THE USE OF ECONOMICS TO ASSESS STAKEHOLDER INCENTIVES IN PARTICIPATORY FOREST MANAGEMENT: A REVIEW

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EXECUTIVE SUMMARY

The environmental impacts of tropical forest loss and its consequences on people dependent in some way upon those forest resources have been a significant rationale for development assistance to the sector in the past 20 years. In general, however, deforestation rates have not slowed significantly, and forest policies and programmes have not had their desired effect. In part, this is due to an inadequate understanding of the real costs and benefits, and how these are shared between forest stakeholders, and in part because of a perceived lack of economic methods and experience in their application in project design and implementation.

Although economics provides a powerful body of theory and evidence for explaining and predicting human behaviour, few studies have focussed on the incentives of the different stakeholders within the forest sector, or considered the impact of non-forest sectoral influences on stakeholder livelihoods and land use decision-making options. The main objective of this review is to explain and critically examine existing and emerging economic methodologies in terms of their potential and limitations to assess stakeholder incentives in participatory forest management (PFM).

Five hypotheses are proposed to explain why more economic analysis has not been carried out. First, it is often felt that economic tools tend to be reductionist and so are not useful for understanding the complex reality of PFM; second, many of the tools are too complex to be accessible to potential users (in particular, the non-economist); third, they are not accessible because the methodologies are not clearly explained; fourth, economics is seen to have lost credibility among professional PFM practitioners, and fifth, as a result of perceptions linked to the earlier hypotheses, donors have tended not to provide resources for exploring local economic incentives.

The paper is divided into six sections. The first examines the hypotheses and provides a brief background to the study and some key definitions. In Section 2 the economic analysis of PFM is placed within the wider methodological development of the application of economics to forestry and rural livelihoods, and the changing sectoral and macro-economic policy framework of the last 30 years. The historical analysis reveals three overlapping if debatable 'methodological approaches': economic and financial cost-benefit analysis, environmental economics methods, and 'participatory economic analysis' which attempts to bring together participatory research methods and neo-classical economics. Although these divisions are somewhat arbitrary (it can be argued that they are all variations on the use of cost-benefit analysis (CBA)), this classification provides a didactic means of explaining the economic tools within their historical context.

The methodological basis of economic (or social) and financial CBA, including such important concepts as opportunity costs, shadow pricing, externalities,

discounting, etc., is presented in Section 3. The paradox is revealed that while CBA has become more 'technically competent' over time, in practice the approach has been used less and less in forest project appraisal. Several CBA studies have examined the economic viability of natural forest management, but in general the approach does not lend itself to examine social and equity impacts, and few studies explicitly pay attention to the perspectives of local forest users. Indeed, the 'classic' top-down and *ex-ante* CBA studies, which have been applied mainly in project preparation, have not proved useful for examining the incentives of the main resource use decision-makers.

Section 4 finds that environmental economics has broadened CBA to include environmental impacts and the valuation of non-market benefits in general. This is important for the comparison of land uses with different environmental impacts, and encourages the analyst to consider the full opportunity costs of changes in forest land use. Most effort has gone into valuation of environmental and other non-market benefits, and the literature is dominated by theoretical and methodological discussion, and the use of sophisticated valuation methods – such as contingent valuation (CV). However, as we move along the continuum from direct use to non-use values, and from market-based to 'constructed market' valuation methods, the methodological and cost problems increase and credibility declines.

The use of valuation methods to assess marketed or direct use values has also tended to be disappointing. For example, *ex-ante* attempts to value non-timber forest products reveal a lack of methodological consistency and have often exaggerated the attractiveness of forest management through simplistic assumptions, especially surrounding the market and resource sustainability. Such studies often suffer from basic methodological flaws like confusing stock and flow values, and expressing returns per unit of a resource (usually land) which is not the constraining factor for small farmers. It is often the lack of reliable data on the flow of forest products or biological growth rates which is the main problem for the economist.

Section 5 reports on more recent attempts to combine neo-classical economics with participatory research methods. 'Participatory economic analysis' has emerged out of a dissatisfaction with neo-classical methods which have failed to take sufficient account of user perspectives of costs and benefits and the differentiated analysis needed in a PFM setting, as well as the insufficient attention paid to the equity, livelihood and institutional issues which often determine project outcomes.

Some studies have experimented with the use of participatory valuation methods like ranking and scoring by local users and contingent ranking. These show potential but a number of methodological difficulties are identified. The literature suggests that participatory economic analysis has made an important contribution to the more qualitative aspects of economic analysis, but its potential for economic quantification remains uncertain

and further action research is required. However, it should be seen as a complement rather than a substitute for conventional economic research methodologies. Participatory monitoring of economic incentives emerges as an important neglected area.

Section 6 asks how useful the theory, methods and literature are for examining stakeholder incentives in PFM. Regarding the theory, some basic assumptions of neo-classical economics can be questioned. For example, it is assumed that the rationale of public policy is to maximise economic efficiency which signals an indifference to the distributional effects of policy (i.e., it assumes governments seek to maximise efficiency which from a political point of view is intuitively unlikely). Also, whether welfare can be measured by an individual's willingness to pay, or whether non-market values can be 'commoditised' and provide a basis for policy decisions over public good values, are controversial and questionable areas.

The methods are often applied in a top-down fashion, which tends to bias the analysis towards global, national and commercial stakeholders, and has proved inadequate for addressing equity, livelihood and institutional issues. For example, traditional measures of project worth like the internal rate of return bias the analysis to capital efficiency and are of limited relevance for local level decision-making, although the underlying neo-classical concepts like opportunity costs and maximising returns to the user's scarce resources are important to an understanding of stakeholder incentives. In terms of project cycle management, the neo-classical tools tend to focus too much on project preparation as opposed to later stages of the project cycle. However, when combined with participatory research methods, it is argued that the wider issues can be satisfactorily addressed, since both the quantitative and qualitative aspects of economic value are tackled. An 'economic stakeholder analysis (ESA) methodology' is proposed in which methods from the three methodological approaches are combined.

The review of the literature found that it tends to be biased towards:

- reviews of valuation studies as opposed to providing clear methodological guidance;
- non-market benefit valuation for global and national stakeholders as opposed to how to add marketable value for local stakeholders;
- benefits in general as opposed to costs, especially indirect costs like transaction costs;
- sophisticated high-cost methods as opposed to more accessible low-cost methods;
- academic, methodological, and policy objectives as opposed to project decision-making;
- *ex-ante* studies for project preparation as opposed to *ex-post* monitoring and impact analysis;
- treating forestry as a separate enterprise as opposed to a more holistic livelihoods focus;

- efficiency and profitability as opposed to equity, gender and institutional issues;
- fine-tuned numbers as opposed to orders of magnitude;
- returns to land and capital as opposed to returns to labour.

The review also indicates that sustainable forestry is often not a viable or economically attractive option in comparison with alternative land uses. The difficulties for PFM are particularly acute since it often takes place on lower value forest land; local users tend to have high discount rates as a result of their high risk environment; and they tend to face high transaction costs. This situation implies that if there are non-financial reasons for conserving or managing forests in a sustainable way, and the market cannot provide for these non-financial benefits, new institutional arrangements and flows of finance or support to the wider-livelihoods of forest users are needed. National governments and donors will have to provide the 'right' incentives to stakeholders if concomitant social and environmental objectives are to be meet from forest land resources. Economic analysis needs to consider a range of market and non-market incentives for supporting community-based NFM, and to pay particular attention to underlying institutional factors which have the potential to reduce risk, discount rates and transaction costs.

Finally the original five hypotheses are revisited. In spite of the difficulties experienced with economic theory, methods and literature, which have led donors and some practitioners to substitute other project cycle tools for economic analysis, it is argued that the more recent combination of neo-classical and participatory methods holds out real promise, and that through appropriate application of the proposed ESA methodology in a range of PFM decision-making contexts, the five hypotheses can, in time, be negated.

ACKNOWLEDGEMENTS

ACRONYMS

BCR	benefit-cost ratio
CBA	cost-benefit analysis
CV	contingent valuation
DFID	UK Department for International Development
ESA	economic stakeholder analysis
FD	forestry department
HHP	hidden harvest programme of IIED
IIED	International Institute for Environment and Development, London
IRR	internal rate of return
ITTO	International Tropical Timber Organisation
JFM	joint forest management (in India)
LFM	local forest management
MCA	multi-criteria analysis
NFM	(sustainable) natural forest management
NGO	non-governmental organisation
NPV	net present value
NTFP	non-timber forest product
ODA	Overseas Development Administration
OVI	objectively verifiable indicators
PFM	participatory forest management
PRA	participatory rural appraisal
PLA	participatory learning and action
RRA	rapid rural appraisal
TCM	travel cost method
TEV	total economic value
WTA	willingness to accept
WTP	willingness to pay

GLOSSARY OF ECONOMIC TERMS
(in the context of forest resource economics)

Benefit-cost ratio
The ratio of benefits to costs. If greater than 1, benefits are higher than costs.

Constructed markets
Hypothetical markets for environmental and other non-marketed benefits in which respondents are asked for their willingness to pay for the benefit or willingness to accept compensation for no longer receiving it.

Consumer surplus
The additional utility to a consumer above the market price: it is the difference between someone's willingness to pay for something and what they actually pay for it.

Contingent valuation
Hypothetical or constructed market valuation.

Direct use values
Benefits that accrue direct to the forest users, whether extractive (timber, NTFPs) or non-extractive, e.g.,education, recreation, etc.

Discounting
A system for measuring future costs and benefits in terms of their present value, based on the concept that it is better to have money (or utility) sooner rather than later since it can be invested and generate income.

Discount rate
An inverse interest rate which measures the rate at which future values decline in terms of present values. A high discount rate reflects a strong preference for present consumption.

Elasticity of demand
The change in quantity demanded in response to a change in price.

Existence value
The value placed by non-users in the fact that something exists; its intrinsic value.

Externality
An unintended cost or benefit of production or consumption that affects someone other than the producer or consumer, and which does not enter, or is external to, the market.

Factors of production
Land, labour and capital.

Indirect use values
Benefits that accrue indirectly to forest users and others, primarily ecological or environmental services.

Internal Rate of Return
The discount rate which causes NPV to be zero; this can be thought of as the return to capital or financial yield of a project.

Marginal utility
The extra welfare gained from an additional unit of consumption. This tends to fall as consumption increases.

Market failure
Where markets are absent or highly imperfect, and thus prices are a poor guide to resource scarcity and consumer utility.

Net present value
The present value of benefits less the present value of costs following the use of a discount rate.

Non-use values
The same as passive use values: the value that accrues to people when there is no active use of the forest.

Opportunity cost
The value of something that has to be given up to achieve something else, or more specifically with reference to resource allocation, the foregone net benefit from the best alternative use of the resource.

Policy failure
Policies that either provide a disincentive to sustainable natural resource management, or fail to correct for market failure.

Residual value
The value left after deducting harvesting, processing, marketing and transport costs, as well as any fees or taxes, and a reasonable profit margin, from the sale price of a processed or unprocessed product.

Sensitivity analysis
Analysis of how changes in the key technical and economic parameters subject to uncertainty would alter the economic performance or decision-making criteria.

Shadow price
In the case of goods with national or international markets which are freer of imperfections than a local market, it is a price based on those markets; in the case of labour, it refers to the opportunity cost of the time.

Surrogate market
The same as a substitute or proxy market: when two products are substitutable, the market value of one can be used to value the other.

Stumpage value
The same as residual value; this term draws attention to the idea that it represents the standing value of the tree, i.e., the maximum someone would be prepared to pay for the standing tree.

Total economic value
The total value of the forest resource, comprising direct, indirect and non-use values.

Trade-off
A situation in which meeting one objective means that another objective(s) cannot simultaneously be met to the same degree.

Willingness to accept
The amount of money or payment-in-kind people are willing to accept as compensation for the loss of environmental goods and/or services in a CV survey.

Willingness to pay
The amount of money or payment-in-kind people are willing to pay for receiving environmental goods and/or services in a CV survey. It is also used more generally to refer to the true 'value in use' of something, i.e., including consumer surplus.

1.   INTRODUCTION

'Ultimately, economic value measures are only one, often small, input into decisions regarding forest use...it is only worth the time and effort to value things if the values are going to be used effectively to accomplish something' (Gregersen et al., 1995)

1.1   Background and hypotheses

There seems to be common agreement that not enough is understood about the economic incentives for different stakeholders to participate in participatory forest management (PFM). For example, ODA (1996:20) points out the need for '*further exploration on the type and level of incentives necessary to secure involvement in the process*' and '*the general need for more rigorous use of economic methods, particularly as design tools. Policy makers – and other stakeholders – also need accurate assessments of who wins and who loses, where gains and losses occur and what the costs and benefits are*' (29). Hobley & Wollenberg (1996:245) note, that in the context of joint forest management (JFM) in South Asia, there is a tendency to assess progress in terms of institutional change rather than the impacts on villagers' lives. They point out that '*chief amongst the questions still to be answered is how great are the real costs and benefits of participation, and how they are distributed amongst the various actors.*'

Economics provides a powerful body of theory and evidence for explaining and predicting human behaviour. The literature reveals, however, few economic studies that have focussed on the costs and benefits to different stakeholders at the micro or project level, or what, for convenience, we call here economic stakeholder analysis – a shorthand for the economic analysis of stakeholder incentives. Thus it seems that the need to undertake ESA is widely acknowledged, but there is relatively little on the ground evidence of its use. There appear to be five likely reasons for this paradox:

(i)   reductionist economic tools are not useful for understanding the complex reality of PFM;
(ii) the tools are too complex to be accessible to potential users;
(iii) the tools are not accessible due to insufficient field experimentation and documentation, and the lack of appropriate methodological guidance;
(iv) economics has lost a degree of credibility among PFM practitioners, partly due to its pre-occupations with quantification and theoretical issues associated with valuation methods, and its assumption that efficiency should be the main decision-making criterion (Bennett & Byron, 1997);
(v)   lack of donor clarity on how to go about ESA (in part linked to perceptions about i-iv).

As in most situations, there is some truth in all the above, but the working hypothesis of this study is that (i) and (ii)

are false, while (iii), (iv) and (v) are true: economic tools have been discredited and under-utilised in the past, partly due to a bias in the literature, but are capable of adaptation to the requirements of ESA through further experimentation and the development of clear methodological guidelines. In other words there are important gaps in applied micro-economics research and the literature.

1.2   Objectives and target audience

The objectives of this paper are to review, in the context of participatory forest management, as clearly and accessibly as possible for the non-economist:

(a)   existing and emerging economic methodologies in terms of their potential and limitations to assess stakeholder incentives through the project cycle;
(b)   the literature in terms of how well the methodologies are explained to the most likely users, and the availability of illustrative case studies.

This should lead to identification of gaps in the methodologies and the literature (case studies and methodological guidance).

Our intention is to make the findings, unlike much of the economics literature, as accessible as possible to the most likely users of an 'ESA toolbox'. We see these *practitioners* primarily as forestry and social development project managers and advisors, donor project analysts and local economists. It is probable that ESA would be most cost-effectively undertaken by locally recruited economists working with project staff and under the supervision of the project manager. This is one reason why this literature review is longer than optimal: it is necessary to provide a basic explanation of the methods and concepts to a largely non-economist audience in order to discuss their relevance for PFM.

1.3   Definitions and scope

Participatory and local forest management

Wollenberg (1997) points out that a host of terms have been used to describe different institutional variations of forest management by local people, often organised collectively or working with common pool resources. Many of these contain the words community and participatory, which are to some extent problematic. For example, community and social forestry has tended to reflect international and national agendas, and it is usually individuals rather than communities who manage forests and tree resources, albeit as members of a community user group, subject to local institutions, etc. Likewise, much has been written about participation in forestry. Although Hobley & Wollenberg (1996:258) point out that the prefix 'participatory' should no longer be necessary, quoting Jack Westoby's assertion that '*forestry is about trees and people, and their association through institutional arrangements*', the term continues to have much currency.

The issue is, however, no longer about the need for participation, but rather how best to put it into practice.

Wollenberg (1997:2) uses the term *local forest management* (LFM) which is defined broadly as: '*the involvement of people living near a forest in activities intended to maintain or enhance the forest and improve local people's well-being*'. She defines three aspects of LFM that distinguish it from other types of forestry intervention: local people contribute to the productivity or sustainability of the forest, although they may not necessarily manage it; they have a share in the benefits and maintain some degree of control over the resource; and promotion of conflict reduction in ways that encourage 'complementary and synergistic relationships.'

However, the substitution of the term LFM for PFM is not widely accepted: most of the disagreement centres on the relative emphasis in the former on local rather than other stakeholders, who may be 'primary stakeholders' – for example the resource owners. The key point is the recognition that the debate about 'participatory forestry' is explicitly linked with the wider issues and processes of decentralisation and public sector reform, and the new institutional arrangements for managing forest resources (Hobley, 1996:9-11).

It should also be noted that the focus of the review is not confined to natural forest management; it includes the planting and management of trees outside forests, as with small on or off-farm plantations and agroforestry.

Stakeholders

Stakeholders can be defined as '*any group of people, organised or unorganised, who share a common interest or stake in a particular issue or system*' (Grimble & Wellard, 1997: 175). Based loosely on ODA (1995), Hobley (1996) and Gregersen et al. (1995), we use here the following broad classification of stakeholder types as the most practical in terms of stakeholder analysis and decision making:

1. Local forest users or forest dependent communities, normally the main intended project beneficiaries, and whose main concerns are generally family welfare and livelihood security;
2. Forest clearers who place a negative value on the forest due to their interest in the land under the trees for short-cycle farming and/or livestock rearing;
3. Forest industry and other external commercial interests in the forest;
4. The Forestry Department (FD) with its concerns of rent recovery, forest productivity, control of access and use, and environmental protection;
5. The 'national interest', composed of a combination of economic, social and environmental concerns, some of which may be represented by the FD;
6. Donors, who are assumed to represent the 'global interest' dominated by environmental concerns, but increasingly concerned with welfare impacts.

This classification follows a typology from the local to global level. In practice many of these interests or categories overlap (for example, across the first three stakeholder groups listed above). Also, there are many stakeholders or sub-groups not directly included here, like consumers of forest products, NGOs, environmental advocacy groups, etc., but the idea is to focus on those stakeholders whose actions are expected to determine project outcomes. Above all this refers to the local forest users or stakeholders.

