on Santos.

A study on the potential returns from tourism in the Vatthe Conservation Area found them unlikely to generate income equivalent to foregone logging royalties (Department of Forests, pers. comm.).

Figure 2. Decision criteria for protected area (PA) assessment.



Box 1 What is intergenerational equity?

In any one generation there is:

- material capital—roads, houses, machinery;
- human capital—skills;
- renewable natural capital—forests and marine resources; and
- non-renewable natural capital—coal, gas and minerals.

Intragenerational equity is about the distribution of the outputs of this capital within a generation. Intergenerational equity is about how much and what type of capital base is passed on to future generations. Tacconi and Bennett (1995) describe three degrees of intergenerational equity.

- Extensive—different generations have equal access to natural capital. Use of non-renewable natural capital must be offset by additional natural capital. Alternatively, the use of non-renewable capital must be offset by technological advance that expands its use.
- Intermediate—the changes in the stock of renewable natural capital must be non-negative. The stock of non-renewable capital is depleted.
- Minimal—sufficient renewable natural capital is maintained to provide life support functions.

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3.4 Institution Building

In 1970 Vanuatu obtained independence from a condominium of France and Britain. The traditional land ownership structure invests in the

landowner all rights to the access and use of the land and associated river and marine areas. The landowner may be a single chief or a family. In the past this structure, with its associated rights of use, payments for use and use taboos, worked well in maintaining the environmental quality of the area for the community and future generations. However, the power of the chiefs in some areas has been eroded with detrimental effects on the resources. In addition, with the advent of more immediate returns on the exploitation of the resources—in particular the timber and marine resources—this has resulted in over-exploitation in some areas, pushing the renewable resource into decline. The gains from exploiting the resource have not always been returned to the community and in these cases the welfare costs can be large.

While the institutions have improved the control of the traditional landowners, this has sometimes been at a cost to the community. Even when the forest resource is protected, community access may be severely restricted, reducing the use benefits of the forest. In general, the net benefit for the community of protecting the forest will far outweigh the costs of greater control over the resource. This is also true for marine areas when the impact of landowner over-exploitation on future generations is taken into account.

In Vanuatu there have sometimes been considerable difficulties in establishing the rightful owners of the land, and claims and counter-claims abound. This has created incentives for logging agreements to be made without community consultation as alternative ownership claims often arise when the land is perceived as valuable.

Conservation Unit in Department of Forests

The project was instrumental in establishing the Conservation Unit in the Department of Forests. This Conservation Unit has been involved in advising on the establishment of PAs in a number of areas. They have more requests from landowners than they can deal with, and are streamlining operations to concentrate on fewer key areas. The Unit and the Department of Forests have raised awareness of the potential environmental costs of logging. This is a key driver in developing acceptance of codes of practice for harvesting trees and in enhancing the role of the forestry officer on logging sites.

Vanuatu Biodiversity Conservation Trust Fund

The project assisted in setting up the Vanuatu Biodiversity Conservation Trust Fund, for the purpose of funding the lease payments to the traditional

landowners of the EKPA. The establishment of the PA had been agreed between the traditional owners and the Government of Vanuatu prior to the project, but the project contributed to the design of the lease agreement (Box 2).

Box 2. History of Erromango Kauri Protected Area (EKPA)[a].

1971 Establishment of EKPA suggested by Royal Society—Percy Sladen expedition.

1974 Societie Agathis ceased logging on Erromango.

1985 Neil (1985)—proposal to conserve 1500 hectares to preserve *Agathis macrophylla*—research value of existing stocks stressed as the variety present has good plantation potential.

1987 Gillison and Neil reviewed ecological status—suggest 3000 hectare for conservation status. Proposed:
- World Heritage listing;
- issue of compensation be addressed; and
- forest inventory and further ecological study be conducted to assess appropriate compensation.

1989 Food and Agriculture Organization of the United Nations (FAO) commissioned Leaver and Spriggs to confirm conservation value. Suggested further tasks are to:
- establish appropriate conservation status;
- establish EKPA as part of a national protected area strategy;
- seek appropriate international recognition; and
- establish compensation framework.

1989 Barrance (Department of Forests) suggested a percentage of foregone royalties is inappropriate as:
- value of undisturbed state is not recognised; and
- value of soil erosion prevention not recognised.

[a]*All sources in Box 2 are cited in Tacconi and Bennett 1997.*

Development of by-laws on the powers of landowners

On the island of Malekula, a number of areas for consideration for PA status had been identified by the Local Government Council (LGC). Legislation—*Bill for the Decentralisation and Local Government Regions, Act No. 1 of 1994*—provided the LGC with the power to establish

such areas in 1994. The project was instrumental in establishing a by-law, modelled on legislation, prepared for the Solomon Islands and modified to suit the conditions in Vanuatu, which provides the legal framework for the establishment of PAs. Landowners, having set out the conditions for the PA, can request the LGC (replaced by the Council of the Malampa Region in 1994) to decree a PA on their land. These conditions generally include all traditional uses of the land, the main exclusion being logging. Success in establishing a PA under these conditions tended to result in the traditional chiefs reasserting control over uses of the forest (and in some situations, riparian and marine) areas.

4. Project Outcomes

The current funding provided by the European Union (EU) for the lease agreement on the EKPA is due to expire in 2000. The Biodiversity Conservation Trust Fund is about to be established, due for government approval by the end of May 1998. This should provide sufficient funding for the 75 year lease. This approach is currently being investigated for the establishment of other PAs but to date EKPA is the only area with established compensation.

At the end of the project four PAs on Malekula had been agreed for a period of ten years and one for five years under the by-law. Details of the areas are given in Table 1. In addition to the areas developed by the project, other areas have been set up as PAs (Conservation Unit, pers. comm.).

