ECONOMIC ASSESSMENT OF AN ALTERNATIVE LIVELIHOOD TO INDIGENOUS FOREST USE BY A RURAL COMMUNITY IN KWAZULU-NATAL.

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1. Introduction

1.1 Need for research in this field

Forests are important to rural people because they are sources of fuel, construction and craft timber, medicines, and food (Scholes, 2004) and are culturally significant. They are regarded as the "poor peoples' safety net" or a "subsidy from nature" (Lawes *et al.,* 2004a), providing as much as 35% of rural household income. Indigenous forest is particularly vulnerable to exploitation in South Africa because there is very little of it (0.56% of the land surface area: (Low and Rebelo, 1996), the pressure to use it is high and most forest areas are, in reality, poorly managed. Natural products are often essential for the survival of rural people (Lawes *et al.,* 2004b). Forest products are widely used and the value of resources harvested from communal, private and state forests is substantial but often underestimated (Mander, 1998). This is because most products from indigenous forest form part of a "hidden economy" and are mostly not openly marketed (Lawes *et al.,* 2004b). Many plant uses have also not been documented and thus remain unknown to all but the users. A major challenge facing conservation in South Africa is to develop sustainable harvesting practices as part of the conservation and management of forests (Lawes *et al.*, 2004b) and to develop alternatives to direct consumptive use of forest products

The 616ha iGxalingenwa forest is located in the southern Drakensberg mountains of KwaZulu-Natal, South Africa. The forest is state owned and is currently managed by the provincial conservation agency, KZN Wildlife. iGxalingenwa is an Afrotemperate mistbelt forest, which is a forest type not well conserved in the province. The remote locality of the forest and the fact that most of the neighbouring rural community is unemployed or recipients of small State pensions, result in these communities being dependent on the forest for essential resources such as fuel, construction material and medicines (Robertson & Lawes, unpublished). However, the forest is also important for the biodiversity it contains and in particular, is one of a few forests in the greater KZN midlands used by the endangered Cape parrot. The forest is also an important water catchment feeding into the Umzimkulu river.

There is considerable harvest pressure for fuel, building material and traditional medicine on most of the scattered forests of the southern Drakensberg (Nomtshongwana, 1999). Rural populations have increased steadily in the region since the 1960s, resulting in an increasing demand for resources, particularly fuel, construction material and medicine, from these forests (Nomtshongwana, 1999). In addition, the centralized and authoritarian policing approach to forest management implemented by the state prior to 1994 has proved ineffective in achieving sustainable use of forest resources (Robertson & Lawes, unpublished). Furthermore, traditional authority in many areas has weakened for various reasons since 1994 (Obiri & Lawes, 2002; von Maltitz & Shackleton, 2004). Until recently, communities neighbouring and using indigenous forest have been denied any form of access rights and responsibility, thereby removing any incentive to use the forest sustainably.

The community living adjacent to iGxalingenwa forest consists of approximately 2500 people living in 250 households, with a mean household income of R250 per month. Each household presently uses approximately15kg of fuelwood per day, making a total of 1500 tonnes used by the community annually. Most of this fuelwood is harvested from the indigenous forest as there are no alternative sources of wood in the area (Robertson & Lawes, unpublished). Robertson & Lawes (unpublished) found that under the present circumstances, the community is unwilling to alter resource use and compromise usufruct rights to achieve conservation goals. McKean (2004) suggested that current use rates are likely to render the forest little more than "scrub" in a period of approximately 80 years if current use rates continue or increase. This is likely to result in further environmental degradation and impoverished people due to consequent alien plant invasion, soil erosion and subsequent decrease in downstream water quality, loss of valuable land and increased fire hazard being imposed on local people and downstream communities.

It is essential that alternative sources of fuel and building material to the indigenous forest are found and implemented if the forest is to survive in the long term and the people who live with and use the resources are to improve their livelihoods. To justify the time, effort and resources required to establish

alternative livelihoods to indigenous forest use, alternatives must provide greater economic benefits to the local people than indigenous forest use currently does. To determine whether this is the case, this study aims to assess the economic value of indigenous forest use to people neighbouring iGxalingenwa forest and compare this to an economic assessment of an alternative strategy.