There are several reasons for this focus. First, the local forest users in PFM are the *de facto* resource use decision makers who respond to prevailing market incentives. Second, if in response to project interventions and market incentives, they practise a more sustainable form of management, the environmental and social objectives of national and international stakeholders are more likely to be met. Third, they have been badly neglected in the past by economic analysis, which has been more oriented towards national and international stakeholders.

Economic stakeholder analysis

Economic stakeholder analysis is our shorthand for the economic analysis of stakeholder incentives. The first thing to clarify is that ESA is not only concerned with financial or tangible costs and benefits; 'economic analysis' should be interpreted in the broadest sense. Hence, ESA is an attempt to move on from its neo-classical origins, and address social welfare issues and the non-market benefits of forestry (see Section 2). Similarly, it is not just about how to derive estimates of non-market values in terms of a common numeraire, but also attempts to provide explanatory analysis, for example in order to help explain resource use allocation and decision-making at the farm, forest or household level.

A vital aspect of ESA is that it assesses costs and benefits from the point of view of the decision maker or stakeholder. As pointed out by Gregersen et al. (1995), there are no absolute values; these depend on individual perceptions and can change rapidly over time. Identifying that a particular stakeholder sub-group holds different views of what is a cost or benefit (one person's benefit can be another's cost) to those of other sub-groups, the donors or the Forestry Department, can be an important step towards a differential strategy to encourage participation (see Box 1).

Box 1 also reveals that in most PFM situations there are likely to be trade-offs between the objectives of any one management approach, and conflicts between objectives. An important challenge for economics is how to address multiple objective and stakeholder situations. Economics should be concerned not only with resource use decision making but also how it can help contribute to the institutional arrangements necessary for managing shared access to the resource in a way that leads to equitable and sustainable management. If economics can generate information on the trade-offs of different management options for the Forestry Department, it can help the latter

Box 1. Different people, different values and different scarce resources

Assume that a study shows that a certain part of the Amazon forest has an estimated capital value of some US$6,000 per ha if managed on a sustainable basis for non-timber and timber products. If the land is converted to slash-and-burn agriculture it has an estimated capital value of US$1,600. One conclusion that might be drawn is that the forest is much more valuable if kept as an extractive reserve and managed for products on a sustainable basis. Yet, local forest farmers continue to practise slash-and-burn agriculture on the land. Why?

Part of the dilemma is caused by differences in value perspectives and who gets the value derived from the forest. The value of the extractive reserve is expressed in terms of value of output *per unit area*, while the local farmer is looking at value in terms of *per unit of labour* required to get various benefits. Since the sustainable extractive activities provide less return per unit of labour, the farmer also sees that there will be a higher return on *labour* by practising slash-and-burn agriculture, perhaps taking out an initial harvest of selected forest products before clearing and burning. To the farmer, land is abundant; labour is the scarce resource. Economic reasoning suggests it is logical for farmers to maximise returns to their scarce resource, labour.

Either value figure above could be used, *depending on the decision context or point of view adopted.* For an environmentalist from a developed country concerned about tropical deforestation in terms of area (hectares) destroyed and area protected from destruction, the value per hectare may be relevant. For the forest farmer with limited labour resources, the higher value return *per hour of labour* expended for slash-and-burn agriculture may be relevant. The question is: who makes the decisions and, thus, whose point of view is relevant?

Of course, the above is an oversimplified view of farmers' decision-making processes, but it illustrates the point that different people are interested in returns to different factors of production, depending on which factor happens to be the limiting one to them.

Source: Gregersen et al., 1995:6

regulate the multiple stakeholder interests in forestry management. One way it could help would be to facilitate negotiation between stakeholders through greater transparency of the prevailing financial incentives.

The extent to which ESA should be accessible to all stakeholders will probably depend upon the objectives of the analysis. There is clearly a need to develop participatory tools which empower local communities or user groups in project decision-making processes, as well as assisting them make their own resource allocation decisions and strengthen their negotiating position with other stakeholders. Some innovative approaches are under development, including farmer evaluation of their resources: a form of analysis by stakeholders, rather than stakeholder analysis. However, participation is not the main criterion in this review: and the appropriate economic tools may not necessarily be accessible for use by all local forest users.

The authors are aware of the dangers of promoting economic analysis divorced from the broader picture. This is because first, economic analysis may be of only secondary importance in explaining decision-making behaviour, for example when survival or self-sufficiency objectives dominate and where local political, institutional or demographic factors determine people's decisions to participate in a PFM project. Second, it should be understood that any economic analysis must be iterative – moving back and forth between the analysis of

institutional, social and technical factors. The optimal design of project interventions will only result from considering all these components simultaneously.

In this paper, economic methods are arbitrarily classified as falling into three overlapping 'methodological approaches': cost-benefit analysis, environmental economics, and participatory economic analysis. This is a somewhat misleading division since environmental economics and CBA share many characteristics, while participatory economic analysis also relies heavily on the use of CBA methods. However it does have a certain historical logic based on an unfolding realisation of the limitations of CBA, first to deal with the environmental impacts of natural resource management, and second in response to the challenges of participation and equity. Also it allows the methods to be presented and assessed in 'bite-size' chunks. The specific economic tools can be divided into two basic types, which can also overlap: those concerned with the collection of information, like household and market surveys, and those concerned with the analysis of the data, as valuation methods and decision making criteria.

The project cycle

Particular emphasis is placed upon the use of tools within the project cycle, since it is within this context that practical tools can be developed and applied in comparison with the more academic research environment,

which tends to dominate the literature. Development projects provide an arena in which the multiple objectives found amongst the various stakeholders can be identified and trade-offs negotiated, both during project design and the project cycle. Hence, we are concerned here with the use of economic tools not only in an *ex-ante* sense at the project feasibility or design stage, but also for on-going and *ex-post* applications which establish trade-off criteria and monitor stakeholder incentives and assess the impacts of PFM.

1.4 Structure of paper

The paper is split into six sections. Following the Introduction, Section 2 provides a conceptual overview which enables the reader to place the 'methodological approaches' in a wider perspective. In Sections 3-5, the methods and concepts in the three methodological approaches are explained and discussed in terms of their potential and limitations for ESA. Section 6 attempts to synthesise the theory and practise of ESA, and asks where this review leaves the economic analysis of PFM.

2. ECONOMICS AND FORESTRY: A CONCEPTUAL OVERVIEW

2.1 Introduction

While this review focuses on the application of economics to forest and tree management at the local level, it is felt necessary to place this in a wider methodological and policy context prior to analysing the specific tools. Here we take a historical approach to the development of economic and related methodologies in the analysis of forestry projects, policies and livelihoods, and attempt to locate methodological change in the context of changing sectoral and extra-sectoral economic policies, and wider development 'fashions'. In doing this, we introduce some of the basic concepts and limitations of economics as applied to forestry.

2.2 Forestry, economics and public resource allocation

Forest management has become a matter of increased policy interest over the last two decades. Concern for the loss of natural forest and recognition of the need to promote forest management has led to a reassessment of forestry policies away from an earlier emphasis on the forest industry and trade and towards wider social and environmental aims (as shown by the support for agroforestry and farm forestry initiatives). Economics has arguably played an important role in this shift of emphasis.

Mainstream economics is often said to be the study of how societies make choices about the allocation of scarce resources. Economics distinguishes between private and public goods. For private goods, which are those goods exchanged in a market and where consumption by one person precludes consumption by others, such choices are relatively simple. However, forest resources can be public

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Box 2. Market and policy failure

Market failure occurs due to malfunctioning, distorted or absent markets. Prices generated by such markets do not reflect the social costs and benefits of resource use. Prices, where they exist, convey misleading information about resource scarcity and send out inappropriate incentives for the efficient management and conservation of natural resources. Major sources of market failure include:

- *externalities* in which the effect of an action on another party is not taken into account by the perpetrator;
- missing markets for environmental services and other 'open-access' public goods;
- market imperfections like lack of information and knowledge, which causes uncertainty, and monopsonic (near-monopoly) competition.

Policy failure occurs both when the state fails to take action to correct for market failure, and when policies are implemented which further distort prices and cause disincentives for sustainable natural resource management. Common examples of policy failures encouraging deforestation are:

- land tenure legislation which is unclear or directly encourages clearance;
- land and/or tree nationalisation without the means to control or manage it;
- low forest fees which underprice forest products from state land;
- subsidised credit and agro-chemical inputs for alternative land uses.

The main way in which market and policy failure leads to deforestation is through under-valuation of forest land and products compared to other land uses. As pointed out by Bennett & Byron (1997:4) '*causes of forest resource undervaluation are various but there is one overriding effect – a reduced incentive for stakeholders to invest their own resources in conserving forests as a source of revenue or welfare.*'

Main source: OECD, 1995

goods and some forest benefits are non-marketed which makes their analysis more complex.

Forestry is characterised by the pervasiveness of a range of *market* and *policy failures*, most of which originate from outside the forest sector (see Box 2). Forestry projects are a significant policy instrument in themselves. It is generally agreed that good forest management depends on policies that correct such market and policy failures, as well as improved dialogue to ensure that forestry policies lead to effective shared forest management (Mayers & Bass, 1997). Local economic perspectives can contribute to both these aims, but in practice have rarely done so (IIED-WCMC, 1996).

Conventional or neo-classical economic tools are regarded by mainstream economics to be adequate to the task of analysing forest resource allocation: thus the basic tools of economics are found under what we term as the first main 'methodological approach' – cost-benefit analysis. For example, widespread use is made of environmental valuation techniques in spite of their apparent conceptual and empirical limitations (for the views of the advocates see Kengen, 1997, and for the doubters Winpenny, 1996). To what extent they can impute values acceptable to policy makers and other stakeholders in forest and tree management will only be known with their further application.

2.3   Recent changes in economic and forest policies

Development economics has had a chequered history reflecting academic fashions and prevailing views on the relative balance between the role of the state, the market and civil society. In the immediate post war period the neo-classical economic school and liberalism were increasingly replaced by a more interventionist approach and a greater role for the state (coinciding with the ending of the colonial period and birth of new nation states) during the 1960s and up to the early 1980s. This period saw a rapid expansion in the funding of the agricultural sector (including forestry) and rural development projects and also a focus on basic needs. While there were differences in emphasis, it was assumed that the state had a direct role in either intervening in the market to increase the rate of economic growth, or redistribute wealth.

The debt crisis, and the stabilization and structural adjustment programmes that followed represented a repudiation of the former models and emphasized deregulation and a greater reliance on market forces. In the 1990s, a more pragmatic approach has emerged which recognises the strategic role of the state albeit within the context of greater market liberalization and decentralization.

On the macro-economic level, the processes of globalisation and market liberalisation over the last 10-15 years have increased the complexity of policy reform and project design. In the forestry and other sectors, reforms are expected to tackle a much a wider range of issues than ever before and take into account the interactions between the macroeconomic, sectoral and microeconomic levels, for example:

- at the macroeconomic level, structural adjustment has led to attempts to improve the balance of payments through increased timber exports or reduced reliance on the imports of tree-based products. Attempts to reduce inflation and budget deficits have also reduced the capacity of the state to monitor and control use of the forest resource, and undertake appropriate research and extension.

- at the sectoral level, trade and exchange rate liberalization have altered the competitive advantage of domestic timber industries, induced private, and often foreign investment in plantations, and created new export and processing opportunities for the timber and non-timber forest product (NTFP) trade. Public institutions have been deregulated, and new private institutions – from producer NGOs to conservation, environmental and other pressure groups – created.

- at the microeconomic level, reforms have included new policies for timber concessions and property rights, forest certification, and incentive programmes (or subsidies) for forest management and plantations.

The goals of the forest sector and type of projects promoted have corresponded to the following broad outline (Byron, 1997):

- in the immediate post-war period, industrial timber was promoted, partly in response to a perceived 'wood crisis', and partly reflecting the prevailing industrial and agro-export development model.

- from the early1970s there was a shift both towards conservation, including forestry, and basic needs or poverty-focussed rural development. This resulted in the consolidation of social or community forestry initiatives, which had been introduced as a concept in the mid-1960s in the Indian sub-continent. These initiatives were nonetheless still premised on an external view of an imminent fuelwood and fodder 'crisis' (Dewees, 1989).

- from the mid-1980s, in response to the perceived failure of 'Integrated Development Projects', there was a reappraisal of this approach in the agricultural sector. In spite of this, 'Integrated Conservation and Development Projects', many with large forestry components, were promoted as an alternative to national parks/protected areas, and also met with mixed success (Wells & Brandon, 1993). At the same time there was an increased emphasis on forestry research and extension parallelling institutional reforms in the agricultural sector, and towards agroforestry and farm forestry and the start of the 'participation' debate within the sector . This period

also saw the FAO-sponsored Tropical Forestry Action Plan initiative.

• during the 1990s, the reassessment of state intervention and influence of the 1992 Earth Summit have seen in many tropical countries a revision of forestry legislation, some privatisation of industrial forestry, and the devolution of non-industrial forestry to a variety of NGOs, community-based organizations and joint forest management (JFM) arrangements. There has been a realisation that institutional change initiated during this decade has to encompass the sector as a whole, and that it is not sufficient to introduce new local level management arrangements without addressing the wider institutional structure.

2.4   The development of environmental economics

Market and policy failure results in undervaluation of forestry land and products in comparison with alternative land uses. Early cost-benefit analysis, in which generally only marketed benefits were considered, did not take into account the real opportunity costs of other land uses including the environmental and other non-market benefits of forests, leading to policy and project decisions which favoured other land uses (IIED, 1994). This situation led an authoritative ITTO survey of sustainable forest management to report that:

'*the inability of tropical foresters to suggest ways of valuing the goods and services from the forest, which are meaningful to their colleagues in national treasuries and planning ministries, has been a major factor in the continuing loss of these forests'* (Poore et al., 1989).

Another emerging concern was with the external (externality) and equity impacts of land use changes. The watershed effects of deforestation, resulting in downstream losers and winners, the problem of cross-border impacts, and the difficulty of dealing with the longer time periods in

forestry, meant that questions like who should pay the costs of deforestation, whether the losers should be compensated, and inter-generational equity issues came increasingly to the fore.

Environmental economics, the second 'methodological approach', can be seen as an extension of CBA designed to deal with such issues, and, at least in the forestry context, revolved around a central concern of how to value the non-market benefits of forestry (in order to show the real opportunity cost to society of forest conversion). Much of the early work in developing valuation techniques arose from attempts to improve the management of natural resources in public lands in the USA through the better 'pricing' of entrance and hunting fees. Another important branch of valuation is green or natural resource accounting, which attempts to measure changes in the inventory or stock value of forests, as opposed to use values, and to incorporate these into national income accounts, in order to show that economic growth is often premised on the liquidation of natural assets (Repetto et al., 1989).

2.5   Valuation in forestry

Issues concerning the valuation of marketed and non marketed goods, and the rationale of states to intervene in, or create markets[1], are germane to both the CBA and environmental economics approaches covered in Sections 3 and 4. This should not be surprising since it is assumed that the objective of economic policy is to maximize social welfare which is measured by *utility*. The extent to which utility can be measured in monetary terms is a constant theme in this review. *Willingness to pay* (WTP) and *consumer surplus,* and their relationship to market prices, are fundamental concepts in monetary valuation. Box 3 explains that, although they usually underestimate WTP, market prices are acceptable as a measure of aggregate utility provided markets are not characterised by imperfections. (However, it should be noted that WTP does not take into account people's ability to pay, and so is

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Box 3. Willingness to pay, market prices and consumer surplus

Underlying the valuation of costs and benefits accruing to different people is the basic notion that what people are, or would be, *willing to pay* for a particular good or service measures their *preference* for it. These preferences should reflect the welfare or utility derived from a good or service, as well as the supply and demand scarcity of the good/service. When market prices correctly reflect economic scarcity, they are known as *economic efficiency prices*.

Theoretically, WTP or *value in use* comprises the price someone pays (*value in exchange*) for a good or service and an additional sum they would be willing to pay over and above the price. The difference between WTP and price is known as the *consumer surplus*. In practice, market prices are generally regarded to be acceptable as a conservative estimate of value – they are conservative because they ignore consumer surplus.

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[1] For example, carbon offset arrangements, certified forest products and transferable development rights (Barbier et al., 1994b; Pearce, 1996).

indifferent to existing wealth and income distribution).

Market imperfections often mean that prices are not a good measure of scarcity and utility. Thus a major challenge for economists is how to find ways of estimating preferences or utility in situations where there are no markets or markets are a very poor guide (these issues are covered in Section 4). Views range from those, like Pearce (1996), who argue that non-market valuation methods are important for demonstrating environmental values and ensuring appropriate resource allocation, to those who believe there are major theoretical and ethical limitations to the approach (Anderson, 1993; O'Neil, 1997). Further debate centres on how important non-market benefits are, and whether the effort spent estimating them is misplaced (Hyde et al., 1993; Bennett & Byron, 1997).

2.6 Development of complementary research methodologies

From farming systems to participatory research approaches

Most of the emphasis in the earlier forestry economics literature has been on land use rather than land users (IIED, 1994). Land use decision making depends, however, on the relative returns to alternative uses as perceived by local communities and individuals at the forest level. There is a wide body of literature on peasant or farm household theories, summarised in Ellis (1988, 1992), from which three principal characteristics may be distinguished. First, farm households are engaged in joint consumption and production decisions; second, they are integrated to some degree to markets for inputs and outputs; and third, these markets are often incomplete or imperfect (e.g., lack of information, high transaction costs). These features are often found in forest-farm communities, where trade-offs between factors of production (labour, land and capital) within the household and between households are faced, and non-marketed goods such as NTFPs are home-consumed or exchanged.

Farming systems research began in the late 1970s and concentrated on resource-poor farm households, emphasising farmer objectives, on-farm research and closer interaction between farmers and researchers. Much of this work fed into the design of agroforestry projects during the 1980s. The 'farmer first' (Chambers et al., 1989) and farmer participatory research (Farrington & Martin, 1988) approaches sought to make research more farmer-orientated. They also emphasised the complexity and risk of resource-poor farmers' farming and livelihood systems, and challenged the conventional roles of the researcher and farmer in the research and technology diffusion processes.

More recent research approaches of relevance to PFM project design and stakeholder perceptions of value include:

- the 'new institutional economics', which particularly looks at the effects of transaction costs and imperfect (rural) markets, how much these factors represent an obstacle to local stakeholders, and the role of institutions both as an explanatory variable of such imperfections (for example the problem of insecure property rights) and as a means of overcoming them (Harris et al., 1995). For example, high transaction costs may exclude farmers from particular markets, so affecting their use of natural resources and their own household inputs. It also moves beyond project-based participation, and examines how new institutions can negotiate between the state or other regulatory bodies, for example to deliver resources at a lower cost, and establish political networks to negotiate sectoral issues and policies (Bebbington et al., 1997).

