1. Introduction

1.1. Problem Identification

The ongoing destruction of global forest resources and its negative ecological, economic, as well as social consequences represent a challenge of considerable importance to the global community. Because a majority of the goods and services provided by forests are global public goods, market mechanisms generally fail to provide the socially optimal amount of these goods and services. In response, governments and other actors are frequently called in to formulate appropriate policies and programs to correct market failure.

In this context, cost-benefit-analyses (CBA), total economic value (TEV) assessments, and more elaborate economic models have been increasingly applied as analytical tools to identify efficient and sustainable forest management strategies (IIED 2003; Pearce, Pearce *et al.* 2002).[1] These analyses are generally executed at a macro-economic scale at which – representing the viewpoint of a social planner – global non-market environmental values, such as biodiversity conservation, recreation, and the regulation of the world's climate, often outweigh by far values that can be attributed to alternative, extractive management options. A common policy approach that results from these analyses is the establishment of protected areas (PA) to achieve forest conservation as the efficient management strategy. In contrast, however, such policies are often criticized for placing a burden of high compliance costs on households living in the vicinity of protected areas, who generally depend on the access to natural resources to a substantial degree to support their livelihoods. Moreover, the success of such conservation strategies is often measured against progress made in reducing the actual rate of deforestation, but not against indicators of poverty alleviation, which would be especially important considering the principle objectives recently pronounced in the Millennium Development Goals.

This rather general perspective applies especially to Madagascar, where the management of forest resources is framed, on the one side, by widespread and extreme poverty and, on the

---

[1] Cost-benefit analysis (CBA) is probably the most frequently applied method. Among the basic tenets of CBA is the need to consider all relevant opportunity costs to identify the socially most efficient forest management strategy. Failure to acknowledge opportunity costs represents a rejection of the principles which make this analytical approach appealing (Carson 1998). Another, though less frequently employed method, is the assessment of the total economic value (TEV) of a forest area. This approach identifies the forest management alternative with the highest economic value as the most preferred management option (Hanusch 1994; Pearce 2002).

other side, by significant global demands to preserve the country's unique biodiversity. Shifting agriculture and the collection of woodfuel[2] as the main source of energy are among the key factors driving deforestation. As a response to solving this problem, the government of Madagascar – with support of many multi- and bilateral donors – has adopted conservation as the guiding principle for natural resource management. In fact, during the World Parks' Congress held in Durban in 2003, the President of Madagascar announced that the country would increase the area under effective conservation arrangements from 1.7 million ha to 6.0 million ha over the next years (Worldbank 2004). This decision is based on the results of several macro-economic studies that focus primarily on non-market environmental values provided by forests, e.g., biodiversity and recreational values (Carret and Loyer 2003; Kramer, Richter *et al.* 1997; Kramer, Sharma *et al.* 1995; Worldbank 2003a; Worldbank 2004). These studies argue that it is especially the poorest people who benefit most from the conservation of natural resources due to the protection of watersheds against negative effects of deforestation.

However, several shortcomings related to the performance of these economic analyses and its implications for policy implementation have to be acknowledged. Firstly, many CBA consider high economic values of non-market goods and services provided by forests that are not translated into real resource flows. In theory, this does not challenge the validity the results obtained from CBA, due to the underlying assumption of Pareto-efficiency, i.e., that those who are better-off can compensate those who are worse-off.[3] In contrast, however, for a great many of resource management problems, costs and benefits only matter if they are associated with real resource flows. Therefore, capture mechanisms have to be designed that translate economic values into real resource flows in order to compensate potential welfare losses resulting from environmental policies and programs (Pearce 2002). This requires that all opportunity costs involved are fully identified and valued. If forest products are used on a subsistence basis – as frequently observed in rural areas of developing countries – market observations, however, often fail to value this welfare loss to a full extent.

The second difficulty relates to the valuation methods that are used to obtain economic values for non-market goods and services provided by forests. These valuation methods are

---

[2] Woodfuel encompasses both, firewood and charcoal. About 80% of all energy consumed in Madagascar is generated from wood–based resources.
[3] Similarly, TEV assessments only consider benefits of management options, but do not acknowledge costs that accrue to potential losers of management outcomes.

frequently criticized with regard to their validity and reliability for obtaining economic values of non-market goods and services – especially if viewed from a developing country perspective (Hearne 1996b). Moreover, non-market valuation applied for evaluating environmental policies and programs frequently neglect the potential of disutility arising from environmental conservation, which leads to a systematic overvaluation of conservation benefits. The inclusion of contingent compensation payments from those respondents who preferred the status quo can substantially reduce net project benefits, even when the proportion of losers is relatively small (MacMillan, Duff et al. 2001).

Considering these deficiencies with respect to the valuation of forest resources and the negative implication they carry for policy evaluation and project design, it can be concluded that there is an urgent need to reconsider and improve the valuation of forest resources for economic analyses. This is especially true in the case of developing countries where the conflict of access to and utilization of forest resources is most strongly pronounced. National governments are often forced to balance direct extraction demands of local populations and international pressure for biodiversity conservation simultaneously. Only if the welfare losses of environmental policies are fully accounted for will economic analyses produce results that can serve as reliable decision-making tools for policy makers. Furthermore, to translate the results of economic analyses into successful capture and compensation mechanisms, the welfare loss of people living adjacent to protected areas needs to be fully assessed.