- A forest area of 1 000 hectares is being set up in Antiole on Erromango.
- The Vatthe Conservation Area Big Bay on Santo Island protects approximately 2 500 hectares of forest in a total area of 4 000 hectares.
- Also on Santo, the Loru Protected Area has been established with a forest area of 100 hectares and a total area of 200 hectares.

While it appears that all areas developed as PAs under the project have remained protected, it is not clear that all areas will remain unlogged after the expiry of the current agreements. The only certainties for ongoing protection are EKPA and Nagha mo Pineia.

Table 1. Protected areas (PAs)

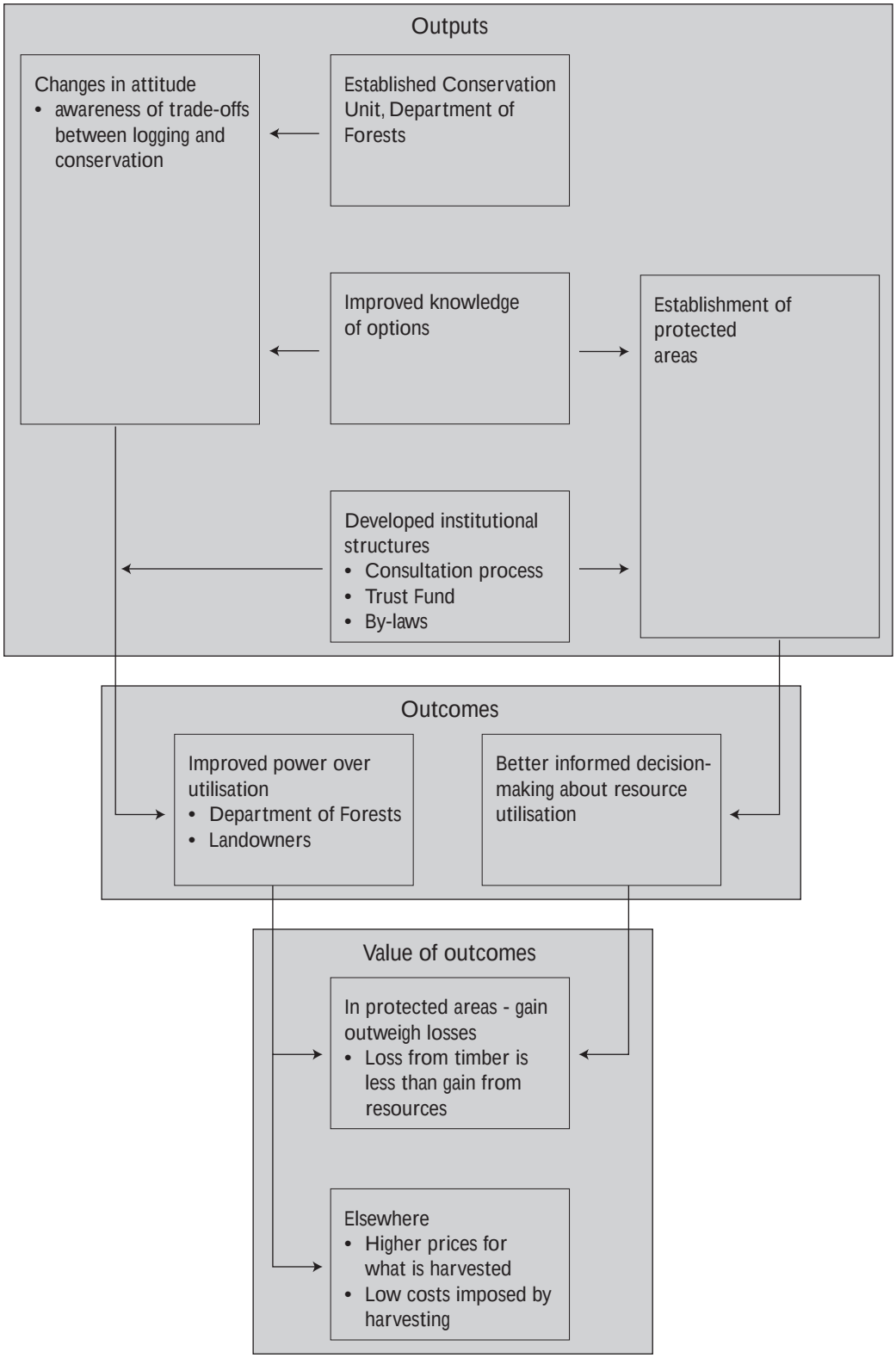
	Forest area (ha)	PA area (ha)	Other features	Years
Erromango	2 641	3 257	5	
Malekula				
Nagha mo Pineia	Small	1 050	Marine	10
Vendik Dik	260		8 km reef	5
Lakorombanga	1 360	4v390	River	10
Pankumo	5 090	11 500	River	10
Nevnal	180	530	Marine	10
Share of total forest area	17%			

Note: If we assume that 80 per cent of the PA forest area is loggable, then 17 per cent of the total loggable areas in Vanuatu are now protected.

The sustainability of the PA agreements in several areas is brought into doubt by a number of recent events. Round log exports were banned in July 1994. However, this ban was lifted on July 1997 (Decision 141). The volume of round wood log exports approved is 180 000 m^3 (to December 1997). This is well above the sustainable cut (see next section), and may be largely for allowing export of already cut material. However, with the removal of the export ban on logs, greater areas of forest are likely to be logged.

There is also evidence of logging against the wishes of the local landowners—the court recently found in favour of a chief, who burnt a bulldozer belonging to Santo Veneers and Timber Ltd., as they were logging in an area for which they did not have a contract. Environmental groups estimate that at the current rate of logging, the islands could be stripped of merchantable timber in less than eight years (IDEAs, pers. comm.). The Department of Forests is attempting to ensure sustainable forest management to prevent this outcome. PAs are an important component of the strategy. Figure 3 summarises the outputs and outcomes of the project.

Figure 3. Outputs and outcomes of the project.