1.2 Goals of the research

The project aims to answer the question: "Are potential alternatives to indigenous forest use likely to provide greater economic benefit to community members than current practices of extractive use of indigenous forest?" In addressing this question, this project assesses the following:

1. The economic value of the current forest use regime to the surrounding people.
2. The economic value to the surrounding people of potential alternatives, such as establishment of *Eucalyptus* species woodlots in terms of an outgrower scheme and entrepreneurial opportunities such as tourism.

The results of the above assessments are then compared in a cost-benefit analysis, the result of which is used to contribute to the economic aspect of a future strategy for forest conservation and livelihood improvement in the iGxalingenwa area.

1.3 Literature review

Throughout southern Africa forest management systems are being redesigned and reviewed. Forest use policy and strategy is continually being shifted toward improving rural livelihoods in the context of sustainable resource management. A mounting recognition of the economic value of forests to communities is at the root of these changes. In addition, there is a growing recognition that the management of forest areas is vital to the sustainability of rural livelihoods (Robertson & Lawes, unpublished). The availability of alternatives to indigenous forest use is vital to long term sustainable use of forests and for rural upliftment.

Estimates of forest values enable researchers to inform policy makers, donor agencies and local decision makers who are attempting to plan and implement interventions that aim to improve livelihoods and conserve resources (Luckert & Campbell, 2002). Understanding how people will behave in response to changes in their environment is crucial to assessing whether interventions actually improve livelihoods (Luckert & Campbell, 2002) and increase the probability of sustainable resource use. For example, a tree planting programme may be introduced as is proposed for the iGxalingenwa area. Unless something is understood about the factors motivating people to use resources the way they do, a project which has little interest to the people it's aimed at may be introduced (Luckert & Campbell, 2002). Alternatively, such a tree planting project may be structured so that benefits accrue to select segments of society only. Economists assume that people have carefully tried, tested and chosen logic to underpin their actions. The values that people attribute to forest resources are important for understanding this rationale (Luckert & Campbell, 2002) and therefore to successful project implementation.

To understand the importance of indigenous forest resources to rural communities, Lawes *et al*, (2004b) recognize and discuss 3 general categories of value. These are "direct use value" (for consumption or sale), "indirect use value" (mostly environmental functions) and "passive" or "non use value" (cultural, religious or existence value). These are all anthropocentric values. A further value, "intrinsic value", is usually regarded as a category beyond anthropocentric value (Clark & Grundy, 2004). Taken together, the values of all the anthropocentric use types constitute "total economic value" of a forest. While some studies have attempted to derive figures for total economic value, others have focused on understanding and deriving monetary values for specific sets of products (Clark & Grundy, 2004). Most of these studies focus on making such assessments in attempts to place a value on the indigenous forest with a view to encouraging "sustainable use". Very few, if any, accounts of forest value actually examine the economics of potential alternatives to forest use for rural communities as a way to divert pressure off the indigenous forest and to develop a local economy independent of consumptive indigenous forest use.

Although these assessments are vital steps in understanding the role of forests in rural livelihoods, the significance of the forest harvest remains hidden (Campbell & Luckert, 2002). Studies need to assess what forest goods and services are worth to users of these and if there are any viable alternatives which can deliver goods and services of comparable or higher value. To make direct comparisons between the economic values of indigenous forest species and alternatives such as agricultural crops, monetary values are required (Campbell & Luckert, 2002). A central challenge of forest valuation is to generate monetary values for its goods and services, most of which are not formally traded and therefore do not have a value assigned through market mechanisms (Clarke & Grundy, 2004).

Cavendish (2001) discusses some of the characteristics of forest products. Many forest products are "common pool" resources with some showing very little exclusivity. In the face of risk, many products are a source of sustenance or can be used to raise cash in times of emergency. Most forest products do not require high skill levels to obtain them. According to Cavendish (2001) (in Campbell & Luckert, 2002), there is strong correlation between the characteristics of the rural poor and those of forest products such as fuelwood and building timber. It can be predicted that it will be the poorest of the poor who rely on forest products and this is certainly the case at iGxalingenwa forest as shown by Robertson and Lawes, (unpublished) and Nomtshongwana (1999). According to Cavendish (2001), forest products are goods which households use according to the economic nature of the product in question. Each product has particular physical, technical and economic characteristics that may or may not make people want to use them. Decisions on use are made in terms of labour investment required, labour availability in the household, quality of the good, quality and accessibility of substitutes and the rules and regulations governing use, including social and cultural norms.