- 'environmental entitlements' analysis is also concerned with institutions. It offers a critique of local-level institutions and the assumption that they regulate a community's resources in the interests of the community, and challenges the notion that local environments are homogeneous (Leach et al., 1997). Similarly, seeing landscape change as a political and economic process also counters the notion that land use changes necessarily result in degradation as a linear process. Rather, local management practices and their socio-political and economic context are seen to 'make' a landscape (Fairhead & Leach, 1996; Tiffen et al., 1994).

2.7 Stakeholder analysis

These recent research approaches, and the more general perception that forestry projects have not been particularly successful, have contributed to a wide acceptance that participation in defining and designing projects is a prerequisite for success. Grimble & Chan (1995:114) point out that stated objectives have not been met in many projects and policies because the consequences are perceived to be adverse by one or more stakeholder groups, and this has led to non-cooperation or opposition: thus *'ways of better anticipating and dealing with stakeholder opposition and conflict, and ways of better incorporating various stakeholder interests, are therefore seen to be crucial for improving policy design and implementation.'*

It has been argued that stakeholder analysis was developed with a focus on poverty and social exclusion, and the role of institutions (MacArthur, 1997a, 1997b). It is particularly relevant to natural resource management, given the nature of watersheds and natural forests which cut across administrative and political divisions, and the presence of multiple (and often conflicting) users and objectives for the resource (ODA, 1995). Projects often have adverse effects on stakeholders, and provoke conflicts of interests. Grimble & Wellard (1997) stress the need to evaluate distributional and social effects as part of an *'holistic approach or procedure for gaining an understanding of a system, and*

Box 4. Is forestry different?

Are there any real differences between forestry economics and the economics of other resources? No, say forest economists like Hyde et al. (1993) and Klemperer (1996): all situations can be tackled using the principles and tools of the neo-classical school. While they recognise that forestry has a number of characteristics that create challenges, their view is that these are by no means particular to forestry:

- production periods can be long, and so discounting is a major factor; however, long time horizons and uncertainty are also prevalent in education programmes and some industrial enterprises;
- trees and forests represent both a capital input and an output, characteristics shared by many assets held in anticipation of future increases in value – such as land, stocks and savings accounts. Standing trees provide the flexibility that they can be harvested when markets are favourable, and trees grow naturally and at a low opportunity cost at the extensive margins of forests;
- trees and forests produce, often simultaneously, a number of goods and services, for a wide geographical range of consumers. Many of the products are consumed locally or not marketed (NTFPs, fodder, watershed protection services, etc.), whilst others (biodiversity, carbon sequestration) are valued most by those furthest from the forest. Harvesting can result in negative externalities (e.g., logging-related damage to watersheds), but environmental damage occurs in many other activities too;
- these characteristics complicate the analysis of optimal forest land use and production, but the complexity can be exaggerated: for example, Vincent (1995) argues that in most situations there is unlikely to be competition between products at the forest stand level, and multiple-use management does not mean that every tract of forest is managed for every good or service it produces (Kumari, 1996), although it must ensure that the productive and protective functions of the stand are maintained.

Much of the remaining natural forest is fragmented and found on small farms, where competing land uses are the main threat to the forest. Since these areas will have been previously logged, it is probable that the main environmental impact has already occurred, and the remnant forests are unlikely to have high non marketed values, according to Hyde et al. (1991, 1993): amenity and biodiversity values tend to be site-specific, while carbon storage values are low on a per hectare basis. That non-market values are likely to be low on land used for PFM does not mean that they are unimportant in livelihood strategies, nor does it negate the importance of trying to estimate the values, but it does suggest *a priori* some basic economic constraints to the achievement of sustainable local forest management.

Source: Mainly based on Hyde et al., 1993

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assessing the impact to that system, by means of identifying the key actors or stakeholders and assessing their respective [economic] interests in the system'.

In theory, if not in practice, eliciting local values (economic, social, cultural, etc.) and assessing the distribution of costs and benefits are fundamental to stakeholder analysis. Through a recognition of the rights of traditional groups or more recent colonist farmers, and the responsibilities of communities and individuals to manage resources, the stakeholder approach can legitimise projects at a local level and also be a means of initiating new institutions for resource management and self-regulation, which should in turn contribute to improved rural livelihood strategies.

2.8 Challenges of participatory forest management for economics

Apart from the valuation of non-market benefits discussed above, forestry presents some other major challenges which economics has only partially come to grips with, notably the problems of how to deal with time, risk and uncertainty, and multiple objectives. Forest and tree management is often characterised by the number of overlapping and discrete uses made of these resources, and the trade-offs between them. However, one view is that the challenge of forestry for economics is not radically different from other sectors, like agriculture and education (see Box 4).

A basic issue is whether natural forest management (NFM) is likely to be financially sustainable if based on market incentives. Leslie (1987) pointed out over a decade ago that returns to forest management are likely to be low if only the direct financial benefits are included, due mainly to the 'cost' of time resulting from slow natural growth and high discount rates (see Section 3.2). Dickinson et al. (1996) point out that farmers, concession owners and loggers act rationally in response to prevailing market and policy signals. Short-term returns to liquidation logging are higher than those accruing to NFM for timber, so forests are logged with little or no concern for subsequent harvests and the proceeds invested in higher yielding alternatives (Vincent, 1995). Gillis & Repetto (1987) also indicate how poor macroeconomic policies cause

distortions in the incentive framework which act against NFM.

The necessary conditions for NFM include *inter alia* correction of the main market and policy failures, establishment of land and tree tenure security, availability of markets for forest products, and access to technical and economic information on NFM to the *de facto* decision makers (Poore et al., 1989; Palmer & Synnott, 1992).

For PFM, such problems are compounded by the tendency for it to take place in low value forest, so making it vulnerable to alternative short-term land uses. Governments sometimes even see PFM projects as a means of improving low value forest areas (Wollenberg, 1997). Furthermore, an important part of PFM takes place on common pool resource areas, whether subject to a common pool regime or of a more open-access nature. Thus efforts to improve market incentives need to be complemented by attention to the institutional arrangements (Richards, 1997). Of course, it is possible that the correction of market failures and internalisation of forest values will not always be sufficient for NFM to be competitive with other land uses.

In contrast, it is important to note the more positive evidence surrounding on-farm tree planting and tending. Recent comparative studies show a variety of farmer household strategies with regard to tree management in farming systems, dependent on the characteristics of the farming system, including the relative availability of labour, land and capital, as well as the relative return to these factors determined by market incentives; time horizons determined by risk factors and institutional support; and household livelihood strategies subject to multiple objectives (Arnold & Dewees, 1997).

Economics faces a number of major challenges when considering PFM, as compared for example with the analysis of farming systems or industrial forest management. The main challenges, which face not just economics but other disciplinary approaches to PFM, are listed in Box 5. These imply that the type of economic analysis needed is rather different from the guidance presented in mainstream forestry economics texts like Price (1989), and have led to attempts over the last five years or so to combine participatory research methods with neo-classical economic methods.

2.9 Division of economic methods in three 'methodological approaches'

The range of economic methods has been arbitrarily divided into three overlapping 'methodological approaches' purely in order to be able to divide up the methods and present them in 'bite-size' chunks, rather than as part of any attempt to develop a new methodological classification:

• economic and financial cost-benefit analysis (Section 3);
• environmental economic analysis (Section 4);
• participatory economic analysis (Section 5).

There is a historical continuum across these approaches also: CBA has been used for as long as 60 years as a project tool and became established in project planning in developing countries in the 1960s, environmental economic valuation approaches have been practised since the early 1980s, but it is only in the past five years that the more participatory approach has been developed. Over this period the policy agenda has changed from a focus on the divergence between market and efficiency prices, to one in which social and environmental issues and the valuing of externalities have become paramount interests. A common factor has been the search for tools to improve policy evaluation and project selection and appraisal.

In practice there are few theoretical differences between these three approaches, and great overlap in terms of the

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Box 5. Additional economic challenges posed by participatory forest management

- The need to assess costs and benefits strictly from each stakeholder's perceptive, given that values vary according to who perceives them;
- the greater importance of equity and gender issues;
- the need for differentiation given the high site-specificity of values according to which stakeholder sub-group has access or control over them;
- the need to understand the context of local forest users decision-making involving the social, biological and institutional complexities of PFM;
- the need to view forestry and tree management as part of a livelihood system;
- stakeholder incentives as moving targets: the need for dynamic analysis, given the evolving nature of PFM (new institutional arrangements, legal and policy reform, technological change, new market possibilities like certification and carbon offsets, etc.);
- the significance of non-economic and intangible costs and benefits, e.g.,from sacred groves;
- the absence of, or imperfections in, product and factor markets making valuation more problematic;
- the difficulty of measuring illegally or opportunistically harvested forest products;
- the need to consider the indirect or hidden costs of participation, notably transaction costs;
- the need to deal with a social process rather than a set of products.

tools: the weighing up of costs and benefits in a CBA framework are common to all three. Financial analysis, providing cash-flow and profitability calculations and returns to capital, land and labour, is, or should be, the first step in undertaking CBA. Economic analysis is brought in to allow for the problem that market prices often do not reflect social efficiency indicators due to market imperfections, policy failure and other factors. Environmental valuation has come to the fore in response to the limitations of conventional economic CBA to allow for the environmental and other non-market benefits of forestry. More recently, participatory research approaches respond to the limitations of the earlier approaches to grapple with the social and distributional aspects which are key to participation. In particular they seek to improve the understanding of decision making situations and local values.

2.10   Conclusion

Historically, the forest sector has been largely residual to other sectoral and macro-economic policies, and although this is changing to some extent, policy spillovers can be expected to continue to have a disproportionate impact. Forest lands are economically marginal due to market and policy failure, environmentally more at risk and difficult to manage successfully. In addition much, if not most PFM occurs in lower value and logged-out forest.

This suggests that (a) getting the macro-economic and sectoral policy framework 'right' is as important as ever, and (b) the promotion of PFM will succeed only if sufficient technical, institutional, and market incentives are present. It implies removal of the 'subsidies' provoking forest loss or degradation, and in most situations the need for long-term institutional support and perhaps subsidisation of, or compensation for, PFM in recognition of the positive externalities generated to downstream, national and international stakeholders.

3.   ECONOMIC AND FINANCIAL COST-BENEFIT ANALYSIS

3.1   Introduction

Cost benefit analysis has been a standard tool for investment and policy appraisal for at least 35 years. It is fundamentally concerned with issues of valuation, and in particular the extent to which prevailing market prices adequately reflect the 'true' value of costs and benefits, as measured by their opportunity costs. The theoretical literature on economic CBA deals with approaches to correct for any divergence between opportunity costs and market prices.

CBA is generally associated with project appraisal. According to Gregersen & Contreras (1992), a number of fundamental questions should be asked in a CBA:

- will the project be financially acceptable in terms of the incremental net benefit (the 'with versus without' project net income)?
- is it profitable? Will the local forest users have a financial incentive to take part?
- are there public good attributes associated with management that could be used to justify subsidising it in some form?
- what are the expected equity and social impacts of the project? How are the costs and benefits shared between the stakeholders? What are the expected gender impacts?
- what will the budgetary implications of the project be for other shareholders, such as the Forestry Department, producer NGOs, private companies and community groups?
- will the project allocates resources in an economically efficient manner?
- what is the foreign exchange balance of the project?

In this chapter we examine the literature on CBA to see how these questions have been tackled.

3.2   Main concepts and methods in Economic Cost-Benefit Analysis

Differences between economic and financial CBA

Economic CBA developed out of financial investment appraisal, and its main concern has been how to deal with public choice issues. The word economic, as opposed to financial, is used since it tries to find what is efficient from society's point of view rather than a private financial perspective. To find the economic or social efficiency of a project, the financial cost and benefit flows have to be adjusted as shown in Table 1: adjustments to market prices are made so that the benefits reflect what society is willing to pay for them and the costs represent the opportunity costs. Off-site or external costs and benefits are also included, but in a purely efficiency appraisal no allowance is made for equity or gender impacts.

Shadow prices and externalities

Prices which reflect opportunity costs (willingness to pay) are known as efficiency, accounting or shadow prices. The conversion of market prices into their respective shadow prices allows a project to be assessed in terms of its economic efficiency. Differences between these sets of prices occur because of (ODA, 1988:29):

- the presence of trade restrictions (import tariffs, taxes, quotas) and overvalued currencies which increase the domestic prices of imported goods and services above their foreign exchange costs;
- monopoly power, indirect taxes, subsidies and other distortions in prices so that the latter do not correctly represent the 'true' value of the resource;
- high rates of inflation which distort relative prices;
- externalities (see Box 6);
- capital and labour market imperfections.

Table 1. Comparison of financial and economic efficiency analysis

Financial analysis	Economic efficiency analysis
1. Identifying and quantifying inputs and outputs	
Direct inputs provided by the financial entity and outputs for which the entity is paid are included.	In addition to the direct inputs and outputs, indirect effects are included, i.e.,effects which are not included in the financial analysis since they are not bought or sold within the project context. These are effects on others in society.
2. Valuing inputs and outputs	
Market prices are used. For inputs which occur in the future, future market prices are estimated.	Consumer willingness to pay (WTP) is used as the basic measure of value. In cases where market prices adequately reflect WTP, such prices are used. In other cases, "shadow prices" are estimated to provide the best measure of WTP.
Inputs and outputs are multiplied by market prices to arrive at total costs and prices, which are then entered into a cash flow table. Transfer payments (taxes, subsidies, loan transactions, etc.) are added to the cash flow table.	Inputs and outputs are multiplied by unit economic values to arrive at total economic costs and benefits which are entered in a total value flow table. Transfer payments are not treated separately, but included as part of economic costs or benefits as appropriate.
3. Comparing costs with benefits	
Using cash flow table, calculate chosen measures of project worth or commercial profitability.	Using total value flow table, calculate chosen measures of economic efficiency or economic worth.
4. Dealing with uncertainty	
Test results for uncertainty by varying values of key parameters in a sensitivity analysis.	Test results for uncertainty by varying values of key relationships/parameters in a sensitivity analysis.

Source: Gregersen & Contreras, 1992

A proposed project will always have an affect on costs and benefits. In CBA we are interested in the incremental net benefits that are expected to be brought about by the change: i.e., the costs and benefits 'with the project' less the costs and benefits 'without the project'.

In many cases where market imperfections or distortions are identified, an adjustment to market prices has to be made in order to derive their shadow prices. For example, if the market or financial price of an input is subsidised, its unsubsidised price is its shadow or economic price, and it is this value that is used in economic CBA. Apart from direct subsidies, other common examples in project appraisal where shadow pricing may need to be applied are for labour (particularly if there is high unemployment or underemployment in the economy), and for imported or exported goods (if foreign exchange is not determined by the market). In this case an international market or *border price* of traded goods is estimated.

Box 6. Externalities

Externalities are costs and benefits which occur outside the project boundary, and affect someone other than the producer or consumers of marketed goods and services. They present a particular set of problems for both quantification and valuation, either because market prices do not reflect people's WTP, or because market prices to value externality impacts do not exist. Quantification difficulties arise in terms of defining the project boundary, and the time and cost of measuring externalities. This is especially the case for non-marketed goods and services, where economic CBA calls for estimates of consumer surplus, and recognises that *'WTP is severely limited by income constraints ... measures of the value of non-priced benefits are difficult to obtain, and may be open to question. The value of cost-benefit techniques is limited in the appraisal of projects of this kind'* (ODA, 1988:26).

Dealing with time: discounting

In CBA, costs and benefits are compared by comparing them at a common point of time. This is because money has a different value according to when it is received or paid out: it is worth more if received sooner rather than later due to the possibility of investing it in alternative investments, and thus reaping the rate of interest. *Discounting* future flows of costs and benefits back to the present is necessary in order to compare projects or land uses with costs and income that occur at different times in the future. A discount rate (Box 7), which should reflect the trade-off an individual makes in terms of preferring to receive benefits in the present as opposed to the future, is used to calculate the present value of costs and benefits.

Decision-making criteria and sensitivity analysis

CBA determines the correctness of a policy decision (or project worth) by reference to a number of decision-making criteria or measures of project worth. These include:

• the net present value (NPV), which is the difference between the total discounted benefits and total discounted costs; a positive NPV favours the 'with project' situation over the 'without project' situation;
• the internal rate of return (IRR), which is the discount rate which equalises the present values of costs and benefits, and can be thought of as the yield of the project; if the IRR is greater than the alternative or opportunity cost interest rate open to the stakeholder, it is a favourable investment;
• the benefit cost ratio (BCR), which is the ratio between total discounted benefits and total discounted costs (or between undiscounted benefits and costs): a BCR greater than 1 is positive for the 'with project' situation.

Although the theoretical literature and manuals stress the need to take into account non-quantifiable elements in investment decision making, in practice emphasis is placed on the achievement of a positive NPV or of an IRR higher than a pre-determined opportunity cost interest rate. However, commentators like Price (1989) have pointed out the dangers of using IRR since it can give conflicting or perverse results depending on the timing and lumpiness of the costs and benefits; it is not advisable to use only one of the measures in isolation. Other criteria have been developed but little used in the forest sector (see Box 8).

In view of the normal degree of uncertainty surrounding technical and economic parameters used in CBA, it is essential to carry out sensitivity analysis. This involves varying the parameters through a range to see how sensitive the decision-making criteria or measures of project worth are. For example, since there is usually a great deal of uncertainty over what discount rate to use, it is normal to carry out sensitivity analysis using different discount rates. In farm or agroforestry where labour is a major input, it would be normal to vary the opportunity cost value of labour through a range. Product prices and productivity are other parameters which normally need sensitivity analysis.

It is also useful to calculate the level of a parameter at which the proposed project or intervention would no longer be attractive in comparison with the 'without project' or alternative land use situation. This is known as the cross-over value, and indicates how pessimistic the analysis needs to be for the proposed change to leave the measures of project worth no better off than before. In the case of the discount rate, the IRR is this cross-over rate, since it is the discount rate at which the NPV of the change is zero.