5. The Value of Forests in Vanuatu

5.1 Forest Resources —Timber

Quantity of timber

Vanuatu has a relatively small volume of timber, but its tropical hardwoods are in high demand. Table 2 summarises the forest areas and the area of accessible closed canopy forest that produces the highest value timber and is also of greatest concern for biodiversity protection.

Table 3 summarises the quantity of merchantable timber in Vanuatu. This is the amount of roundwood timber that is accessible in Vanuatu forests. Estimates of the maximum sustainable cut—the annual volume that can be harvested on an ongoing basis—vary. Estimates range from 22 800–52 700m^3 per year depending on the assumptions used about forest quality and yields. The Department of Forests set the sustainable yield at 66 000m^3. More recent information from the Department of Forests sets the sustainable cut at 40 000m^3. However, current licenses allow for a maximum cut of 224 300m^3.

Table 2. Forest areas.

	Total (ha)	Malakula (ha)	Share of total (%)	Erromango (ha)	Share of total (%)
Land	1 226 905	207 756	16.9	88 874	7.2
Forest	438 279	75 306	17.2	48 681	11.1
Loggable	116 640	20 200	17.3	13 450	11.5
Closed canopy forest					
Total	109 928	5 848	5.3	25 342	23.1
Accessible	44 976	5 790	12.9	13 598	30.2

Note: Loggability is a result of Vanuatu logging codes that prevent logging on slopes of greater than 30 degrees. Other landforms are also taken into account to estimate loggability.
Source: Estimates from Table 2.3, Tacconi and Bennett (1997) and from Table 2.4, Baldwin (1993, cited in Tacconi and Bennett 1997).

Industry structure

There are five foreign-owned timber companies (four Malaysian) operating in Vanuatu—Santo Veneers and Timbers Ltd., SK Logging, Pacific Veneers, Erromango Lumber Ltd. and Parklane. While there are a number of small local operations based largely around portable sawmills,

the dominance of foreign-owned companies means that the increase in the royalties and license fees result in a higher share of the resource rent being returned to the domestic economy.

The majority of the logging operations are centred on Santos. Santo Veneer and Timbers recently established a US$20 million saw mill on Santos.

The Department of Forests, assisted by an AusAID project, has been developing codes of practice for both the harvesting and the regeneration of forest. The production of simple 'how to' manuals and training courses for department officers and industry have already significantly improved harvesting practices.

Table 3. Estimated sustainable cut.

	Unit	Pacific species		Vanuatu species		
		Baldwin	Incoll	Incoll	Incoll	Incoll
Total volume	Mm^3	12.120		12.883		9.351
Loggable	Mm^3	7.210		8.851		6.454
Yield	m^3/ha	15	15	10	15	10
Merchantable	Mm^3	1.139	1.887	2.638	2.585	1.921
Sustainable yield	m^3/yr	22 800	37 700	52 700	51 700	38 400

Note: Loggability is a result of Vanuatu logging codes that prevent logging on slopes of greater than 30 degrees. Other landforms are also taken into account to estimate loggability.
Source: Tacconi and Bennett (1997), Table 2.5; Baldwin et al. (1993, cited in Tacconi and Bennett 1997), Incoll (1994, cited in Tacconi and Bennett 1997).

Employment

The industry employs about 1 000 full-time workers earning around 1 800 vatu a day. In addition, another 1 000 workers are employed for approximately half the year at around 900 vatu a day. These temporary workers are often drawn from the local labour supply. The analysis assumes that the opportunity cost of the full-time workers is reflected by their wage, but that for local communities logging provides employment opportunities.

5.2 Subsistence Uses

There are a variety of possible subsistence uses of the forests. These are summarised in Figure 4. In the work (rapid rural assessment process) conducted for the project on Erromango very few subsistence uses were identified as being harvested from the main forest areas (dark forest). Gardens, and to a lesser degree secondary forest, were the main source of food, medicines and firewood. While a land dispute in the area on Erromango had resulted in a ban on uses of part of the forest, it did not appear that this impacted on the results (Tacconi and Bennett 1995).

Discussions indicate that there does not apprear to be extensive use of the forest in the PAs on Malakula, however the forest can be a significant source of food such as wild yams if gardens are destroyed by hurricanes. In this way they act as insurance. For areas with good roads with access to alternative sources of food, this is less valuable than in the more remote communities. Such uses should not be discounted, but they are exceedingly difficult to value.

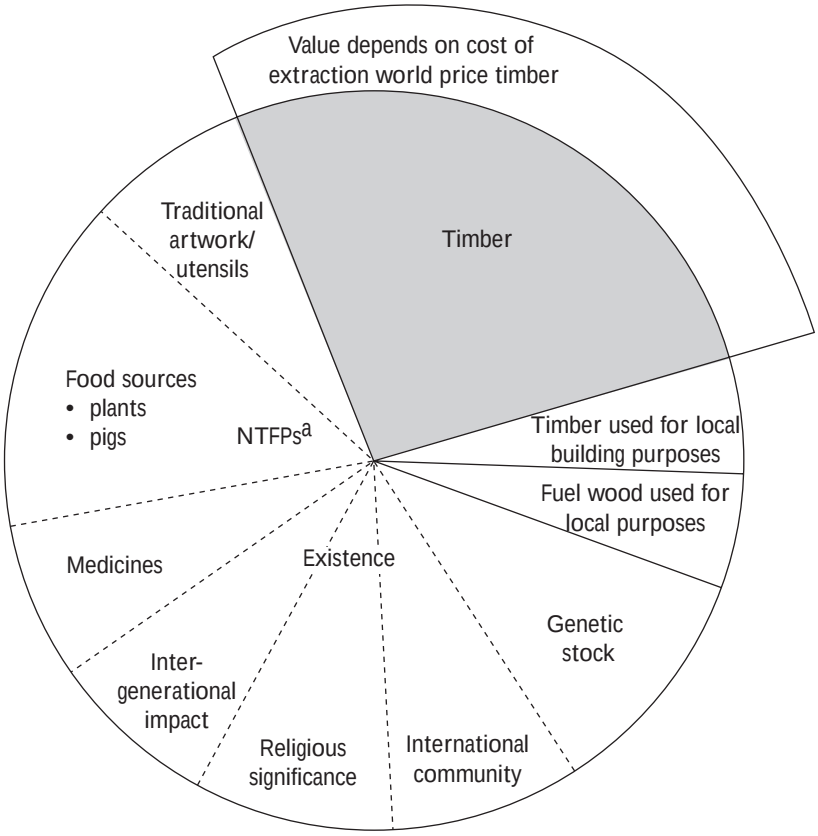
Discussions with officers of the Conservation Unit in the Department of Forests revealed that this is an area where little is known and further research on the contribution of the forests would be of value.