Household forest resource use decisions are influenced heavily by macro-economic policies and by legal and land tenure frameworks which define institutions operating in rural areas (Campbell & Luckert, 2002). In addition to this, resource use decisions are influenced by factors such as property rights, social differentiation, time, risk perceptions and whether values are considered in partial or general contexts (Luckert & Campbell, 2002). Changing property rights in a community is an intervention which will change the social environment of the community, influence resource value and alter behaviour and livelihoods (Luckert & Campbell, 2002). For example, an agency outside of the community may consider implementing a tree growing project, as this project is proposing for iGxalingenwa forest. If the agency promotes planting in communal areas, it may be difficult to convince people to plant, no matter how economically viable it may be (Luckert & Campbell, 2002). Local property rights may dictate that trees may be used and/or harvested by others in the village or even outside it as well as the person doing the tree growing. There is therefore little or no incentive for individuals or households to undertake such endeavours and such projects would need to be community based and run according to an agreed common property regime where the community benefits and not some households only. If, however, tree planting efforts are targeted at homesteads where households have exclusive rights, people are likely to be more willing to participate (Luckert & Campbell, 2002).

However, such a scenario is unlikely to change the community's resource use habits as in this case, many people would not be benefiting from the tree planting project and so would continue to exploit the indigenous forest. Property rights are therefore vital elements of incentive frameworks for behaviour and are key in influencing whether interventions improve livelihoods (Luckert & Campbell, 2002) and contribute to achieving "sustainable use". In the case of this study, iGxalingenwa forest is state owned land but this ownership is poorly enforced. The community views the forest as their ancestral land but do not have legal tenure. As a result, they believe they have rights to use the forest but do not have any responsibility or incentive to conserve it (Robertson & Lawes, unpublished).

2. Research method

Cost-benefit analysis was the approach used for this research and involved the following steps.

2.1 Economic assessment of current forest use

This was done by using existing, mostly unpublished, data from recent socio-economic studies done on iGxalingenwa forest neighbours and also by extrapolating from published data. The following data were used for inclusion in a cost-benefit analysis:

a. Values and quantities of indigenous forest resources used by local people. These data were sourced from existing literature as cited in Table 1 and from unpublished KZN Wildlife monitoring data. Values are based on what it would cost the community to replace what they currently harvest from indigenous forest with alternative timber. Medicinal plants were valued based on replacement costs of amounts harvested from indigenous forest by the community.
b. Costs of indigenous forest use to local people. Data on the cost of potential loss of existing environmental services as a result of forest destruction were derived from existing literature as cited in Table 2. The value of water quality maintenance was based on the estimated amount used by the rural sector in the Umzimkulu area of KwaZulu-Natal and the water value per cubic meter (King, 2004).The cost of not using alternatives to forest use (opportunity costs of Cape Parrot viewing and bird value, yellowwood use) was derived from existing KZN Wildlife unpublished data. The cost of increased fire hazard as a result of forest destruction assumes

an annual loss of 50ha of grazing and /or cropped land at an average net value of R600ha^{-1} and loss of 10 huts at a replacement value of R1000 each (Robertson & Lawes (unpublished); Holland *et al*., 1989).

It is assumed that the values used are representative of the true costs and benefits of indigenous forest use. This may not be a valid assumption as data were derived from varied sources, many of which are out of date.

2.2 Economic assessment of potential alternatives to indigenous forest use.

This was done using existing data as proxies to estimate potential tourism and "ecosystem service" costs and benefits. The following data were used for inclusion in a cost-benefit analysis:

a. Cost and benefit data for establishment of timber woodlots to replace resources harvested from indigenous forest were obtained from Port Elizabeth Technikon staff.
b. "Benefit transfer" and "travel cost" data were derived from existing literature and existing unpublished KZN Wildlife data and used as proxies to estimate potential tourism and "ecosystem service" costs and benefits.
c. Opportunity cost of adoption of alternative livelihood forms to indigenous forest use to local people. Data were obtained from existing literature, assuming that existing resource use would be substituted for alternative livelihoods. Values of existing extractive resource use from forest therefore constituted "opportunity cost".