3.3 Economic CBA in theory and practice

Literature and application: a paradox

There is a large theoretical literature and number of professional and academic economists extolling the ability of economic appraisal (and valuation techniques), and a more sceptical audience of aid administrators, observers and field-based practitioners. There have been a plethora of texts and manuals which, during the 1970s, tried to put into general practice the economic aspects of public investment and, since the 1980s, have discussed how to account for environmental impacts. Gittinger's 'Economic Analysis of Agricultural Projects' (1982) remains a classic text, and reflected the practice of the

Box 7. The discount rate

The discount rate measures how people value present as opposed to future consumption. It shows how much they are willing to sacrifice or trade-off benefits in the future in order to secure current benefits. Thus a higher discount rate reflects a higher value on present consumption. Mathematically it is the inverse of a compound interest rate. It effectively measures the cost of time, and is critical for forestry due to the long period that capital is tied up in comparison with alternative land uses. People have a high discount rate when they face severe risk factors like tenure insecurity and market uncertainty. Risk is also strongly related to the levels of institutional support and market/technical information. These and other factors like age, degree of food security and poverty, tend to cause high discount rates in forest-dependent communities, a situation which Schneider et al. (1993) term 'imediatismo'. A low discount rate usually means that stakeholders have more secure tenure, and a supportive institutional and policy framework and limited alternative investment opportunities. Where wider investment opportunities exist, the discount rate will be strongly influenced by real interest rates in the economy. A high discount rate usually results in the present value of the benefits being lower than the present value of the costs, since in forestry the costs tend to come first.

The appropriate discount rate should reflect the 'time preference rate' of the person receiving the costs and benefits. For commercial ventures it is normal to use the opportunity cost of capital, i.e., the prevailing rate of interest charged by private lenders for similar activities. And for public investments, the rate of interest on alternative investments or the cost of capital, which is usually considerably lower than private discount rates, can be used. This is because society is able to spread risk across a range of activities and regions and can thus afford a longer-time horizon that can encompass conservation objectives.

But the discount rate from a farmer's perspective and for a particular activity is very difficult to ascertain. There are many differences for example between NFM, commercial plantations, woodlots, and agroforestry systems in terms of resource use, risk and returns whether in the form of cash income or non marketed benefits. Most forest and tree resources have multiple outputs, and different components of these systems have distinct cash flows; farmers themselves have multiple objectives encompassing both on and off-farm enterprises and activities, and depending on family size and age structure. A farmer may have different discount rates for different activities, and for different periods in any particular activity.

One possible approach is to base the discount rate on actual borrowing rates, for example from informal credit sources, although these may not always accurately reflect time preferences. Another is look at the rates of return that farmers can get from investing their time and money in alternative production activities like livestock rearing. But such approaches are difficult and have their limitations. There are no simple solutions to estimating the discount rate, but sensitivity analysis can help the analyst identify likely returns or profitability dependent on farmer and community time horizons. Who decides the discount rate, and on what basis, is a critical issue for forestry, and thus discounting in forestry has been the subject of a voluminous literature (e.g., Price, 1993).

World Bank and the other regional development banks. Gittinger pointedly sidestepped many of the complex methodological discussions raised by the proponents of social CBA, Little & Mirrless (1974) and in particular Squire and van der Tak's (1975) attempt to weigh efficiency prices according to income distribution, savings or other national objectives. Environmental concerns were taken forward by Winpenny (1991) and OECD (1994, 1995) focussed specifically on forestry. Wilmshurst (1996:27) argues that since CBA was introduced by ODA in the early 1960s, experience has shown that '... *the operational validity of this activity [the identification, appraisal and design of projects] has been enhanced over this period*.'

The paradox is that while project appraisal techniques have become more sophisticated as the need for a more comprehensive decision frame has been sought, they have been used less and less by the development agencies, and the logical framework has tended to be used more than CBA as an appraisal tool.[2] Thus Little & Mirrless (in Devarajan et al., 1996:35) comment '*we have found that the extent to which ... CBA is used and ...has real influence is not great, even within the World Bank*'.

While it is not possible to judge whether the economic efficiency of public investment has improved or not, a significant proportion of development lending has proved disappointing, especially rural development projects. Wilmshurst (1996) identifies bad governance, institutional failure (e.g., weak counterpart management and absence

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[2] The log frame cannot be a substitute for project appraisal; however, economic analysis could be used to a greater extent to complement log frameworks – for example in defining and monitoring OVIs.

Box 8. Decision-making criteria

Most CBA applications rely on traditional measures of financial profitability, or project worth such as the Net Present Value (NPV) and Internal Rate of Return (IRR) to provide decision rules for policy makers. These measures embody a singular 'economistic' approach (OECD, 1995), by reducing all the cost and benefit data about a project or policy to a single number. The advantage is that the measures are widely recognised and understood.

With social and environmental values increasingly to the fore, various attempts have been made to introduce other decision-making criteria (see below) but these have not been widely used in the analysis of forestry projects. However it should be pointed out that NPV and IRR are rarely employed in isolation; as pointed out by OECD (1995) *'although such methods as CBA purport to give a categorical and definitive rule on the acceptability of a project or policy, most decision makers are more comfortable using CBA alongside other criteria and methods, including subjective judgements.'* Also the proffered alternatives, described below, are often perceived to be more arbitrary.

Multi-criteria analysis (MCA)
involves a range of criteria, both quantitative and qualitative, which are ranked and then weighted using simple mathematical methods, so that an overall 'utility' score or composite decision-making criterion is generated. For example, criteria might include the rate of return, the cost per beneficiary, number and type of beneficiaries, sustainability, equity and other less quantitative criteria. Van der Pelt (1993) argues that MCA is most useful when there are multiple objectives and information on impacts is weak. The weighting procedures can also reflect local perspectives and sensitivity analysis may be carried out, but one criticism is that the weighting system involves subjective judgements on the part of the analyst or decision-maker detracting from its objectivity as a decision-making criterion (Grimble & Wellard, 1997). Few forestry examples could be found, although Van der Pelt (1993) reports an application to watershed management in India, and Janssen & Padilla (1996) use a form of MCA to look at the trade-offs of management options for the Pagbilao mangrove forests in the Philippines.

Cost-effectiveness
offers another criterion for project efficiency. Costs are measured in monetary terms, and benefits in physical units. It is particularly useful when benefits are not easily measurable and can be specified in terms of a fixed objective, but its main limitation is that it makes no allowance for variation in the level or quality of benefits. A number of project options are evaluated and the option with the lowest discounted cost selected. It is a procedure particularly suited to health projects where there are no differences in the service that each alternative offers (Evans et al., 1997) or when outcomes are known (Magrath et al., 1997). Conversely, it appears to be of limited usefulness in forestry in which there is always likely to be a wide variation in benefits according to different project interventions. No developing country forestry examples were found, and examples from other sectors were of little relevance due to the very different nature of the outputs.

Decision analysis
drops the assumption implicit in CBA that decision-makers are risk-neutral, and analyses the effect of risk-averseness. Expected values are weighted by attitudes to risk, and the probability of achieving the expected outcomes. At this point the decision-makers' preferences, judgements and trade-offs are assessed, the purpose being to obtain the weights that decision-makers would attach to outcomes carrying different levels of risk. The analysis could incorporate for example the *minimum regret rule* (what choice is the decision-maker least likely to regret whatever happens?) and the *MiniMax rule* (minimising the maximum possible loss). Again no forestry examples of this were found.

Sources: Winpenny, 1991; OECD, 1995

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of dialogue with project beneficiaries) and macroeconomic factors as the main causes of some of the earlier failures. These factors have contributed to the demise of CBA in project appraisal[3]. Byron (1991) has also been highly critical of CBA in a PFM context – see Box 9. Although

CBA has waned in importance in development assistance, it is still extensively used in both public policy and private investment appraisal.

The high rate of project failure experienced by development agencies suggests the need either for more rigorous appraisal techniques, including economic analysis, or the search for alternative methods. Devarajan

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[3] However, it should be stressed that CBA techniques remain a key component of policy appraisal and the environmental economic approaches discussed in Section 4.

> ## Box 9. CBA and community forestry in Nepal
>
> Byron (1991) reviewed a number of economic CBA studies applied to community forestry projects in Nepal and concluded that *'CBA ... is severely stretched as a concept ... in application to local, self-help, subsistence orientated community forestry.'* Byron found that all the CBA studies (no less than five on the Nepal-Australia Forestry Project) suffered from conceptual flaws which could render the resulting numbers meaningless, and dismisses CBA as a *'ritual of development'* favoured by donors and governments and as *'another remnant of the top-down expert-based paradigm'*.
>
> He particularly questions the legitimacy of employing CBA techniques, with their emphasis on efficiency of capital use, in situations where distributional issues are of primary concern and probably the key to project success. In addition, at the micro-level, he asks whether a typical farm budget exercise is capable of capturing the extensive use of non-traded inputs like family labour, or joint outputs from household agroforestry activities; and at the macro-level, he is unconvinced by attempts to calculate the wider external effects of community forestry, describing them as 'a highly speculative exercise'. He stresses the importance that the intended beneficiaries participate fully in project design, monitoring and evaluation so that their costs and benefits are factored in.
>
> Source: Byron, 1991

et al. (1996) point to the latter, calling for the development of more simple and practical valuation methods with reduced demands on time and data. Whatever the approach, '*knowing when sufficient appraisal work has been undertaken to permit a soundly based decision*' (Wilmshurst, 1996) remains a key skill.

3.4   Financial CBA of NFM and planted tree systems

The private perspective

Whereas economic CBA considers the use of trees and forest land in terms of the net economic benefits to society, financial CBA looks at *private* benefits and costs. The costs and benefits used in the financial analysis are those actually incurred or received by the farmers or other local stakeholder groups. At the same time it is recognised that profitability is by no means the only reason for the adoption, or not, of forest or tree management. The adoption of management options depend on a range of factors including relative resource availability, household savings and income strategies, security of tenure, farmer assessment of risk and thus their discount rates, and the availability of technical and financial information, as well as their perceptions of the value of tree resources (Current et al., 1995).

CBA studies of natural forest management

A number of financial CBA studies of NFM have been undertaken. On the whole their main objectives have been to demonstrate whether NFM is a viable option (e.g., Reid & Howard, undated; Hardner & Rice, 1994). These are *ex-ante* studies[4] stemming from research programmes or academic studies. Forest inventory data is usually specific to the study area, and used for modelling exercises from which expected yields are drawn. The financial data is

drawn from local studies of traditional logging practices and markets, which is extrapolated to the NFM scenario. The most common measure of project worth is the NPV, although the IRR and Benefit Cost Ratios are also usually estimated. Extensive use is made of sensitivity analysis to test key technical and economic assumptions.

Reid & Howard (undated) highlight the negative impacts of high opportunity costs and discount rates on the viability of NFM. Their study considers three principle variables: the rate of growth of the forest stand, the rate of growth of alternative investments (i.e., the discount rate), and the rate of change of timber prices. Their analysis encompasses two cutting cycles of 25 years, and three discount rates (5%, 10% and 15%). They conclude that reduced logging intensity required for 'good management practices' and increased unit management costs implies a high opportunity cost in terms of the foregone income from liquidation logging. Sensitivity analysis of timber prices suggests that prices are unlikely to rise enough to offset the cost of waiting for a second harvest.

A study prepared for the Lomerio Community Forest in Bolivia estimated the incremental return to certified forest management (Hanrahan et al., 1997). The expected NPV of certified forest management is high but sensitive to variation in the sawnwood prices of secondary timber species, which are currently restricted to a narrow market. As in the majority of CBA studies, distributional issues are hardly addressed. For example, it is not clear from the Lomerio study how benefits would be shared among community members, nor is there any analysis of the impact of the proposed increase in logging on the production of non-marketed NTFPs which at present constitute up to 75% of average family income (cash and consumption).

Finch's (1997) study of the Plan Piloto Forestal in Mexico examines the profitability (using cash flow, and NPV and IRR measures) of introducing new roads and harvesting

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[4] No *ex-post* studies were found.

techniques, in particular with regard to the size of the *ejidos* and their forest resources. Identified problems include the impact of illegal felling on sale prices and the exaggeration of current profits through the omission by *ejidos* (Mexican land-reform co-operatives) of capital replacement costs.

A DFID-supported NFM project in Costa Rica prepared *ex-ante* estimates of the returns to individual private forest owners – using actual field data for the particular forest block to be managed, and regional studies of forest growth based on permanent sample plot data (Davies, 1997). A primary objective of this work was to enable foresters to undertake financial analysis of the technical options in the management plans. Particular attention was paid to monitoring management, logging and post-harvest silvicultural treatment costs. Sensitivity analysis was undertaken on a number of key variables, including the discount rate (from 5-20%). The analysis shows the financial return to the forest owner, logger and NGO providing technical assistance. At the prevailing market prices, the management of small forest blocks – the majority previously logged – was rarely found to be profitable

with real discount rates above 10% and 15-20 year felling cycles. However, with a forest management subsidy introduced in 1992, and replaced in 1996 by a compensatory payment for the environmental services provided by good management, forest income increased at the beginning of the felling cycle and management became profitable in most cases.

Agroforestry

There have been a number of recent surveys of agroforestry which predominantly use a financial CBA approach (Prinsley, 1990; Sullivan et al., 1992; Current et al., 1995). Such studies have not only looked at overall measures of net benefits (NPV, IRR, etc.), but also situated the analysis in the farm household context, and estimated (albeit on an *ex-ante* basis) the expected returns to scarce factors such as family labour. Current et al. (1995) compared agroforestry experiences in a number of countries in Central America and the Caribbean by standardising the financial evaluation of projects: for example, in each case a real discount rate of 20% was used to calculate NPVs. The cash and labour requirements of the various

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Box 10. Partial CBA approaches to evaluating farmer decision making

The concept of *opportunity cost* is fundamental to methods of economic analysis: whether input costs or non cash inputs (such as family labour, forage, etc.), their cost is measured by the value of production foregone of the best alternative use of the resources. Likewise, for a farm household, factors of production should be used up to the point where they will have the greatest return. A number of techniques are available to the analyst to assess farm decision-making:

Farm income analysis
evaluates the present situation of a given farming system, by looking at production revenues and costs, the use of factors of production (labour, land and capital), and management constraints, such as marketing opportunities and resource endowments. It provides a snap-shot of the system and the efficiency of resource use, normally over a period of one year. The data demands are high.

Partial budgeting
evaluates the impact of change; partial budgeting considers a change that only occurs in one component of the farm system, and so only the additional costs and benefits need to be calculated and valued. The advantages of this method is the focus on labour and cash aspects of any proposed change, such as the introduction of a new technology, and the way it reflects the gradual approach of farmers in adopting technologies. The main disadvantage of partial budgeting is the possibility of overlooking wider resource constraints and other household and livelihood objectives.

Gross margin analysis
is a simpler approach insofar as it considers only the expected gains and losses in outputs due to minor changes in inputs, i.e. estimates of revenues minus variable costs for a given activity are found. Gross margins can be expressed in terms of any unit of resource (per hectare, per head of livestock, etc.). The total of a farm's gross margins minus fixed costs is equivalent to net farm income. Gross margin analysis is thought to lend itself to farmers' own assessment criteria, and rough estimates can be made 'on the back of an envelope' which means that the analysis can be shared with farmers in the field. It shares the same disadvantages of the partial budgeting approach.

The choice of any particular technique will depend on the objectives of the study and the time and resources available for data collection. A good understanding of farmer decision-making criteria is the most important aspect.

Main sources: Brown (1979); Dillon & Hardaker (1980)

systems, and payback periods were also estimated. Much of the analysis was based on farm income, partial and whole farm budgeting techniques (see Box 10).

3.5   Conclusion

Economic CBA is an important tool for evaluating public investment choice, and to correct perceived distortions caused by policy and market failures. The adjustments necessary have become more complicated as natural resource and environmental issues have come to the fore. In practice one of the limitations of economic CBA has been the difficulty in quantification or measurement of non-marketed benefits, not least because of the short period usually allowed for project appraisal.

Economic and financial CBAs in PFM situations have rarely considered local valuation or distributional aspects, in contrast to the analysis of agroforestry systems and trees on farms. Project appraisal reports have responded more to the investment needs of donors and capital efficiency criteria, and published case studies to specific academic and research programmes of funding agencies. There is some evidence that these biases are changing. This may be partly because the gap between market and efficiency prices has narrowed, and because economic CBA has been de-emphasised by development agencies as a tool in project preparation. However, the more important reason is probably that some of the tools of CBA are being employed in conjunction with the methodological approaches described in the following sections, and the usefulness of this combination is becoming increasingly apparent.

4.   ENVIRONMENTAL ECONOMIC ANALYSIS

4.1   Introduction

The main impact of environmental economics has been to focus attention on quantification and valuation issues, particularly of environmental and other non-marketed benefits and costs, and to shift the emphasis away from project appraisal to policy issues. In terms of the forestry sector, important policy areas for environmental economics have included the analysis of the impact of trade restrictions like log export bans (Barbier et al., 1994a), the potential for capturing global externality values through appropriate market-based instruments (Pearce, 1996) and the assessment of forest pricing and concession policies. The emphasis in the environmental economics approach has been less on data collection and more on data analysis, particularly the methodological issues surrounding the valuation of non-market benefits. Many environmental economics studies rely on short-cut methods like the use of comparative data from another similar area, expert opinion and a greater dependence on secondary data in general.

4.2   Classification of forest benefits and valuation methods

Environmental economics has extended the boundaries of CBA in that it has forced the analyst to take account of the full opportunity cost of a change in land use. This involves accounting for both the environmental costs and the market/subsistence benefits foregone by local users in the alternative (to forestry) land use. The literature varies slightly but usually defines four main benefit types (e.g., IIED, 1994), which are sub-divided into use and non-use values:

1. **Direct use values** are received directly by forest users and other stakeholder groups, and can be divided between:

- *extractive uses,* mainly marketed or subsistence forest products; and
- *non-extractive uses* like eco-tourism, recreation and scientific studies, as well as cultural or spiritual values to forest users.

2. **Indirect use values** support and protect economic activities, can accrue to specific stakeholder groups like forest users or society in general, and mainly comprise environmental or ecological services. They can be:

- *on-site*: e.g., soil fertility and micro-climate benefits of trees; or
- *off-site*: e.g., downstream watershed protection, reduced siltation and avoidance of carbon loss. Off-site costs and benefits are often termed *externalities.*

3. **Option value** is the value that the various stakeholders place on the future direct and indirect use values (as per 1 and 2) to current users. In other words it is the value of keeping open the option of using the forest in the future. *'Quasi-option values'* are undiscovered and unrealised scientific, educational and commercial uses or benefits from the forest.

4. **Non-use values**, comprising *existence* and *bequest values:*

- *existence value* is the value placed on the continued existence of something independent of its use values, i.e., its intrinsic worth. It accrues mainly to people who do not use the forest, and may never even see it except in books, but value the fact it exists, for example for its biodiversity, cultural heritage value, etc.