5.3 Other Sources of Income From the Forests

Apart from timber, the main commercial resource from the forests is sandalwood. The marketable product comes from the heartwood that is present in large quantities in old trees that have grown under high stress conditions. However, most sandalwood has been harvested from the accessible areas of the forest. Sandalwood planted in secondary forest and gardens is now the main source of heartwood production.

Ecotourism is often put forward as an alternative source of income. Success in this venture probably depends more on the human resource—entrepreneurship—than the natural resource, which is a necessary but not sufficient condition.

Figure 4. Forest resources and subsistence uses.



Main sources for subsistence production

Gardens	Thickets — previously cleared	Seconday — includes planted trees	Primary forest

• Food
• Medicines
• Building materials (denium)
	• Firewood (novou, nilaru, nangal, pongnut)
	• Building materials (namariu, netar novou)
	• Food
		• Firewood
		• Building materials
		• Sandalwood
		• Food
		  • pigs
		  • wild yam
		  • nuts
		  • edible leaves
			• Few medicines
			• Sandalwood
			• Food in emergencies

[a]NTFP = non timber forest products

5.4 Existence Value

The project conducted two surveys to assess the existence value of the forests.

- A contingent valuation survey was conducted on Australian visitors departing Vanuatu over a two week period during 1994. The payment vehicle was a conservation trust set up specifically for the task of establishing PAs. Fifty eight per cent of respondents were willing to pay something toward the trust. The average amount that survey participants were willin to pay was $20.22.

- A choice modelling exercise consisting of four sets of surveys was used to assess the willingness of Australian households to pay for protection of forests in Vanuatu. This was one of the first uses of choice modelling to elicit conservation values. Unfortunately, the attribute values—area of forest and longevity of protection—did not match up to the outcomes of protected areas in Vanuatu, with the possible exception of the EKPA area.There were several problems in experimental design that would be expected in the development of any new assessment technique. The main problem was the lack of a constant base against which all the scenarios could be assessed. The implication of the survey results is that any average Australian household is willing to make an additional payment of around $3 to a trust fund to protect 10 000 hectares of forest in Vanuatu that has some unique features and will benefit the local community.

Figure 5 summarises the potential benefits and costs flowing from the project.

6. Approach to Evaluation

The value of the project comes from three main sources:

- assisting the locals to take into account the true value of the unlogged forest relative to the benefit they derive from logging the forest;

- supporting the introduction of higher royalties and government fees and charges on logging activities and lowering the environmental costs of logging; and

- allowing the value to the international community of the unlogged forests to be taken into consideration.

These benefits can be represented as changing the demand for and supply of unlogged forest (Figure 6). By providing information and institutional structures the project focused on ensuring decision-making was based on the true local demand for forests. This project, along with others, shifted the demand for unlogged forests out to the actual marginal private benefit curve. The net benefit delivered by this project is the area below the demand curve above the logging returns, however the value of the PAs is the sum of the two. The net benefit is made up of the value of the non-timber forest products and the existence values of the forest to the current generation, including intergenerational equity considerations. Unfortunately these benefits cannot easily be estimated, so for the purpose of this assessment we assume that they are 20 per cent of the logging value of the forest. Twenty per cent is chosen as the value of forest to local communities is likely to rise with scarcity. It is based on the assumption that most valued area delivers an additional value of between 40 and 50 per cent of the logging returns.

The second area of net benefit comes from the project outcomes facilitating the introduction of better logging practices, lowering environmental costs, and raising the royalties for landowners and the government. The fees paid to the Department of Forests for managing the harvest are a minimum value estimate of the saving in environmental costs—given that improved practices are lowering rather than raising costs for the logging operator (Department of Forests, pers. comm.). These and the higher royalties are represented by a shift upwards in the supply curve. The value comes from the extra value captured on the areas that are logged (Figure 6). For this assessment we assume that sustainable volumes of timber (40 000 m^3 per year) will be cut in the future. The extra value can be attributed to these volumes, allowing some years for the practices to be phased in. As the decision to protect the areas was made prior to the impact of the project, the logging value of these areas upon which decisions were based is the original supply curve.

Figure 5. Benefits and costs of the project (PA = protected area).