The costs and benefits of both existing forest use and alternatives to extractive forest use were compared and cost-benefit ratios derived. The cost-benefit ratios were then compared.

2.3 Limitations of the chosen method

There are several theoretical and practical problems with cost-benefit analysis. Firstly, in the absence of more developed measures of welfare, the typical focus of cost-benefit analysis is on the monetary values of benefits and costs, with little or no attention to questions of equity or income distribution (Veeman & Luckert, 2002). The data requirements of high quality cost-benefit analysis are also very high. Further limitations of the method employed above are that data derived from existing literature may not be directly applicable to the current circumstances at iGxalingenwa forest. Potential future benefits need to be discounted according to current benefits. For example, the current value of R10 may be worth more to a community member now than if invested in an outgrower scheme which will provide a R100 benefit in 10 years time. It is extremely difficult to know to what degree benefits need to be discounted.

The difficulty in choosing an appropriate discount rate arises from the need to put all benefits and costs, regardless of their occurrence in time, on the same temporal footing. In this instance, the costs and benefits of establishing alternatives to indigenous forest use were estimated on an annual basis. Annualizing costs and benefits precludes having to select a discount rate with which to discount future flows to present values to allow comparison (Holland *et al.*, 1989). Annualizing should be done only when both benefits and costs are realized uniformly over time. This project assumes this to be the case but this may not be a valid assumption. Cost-benefit analysis may not be perfect but its logic in assessing the pros and cons of alternative courses of action remains extremely useful as a general rational approach to decision making.

Assumptions made in placing monetary value on resources (as discussed above) may not be accurate, but are based on best available information. The assumptions made may result in over and/or under estimates of resource values.

3. Results

3.1 Economic assessment of current forest use

Table 1 shows the value of current indigenous forest use by the iGxalingenwa community. It shows that the annual economic benefit to the community of harvesting fuel, medicinal plants and building material from the indigenous forest is approximately R9.33 million. There are currently no direct economic costs to the community of harvesting from the indigenous forest apart from the opportunity costs of not using alternative building material, fuel and medicine sources and of alternative livelihoods such as tourism. These are described in Table 2. Broader scale environmental costs such as loss of carbon sequestration and release of CO_2 to the atmosphere by forest destruction, forest damage induced soil erosion, alien plant infestation and

loss of possible flood mitigation services by the forest are not considered here for lack of available data. These would clearly need to be considered in an economic assessment of the full costs of destruction of iGxalingenwa forest to the environment and to society.

Table 1. Annual benefits of current use of indigenous forest to the iGxalingenwa community

Benefit	Measure	Valuation	Amount used	Value (Rand)	Reference
Fuel and building material	Use value	Replacement	1500 tonnes	170 700	Nomtshongwana (1999)
Medicinal plants	Use value	Market	102 tonnes	910 000	Nomtshongwana (1999), Mander (1998)
Soil conservation & water quality maintenance.	Option value	Benefit transfer	Unknown	8 250 000	King (2004)
TOTAL				9 330 700	

Table 2. Annual costs of current use of indigenous forest to the iGxalingenwa community (replacement and opportunity costs). These data assume that the forest is destroyed

Impact	Measure	Valuation	Value	Reference
Parrot : asset **Parrot : view**	Existence/ use value	Market / TCM Opportunity cost	R400 000 R520 000	KZN Wildlife unpublished data
Yellowwood: asset	Existence/ use value	Market Opportunity cost	R7200 000	KZN Wildlife unpublished data
Yellowwood: use	Existence/ use value	Market Opportunity cost	R144 000	KZN Wildlife unpublished data
Medicinal plants	Use value	Market, replacement cost	R910 000	Nomtshongwana (1999), Mander (1998)
Fuel and build	Use value	Replacement	R170 700	Nomtshongwana (1999)
Soil loss & water quality	Option value	Benefit transfer	R8 250 000	King (2004)
Fire hazards	Replacement value of housing, grazing, crops.	Productivity loss / loss of property	R40 000	Robertson & Lawes (unpublished), Holland *et al.* (1989)
TOTAL			R17 634 700	