- *bequest* value is a special case of option value: it represents the value (to current users) of being able to bequeath the forest to future generations.

Lampietti & Dixon (1995) simplify the classification in the forestry context by grouping option and non-use values together as *preservation values*. When added together, the use and non-use values comprise the *Total Economic Value* (TEV) of the forest. Table 2 attempts to classify the

values according to which stakeholders are most likely to receive them.

There is an abundant literature reviewing valuation methods for forestry, including *inter alia* IIED (1994), Gregersen et al. (1995) and Kengen (1997). Valuation methods can be classified into three main types:

• *direct market price* (or cost) methods based on prices observed in markets;
• *surrogate market* methods based on the price or value of other products or inputs;
• *constructed market* methods based on hypothetical markets for non-market benefits.

Table 3 indicates the circumstances in which these valuation methods are most likely to be used, and lists some tropical forestry case study examples, while Appendix 1 describes the valuation methods themselves.

4.3   Review of forest valuation methods

Marketed direct use values

Common difficulties, especially in valuing NTFPs

The most straightforward approach for marketed forest products and inputs is to use market prices and subtract the costs of production to find the net economic value. However, life is not that simple and the appropriate price to use depends on the stakeholder type, whether there are market imperfections or distortions, seasonality and

quality of the product, and changing market patterns over time (an average market price can be very misleading).

For primary and commercial stakeholders, it is best to use prevailing market prices as a basis, as opposed to shadow prices, because this is their decision-making reality. Efforts must also be made to assess how prices will change in the future, which means considering if the price will fall as a result of a production increase, trends in resource scarcity, technological change, consumer preferences, etc.

When considering national and international stakeholders, shadow prices for forest products should be used when there are trade restrictions, like a log export ban. Trade restrictions depress local timber prices below world levels. A further concern about using market prices, even world market prices, as a basis for valuing timber is that they reflect the costs of harvesting existing forests rather than the cost of establishing a replacement resource, and so undervalue it (Gregersen et al., 1995).

NTFPs are harder to value than timber, since they are often confined to small and imperfect local markets, or are intermediate inputs into farming systems. A review of the methodology to estimate NTFP values was carried out by Godoy et al. (1993), who looked at 24 NTFP valuation case studies. They found that there was little consistency either in the methods employed or results obtained with gross values ranging from US$0.75 per ha/year to over US$422 per ha in one celebrated study in the Peruvian Amazon (Peters et al., 1989). They also reported a lack of attention to the sustainability of production, inadequate

Table 2. Distribution of total economic value among stakeholders

Affected Stakeholders	Total Economic Value (TEV)			
	Extractive direct use values	**Non-extractive direct use values**	**Indirect use values**	**Preservation values**
Local forest users and forest clearers	Forest and agricultural products (sale and subsistence)	Cultural and spiritual values	Micro-climate, soil conservation and nutrient cycling	Bequest value
Commercial interests	Timber, commercial NTFPs	Ecotourism		
National and Forestry Dept. interests	Export and other market outputs, forest revenue	Ecotourism, recreation, education, science	Watershed protection and other hydrological functions	Biodiversity quasi-option values (commercial potential)
Donor and global interests	Consumers of imported timber and NTFPs	Science (esp. medical), education and ecotourism	Global environmental services, as CO_2 and climate stability	Biodiversity and other existence values

Source: Adapted from Lampietti & Dixon, 1995

Table 3. Valuation methods, conditions for use and forestry case studies

Valuation method	Type of benefit/cost and conditions for use	Tropical forestry case study examples
Direct market price/cost: - market prices (based on market surveys) - stumpage value - replacement cost - preventive expenditure	- direct extractive use values: forest and agricultural products/inputs with established markets - marketed/processed forest products - indirect use values if an alternative source of benefit would be sought (e.g.,fertilizer used to replace soil nutrients) - indirect use values if beneficiaries prepared to spend to avoid impacts (e.g.,flooding due to river bed sedimentation)	- net value of NTFPs from 1 ha. Amazon forest (Peters et al, 1989); returns to labour from basket making in Botswana (Bishop & Scoones, 1994) - analysis of profitability of *ejido* producers, Mexico (Finch 1997)
Surrogate markets: - proxy or substitute products - change in productivity - opportunity cost of labour - indirect opportunity cost method - travel cost method - hedonic pricing	- direct extractive use values: forest products with close market substitutes (e.g., kerosene for firewood) - indirect use values where the impact on the productivity of another marketable product can be measured (e.g.,fish output affected by soil erosion) - direct or indirect use values where labour is the major cost (e.g.,firewood) - where non-marketed products are substitutable - direct non-extractive use values involving a high travel cost element (eg ecotourism, recreation) - indirect use values where a change in property values can be predicted from a change in an environmental amenity	- reforestation and agroforestry benefits in Nigeria (Anderson, 1987) - firewood valuation in Nepal (Dixon et al, 1994) - dung to value firewood in Nepal (Dixon et al, 1994) - ecotourism benefits in Madagascar National Park (Kramer et al, 1995)
Constructed markets: - contingent valuation methods	- non-use values, and other benefits for which other valuation methods cannot be used, and when it is possible to construct a hypothetical market (e.g., existence values of endangered species)	- existence value of tropical rainforest to US residents (Kramer et al, 1996); compensation for removal from protected area; social forestry in India (Köhlin, 1996); environmental services in Peru (Smith et al, 1997)

biological description, the problem of data based on unrepresentative years, the limited usefulness of gross value figures and the mixing up of stock (what is in the forest) and flow (what comes out of it) valuation, leading to highly divergent figures.

Padoch & Pinedo-Vasquez (1996) point out that many valuation studies have come up with calculations based on simplistic assumptions, especially about the market and tenure security, which make it appear that NTFP-based extractivism is more attractive than land use alternatives. The most serious problem in the Peters et al. (1989) study was the assumption that a per hectare value could be grossed up using local market prices. But local markets are easily saturated, so prices are likely to fall sharply with increased output. Other problems included the failure to remove policy distortions from market prices and costs; underestimation of transport costs; making comparisons with alternatives in terms of returns to land when labour was the scarce factor; and the assumption of sustainable NTFP extraction in the face of insecure land tenure.

A later study in a neighbouring area (Pinedo-Vasquez et al., 1992) showed how different assumptions resulted in a much lower return to forest management (US$20 per ha/ year), both in comparison to Peters et al. (1989) and the opportunity cost alternative – shifting agriculture. They found that the actual use value, when taking into account the marketing and tenure constraints, was less than 4% of that assumed in the earlier study. Of particular significance

for ESA, the latter study adopted a local stakeholder perspective. For local farmers with tenure insecurity it was more rational to consider profit maximisation over a two year time horizon. The comparison of these case studies is also significant in that it contrasts an *ex-ante* study based on estimated parameters with an *ex-post* study based on field observation.

Another issue of importance for ESA is the tendency in virtually all the studies reviewed by Godoy et al. (1993) to express values per unit of land area. Especially in Africa and Latin America, where population densities are lower, the limiting factor of production is more often labour. In this situation, the return to labour is critical to resource use decision making, while the return to land may not be so relevant. A further danger is when the same prices of products and inputs are used in the with and without project comparison for alternative land uses. Major land use changes would be expected to change factor and product prices in an area, since they would change the relative scarcity of products and the demand for labour and land (Hot Springs Working Group, 1995).

Valuation difficulties are not confined to assigning the correct price. Great care is also needed for measuring yields of NTFPs which can vary enormously from year to year; e.g., some 13,000 tonnes of *illipe* nuts were exported from West Kalimantan in 1987, whereas in the following year only 50 tonnes were collected (reported in Kengen, 1997).

Net return to labour

One of the difficulties of calculating the net value per hectare is the cost of labour. In many PFM situations, the labour market is not well developed. In such situations, the price of labour should be based on its opportunity cost, which is subject to considerable seasonal and spatial variation. Many economic studies, as those reviewed by Godoy et al. (1993), make simplistic assumptions about the cost of labour, and ended up with figures of little comparative validity.[5] This is particularly critical for NTFPs since labour usually represents the principal cost.

In order to overcome the difficulty of valuing labour in a situation where labour was constraining, Bishop and Scoones (1994) calculated the return to labour from basket production in Botswana. This was compared to the net return to labour from agriculture, beer brewing and drought relief, thus permitting a useful discussion on the livelihood trade-offs involved.

Subsistence direct use values

There appear to be four main possibilities, depending on the circumstances, for valuing subsistence production, whether referring to forestry-based livelihood options or alternative land uses: the market price, a proxy market value, the opportunity cost of production, or a constructed market method.

The simplest approach is to assume a family would purchase the good in question if they didn't produce it themselves. The appropriate value would be the purchase price plus any transport or travel cost to buy it, although the possibility of multi-purpose journeys needs to be kept in mind. However when cash income is a major limitation, households are unlikely to purchase replacement forest products. A more conservative approach is to value consumption by its opportunity cost – the loss of sale value: this would be the sale price less marketing and travel costs.

In the absence of a market for the product, a proxy market approach might be possible, for example purchased fuel instead of firewood. This can be very practical if the different fuels can be expressed in the same delivered energy terms, but will overvalue subsistence if the users would not in reality buy in the fuel if they could not gather firewood (Gregersen et al., 1995). Also, fuels are rarely perfect substitutes; for example, the utilizable energy from the same calorific value can be 50% for kerosene as opposed to 10-20% for firewood, and kerosene is a cleaner fuel; on the other hand kerosene stoves have higher fixed costs (Kengen, 1997).

In situations where there is substitutability between two non-marketed products, an opportunity cost approach (sometimes called the *indirect substitute* method) can sometimes be used. For example in Nepal, firewood was valued in terms of its nearest substitute dung, the value of the latter being determined by the foregone production of maize from not using it as a manure (Dixon et al., 1994).

There are several examples in the literature in which subsistence products, usually firewood, have been valued using the opportunity cost of labour, based on the observation that this is the main component of cost. This method depends on being able to identify the time involved, remembering to allocate the time between firewood collection and other activities *en route*, and the value of the gatherers' alternative activities during that time. Thus it is important to distinguish between household members. One obvious drawback of basing the value of something in terms of its main cost, is the implication that its net value is near zero.

The problems of valuing subsistence production have convinced some economists to use constructed market methods. CV methods were used to assess the forest benefits being received by local forest users in a proposed protected area in Madagascar, in order to see how much they would need compensating for a loss of access (Kramer et al., 1995). Villagers were asked their willingness to accept compensation for leaving the protected area in terms of baskets of rice. A referendum format was used so people were offered a specific amount of rice; depending if they said yes or no, they were then offered a lower or higher quantity of rice, and so on, until

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[5]Also many of the studies reviewed did not take into account resource tenure and sustainability issues. Clearly where property rights are poorly defined or the resource tends towards open access, it cannot be assumed that current returns are a good guide to future returns.

their willingness to accept was found. The authors claimed that with due attention to enumerator training, pre-testing, etc., and use of rice instead of money as the numeraire, the responses were consistent with economic theory.

An innovative and participatory constructed market approach was used to value subsistence production in the context of a community forest management project in the Bolivian Amazon (Vallejos et al., 1996). A two-day workshop was carried out with 12 representative villagers in which the barter exchange values of non-marketed fruits were determined in terms of bags of salt, with the villagers taking it in turns to be fruit sellers and salt owners. Following the exercise the participants as a group decided if the prices determined by the bartering process were appropriate. This study is one of many indicating the potential of group discussions with key informants as an effective means of obtaining economic data, as opposed to individual interviews.

While Godoy et al. (1993) observed that the main problem for NTFP valuation is normally the price, physical quantification can also be a major hurdle, especially if hunting, fishing and illegal harvesting are involved. The latter is particularly tricky to elicit from local users. Godoy et al. (1993) recommend a number of approaches to estimate production, including physically measuring and weighing products on a sample household basis; training farmers to do this and record the results in a log book; and accompanying users on collection trips. These are higher cost methods but more reliable than relying on memory, although it is noted the latter can be considerably enhanced by using picture cards as memory aids.

Non-extractive direct use values

Whether cultural or spiritual value accruing to local users, or to educational, recreational and other non-extractive direct use values accruing more to urban and international stakeholders, these values are difficult to quantify and value. In the case of local stakeholders it is important to find their relative importance through a participatory ranking exercise (see Section 5.2). Valuation of this type of benefit is normally only carried out when attempting to show the total economic value of the forest in comparison to an alternative land use, for example when justifying the establishment of a protected area. For recreational or eco-tourism values, the usual approach is to use the travel cost method or to carry out a CV study, but these methods have a number of limitations (see Table 4).

Indirect use values

A range of methods can be used to value the retention of environmental services due to forestry, but most examples in the literature relate to off-site or downstream benefits or costs rather than on-site effects, and so are of limited relevance to local forest users unless government intervenes to tax the downstream beneficiaries, returning this revenue to the forest managers, or to impose a 'polluter pays' tax on

the latter. The most satisfactory approach to valuing indirect use values is probably the change of productivity method, but in practice the difficulties and cost of quantifying complex chains of cause and effect often rule this out. The most significant applications of this method have been when considering afforestation and agroforestry benefits (e.g., Anderson, 1987).

Replacement cost (e.g., fertilizers to replace lost soil nutrients) and preventive expenditure (e.g., developing a windbreak to replace natural forest) are easier to calculate, and can be considered a useful adjunct to other valuation methods, particularly for downstream benefits, but are considered unreliable on their own due to the problematic assumption that the level of benefits would remain the same, even if it can be established that people would actually make the additional outlays involved.

Another way of measuring environmental service benefits is through contingent valuation. In one application in Amazonian Peru, CV methods were used to value the environmental services that could be gained by slash-and-burn farmers in the Amazon adopting agroforestry or forest management practices (Smith et al., 1997). Of particular interest in this study is the way that local values are linked to global benefits.

Non-use or preservation values

For non-use values, there is little alternative to CV or participatory valuation methods. Existence and other non-use values are usually only looked at from the perspective of the global stakeholder, and sometimes come into TEV studies. Most cases of valuation of existence values have focussed on endangered fauna.

4.4   Conclusion

Table 4 shows that, broadly speaking, the methodological and practical difficulties and cost become greater, and credibility declines, as we move along the continuum from market prices to contingent valuation methods, which are subject to continuing controversy (see Box 11). The main difficulty is not so much finding an appropriate valuation method (although this is an issue with indirect and non-use values) but more commonly one of quantifying the physical relationships (Gregersen et al., 1995). The main problem is normally establishing production and/or consumption levels of forest products: the use of some valuation methods, notable CV and the travel cost method, overcomes this problem since physical relationships do not need to be specified**.** It appears that unless we can find the data from market surveys, whether from direct or proxy markets, it is too expensive and beyond the normal time-horizon to hope for accurate estimations of stakeholder costs and benefits.

An increasingly worrying aspect of some of the valuation methods is credibility: the '*eagerness to find monetary values may, by generating unrealistic numbers, eventually undermine the credibility of forest valuation in*

Table 4. Strengths and limitations of valuation methods

Valuation method	Strengths	Weaknesses or limitations
Direct market price or cost: - market prices	- market/shadow prices are usually the best estimate of WTP - market prices reflect stakeholders' decision-making reality (they are the prices faced when making decisions)	- market and policy failure mean that shadow prices need calculating to find WTP - prices understate true 'value in use' since they don't include consumer surplus - prices vary by season & year, so averages mislead - care is needed over the assumption that output will not affect price
- replacement cost and preventive expenditure	- relatively easy to calculate (sometimes based on observed behaviour) and useful as second-best estimate, especially where forestry has downstream impacts	- difficult to establish if people really would be prepared to incur costs to secure benefits in without project situation - difficult to establish if net benefits of prevention or replacement would be same as the 'with project' intervention
Surrogate markets: - proxy/substitute products	- relatively easy to collect data	- proxies are rarely perfect substitutes - same limitations as for market prices
- change in productivity	- if data exists, easily understood by decision makers	- quantitative input-output data needed on physical relationships (usually only available if research), and difficulty of isolating cause and effect
- opportunity cost	- useful for subsistence production with high labour requirements, and one land use precludes another	- only useful for gross value since the product is effectively valued by its cost, and labour opportunity cost can be difficult and costly to value properly
- travel cost method	- several case studies estimating recreation and eco-tourism exist; more accurate when short distances - no need to quantify physical or technical relationships	- assumptions required to develop demand curve (e.g., whether travel is uni- or multi-purpose); results sensitive to statistical methods; data intensive and complex/high cost; tends to underestimate value
- hedonic pricing	- potential use in high income/semi-urban areas	- relies on highly developed property markets, and it is difficult to isolate the explanatory variable
Constructed markets: - contingent valuation methods	- regarded by many as reliable if strict procedures are followed and pre-testing carried out (now accepted by US legal system as basis for assessing environmental damages) - the only method available for non-use values - includes consumer surplus, so nearer to 'true' WTP - no need to quantify physical or technical relationships - gives net value, so no need to deduct costs	- difficulty of the hypothetical market: results depend on 'theatre' in which the scenario is presented - 'embedding': people find it difficult to separate environmental from wider values - respondent bias: strategic bids, protest bids, public citizen voting, etc. - starting point bias in referendum-style bids - monetary measures in subsistence societies - low credibility to stakeholders and policy makers - high cost if done properly - low income as a constraint on WTP or WTA - ethical issues, especially in low income societies

> **Box 11. The on-going debate about contingent valuation methods**
>
> Economists seem about equally divided between supporters and detractors of CV. There are an increasing number of tropical forestry applications by the 'believers' (see case studies 10-13). Many commentators believe that CV methods are here to stay and, as the methodologies develop, will increasingly become an important tool in forest economic analysis. For example, Smith et al. (1997:7) claim that *'it is now well-documented that the values obtained correspond to the correct welfare measures'* and Kengen (1997:59) states that *'there are no major problems in applying the theory or techniques available'*.
>
> Such viewpoints are contested by such as Winpenny (1996) and Bennett & Byron (1997) who raise a series of methodological and practical doubts, which are summarised in Table 4. These range from the problems surrounding the hypothetical scenario – Whittington (1996) has pointed out that in some cultures the *'conditional subjunctive is not translatable'* – through to ethical objections like whether it is correct to ask people to place a monetary value on their cultural capital (Köhlin, 1996). The 'bottom-line' reservation is that although rural forest dwellers, when asked, may be able to come up with a number, it is not clear that the thought processes at work are actually those assumed by economic theory (and thus by economists), and that what people say they will pay for something reflects what they would actually pay (Gregersen et al., 1995).

general' (Kengen, 1997). The more sophisticated and abstract the methods are, the less well they are understood by decision-makers, and the more difficult it is to unravel the underlying assumptions. Even when it might be possible to derive estimates using these methods, there are still a number of pitfalls, and it has been observed that different valuation methods have resulted in divergent values for the same good or service (Bennett & Byron, 1997).