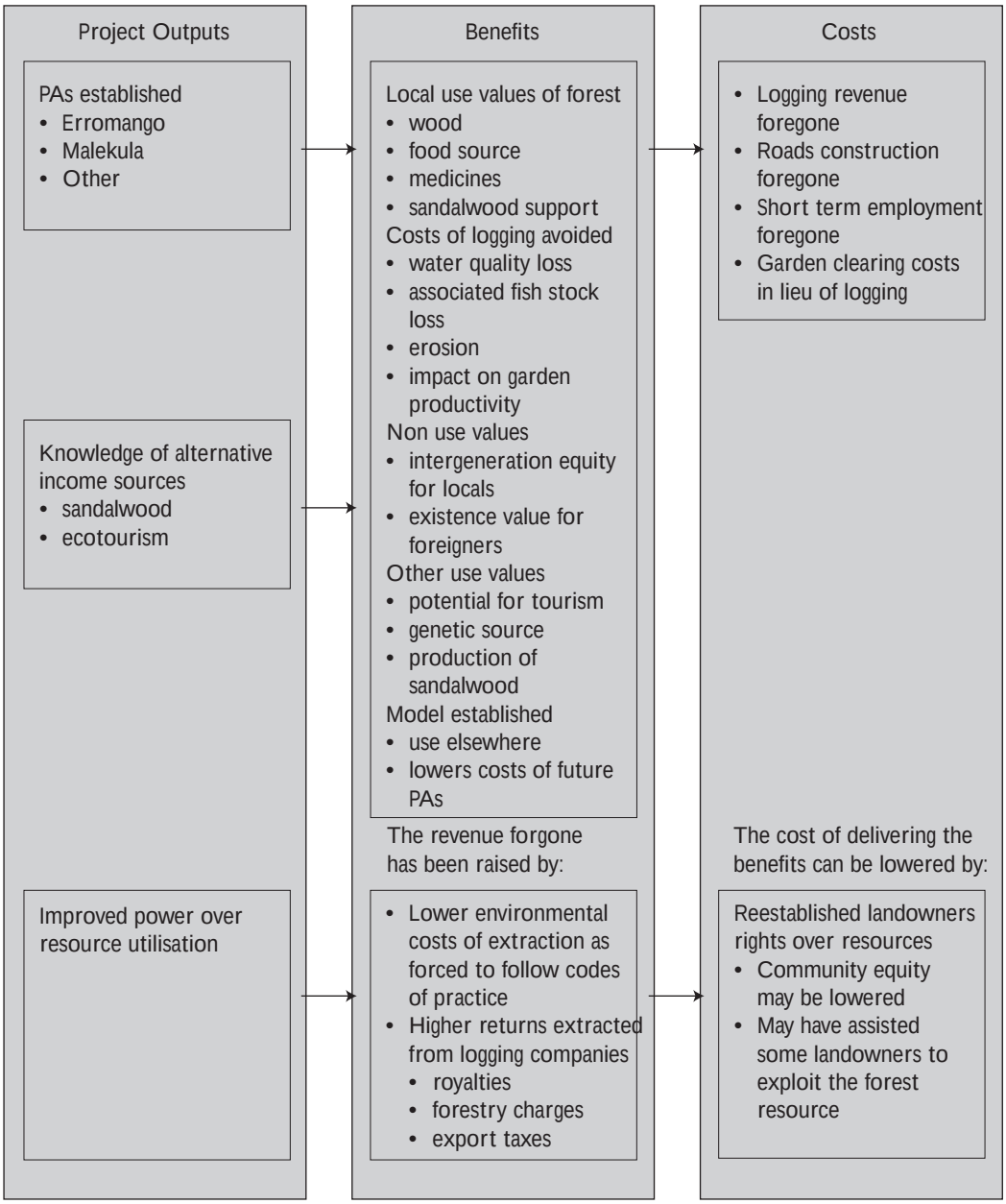
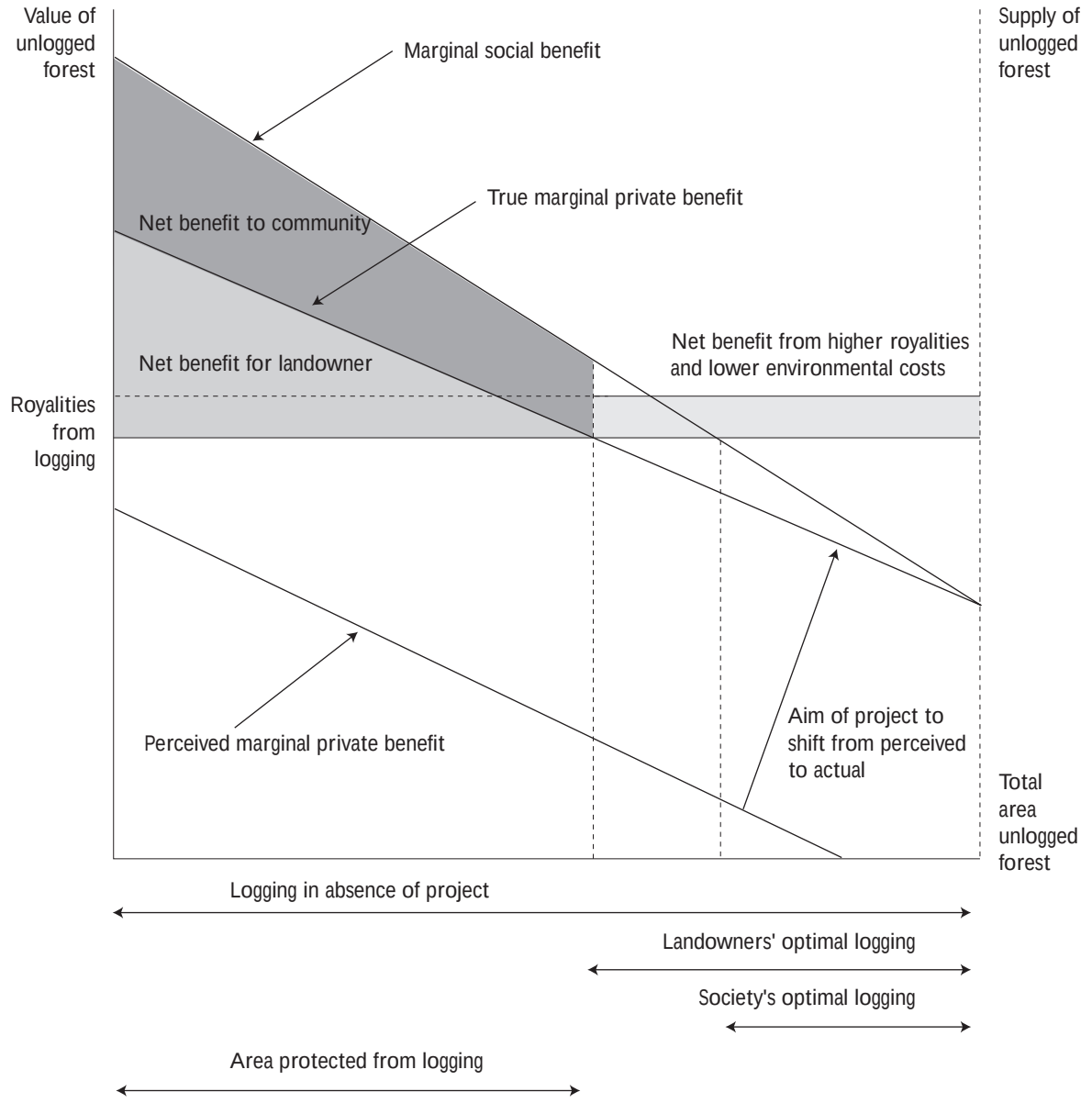