The endangered Cape Parrot is a draw card for tourism and birds are worth a considerable amount (approx. R20 000 per bird) in the international pet trade (KZN Wildlife unpublished records). There are an estimated 20 birds which inhabit iGxalingenwa forest, with the population therefore valued at R400 000. There is potential for captive breeding and sale of Cape Parrots by local people for economic gain but this was not examined by this study. The tourism value of the Cape Parrot is based on an average of 1 bird watching visit per week by tour groups consisting of 10 people each at an average cost per person of R1000. However, assuming that current harvest levels will eventually lead to resource depletion and forest destruction in approximately 80 years (McKean, 2004), the future costs to the community are likely to be considerably higher than the figures indicated here.

From tables 1 and 2, the cost-benefit ratio of indigenous forest use to the community is 1.89. The costs of indigenous forest use to the community are almost twice the benefits. However, as discussed previously, costs are not direct and current costs to the community but are mainly opportunity costs and replacement costs of potential loss of the forest resource. If the potential future costs are removed from the calculation of the cost-benefit ratio, the ratio changes to zero. Hence, in reality, actual benefit of indigenous forest use to the community is high while the current direct costs are extremely low.

3.2 Economic assessment of potential alternatives to indigenous forest use

Table 3 shows the time frames involved and value of establishing a 100 hectare area of *Eucalyptus* spp. plantation as an alternative source of fuel and building material. It is assumed that 100 hectares at a growth mean annual increment of 15 tonnes per hectare per year would be sufficient area on which to establish a plantation which would replace the amounts which the community currently harvests from the indigenous forest.

Table 3. Annual benefits to the iGxalingenwa community of establishing alternative sources of fuel and building material and alternative livelihoods to current use of indigenous forest

Benefit	Measure	Value	Reference
Fuel and building material	Use value	*R2 700 (no subsidization) *R87 833 (full subsidization)	Steenkamp, J. (P.E. Technikon)
Water quality maintenance	Option value	R8 200 000	King (2004)
Continuing medicinal plant use	Market, replacement cost	R910 000	Nomtshongwana (1999), Mander (1998)
Fire hazard mitigation	Productivity loss / loss of property	R40 000	Robertson & Lawes (unpublished), Holland *et al* (1989)
Parrot : asset **Parrot : view**	Existence/ use value	R400 000 R520 000	KZN Wildlife unpublished data
Yellowwood: asset	Existence/ use value	R7 200 000	KZN Wildlife unpublished data
Yellowwood: use	Existence/ use value	R144 000	KZN Wildlife unpublished data
TOTAL		R17 416 700 (No subsidisation) R17 501 833 (full subsidization)	

*The project would be established over a 6 year growth period. Assuming that the community would bear the costs and derive the benefits, the costs of establishment, maintenance, etc. of the *Eucalyptus* plantation would be approximately R255 400. These costs would be spread over the first three years, with benefits being realized thereafter. The financial value of benefits derived from year 4 to year 6 would be R271 600, leaving a net benefit of R16 200 (annualized value = R2700). If, however, establishment of the *Eucalyptus* plantation is fully funded, the community would benefit by R527 000 over 6 years (annualized value = R87 833). No future cost increases were taken into account in calculating these figures. Costs to the community of not using the alternatives will increase as the forest is further denuded and resources depleted. Once established after 6 years, this project would have no time limit and hence annualized benefit figures would be assumed to continue for an unknown period into the future. It is therefore not possible to calculate a realistic annual benefit figure.