5. PARTICIPATORY ECONOMIC ANALYSIS

Participatory research methods like participatory research appraisal (PRA) or, as it is now often called, participatory learning and action (PLA), are now well established as a means of understanding the local perspectives of resource use, and have developed their own toolbox of data collection and analysis methods to inform decision-making by local stakeholders (Pretty et al., 1995). PRA has been defined by Chambers & Guijt (1995) as *'a family of approaches and methods to enable rural people to share, enhance, and analyse their knowledge of life and conditions, to plan and to act'*.

The term 'participatory economic analysis' is used here to describe attempts to combine participatory research methods and neo-classical economic methods. Arguably, the main emphasis in this 'methodological approach' is more on the process of data collection rather than data analysis, although the distinction between the two stages is greatly reduced, since much of the analysis takes place as the data is being collected, for example in mapping exercises, seasonal labour calendars, the ranking of benefits, etc.

5.1 Strengths and weaknesses of participatory research methods[6]

The claims of participatory research advocates

Participatory approaches to economic analysis have evolved from a growing dissatisfaction with the record of neo-classical economic analysis of community-level natural resource management situations. The criticisms levelled at neo-classical methods, especially household surveys and CBA, come both from the advocates of participatory research methodologies (Chambers, 1992, IIED, 1997) and those who argue from a forestry economics perspective (Byron, 1991; Tacconi, 1995; Bennett & Byron, 1997), and include:

- the top-down analysis ignores the fact that different stakeholders value the same costs and benefits in different ways according to their perspectives and objectives;
- the tendency to ascribe less weight to equity, livelihood and institutional issues, including resource access and control, when these are usually the main determinants of PFM outcomes;
- the theoretical and practical problems of using discount rates to account for time;
- the assumptions of neo-classical economics are often tenuous or invalid in a PFM context (e.g., local forest users as profit maximisers, constant marginal utility of income, etc.);
- the lack of transparency makes it easy for economists to 'massage' the data or hide key assumptions in order to window-dress a pre-determined outcome;
- the emphasis on marketed and environmental impacts at

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[6]This discussion ignores the role of key informant interviews. While PLA advocates might claim that the key informant approach belongs to the participatory research family of methods, good economists have always balanced more structured research methods with informal field interviews and group discussions.

the expense of subsistence and non-tangible benefits;
- the bias to the efficiency of capital use as the main decision making criteria.

According to Tacconi (1997), there are a number of basic methodological and philosophical differences between 'positivist' neo-classical economics and 'post-positivist' participatory research:

- the latter recognises that resources are valued by different people at different times and for a variety of reasons;
- knowledge is regarded as culturally and socially constructed, so by definition there are multiple views of a particular situation and no single version of reality;
- it recognises that stakeholder objectives often differ from profit maximisation, and that the choice of means may be constrained by cultural and moral values;
- it recognises that resources are continuously being (re)negotiated among the stakeholders, so there is a need to understand patterns of power and control;
- a learning process can be adopted involving consultation, empowerment and negotiation, in which the outsider can become a visible actor as a facilitator and catalyst, and the insider an active, creative participant;
- participatory research methods can empower communities to address their social, political and institutional constraints.

There is also a different attitude to the statistical precision of quantitative data; in PRA, non-random sampling based on researcher judgement is thought to be as reliable as formal survey questionnaires (IIED, 1997). Thus Chambers (1992) claims that '*it is better to be approximately right than precisely wrong*' and that participatory methods can yield comparable information at a much lower cost. Other claims, which imply that traditional research methods are correspondingly deficient, are set out in Box 12.

Criticisms of participatory approaches to economic analysis

Unfortunately the practice and results of much participatory work, especially when it tackles economic themes and analysis, has not lived up to the above claims; the benefits of participatory research methods seem to have been exaggerated. First, it is unclear whether PRA does empower local communities to confront social and institutional constraints. It may raise expectations that this is possible, but change is only likely to occur if a community is able to exert influence within the existing institutional hierarchy. Second, there is little evidence to suggest that PRA has been less 'extractive' than neo-classical approaches. There is a fine line between PRA and RRA, in which the extractive basis of the research is clearly acknowledged. For example, IIED (1997) acknowledges that the Hidden Harvest case study methodologies, reviewed below, are best discussed under the RRA umbrella.

Much of the PRA literature assumes 'best practice' participatory research. Experience shows that there are many elements that have to be exactly right for best-practice PRA, including:

- a group which is both representative and an optimal size for discussion;
- a means to counter the tendency for strong individuals to dominate or bias the group;
- adequate space for discussions and where distractions are minimised;
- stability: the problem of people joining or leaving the group half way through;
- the ability of the facilitator to ensure a good group dynamic.

Among the weaknesses of participatory research in comparison with more traditional economics methods, IIED (1997) point out that detailed micro-level PRA studies have had a limited impact on policy level decision makers who have been unable to make the necessary micro-macro linkages, and the difficulties of estimating the cardinal (absolute) values needed in economic analysis, as opposed to ordinal (relative) values. PRA methods are more orientated to relative values and bringing together different perspectives, which makes quantification difficult. It is also difficult and probably invalid to compare ordinal values from one place with those from somewhere else, and it is certainly invalid to aggregate them. A major concern is the difficulty of knowing how representative of stakeholders a particular PRA group is, although this can be ameliorated to some extent through a prior wealth ranking exercise. Against these criticisms, PRA advocates may argue that the methods were never designed for economic quantification.

In participatory research the quality of the data is arguably even more dependent on the skill of the researcher than other research methodologies. For example, PRA facilitators need to be aware of their own biases which can lead to misinterpretation of information, of strategic 'group think' or manipulation, of posing leading questions, and of being over-influenced by anecdotes. This leads to the suspicion that much PRA data is 'untrustworthy', since it can be based on an unquestioning acceptance by researchers of statements by local people, or the researchers lack the social science skills to detect when they are being told what it is thought they want to hear or are even being manipulated.

5.2 Applications of participatory economic analysis to PFM

The experience of the Hidden Harvest Programme

The main programmes to realise the need for a more participatory approach to forest valuation have been the Hidden Harvest Programme (HHP) developed by IIED and collaborating institutions, the 'Value of Trees' research programme involving the Universities of Zimbabwe and Alberta (these two programmes joined forces for the Hot Springs (1995) study in Zimbabwe, and

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Box 12. Characteristics of participatory research approaches

The advocates of PRA claim that participatory research methods can result in:

- the offsetting of biases: spatial, project, person-specific (gender, elite), seasonal and professional;
- rapid progressive learning which is flexible, exploratory, interactive, inventive and visible;
- a reversal of roles: learning from, with and by local people; eliciting and using their criteria and categories; and finding, understanding and appreciating local people's knowledge;
- optimal ignorance and appropriate imprecision: not finding out more than is needed and not measuring when comparing is enough;
- effective triangulation: cross-checking using different methods, information sources, disciplinary insights, and informants in a range of locations;
- outsiders learning directly from and with local people;
- recognising that resources are valued by different people at different times and for different reasons, it seeks out diversity and differences;
- more effective analysis of intra-household and gender issues.

Best practice PRA emphasises:

- facilitation skills which enable local people to do the research, analysis, presentation and planning;
- the sharing of information, methods, food and field experiences between stakeholders;
- the behaviour and attitudes of external facilitators.

Source: Modified from IIED, 1997

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the Joint Forest Management (JFM) Support Programme in India.

The HHP has focused on the valuation of wild resources, and carried out a series of case studies in Zimbabwe, Botswana, Nigeria, Brazil and Papua New Guinea. These case studies attempt to bring together neo-classical based economic methods and RRA. Table 5 from IIED (1997) relates the PRA and neo-classical methods, as well as techniques borrowed from other disciplines, to the key questions to be answered in a PFM context. From the HHP case studies, the most useful methods for participatory economic analysis have been (IIED, 1997):

- social mapping and wealth ranking to differentiate stakeholder sub-groups;
- seasonal calendars and time lines to understand how the use and importance of wild resources varies over time, including analysis of price trends with key local informants to assess changes in resource scarcity;
- maps, models and transects to differentiate the resource, and help understand the main historical changes in resource status;
- the use of role-plays to elicit the range of benefits;[7]
- matrix scoring and ranking techniques to elicit the relative values of direct and indirect use values (financial and non-financial);
- product flow diagrams and tenure maps to clarify resource control and access.

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[7] Anton (1997) questions the way indirect and non-use benefits were elicited using role plays in the Hot Springs Working Group (1995) study: this was based largely on researcher interpretation of the role plays, casting some doubt on the extent to which they reflected villagers' perceptions.

Economic analysis of Joint Forest Management in India

The JFM Support Programme has produced a Field Manual in two volumes on the collection and analysis of economic data (Poffenberger et al., 1992). Box 13 shows that, as with the HHP, the approach is to integrate PRA methods and neo-classical economic tools. Box 14 demonstrates how this approach was used in a World Bank study of the West Bengal and Gujarat JFM projects. A four-stage analysis of JFM is proposed in the Field Manual:

1. A profile of community forestry interactions using PRA methods (including the ranking and scoring of forest products);
2. An ecological study involving an overview of important species, changing diversity and stocking levels, and patterns of disturbance. This information feeds into a yield and sustainability analysis;
3. An institutional analysis to assess the 'socio-political opportunities' involving assessment of community organizations, the Forestry Department, NGOs and any other key actors;
4. Economic analysis including calculation of the CBA measures of project worth. Only direct use values are included in this analysis; for subsistence values, the surrogate market method is suggested – in the case of edible products, the calculation should be based on an estimation of the nutritional values involved.

PRA assessment of markets and marketing

Markets and marketing are often under-researched and analysed in stakeholder assessment. PRA techniques can

be particularly useful for assessing how serious market imperfections are (e.g., how free is the competition? how accessible the market information?, etc.) and for analysing the incentives and behaviour of marketing actors. IIED (1997) suggests the usefulness of network diagramming, chain interviewing, flow charts and Venn diagrams of the actors and institutions in the marketing chain. This analysis is likely to reveal the key actors and their social and economic relationships in the market chain, and the flow and exchange of market information. Individual and group interviews can be conducted to identify the costs and returns at each point in the marketing chain.

PRA assessment of risk

As discussed in Section 3.2, people's perceptions of risk and uncertainty, and thus their rates of time preference or discount rates are critical factors in choosing between alternative courses of action. PRA can help explore how people view risk and uncertainty. For example, following a ranking and scoring exercise (see below), discussions as to why certain benefits are ranked lower than others can reveal important risk factors (IIED, 1997).

Ranking of quantified and non-quantified benefits

The HHP case studies stopped short of trying to quantify non-market benefits, although the Zimbabwe case study (Hot Springs Working Group, 1995) got as far as ranking and scoring (with beans) the 19 benefits identified in one village, and using PRA ranking to compare the importance of the more tangible/quantifiable benefits with the non-quantified benefits.

In the latter exercise, several non-market values – water retention, rain-making functions, inheritance and sacred sites – were ranked higher than firewood, which had the highest quantified market value. Thus it was concluded that the total (unknown) value may be much higher – possibly several times higher – than the total estimated value of the quantified benefits.

Contingent ranking

A couple of studies have attempted to quantify non-market benefits using a participatory variant of CV called *contingent ranking*. This involves getting respondents to rank and score a range of products and services against a numeraire or anchor item with a known value, or for which they have to express their willingness to pay. The value of the benefits can then be expressed in terms of the value of the numeraire. IIED (1994:70) commented that contingent ranking was a *'technique of great potential to tropical forest valuation'*, while recognising that it could only approximate WTP due to it being such an indirect approach. It is relatively simple to implement (according to the same source), and reduces, but does not eliminate, the bias problem, since values are elicited by ranking products and services against something which is relatively easy for respondents to value, rather than being asked to provide a monetary value.

In another Zimbabwe case study (Campbell et al., 1991), farmers were asked to rank and score 10 benefits from multi-purpose agroforestry trees as well as a hand-pump borehole and a latrine (Box 15). The farmers' WTP for the borehole served as a numeraire with which to value the forest products and services, according to their relative scoring. Extensive checks were also carried out on the validity of the numeraire as a reflection of farmer preferences. A study from Kenya also employed contingent ranking in the exploration of subsistence and indirect use values threatened by external land use pressures (Emerton, 1996). In this case the numeraire was a castrated bullock as a component of the local economy representing wealth and a common medium of exchange. A further study has used the traded value of firewood in the community to value non-marketed NTFPs to villagers living close to a protected area in Botswana (Anton, 1997).

However there are a number of serious question marks against the use of contingent ranking methods, and with other participatory valuation approaches (Mike Arnold, William Cavendish, Joshua Bishop & Knut Veisten, pers. comms.; Clarke et al., 1996):

- whether it is valid to use a market-based numeraire in a primarily subsistence rural economy;
- whether it is valid to convert an ordinal or relative score into a cardinal value by reference to an anchor value;
- ranking and scoring methods may be unreliable, especially where people are unused to valuing goods and services in monetary terms; for example in most of the studies referred to above, fuelwood is ranked higher than fruit, but actual farmer tree planting preference seems to be for fruit trees;
- respondents can find it difficult to separate out flow (resource use) and stock (resource availability) values;
- double-counting problems: e.g., the 'inheritance' and 'aesthetic' benefits identified by respondents in the Hot Springs Group (1995) study incorporated overlapping stock and flow values;
- ranking and scoring benefit categories that are not clearly specified in terms of their quantity and quality;
- the use of a 'durable good' type numeraire like a cow or radio which is differentially owned by respondents (i.e., whether they own an item, and how many they own, will clearly influence their valuation of it);
- the problem of disappearing and/or 'irrational' values: e.g., in the same study older people valued certain trees because they 'attract rain', while younger people didn't;
- the risk that a focus on benefits can result in negative values being missed, e.g., woodland as a hiding place for thieves and crop-damaging animals, as in the Hot Springs study.

Monitoring of economic incentives

Given the dynamic nature of PFM, and hence the limited usefulness of static snap-shot studies, there would appear

Table 5. Answering economic questions with participatory techniques

Question to be answered	Economic perspective/issues	Information methodologies	
		Participatory techniques	Other approaches
1. What resources are there and where are they?	• Inventory of resources in quantitative, physical terms, differentiated by location	• Participatory mapping • Transects • Mobility maps	• Aerial photographs • Ecological/ resource inventories • Yield measurements
2. Why are they important and what benefits do they provide?	• Uses made of resources	• Relative ranking • Matrix scoring • Role plays • Pie diagrams	
3. When are they used/available?	• Months/seasons in which harvested • Complementarity with other economic activities	• Seasonal calendars • Daily and seasonal labour and activity calendars • Product flow diagrams	• Phenological studies • Biomass calculations
4. Who uses them?	• Which groups of individuals by gender and household socioeconomic group	• Well-being (wealth) ranking • Social maps	
5. How are they used?	• What are the stages of harvesting, processing and selling? • Who is involved in these?	• Product flow diagrams • Chain interviewing	
6. Who controls these stages?	• How many people or groups are involved? • Do they exercise control, i.e. market concentration? • What are the rules & rights governing use and how do they translate into practice?	• Tenure/social maps • Venn diagrams • Network diagrams • Case studies	
7. What are they worth in monetary terms?	• What is monetary value per time period per harvester (by type) and community? • What is value of equivalent substitute or barter good?	• Product story • Product transect • Substitute ranking	
8. What is the relative importance of their indirect use or non-use values?	• How important are these values compared to other tangible goods? • What production activities depend on their existence and to what extent?	• Role plays • Ranking and scoring matrices	• Ecological studies of physical relationships • Contingent valuation surveys
9. How sustainable is resource use?	• How are quantities changing over time? • How do these compare to natural productivity?	• Historical maps, transects and matrices • Trend ranking/analysis • Critical events analysis	• Ecological models of populations

Source: IIED, 1997: 59

Box 13. PRA-based approaches in India's JFM programme

Issues	Questions	Methods
1. Product volume flows and values	• What are the annual yields of timber and NTFP? • What proportion is commercially sold and how much income does it generate for collectors? • What is the substitute value of forest products used for home consumption?	• Interviews with collectors • Participant observation during collection activities • Interviews with stratified social groups • Market visits to determine prices, volume and substitution values
2. Labour and capital costs	• How much labour is allocated by individuals and households for collecting, processing, and marketing of different forest products? • What recurring and fixed costs are associated with forest production activities?	• Daily and seasonal activity schedule • Seasonal calendar • Interview collectors, processors and middlemen to identify equipment and related capital costs
3. Product prices	• What have been the trends in market prices over the past ten years? • How do they vary between markets? • How do prices fluctuate during the year?	• Interview middlemen, FD staff and collectors • Check FD records and policies • Conduct market visits across seasons for seasonal price calendar
4. Processing and marketing	• How does the quality and availability of raw materials compare with the requirements of processors? • What value additions are obtained through processing and how could profits be increased? • How effectively do current market linkages meet the needs of village producers?	• Interview artisans to document raw material requirements and supply • Analyse processing system in use flow chart • Conduct market linkage study and analyse profit margins
5. Financial analysis of forest production systems	• What are the benefits and costs of different production-oriented management options?	• List non-monetised values for each option • Calculate Benefit Cost ratios and Internal Rates of Return for different management investments

Source: Poffenberger et al, 1992

to be a strong case for the participatory monitoring of economic incentives. While there is an increasing literature on participatory monitoring and appropriate indicators (Abbott & Guijt, forthcoming; ILIEA, 1996), there is little evidence of economic monitoring in the field.

One exception is the participatory monitoring system developed for the extraction and marketing of the bark of *Prunus africana* in the DFID-supported Mount Cameroon Project (Mount Cameroon Project, 1997).

This initiative stemmed from a conflict resolution process which resulted in local stakeholders reaching agreement on a harvesting and marketing plan, where before external middlemen and a community sub-group (young men) were creaming off the benefits and promoting destructive harvesting methods. There is now an agreement, signed by all stakeholders except the disenfranchised middlemen, to monitor the benefits, including financial indicators like the level of village funds. The agreement specifies where, when, how and by whom the indicators will be monitored. Within eight

months it was reported that bark prices and harvesters' incomes had trebled, and equity had improved through contributions to the village fund.