Figure 6. Estimating the net benefits.



The third source of potential net benefit for the country is based on capturing some of the value Australian tourists place on the forests. The project estimated that tourists were willing to pay a once off figure of $20 for preserving forest areas. If captured by the government through a tax on tourists this will accrue to the country, otherwise it represents a net benefit to Australians who visit Vanuatu. This may or may not be associated with a use value of the forest areas. The assessment assumes that tourism by Australians grows at one per cent per year, and that the willingness to pay is based on the current level of protected areas.

The last source of net benefit accrues to the international community. The project estimated that, on average, the value to Australian households of PAs on Vanuatu was three dollars. This existence value, and the value to Australian tourists, is represented by the gap between the marginal private benefit curve and the marginal social benefit curve in Figure 6.

6.1 Unquantified Benefits

There is potentially an additional source of benefit from the project that is not included in the quantitative assessment. The economic evaluation of sandalwood production demonstrated that, at least for the rocky areas of Erromango, plantation sandalwood production is economically viable. The Review Team (ACIAR 1996) found that there had been an increase in small holder plantings in the area, but the influence of the project on this outcome is not quantified. Additional funding from the Australian High Commission was used to assist in a nursery establishment, and this may be an important source of the impact.

While an improvement in prices of sandalwood has been observed, there is no information on whether the findings of the review of sandalwood prices were responsible for this outcome. The Department of Forests expressed the opinion that there is little wild sandalwood left in most areas.

The net benefits to the local community (landowners) are:

- avoided net costs associated with logging activities—the value of any roads that would have been built and garden areas cleared less avoided environmental costs (these are unique to each area);
- value of the wood products from the forest for building and firewood (estimated to be very small);
- value of the non-timber forest products (estimated to be low except as insurance value); and
- value of existence for intergenerational equity and other purposes such as religious significance (impossible to value).

These are estimated as a proportion of the logging and associated employment revenue foregone.

6.2 Project Costs

The funds invested jointly by the University of New South Wales and ACIAR in the project are estimated to be $383 088 (ACIAR 1996). The project costs used in the assessment are given in Table 4. The Department of Forests (Vanuatu) provided one full-time research officer for the project, however the cost of this officer should be assessed at the shadow price—the benefit from undertaking alternative activities. Offsetting this cost is the training benefits of working on the project team, so for the purpose of the assessment these are assumed to roughly cancel out.

Table 4. Project costs.

Year	$
1992	130 400
1993	151 796
1994	143 516

Source: Centre for Internation Economics calculations.

6.3 Project Impacts

A number of the protected areas had been identified prior to the project and, while the project influenced their survival, it cannot be attributed with the full benefits derived from their existence. Similarly the project influenced the outcome of better logging practices and higher royalties, but is not solely responsible for these outcomes.

The assumptions about the influence of the project follow.

- Ten per cent of the EKPA returns can be attributed to the project as it was involved in ensuring that the Trust Fund was developed.
- The areas of Nagha mo Pineia, Vendik Dik and Pankumo had been identified to the LGC on Malekula prior to the project. The project was instrumental in establishing the by-laws supporting their existence. Fifty per cent of the net benefit of these areas is attributed to the project.
- The areas of Lakoromba and Nevnal were suggested as PAs by the project. The full net benefit of protecting these areas is attributed to the project.

- The project is assumed to have contributed ten per cent of the force behind raising royalties and promoting codes of practice.
- The project is fully attributed with the benefits to Australian tourists as it is this estimation that may be instrumental in setting up a conservation levy on tourists.
- The willingness to pay of Australian households is attributed to the project in the results below, but clearly these results should be treated as indicative of the overall value placed on improving forest conservation throughout the region.

It is assumed that logging would have taken place in the areas that are now protected on the schedule described in Table 5.

Table 5. Logging potential of protected areas.

	Forest area	Quantity of timber	Value of royalties	Value of employment	Total value logging	Assumed dates of logging		Proposed clearing for gardens
	ha	m^3/ha	million vatu	million vatu	million vatu	Start	Finish	
EKPA[a]	2 641	26 410	24.54	27.01	51.55	1992	1994	No
Nagha mo	20	200	0.16	0.20	0.36	1994	1994	No
Vendik Dik	260	2600	2.08	2.66	4.74	1996	1996	Yes
Lakoromba	1 360	13 600	10.88	13.91	24.79	1996	1997	Yes
Pankumo	5 090	50 900	40.72	52.06	92.78	1996	2000	Yes
Nevnal	180	1800	1.44	1.84	3.29	1996	1996	No

[a]EKPA = Erromango Kauri Protected Area.

Source: Centre for International Economics calculations.

The assessment concentrates on the areas developed by the project. All areas are treated as though PA status is continuing, which overstates the benefits if PA status is not renewed, which for some areas may be the case. The projects also contributed to several PAs established after the project concluded. Omitting these PAs from the assessment understates the benefits. These two sources of error are assumed to roughly cancel each other out as they involve similar areas of forest.