Table 4. Annual costs to the iGxalingenwa community of establishing alternative sources of fuel and building material and alternative livelihoods to current use of indigenous forest

Impact	Measure	Value	Reference
Fuel and building material	Replacement value/opportunity cost	R170 700	Nomtshongwana (1999)
Plantation establishment costs	Establishment costs	*R85 133 (no subsidization) *R0.00 (full subsidization)	Steenkamp, J. (P.E. Technikon)
TOTAL		*R255 833 (no subsidization) *R170 700 (full subsidization)	

3.3 Cost-benefit analysis

From Tables 3 and 4, the cost-benefit ratio of establishing and using alternative sources of fuel and building materials and alternative livelihoods to indigenous forest use depend on whether establishment costs of the envisaged 100 hectare *Eucalyptus* spp. plantation are carried by the community or not. If these costs are to be borne by the community, the cost-benefit ratio of alternatives as assessed in this report is 0.014. If establishment costs are fully subsidized by an external organisation, the cost-benefit ratio is 0.009. Comparing the cost-benefit ratios of current indigenous forest use and use of alternatives (1.89 and 0.014 or 0.009 respectively), it is clear that the use of alternatives holds significantly greater benefits for the community in the long term than current indigenous forest use.

4. Discussion

This project aimed to answer the question: "Are potential alternatives to indigenous forest use likely to provide greater economic benefit to community members than current practices of extractive use of indigenous forest?" Results presented suggest that economic benefits from establishment and use of alternative sources of fuel and building material, together with establishment of alternative livelihoods, are potentially significantly greater than those derived from current use regimes. The cost-benefit analysis shows that the benefits of establishing and using alternative sources of fuel and building material and of establishing alternative livelihoods are significantly higher in the long term than non-sustainable indigenous forest use.

However, the data presented in Table 2 show that the costs to the community of indigenous forest use are mainly potential future costs or are opportunity costs of not using alternatives. The data (Table 2) are used to calculate costs to the community with the assumption that the forest is destroyed, which it currently is not. These "costs" therefore have little or no immediate and real impact on their lives. Any direct costs, such as loss of sources of fuel, building materials and medicinal plants, detrimental effect on soil and water quality, increased fire hazard and potential property loss etc resulting from forest over-utilisation, are likely to impose themselves on the community in the future. The present value of indigenous forest use to the community is likely to be considerably more than the future value of alternatives as this community, with an average household monthly income of R250 and pressing immediate needs to meet, is unlikely to afford investment in future alternatives to indigenous forest use.

Despite the results showing cost-benefit ratios being significantly in favour of establishment of alternatives, in reality it is clearly in the community's economic interests to continue harvesting from the indigenous forest as there are little or no immediate and direct costs to them of doing so. In addition, the fact that the forest is poorly managed by the conservation agency and that access to resources is in reality "open access" means that there are also powerful incentives in place to harvest the forest with little or no consideration for its long term conservation.

This scenario could change if the initial capital costs of establishing and maintaining *Eucalyptus* spp. plantations for alternative fuel and building timber sources were to be subsidized. This would constitute a considerable "benefit" to the community. This is also the case for initiation of other alternative livelihood strategies such as a business based on tourism to view Cape Parrots. It has the possible disadvantage of the community not perceiving "ownership" of the alternatives as they would have invested little, apart from their time and sections of communal land, into establishing them. Assuming that the necessary initial capital to establish 100 hectares of *Eucalyptus* spp. is available, that the community supports and desires the project, that issues of ownership are clarified and that agreements are in place to substitute indigenous forest use with use of alternatives, the project has considerable potential for some success. This is also true for other alternative livelihood initiatives.

Data presented in Appendix 1 show that plantation establishment would require six years from initial planting to realizing full benefit. An agreement with the community would need to be established that the indigenous forest continued to be harvested for three to five years after initial planting, following which use must switch to the plantation (apart from medicinal plants). Alternatively, transporting in of "wastewood" from nearby timber plantations for use by the iGxalingenwa community could be done as an alternative source of fuel and building material until the plantation is ready for harvest. This would also require external funding as the costs of this endeavour are approximately R52 000 annually (Robertson & Lawes, unpublished). The economics of establishing a medicinal plant nursery were not examined in this study.