5.3   Conclusion

Participatory economic analysis is a relatively recent development which appears to have the potential to respond to some of the challenges of PFM set out in Box 5. It seems almost too obvious to point out that any attempt to identify local values would be rather meaningless without the active participation of those people supposed to be perceiving them. However, to date there have been relatively few applications, and the range of methods is at an early stage of development.

There seems little doubt that participatory economic analysis is a positive development which locates the analysis at the community level, and can better incorporate the institutional, livelihood and equity issues, but there is little evidence to date of any real impact in terms of project level decision-making. One reason for this is that the documented studies have been carried out primarily in a research context – most studies have been more concerned with methodology development than assisting project design or solving problems. It appears that it is the researchers who have learned most, and this increased knowledge has not generally benefited local stakeholders.

6.   SYNTHESIS AND CONCLUSIONS

'Though the burgeoning literature on the subject [of valuing forest goods and services in practice] may give the impression of considerable recent activity in actual applications, in practice .... most writing still focuses on methodology, hypothetical applications, reviews of other work, or partial applications' (Gregersen et al., 1995: 27).

6.1   How useful is the theory?

The theoretical foundations of CBA and environmental valuation are the same. It is therefore curious why the former should have received so much opprobrium, whilst the latter is apparently more widely accepted (and presently dominates the published literature). Many of the economic tools used in these methodological approaches have also been adopted in participatory economic analysis and appear to have proved their worth. However, there are three problems that suggest that there are some real theoretical limitations.

First, mainstream neo-classical economics assumes that the rationale of public policy is to maximise *economic efficiency*, or more explicitly that there should be a net welfare gain, sufficient to compensate the loser as a result of the change. This approach is indifferent to distributional effects of change and whether or not any compensation is actually paid. Environmental valuation techniques do not address distributional issues either; WTP reflects present relative income and so basing valuation on it weighs the preferences of the rich more than the poor. However, in an econometric study, based on a household survey of consumption of forest products in Zimbabwe, Cavendish (1996) found that the value people give to 'environmental goods' falls as their income rises.

Box 14. Combining CBA & PRA methods in the analysis of JFM projects

Firstly, participatory research methods were used to development a village model in which the socio-economic structure of the village was defined, institutional relationships analysed and the stakeholder sub-groups and their dependencies identified. The stakeholder sub-groups included revenue earners, wage earners, fuelwood head loaders, livestock owners and NTFP collectors.

Secondly a biological model of forest production based on inventory, growth projections in the with project (managed forest) and without project (unmanaged forest) situations, etc., was developed, permitting the estimation of production with and without the project. Analysis of this allowed linkages to be made between the growing stock, canopy cover and NTFP production, and the impact of different rates of offtake. It was commented that some of the physical relationships were based on indirect relationships (e.g., NTFP production increasing in proportion to canopy cover) and were in need of validation by further research.

Thirdly, an economic model was constructed which allowed the returns to the different sub-groups to be estimated under different institutional and management conditions. Stumpage values or residual prices were obtained for forest outputs, and the State opportunity cost discount rate of 12% was used (although a comment was made that villager discount rates were in excess of this). There was also an analysis of the marketing chain and marketing margins. Some stakeholders, generally the poorer ones, have seen a reduction in income with their loss of access to forest resources. To some extent this has occurred because of an emphasis on 'protection and planting, rather than with management and decision-making.' The overall impact of JFM, which was positive, was found by assessing the change in the net worth of the forest due to the project.

Source: Hill & Shields, 1998

Box 15. Contingent ranking of agroforestry benefits in Zimbabwe (values expressed in Zimbabwean dollars: Z$1=US$0.32 in 1991)

This was an exercise to value the benefits from multi-purpose trees by small farmers with agropastoral systems in one of the Communal Areas in Zimbabwe. The study involved market-based and CV valuation techniques. A sample survey of 359 households included a CV section. The design of this was developed in a half day workshop of academics and professionals, and refined following a field test. In the first part of the questionnaire, 10 cards were laid out before the respondents representing the main (previously ascertained) tree benefits. Also, two cards representing non-tree commodities were included as 'anchor' values: a hand borehole and a 'Blair' latrine. The cards were ranked in order of importance by the respondent, who was then asked to score the 12 goods and services with 50 matches. Three main questions were put to the respondents:

1. What would you be prepared to pay to have the (hypothetical) opportunity of joining four other households in sinking a borehole and installing a hand pump, with success guaranteed and an interest-free loan to be paid back over five years? This was the WTP for their share of the borehole.
2. What compensation would they accept from the state if it subsequently decided to destroy the borehole? This resulted in a WTA value to be used as a validity check.
3. What would be their choice between a share of the borehole and (one at a time) five commodities decreasing in value from about Z$35,000 down to Z$90.

Matches allocated to each category were then standardised against the points allocated to the borehole. Thus each benefit was expressed in terms of its borehole equivalent, and thence multiplied by the WTP borehole value. Validity checks were carried out on the WTP estimate and proved satisfactory (e.g., comparing the WTP with the costs of building a borehole). As regards the WTP of the forest benefits, it was found that household-consumed products had the highest values, followed by inputs to crop and animal production, and then cash, health and social service values.

Good/service	Mean WTP ($Z)	Median WTP ($Z)
Fuel	373	500
Farm/house materials	290	400
Crop production	222	333
Animal feed	181	144
Ecological services	175	257
Food	136	200
Shade	102	150
Cash income	82	125
Health	71	100
Social services	46	47

When the total was converted to an annual benefit stream using discount rates between 5% and 20%, the annual benefit came to a range of Z$84-336 per household. This came to 3% and 50% of household income depending on the area and discount rate.

Source: Campbell et al., 1991

A second major assumption is that welfare or utility can be measured by an individual's WTP. The crucial point here is that all individuals must accept that all of their values have a monetary equivalent. For marketed goods this is not generally a problem. However, in the case of non-market benefits, value is based on individual or private preferences that are derived by inference from the market. The extent to which a private good can be an adequate measure of shared values (e.g., a common pool resource or a unique or cultural good) for a particular community is open to question. Can environmental goods which are valued both intrinsically and extrinsically be treated or valued solely as goods exchanged in the market place? To some commentators this invalidates the use of CBA for many environmental goods (Anderson 1993; O'Neil, 1997).

Third, in response to the argument that in the face of competing objectives (e.g., land use options), full economic valuation of environmental goods will result in a proper account of the trade-offs involved, it can be contested that to reduce an environmental good to a cash equivalent is to legitimise an inappropriate attitude towards environmental decision-making. It signals an acceptance of market preferences as a basis for public decision-making. Hence O'Neil (1997) argues that decisions on the use of

some environmental goods should rather be made on the basis of public deliberation: *'the debate needs to move from the criticism of economic methods of valuation to consideration of the true nature of proper deliberative institutions for resolving environmental problems and of the social and economic framework that will sustain these'*.

6.2   How useful are the methods?

Assessment in terms of the challenges posed by PFM

Table 6 attempts to summarise the 'methodological approaches' in terms of the range of economic tools and concepts in data collection, data analysis and decision-making criteria. This is an arbitrary exercise since most of the neo-classical economic tools and concepts are used in all three cases. However, it does suggest a continuum from a more reductionist, quantitative and top-down approach to one that is more holistic, qualitative and bottom-up.

At one level, the methods discussed in Sections 3-5 can be discussed in terms of the challenges set out earlier in Box 5. A conclusion might be that CBA and more sophisticated valuation methods have little to offer: the methods are oriented mainly towards national and international stakeholder perspectives and do not address broader livelihood questions. Hence capital efficiency and environmental issues are implicitly seen to be more important than equity considerations. Participatory economic analysis, on the other hand, would appear to be able to address the main challenges, but has yet to be applied in a project decision-making context and used for the benefit of local forest users.

However such a dismissal of neo-classical economics is too simplistic. First, various case studies show that it has been the combination of neo-classical economic tools and participatory research which has resulted in a better understanding of stakeholder incentives. Second, the effectiveness of their use depends on the objectives and framing of the studies; the conclusion here is that neo-classical tools have not been properly tested in PFM decision-making contexts.

Assessment in terms of the project cycle

The concept of the project cycle is likely to be viewed by different stakeholders in different ways. For example, some commentators argue that the current donor approach in which considerable reliance is

placed on the logical framework[8] takes a limited view as illustrated in Box 16.

The range of methods presented here can be assessed in terms of their relevance to different stages of the project management cycle:

Identifying stakeholders and their perceptions, and understanding the decision-making framework

Participatory research methods provide the basic contextual understanding for any economic study which attempts to elicit and understand local stakeholder incentives. In particular PRA methods can locate an economic analysis in a wider livelihood, institutional, socio-political and cultural context.

Identifying costs and benefits

PRA methods like group discussions and role plays may be the main means of identifying costs and benefits to local users, but neo-classical concepts are also important, e.g., for thinking through the full range of opportunity costs involved.

Quantifying costs and benefits

Neo-classical approaches are normally effective for marketed costs and benefits, but experience increasing difficulties as they move along the continuum through subsistence benefits where markets are absent, to indirect use values and non-use values. Most ESA studies are likely to have to call up such tools as market and household surveys, shadow pricing, and discounting to allow for the problem of land use alternatives with costs and benefits occurring at different times. It is also important to recall that with most methods valuation is only as good as the biological quantification of the underlying physical relationships, which are usually subject to considerable uncertainty (Gregersen et al., 1995). CV and TCM find a way around this problem, but are more complex and subject to methodological problems.

Both neo-classical and participatory methods have their strengths and limitations in attempts to place monetary values on costs and benefits in a PFM context. For example, participatory valuation methods like contingent ranking appear to have potential in ensuring that valuation reflects local forest users' perspectives, but suffer from methodological and theoretical inconsistencies. They should be seen as complementary rather than substitute tools.

Decision-making criteria and project design

The traditional neo-classical measures of project worth (as the IRR or NPV) are probably less useful in a PFM context, as opposed to an industrial forestry situation, as

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[8]However the log frame is also capable of being used successfully in a participatory fashion – the problems are with the process not the tool. In Himachal Pradesh the FD has adopted the tool with villages in order to develop forest management plans. In Central America producer organisations are being assisted to develop their own log frames as a monitoring instrument: the process of developing the log frame helps farmers prioritize their goals and the tradeoffs between them, and identifying the key indicators clarifies the responsibilities among different members of the organisations, and other stakeholders.

Table 6. Classification of economic tools and concepts according to methodological approaches

	COST-BENEFIT ANALYSIS	ENVIRONMENTAL ECONOMICS	PARTICIPATORY ECONOMIC ANALYSIS
Data collection	Statistically representative household surveys based on questionnaires Market surveys Enterprise surveys	Household and market surveys Contingent valuation surveys Short-cut methods for environmental impacts (secondary data, expert opinion, data from comparative sites, etc.)	PRA methods with groups Purposive sampling
Data analysis	Opportunity cost basis Shadow prices Discounting Partial budgeting Sensitivity analysis Input-output analysis Household models Statistical methods	Valuation methods for non-marketed benefits Comparison between land use alternatives Triangulation + same as for CBA methods	Fusion with data collection Ranking and scoring benefits Contingent ranking Intra- and inter-household analysis Gender and equity analysis Livelihood basis Triangulation
Decision-making criteria	Measures of project worth: - net present value - internal rate of return - benefit cost ratio Net value per unit scarce resource	Same as for CBA methods	Orientated to livelihood security Defined by stakeholders
Main distinguishing characteristics	Donor, project and Treasury policy makers: top-down Statistical concern/precision Aggregation Financial or efficiency criteria emphasising return to capital	Emphasises valuation methods Policy or global perspective Less precise than CBA: order of magnitude figures are acceptable Emphasis on data analysis rather than data collection	Qualitative analysis dominant Insiders' perspectives and values Appropriate imprecision Differentiation Equity, gender, livelihood and institutional issues Can be rapid and low cost

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Box 16. The project cycle

The 'project cycle' is generally seen to be made up of four consecutive components: project identification, appraisal, implementation and evaluation (Gittinger, 1982:21-26; ODA, 1988:9). Both Gittinger (1982) and Cusworth & Franks (1993) distinguish between *implementation* (the period of investment, coinciding with the disbursement of the largest proportion of funding), *commissioning* and *operation*. Commissioning (or development) is a process in which the 'constructed systems or assets are first put into operation'. During the operational phase, those 'assets created by project implementation ... yield a flow of benefits'. Using their terminology, the commencement of the 'operational phase' marks the completion of the 'project phase': as they comment, the project is implemented precisely in order to yield these benefits. However, the weight put on implementation ('activities to outputs' in the log frame parlance) suggests that the project phase becomes an objective in itself.

Stakeholder analysis has tended to focus on the identification and preparation phases, and it has been argued that the exigencies of the log frame have concentrated donor interest on a narrow interpretation of the implementation phase at the expense of wider considerations of purpose and post-donor support to projects and programmes, and other stakeholder interests.

The logical framework is widely used in the preparation, monitoring and evaluation of projects, and has become a management tool for project implementation. While capable of being used in a participatory fashion it has tended to be used as a 'top-down' tool in practice due to the time constraints within which the framework is normally drawn up, and the pressure on project management to transform inputs (funding, technical assistance, etc.) into outputs. The log frame provides a short-cut form of accountability to one stakeholder in particular – the external donor. This is in spite of the observation that 'the contribution of the project outputs to the achievement of the purposes takes place when the assets have been created and are in operation' (Cusworth & Franks, 1993:18).

Source: Adapted from Maginnis & Davies, 1995

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they can bias the analysis to capital efficiency and may not to reflect local user group decision-making criteria, although they can be useful for assessing the overall viability of a natural forest management or agroforestry system. The economic principles behind CBA calculations are, however, essential to the analysis of local resource use decision making, for example, opportunity cost pricing, assessing the time preference of forest users, and calculating the return to the scarcest resource(s) in alternative livelihood options.

Participatory research is arguably essential for identifying the decision-making criteria of (different) local users, and particularly the importance of profitability *per se*. Even when financial profitability is a less important decision criteria, as shown in much of the 'trees on farm' research, 'economic' analysis is still central to understanding other determining or constraining factors; e.g., assessment of relative resource availability, market analysis, household savings or income generation strategies, etc. (Arnold & Dewees, 1997).

Monitoring incentives and measuring impacts

The economic monitoring of incentives and impacts in PFM has been the most neglected area. Participatory monitoring is crucial to understanding the incentives for participation, as pointed out by Hobley & Wollenberg (1996:244): '*relatively little is known about how villagers' well-being improves with, for example, the handover of forests under community forestry or joint forest management. The information is lacking in part because of inadequate resources or systems for monitoring ... there is an urgent need to develop local monitoring systems implemented by the users and managers of forest resources*'. During the project cycle a number of key variables can change, some deliberately as a result of project interventions (e.g., formal and informal institutional change, technology, etc.), and others due to unforeseen consequences (e.g., disease) or wider sectoral or macroeconomic influences (e.g., market prices, emerging market opportunities, legislation etc.). PFM is a moving target and a static economic analysis is of limited usefulness. Participatory identification of economic indicators and their monitoring is indispensable, but guidance and case studies are still lacking.

6.3   How useful is the literature?

Recent 'forestry economics' literature has been preoccupied with valuation issues, and especially non-market valuation. A strong momentum has been developed around the argument that identifying the difference between social and private values is an essential first step towards correcting undervaluation of the forest resource. These pre-occupations have arguably dampened the emphasis on how to add value to the marketable benefits to local stakeholders, and how to tap the potential of the market to decentralise economic

> ## Box 17. Biases and neglected areas in the literature
>
> | Biases | Neglected Areas |
> |---|---|
> | • reviews of valuation studies | • field manual type methodological guidelines |
> | • non-market benefit valuation for global and national stakeholders | • how to increase the marketable value to local stakeholders |
> | • benefits in general, esp. non-market benefits | • costs, esp. indirect costs like transaction costs |
> | • sophisticated high-cost methods | • more accessible low cost methods |
> | • academic, methodological & policy objectives | • project cycle decision-making context |
> | • *ex-ante* estimations for project design | • *ex-post* monitoring and impact studies |
> | • forestry as a separate enterprise | • livelihood and household economy focus |
> | • efficiency, profitability | • equity, gender and institutional issues |
> | • fine-tuned numbers (spurious precision) | • orders of magnitude (approximate imprecision) |
> | • returns to land and capital | • returns to labour |

activity and contribute to prosperity (Carney, 1995). These and other biases and neglected areas discussed here are summarised in Box 17.

Several recent reviews (Gregersen et al., 1995; Kengen, 1997; Gregersen et al., 1997; Bennett & Byron, 1997) emphasise that valuation is of limited usefulness unless:

(a) undertaken in a specific and well-understood decision making context;

(b) the estimated values can be captured or internalised by the decision-makers.

These reviews concur that there is a real need for practical guidance and applications that are more micro, project and decision-making orientated. The paradox is that most of the case studies and literature have had a more academic, macro, policy and methodological orientation[9], e.g., focussing on valuation methods and quantification rather than the decision-making context. For example, Kengen's (1997) major review concluded that:

• most studies have been academic or orientated to environmental interests, and been carried out in isolation from forest policy and management (e.g., TEV studies);

• studies using sophisticated methods have been expensive, and have not generated better project results or had an impact on decision-making;

• there is a need for rapid, simple and less costly valuation techniques which are orientated to decision making, and generate 'orders of magnitude' rather than fine-tuned numbers.

The only studies that have deliberately tried to look at costs and benefits from the perspective of local users and attempted a more holistic understanding of decision-making have been the participatory research programmes reported in Section 5. It is therefore puzzling that none of the above-cited reviews (even the otherwise comprehensive Kengen, 1997) mention these studies or participatory valuation methods in general. Methodological and practical field level guidance for the use of participatory economic methods is scarce, although the manuals developed by Poffenberger et al. (1992) in support of JFM in India represent an important start.

Another major bias in the literature is towards *ex-ante* studies in which the benefits are estimated on the basis of technical and economic parameters, rather than based on the net benefits actually received. For example, a review of 350 case studies on the economics of agroforestry found only a handful of *ex-post* studies (Sullivan et al., 1992) and there have been several celebrated NTFP valuation studies using this approach (Peters et al., 1989; Grimes et al., 1994). Among others, Padoch & Pinedo-Vasquez (1996) criticise these studies as being over-optimistic due to unrealistic assumptions, especially about the market. They argue that valuation should only take place after the socio-economic constraints have been identified.