7. Results of Assessment

The base case assumes:

- the benefit flows from the landowners' use and non-use value of the forest is equivalent to 20 per cent of the foregone timber revenue and employment;
- the project contributed 10 per cent of the actual improvement in royalties and reduction in environmental costs in areas that are logged on a sustainable basis;
- tourism grows at 1 per cent a year, and the value of protected areas remains at $20 per tourist. If a tourist tax is instituted this returns to the Vanuatu economy, if not then the benefit accrues to the Australian tourist to Vanuatu.

The estimates of the net benefits are given in Table 6 for discount rates of 0, 5 and 10 per cent. The internal rate of return (IRR) on the project is 22 per cent. At a five per cent discount rate, the net present value (NPV) of the project is just under $1.5 million, a benefit cost ratio of 4.5:1. The stream of benefits are given in Appendix I.

Table 6. Net benefits of the project.

	Unit	Discount rate		
		0	0.05	0.10
Present value of benefits	$ million	4.62	1.89	0.96
Present value of costs	$ million	0.46	0.42	0.38
Net present value	$ million	4.17	1.47	0.58
Benefit–cost ratio	10.10	4.50	2.50	
Internal rate of return	22%			

Note: Includes local employment foregone. Logging revenues foregone at royalty of 800 vatu/m^3 and 1300 for Kauri.
Source: Centre for International Economics calculations.

7.1 Components of the Net Benefit Estimate

The total benefit flow is made up of the benefit to the landowners of the PAs, the broader community, and Australian tourists. Table 7 provides the estimates of the net benefits to each of these groups. The total benefit of the project as a share of national income is 0.7 per cent.

Table 7. Contribution to net benefits at a 5 per cent discount rate.

	Unit	Landowners	Domestic community	Tourists	Total
PV[a] benefits	$ million	0.14	1.07	0.67	1.89
	% GDP	0.05	0.37	0.23	0.66

[a]present value [b]gross domestic product

Note: The value to the landowner is net of logging royalties foregone.
Source: CIE calculations.

Net benefits to the landowners of protected areas

The net benefit of the PAs to the landowners attributed to the project is estimated at $140 000 at a 5 per cent discount rate. The project is attributed with only part of the net benefit as a number of the areas might have been protected in the absence of the project. The total net benefit to the landowners of the PAs is estimated at $0.98 million at a 5 per cent discount rate. Relative to an annual per capita income of around $1 600, there is a considerable benefit to the seven landowner groups involved, and to the local communities.

The value placed on the PA must clearly be greater than the return from logging, otherwise the landowners would not have agreed to protecting the area. The exception is the EKPA—as they are compensated for the logging royalty (although not employment) loss. The total value of the PA is the logging revenue foregone plus the net benefit. The total logging revenue forgone is estimated to be $2.2 million at a 5 per cent discount rate.

This suggests that the total value of the PAs to their owners exceeds $3.2 million.

Net benefit to the domestic community

The contribution of the project to higher royalties and improved logging practices is estimated at $1.07 million. The total present value of the higher royalties and improved logging practices—which is the outcome of the project and a number of other activities outlined in Figure 1—is estimated at $11.4 million.

Potential net benefit to the domestic community—charging tourists

The value of the protected areas to Australian tourists is estimated at $0.67 million. This accrues to Australian tourists unless the Vanuatu government install a tourist tax to capture this rent.

7.2 Sensitivity Analysis

To test how sensitive the estimates are to the assumptions made, we estimate the NPV and IRR under a number of different assumptions. These are summarised in Table 8.

Table 8. Sensitivity analysis results.

	Change in PV benefits on base estimate $million	PV benefits $million	NPV $million	IRR %
Base estimate		1.89	1.47	22
Value to landowners — 50%	0.21	2.10	1.68	28
Value to landowners — 10%	–0.07	1.81	1.40	21
Impact on logging returns — 20%	1.07	2.96	2.54	28
Impact on logging returns — 5%	–0.54	1.35	0.93	18
Tourism growth — 5% per annum	0.51	2.40	1.98	24
No tourist payment	–0.67	1.22	0.80	15
Total upside scenario	1.80	3.68	3.27	34
Total downside scenario	–1.28	0.61	0.19	8

Note: PV = present value, NPV = net present value, IRR = internal rate of return
Source: Centre for International Economics calculations.

For each type of contribution we run what we consider are feasible upside and downside scenarios. We then combine the upside scenarios to get a maximum likely bound, and combine the downside scenarios to get a minimum likely bound. The maximum likely bound for the IRR on the project is 34 per cent, with a NPV of almost $3.3 million. On the downside, the minimum likely IRR is 8 per cent, and the NPV is $0.19 million at a 5 per cent discount rate.

Net benefit to landowners

If, on average, the benefits exceed the logging royalties by 50 per cent rather than 20 per cent, the landowners' benefits rise by $0.21 million. The IRR on the project rises to 28 per cent.

If the benefits to landowners are only 10 per cent above foregone logging returns, then the IRR on the project falls to 21 per cent, and landowners net benefit is $0.07 million.

Net benefit to the broader community

While the net benefit to the broader community does not change under these different scenarios the amount that is attributable to the project does. If the project is responsible for 20 per cent of the change instead of 10 per cent, then the pay-off of the project rises to a NPV of $2.5 million with an IRR of 28 per cent.

If the project can only be attributed with 5 per cent of the improvement in logging royalties and practices, the IRR falls to 18 per cent and the NPV to $0.93 million.

Net benefit to tourists

The return to tourists depends on tourist numbers and their willingness to pay. As an upside scenario we assume a growth rate of 5 per cent in Australian tourists. This increases the IRR to 24 per cent, giving a NPV of $1.98 million.

The downside scenario is that the tourism drops to zero, or that they are not willing to pay anything. In this scenario, the IRR falls to 15 per cent, and the NPV to $0.8 million.