This project could impact on the community in a number of ways. It may be difficult to convince the community to establish a *Eucalyptus* spp. plantation, no matter how economically viable it may be, if the project is to be established in a communal area. Local property rights may dictate that trees may be used

and/or harvested by others in the area or even outside it as well as the person doing the tree growing. There is therefore little or no incentive for individuals or households to undertake such a project. Such undertakings would need to be community based and run according to an agreed common property regime where the community benefits and not some households only. If, however, tree planting efforts are targeted at homesteads where households have exclusive rights, people are likely to be more willing to participate (Luckert & Campbell, 2002). However, such a scenario is unlikely to change the community's resource use habits, as in this case many people would not be benefiting from the tree planting project and so would continue to exploit the indigenous forest. This is a probable scenario at iGxalingenwa. Benefits of a plantation project, such as that described here, are likely to reach only a few people in the community thereby leaving the majority of people dependant on the indigenous forest. Property rights are therefore key in influencing whether interventions improve livelihoods (Luckert & Campbell, 2002).

There is also no guarantee that the community would not continue to exploit the indigenous forest even if successful alternative livelihood strategies, such as outgrower schemes, were implemented. As the indigenous forest resource is "free", there is an incentive to sell all resources derived from such projects to derive additional income instead of replacing indigenous forest derived resources with these. This may result in project failure with consequent continuation of non-sustainable levels of indigenous forest use. A number of interventions, including plantation projects and alternative livelihood programmes, would need to be instituted to benefit as many community members as possible if dependence on the indigenous forest is to be reduced.

This study has a number of limitations. Firstly, it has not considered the full costs of potential destruction of this forest to broader sectors of society. These costs would include:

a. Loss of a C sink and concurrent release of CO_2 into the atmosphere,
b. destruction of an important catchment area for the Umzimkulu river, thereby imposing a water quality cost on downstream users,
c. provision of an alien plant invasion opportunity with associated cost implications to the South African taxpayer,
d. loss of flood mitigation capacity,
e. increased soil erosion with associated impacts on agriculture, water quality etc.,
f. loss of income generation through tourism,
g. loss of biodiversity.

There are many other costs which would need consideration which are not mentioned here. A full cost-benefit analysis would require considerable input and additional socio-economic and ecological data collection. Furthermore, this study did not detail the costs and benefits of alternative livelihood strategies such as tourism, sale of yellowwood timber from "sustainable" extraction, vegetable farming and other potential alternatives. For a comprehensive cost-benefit analysis of all the possible alternatives, this would need to be done.

Although every attempt was made to use meaningful figures, the potential for inaccuracy of much of the data used is recognized. It is highly probable that cost and benefits data obtained and presented, particularly in Tables 2, 3 and 4, have little relation to reality. Items that were identified as being particularly weak were soil conservation and water quality/quantity maintenance and fire hazard mitigation values.

5. Conclusions

Despite the numerous limitations of this project, the following conclusions were reached.

1. Economic benefits from establishment and use of alternative sources of fuel and building material, together with establishment of alternative livelihoods, are potentially significantly greater than those derived from current use regimes.
2. Most of the costs to the community of indigenous forest use are "opportunity costs" or are costs likely to impose themselves on the community if the forest is destroyed in the future. Thus, in reality, the costs of current indigenous forest use to the community are negligible.
3. To improve the probability of establishing alternatives to indigenous forest use being successful, projects such as alternative livelihood establishment and initiation of small plantations to provide fuel and building resources would need to be subsidized. Land and resource tenure would need to be carefully considered in implementing such projects.

6. Recommendations

1. Successful implementation of projects to establish alternative fuel and building material sources and alternative livelihoods will require initial capital investment to be subsidized as the community does not have the means to provide this capital and are unlikely to be able to raise the capital through loans.
2. Due to poverty levels prevailing amongst the community, alternative strategies to indigenous forest use must provide immediate benefits. The community does not have the resources to be in a position to forego indigenous forest use while waiting for alternatives to provide benefits.
3. Implementation of alternative livelihood projects will need to carefully consider current tenure systems in place in the iGxalingenwa area and will need to involve as many community members as possible if dependence on indigenous forest resources is to be removed or significantly reduced. Projects suggested and initiated by the community have greater probability of success than outside interventions.
4. A full cost-benefit analysis of non-sustainable use of iGxalingenwa indigenous forest should be done to highlight the full benefits and costs to society and the environment. This information could be used to secure funding for appropriate projects in the area.
5. A full economic analysis of alternative livelihoods needs to be done to comprehensively assess feasibility, costs and benefits of each.

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