Economic studies of PFM have also been biased towards measuring benefits as opposed to costs, especially the likely major transaction costs of PFM projects for local forest users (Romm, 1980)[10]. They have also ignored some of the wider benefits and costs of PFM projects, like research and development costs, institutional building costs and benefits, and wider project lessons which can be fed into the design of future projects (Byron, 1991), although quantification here is more difficult to envisage.

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[9] This paradox appears to be due, at least in part, to professional and academic incentives revolving around refereed journals and PhD criteria (Chambers, 1983)

[10] Although Magrath et al. (1997) have carried out an interesting study of the costs and benefits of participation in an integrated pest management project in Ghana.

6.4 The quantitative and qualitative dimensions of value: towards an ESA methodology

In some of the literature, there is an apparent perception of a dichotomy between more quantitative/economic perspectives and the associated tools of analysis, and more qualitative/non-economic viewpoints and research methods. This is misplaced since the real challenge is to work out the best combination of a range of disciplinary perspectives and quantitative/qualitative methods for each decision-making context (Eaton & Sarch, 1997).

This is especially clear when it is considered that there are two dimensions to economic value: a qualitative one which provides a differentiated (by access, gender, time, etc.) understanding of how local people perceive the costs and benefits of alternative courses of action and seeks a broader understanding of livelihood options; and a quantitative one in which an attempt is made to summarise the more tangible costs and benefits in terms of a comparable numeraire. The PRA toolbox is necessary to ensure appropriate use of the more reductionist economic tools, and a sound ESA will call on tools from all three methodological approaches. A good example of this is presented in Box 14. This complementarity is also recognised by Poffenberger et al. (1992 (2):67) in the context of JFM:

'*currently, PRA methods seem most useful for obtaining certain types of preliminary forestry information, such as historical, spatial, temporal and volumetric flows, but may be less suited to microeconomic analysis unless combined with statistically more rigorous research methods. These would include standing stock inventories, periodic measurements of forest product collections, minimum stratified samples for household data, and more detailed market research.*'

Stakeholder analysis is now an established project appraisal and design tool which focuses on the need to assess stakeholder trade-offs between objectives for alternative courses of action. Economic analysis can go some way to providing a comparable basis for assessing these trade-offs, and thus help predict likely stakeholder response to project interventions. Box 18 suggests how a combination of neo-classical analysis and participatory research methods can lead to a more rigorous approach to the economic analysis of stakeholder incentives in PFM. It is the neo-classical economic concepts like the with versus without project comparison which focuses the analysis on marginal or incremental change, the focus on opportunity costs, and the importance of establishing the economic trade-off criteria[11] which provides the rigour behind the sequence of steps proposed.

The dangers of adopting a mechanical approach to ESA, or isolating the economic analysis from institutional, social

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[11]The principle of maximising returns to the scarcest resource (Gregersen et al., 1995).

and technical analysis, cannot be over emphasised. The availability of good physical data on local forest resources and their productivity, and also researcher/project staff time, constrain what can be done in practice. In particular, understanding and quantification of the physical relationships is a major constraint to meaningful economic analysis.

However it is proposed that the conceptual thinking involved in going through the proposed iterative stages and questions in Box 18 can lead to a better understanding of the prevailing economic incentives for PFM stakeholders, and how likely the latter are to respond positively to any proposed intervention. A crucial stage in this process is defining the decision-making criteria, since this will determine what data needs to be collected – and may well result in the conclusion that an economic study will be unhelpful. An important principle is that economic quantification is only needed to the point at which a decision can be justified.

6.5 Challenges and research gaps

This review finds that the main challenges and research gaps for the economic analysis of stakeholder incentives in a PFM context are:

- applied *ex-post* research in a variety of PFM decision-making contexts with the aim of developing economic methods as project management tools;
- subsequent to this, the production of clear and accessible methodological guidelines for the potential users;
- applied research and guidelines for the participatory identification and monitoring of economic incentive indicators;
- further testing of participatory valuation methods, especially contingent ranking, and developing practical guidelines for their use;
- developing economic tools which can be implemented and analysed by local people, possibly with some supervision;
- research into the transaction costs of local people in PFM projects;
- research on how to make livelihoods the centre-stage in economic analysis, as opposed to the normal more sectoral focus: will the next major branch of economics be livelihood economics?

6.6 The economics of community-based NFM

There is little evidence that, on the basis of current market incentives, sustainable forest management (for timber production) is viable. On the contrary, the literature overwhelmingly finds the opportunity costs are prohibitive, especially for PFM (Box 19). There are likely to be weak incentives for community-based participatory NFM projects and strong incentives to engage in alternative land uses. Does this mean that a project, or particular project intervention, should not go ahead? One obvious reason

Box 18. Proposed economic stakeholder analysis methodology

Stages	Key questions for analyst	Observations/Methods
1. Identifying the stakeholders, their objectives, trade-offs and conflicts	Who are the 'primary' stakeholders? What other stakeholders impact positively or negatively on the forest resource? Who controls and has access to the resource? Are there differences according to gender and end-users? What are the objectives/ interests of each stakeholder type/sub-group? Does the stakeholder or sub-group face a trade-off between their objectives? Are there clashes of interest between the stakeholders/sub-groups? Who wins/loses in these clashes? How are clashes of interest resolved/not resolved at present?	Consider relative weighting in analysis to 'primary' and *de facto* decision makers if not the same Discussions with key informants PRA tools, well-being ranking, social/tenure mapping
2. Understanding the decision-making context and trade-off criteria	*For each stakeholder or sub-group:* What is the history of the problem or decision-making process? Why/how was the decision taken leading to the present course of action? What are the alternative courses of action, and what is the best alternative? Why is x course of action the best alternative? What is the relative importance of physical, institutional, economic, socio-cultural and political factors - would economic quantification have a significant impact on the decision? What is the main limiting factor or resource? (the economic trade-off criteria)?	Provides a comparable basis for the economic calculations Informal group and individual discussions Only proceed with Stages 3-6 if economic criteria are more important than technical, socio-political, etc., criteria
3. Identification and physical quantification of costs and benefits	*For each alternative course of action in comparison with the best alternative:* What are the costs and benefits in the current or best alternative use of the resources? What are the additional costs and benefits in the contemplated action? How important are the costs and benefits? Is it possible to physically quantify the benefits and costs in a cost-effective way? How does the flow of benefits and availability of inputs (especially labour) vary through the year? How sustainable are the benefit flows? Can the inputs or costs be broken down by stages in the production and marketing cycle?	Without project scenario PRA, role plays Ranking and scoring Start with direct use values Labour/benefit calendarization PRA trend ranking
4. Valuation of costs and benefits	*For each benefit and cost:* What is the most appropriate method of valuation? (marketed products) Is there reliable market data? What market imperfections or distortions can be identified? Are marketed substitutes for forest goods and services available in the area? How do prices or values (including labour costs) vary through the year? How do prices or values vary according to quality? Will the price fall due to increased project production or competition from other producers? Are there marketing or transport constraints which could reduce net values? How will prices/values change in the future? Can a second valuation method be used?	Stakeholder perspectives of values Surveys, key informants, etc. Shadow pricing Calendarisation of prices and supply/demand scarcity Analyse elasticity of demand Marketing chain analysis Key producer/marketing groups Triangulation
5. Economic comparison of the alternatives	*For each alternative course of action:* What kind of time horizon do the stakeholders have? What discount rate should be used? What is the incremental NPV and annualised net income per unit of the scarce resource(s)? What is the break-even production level to cover the costs in the contemplated option? Which are the most important technical or economic parameters subject to uncertainty?	Risk analysis, savings & investment opportunities, etc. With vs. without project comparison Sensitivity analysis
6. Analysis of decision-making options	*For each decision-making option:* How does the order of the quantified benefits compare with the participatory ranking (3)? Has the participatory and economic analysis affected the way they view the decision/problem? Who are the winners and losers, and by how much? How do the perceived incentives compare with what the other stakeholders (donor, FD, etc.) think their incentives are? What do they think about the incentives faced by other stakeholders or sub-groups? What does this analysis not take account of? What are the implications for project design, the process of developing PFM, and for wider institutional and policy issues?	Return analysis to stakeholders Implications for total utility and possible need for triangulation Compare different perceptions of incentives Wider institutional, livelihood & equity factors

Source: partly based on Gregersen et al., 1995

Box 19. The economics of community NFM: what can donors do about it?

Supporting NFM by local communities can be seen as a low cost option for pursuing the global stakeholder environmental agenda, for example in comparison with international transfer payments to the producers of tropical forest services. The ideal solution would be if market incentives were sufficient for sustainable NFM, but they are clearly not – even in the commercial sector. Southgate (1998) points out that one of the reasons has been depressed product prices; in the case of timber this is due in large part to the large supply of illegal timber still coming on to the market. Another major problem is the high cost of time in NFM due to slow biological growth and high discount rates. Thus one recent review concluded that 'taking these three factors together – tree growth, [forest product] price growth, and interest rates – most studies have found that there is no financial incentive for a logger to engage in [sustainable] natural forest management in the tropics' (Reid & Rice, 1997:384). Gillis & Repetto (1997) also indicate how policy failures, especially those associated with macroeconomic policies, have caused distortions in the incentive framework which make alternative land uses more attractive to local people.

The economic problems are particularly acute for PFM since:

• it tends to take place on low value forest land, since higher value forest is usually controlled or managed by more powerful interest groups;
• local forest users suffer from high risk, and so have high discount rates; and
• institutional weaknesses result in high transaction costs.

In the case of some indigenous communities with limited prior exposure to markets, for example in some Amerindian societies, there are particular dangers of pushing market-orientated NFM. This is due to the clash of individualistic market economy incentives and the 'gift economy' incentives that hold together the common pool regimes which underpin traditional natural resource management (Richards, 1997). This clash of incentives also increases risk and discount rates.

In order to materially alter the economics of NFM for local people, there are arguably five non-mutually exclusive choices for donors:

• take advantage of new or improved market opportunities, e.g., for certified timber and carbon offset arrangements;
• tackle the causes of policy failure;
• promote international transfer payments as a way of tackling market failure;
• subsidise PFM on a continual basis;
• provide support to other parts of the livelihood system.

So far, community-level NFM projects have found it difficult to take advantage of niche certified timber markets, the main problem being maintenance of the quality and continuity of supply demanded by importers, and the market for carbon offsets is still incipient (Richards, 1999). However this will continue to be an important area for donor support. Some countries are attempting to make progress on policy failure (e.g., new forestry legislation and removal of trade restrictions), but this approach requires considerable domestic political will. In the area of international transfer payments, there have been some significant initiatives like the Global Environment Fund, debt-for-nature swaps and the setting up of trust funds, but here the problem is the combined political will of consumer countries.

It is therefore likely that donors will have to continue subsidising community NFM initiatives and/or find ways of supporting the broader livelihood basis of forest dependent societies, unless they take the view that it would be better for both environmental and social reasons to facilitate the transition to higher welfare livelihood options that reduce the pressure on the forest (Byron & Arnold, 1997).

why this would not be the case is that a decision to participate does not depend only on financial profitability.

The evidence reviewed here implies a rather different role for economics in a PFM context in comparison with other sectors in which viability is more assured, institutional issues are less central, and profitability is more obviously the main criterion. Analysis of NFM needs to be broadened both because financial analysis will not justify it, but also because the social and environmental issues that are part of any natural resource project justification are likely to be particularly significant for NFM projects.

Given the options discussed in Box 19, economic analysis applied to NFM needs to look increasingly beyond the sectoral incentives to consider how a range of market and non-market incentives can be harnessed to stabilise the wider livelihood and community basis, as well as more directly support the forestry activity. These might include, for example, research and extension support to complementary parts of the farming system, off-farm income generation, social infrastructure, improved health and education services, and institutional support in general – not least to counter risk and reduce the transaction costs which favour short-term and individual livelihood options.

6.7 Where does this leave economics and PFM?

Revisiting the hypotheses in Section 1.1

Mainstream neo-classical economic theory is built on a number of assumptions which do not sit comfortably with PFM, and there has been a bias in applied research and the literature to more sophisticated methods of limited relevance to PFM. These difficulties are perceived by donors who remain sceptical of economic methods, preferring to use non-economic stakeholder analysis and the logical framework as the main project cycle tools. It appears we can affirm the five hypotheses listed in Section 1.1.

However our view is that more recent approaches which combine neo-classical and participatory methods hold out real promise in terms of their development as project tools, but have yet to be properly tested and developed in a project decision-making context. We think that an appropriate combination of tools can address some of the complexities of PFM, and that the tools are not over-complex; through case study applications and appropriate methodological guidelines, the hypotheses can, in time, be negated.

To value or not to value?

Among the unresolved issues facing the economics of natural resource management is the desirability of quantitative valuation. Several observers point out the danger that numbers can detract from more critical issues,

and the high opportunity costs of researcher time (Bennett & Byron, 1997). But, as IIED (1997) point out, the dilemma of how far to quantify remains: '*there is a danger that by focussing on valuation studies, the temptation is to convert everything to financial terms. Is this playing into the hands of the policy-makers who we perceive as tending to look for the bottom-line when making decisions? It would be more difficult, but perhaps more honest, to emphasise the importance of those values which cannot be monetised ... but the challenge remains: how can we convince policy-makers of those values which simply cannot be expressed in financial terms?*' (IIED, 1997:57).

Finally it is worth restating that there is little point in valuing something that is not going to affect a decision, for example a benefit which is not actually captured by a stakeholder. Therefore the key question is – will putting a value on a particular cost or benefit make a difference in the decision to choose between alternatives or to participate in a project? To answer this we have to discover people's decision-making criteria and then decide whether economic analysis can help. This judgement can only come from a clear understanding of the decision-making context. Otherwise economics quickly becomes an academic exercise.

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APPENDIX 1

VALUATION METHODS

Direct market price or cost-based methods

Direct market prices

Wherever there is an established market for a product or input, valuation can be based on market prices collected from a market survey. It should be recalled that this is the 'value in exchange' rather than the 'value in use' and so underestimates the true WTP. When considering national or global stakeholders, a shadow price should be estimated if market imperfections or distortions are identified in local or regional markets.

Stumpage value

For forestry products, especially when they are processed, a common approach is to calculate the *stumpage* or *residual* value after deducting all harvesting, processing and marketing costs, and a reasonable profit margin, from the sale price of the product. Thus a roundwood log value, for example, can be estimated from the sawnwood price, after allowing for conversion efficiency, profit margin, logging, transport and processing costs. This means that the price used does not have to be the nearest market price – it could be from a more competitive regional or national market. The stumpage or residual value shows the value of the standing tree to the person who has the rights over its production and is equivalent to the maximum anyone would pay for the right to harvest the tree.

Replacement cost and preventive expenditure

These methods can be used to estimate indirect use values (environmental services) in situations in which stakeholders would be prepared to make an outlay to prevent losses. *Replacement cost* is the cost of replacing a benefit which would be lost or damaged in the without project situation. For example, it may be possible to estimate the effects of soil erosion by calculating the quantity and cost of fertilizers to replace lost soil nutrients, if it can be shown that fertilizers would be bought in such a situation. A special case of replacement cost is the relocation cost of displaced forest peoples. *Preventive expenditure* to avoid damage, or estimation of the damage costs avoided**,** is a possibility for measuring the downstream watershed protection benefits of forestry projects, like avoided siltation and flooding. The cost of building dykes, gulley plugs, reafforestation, etc., would comprise this preventive expenditure. In order to avoid a situation in which costs are synonymous to benefits, estimation of the damage (flooding, sedimentation, etc.) costs avoided due to these measures can be used.

Surrogate market methods

These methods depend on the existence of markets for substitute products, or of markets which reflect changes in the value of the goods or services in question. The extent to which the surrogate market technique can be used depends on the strength of the relationship between the item being valued (e.g., firewood) and the substitute item (e.g., dung).

Substitute or proxy market

In situations where a product has close marketed substitutes, the price of the latter may sometimes be used. A simple example could be kerosene for firewood. As with the direct market price approach, a shadow price may need to be calculated. A special case of the proxy market approach is where goods are bartered. In this situation, the value of a product can be found by its equivalent barter value.

Change of productivity method

This method involves measuring the benefits, usually of an indirect use value, in terms of what has happened to a more measurable direct use value. It can be used if it is possible to measure the effect of one activity on the production function (i.e., the relationship between inputs and outputs) of another activity. Typical examples might be the increase in crop net income to measure the soil erosion protection effects of a small plantation, and the loss (or gain) in electricity power generating capacity due to deforestation of watershed, and the resulting changes in water yield and sedimentation.

Opportunity cost method

This method estimates the value of products or services foregone as a result of providing a particular good or service. This should be the value of the best alternative use of the stakeholder's limiting or constraining resources (land, labour or capital). It is perhaps most commonly used to value non-marketed production or consumption where there is a high labour content, for example, the opportunity cost of labour involved in firewood collection becomes a proxy for its gross value.

Hedonic prices

It is possible for a change in environmental quality to be assessed from a consequent variation in the price of another asset, for example property values or wage rates. But this is of limited practical relevance in tropical forestry situations, due to imperfections in the property and labour markets and the great difficulty of collecting the data necessary to establish cause and effect.

Travel cost method

The travel cost method is based on the idea that the amount of money people are prepared to spend to travel to an amenity, and the opportunity cost value of the time involved, can serve as a proxy for their WTP. More specifically it involves estimating the consumer surplus

from a demand curve derived from travel cost and socio-economic data. It has been frequently applied to the valuation of ecotourism and recreational benefits, and occasionally for the valuation of fuelwood and water supply.

Non-market price or constructed market methods

The basic tenet of the *contingent valuation* (CV) approach is that where markets do not exist, they can be constructed or imagined, and that people are capable of expressing their preferences in this hypothetical situation. CV involves asking people what value they would place on a hypothetical change, either in terms of their willingness to pay for an environmental improvement, or their willingness to accept compensation for loss of a benefit[12]. For example, *how much would you be prepared to accept as compensation (in money or bags of rice) for leaving a protected area and moving into a buffer zone*? (Kramer et al., 1995).

People can either be asked this in an open-ended way, or be given specific values which they can accept or reject (the referendum approach). There are more sophisticated variants in which the respondent is offered a series of monetary bids until a negative response is generated, or is asked to select from a range of values. A rarely used constructed market technique is to create an *experimental market* in which goods are bartered or money exchanged.

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[12] In subsistence situations, asking for people's willingness to accept compensation for the loss of benefits from an environmental asset is regarded as more reliable than asking their WTP to retain those benefits (Gwaii Working Group, 1997).