7.3 Total Value of Protected Areas

The estimates of the value of the existence of forests in Vanuatu made in the project can be applied to estimate the total value of the protected areas. These estimates depend on a number of conditions, of which few are likely to be met. While they are a reflection of value placed on forest preservation, they should not be taken as a willingness to pay by Australian households for the PAs promoted by this project.

The project estimated, for the average household in Australia, a willingness to trade off protected areas in Vanuatu for a $3 trust fund payment for conservation work. This is roughly equivalent to a once off payment of $13.5 million in 1994. At a 5 per cent discount rate, such a payment would support an annuity of around $0.5 million a year. While applying this to the value of the protected areas in Vanuatu is a long stretch, it is reasonable to argue that these estimates reflect a willingness of Australians to pay around half a million dollars a year to improving the conservation outcomes in the Pacific Island region.

Discussions were held with:

- Professor Jeff Bennett, Project Leader, Australian Defence Force Academy, University of New South Wales, April 1998.
- Ms Andrea Clark, Ideas Vanuatu, May 1998.
- Ms Helen Corrigan, Conservation Unit, Department of Forests, Vanuatu, May 1998.
- Mr Adam Gerrand, Principal Forest Utilisation Officer, Department of Forests (Vanuatu), April 1998.
- Professor Ron Duncan, Centre for Development Studies, Australian National University, April 1998.
- Dr Luca Tacconi, Project Officer, AusAID, April 1998.
- Mr Dan Raymond, Margills Porphy, April–May 1998.
- Dr John Rolfe, University of Central Queensland, May 1998.

References

ACIAR (Australian Centre for International Agricultural Research) 1996. The socioeconomic assessment of native forest preservation proposals in Vanuatu: implications for forest management. ACIAR project review No. 9020. Canberra, Australian National University, confidential.

Tacconi, L. and Bennett, J. 1995 Economic implications of intergenerational equity for biodiversity conservation Ecological Economics, 12, 209–224.

Tacconi, L. and Bennett, J. ed. 1997, Protected area assessment and establishment in Vanuatu: a socioeconomic approach. ACIAR Monograph No.38, Canberra, ACIAR.

Appendix I

Table A1. Benefit and cost flows.

Year	Research costs		Benefits—Vanuatu					Totals	
			Landowners		Community		Tourists	Gross benefits	Net benefits
	Nominal $	1996 $	1996 vatu	1996 $	1996 vatu	1996 $	1996 $	1996 $	1996 $
1992	130 400	141 993	0	0	0	0	0	0	–141 993
1993	151 796	163 226	0	0	0	0	0	0	–163 226
1994	143 516	153 074	0	0	0	0	42 664	42 664	–110 410
1995	0	0	343 663	4 011	0	0	42 646	46 881	46 881
1996	0	0	5 808 199	67 797	1 010 515	11 795	41 845	123 467	123 467
1997	0	0	4 714 563	55 032	2 778 916	32 437	41 212	128 681	128 681
1998	0	0	1 855 536	21 659	4 547 318	53 079	41 624	116 363	116 363
1999	0	0	1 855 536	21 659	6 315 719	73 721	42 040	137 421	137 421
2000	0	0	1 855 536	21 659	8 084 120	94 363	42 461	158 483	158 483
2001	0	0	0	0	8 084 120	94 363	42 885	137 249	137 249
2002	0	0	0	0	8 084 120	94 363	43 314	137 678	137 678
2003	0	0	0	0	8 084 120	94 363	43 747	138 111	138 111
2004	0	0	0	0	8 084 120	94 363	44 185	138 548	138 548
2005	0	0	0	0	8 084 120	94 363	44 627	138 990	138 990
2006	0	0	0	0	8 084 120	94 363	45 073	139 436	139 436
2007	0	0	0	0	8 084 120	94 363	45 524	139 887	139 887
2008	0	0	0	0	8 084 120	94 363	45 979	140 342	140 342
2009	0	0	0	0	8 084 120	94 363	46 439	140 802	140 802
2010	0	0	0	0	8 084 120	94 363	46 903	141 267	141 267
2011	0	0	0	0	8 084 120	94 363	47 372	141 736	141 736
2012	0	0	0	0	8 084 120	94 363	47 846	142 209	142 209
2013	0	0	0	0	8 084 120	94 363	48 324	142 688	142 688
2014	0	0	0	0	8 084 120	94 363	48 808	143 171	143 171
2015	0	0	0	0	8 084 120	94 363	49 296	143 659	143 659
2016	0	0	0	0	8 084 120	94 363	49 789	144 152	144 152
2017	0	0	0	0	8 084 120	94 363	50 287	144 650	144 650
2018	0	0	0	0	8 084 120	94 363	50 789	145 153	145 153
2019	0	0	0	0	8 084 120	94 363	51 297	145 661	145 661
2020	0	0	0	0	8 084 120	94 363	51 810	146 174	146 174
2021	0	0	0	0	8 084 120	94 363	52 328	146 692	146 692
2022	0	0	0	0	8 084 120	94 363	52 852	147 215	147 215

Year	Research costs		Benefits—Vanuatu					Totals	
			Landowners		Community		Tourists	Gross benefits	Net benefits
	Nominal $	1996 $	1996 vatu	1996 $	1996 vatu	1996 $	1996 $	1996 $	1996 $
2023	0	0	0	0	8 084 120	94 363	53 380	147 744	147 744
2024	0	0	0	0	8 084 120	94 363	53 914	148 277	148 277
2025	0	0	0	0	8 084 120	94 363	54 453	148 817	148 817
2026	0	0	0	0	8 084 120	94 363	54 998	149 361	149 361
2027	0	0	0	0	8 084 120	94 363	55 548	149 911	149 911
Present value		415 513		141 501		1 072 595	669 829	1 885 698	1 470 185

Source: Centre for International Economics estimates.