1.2. Objectives of the Study

The central topic of this research study is the assessment of opportunity costs of forest utilization from the viewpoint of local households in a developing country. To assess these opportunity cost, two alternative valuation methods are employed: The first one represents a market based valuation approach that observes actual behavior of households with respect to forest utilization. It values harvested forest products and agricultural production coming from slash-and-burn agriculture using real prices obtained from local or regional markets. The second valuation methodology is the contingent valuation method (CVM), which makes use of the construction of hypothetical markets asking direct valuation question to respondents in a survey. This study contrasts and evaluates the reliability and validity of both valuation methods in several ways:

At first, the results are compared and discussed at different aggregation levels, i.e. at the household, sub-sample, and full sample level. Secondly, this qualitative examination is extended by a quantitative analysis of explanatory variables that help to explain households' economic dependence on forest resources. Moreover, aspects of convergent and construct validity of the CVM results will be discussed. While convergent validity tests whether the results are robust compared to the results obtained from other valuation methods, construct validity asks whether stated preferences comply with economic theory (Carson, Flores et al. 2001). Thirdly, aspects of the implementation of the alternative valuation methods for the implementation in field surveys is presented. Such a thorough analysis is not only highly necessary considering the current debate regarding the application of the CVM in a developing country context, but also with respect to the evaluation of alternative forest policies using CBA, TEV, or more elaborate economic analyses and models.

In a second stage, this study applies the results from the valuation methods in an economic analysis to analyze the impact of forest policies on biodiversity conservation and poverty alleviation. In this context, the potential use of transfer or compensation payments as a policy tool is discussed. Although this research study relies exclusively on empirical data from a research site located in the Northwest of Madagascar, evidence will be provide that the results of this research carry implications beyond this case study level.

Focusing on the evaluation of the potential of how alternative forest management scenarios can contribute to poverty alleviation, this research takes not only direct use values that accrue to people living adjacent to forests account, i.e., the commercialization and subsistence use of woodfuels and construction timber, fruits, medicinal plants, and other non-timber forest products (NTFP), but also the conversion of forest resources for extending agricultural production areas. Indirect forest values that may be of relevance to rural households, such as watershed protection or socio-cultural values, are not considered in this study.

With respect to the valuation of opportunity costs, special emphasis is given to the application of the Contingent Valuation Method. Whittington (2002) states that CVM surveys in developing countries are often poorly administered and executed, that hypothetical scenarios are often poorly defined, and that only few CVM studies are designed to verify whether some of the key assumptions made by the researcher were the right ones. Research on CVM in developing countries is decisive because there is not only no empirical evidence to suggest

that rapid, streamlined CVM surveys yield reliable accurate results, but, moreover, there is a significant risk that the current push for simpler, cheaper survey methods could discredit the CVM itself. In this context, Whittington (2002) emphasizes that the policy debate to which CVM researchers are asked to contribute are of tremendous importance to the well-being of households in developing countries and the costs of policy mistakes can prove tragic. Thus, it is mandatory for the CVM researcher to push for excellence in this research enterprise and that funding agencies think more carefully about the value of policy relevant information in the fields in which the CVM method is used to study household preferences and behavior.

Considering these arguments, it is believed that the results of this research study can contribute significantly to the current disagreement on whether the CVM can reliably be applied in developing countries or not. With regard to other valuation studies executed in developing countries, this study is somehow unique, because it applies two valuation methods simultaneously using the same household survey. This is especially beneficial when testing for convergent and construct validity. Responses of both methods can be compared at the household level, which eliminates the problem of benefit transfer that arises when valuation results obtained from different surveys and methods are to be compared (Venkatachalam 2004).

1.3. Structure of the Thesis

Chapter 2 continues with a discussion of the political economy of forest resource management in Madagascar. This encompasses a theoretical outline of the theory of externalities in relation to global public goods provided by forest resources. Furthermore, the specific political challenges to forest resources management in Madagascar are presented in detail. In this context, the need for an economic valuation of all relevant opportunity costs of alternative forest resource management options is further elaborated. To complete the broader framework in which resource management decisions are made in Madagascar, this chapter also entails a narrative introduction to the general economic situation prevailing in Madagascar.

In chapter 3, the theoretical underpinnings of the economic valuation methods applied in the analysis are presented. This starts by providing a definition what type of forest values contribute to the total economic value of forest resources and which of those values are

considered in the analysis. This chapter continues with a theoretical discussion of the concept of economic value. This serves as the starting point for developing the methodological framework of non-market valuation techniques and their most important concepts and assumptions. For the CVM, this chapter provides a detailed review of the main points of controversy that are relevant for conducting a CVM survey in Madagascar.

Chapter 4 introduces the reader to the research design and data collection process. This involves a presentation of the sampling method as well as a description of the questionnaire design and types of surveys methods used. Furthermore, this chapter also introduces the reader to the specific socio-economic characteristics that are found in the region where the field survey was executed.

Descriptive statistics on the sampled households are discussed in chapter 5, which is complemented by a presentation of data on forest ecosystems. This chapter is particularly important to identify and describe relevant socio-economic variables that are applied in the analysis of forest utilization presented in the following chapters. Such variables are, for example, wealth indicators, a poverty index, education, demographic factors, and agricultural production.

Chapter 6 describes in detail the forest utilization patterns of local households in the research area. The chapter starts with a qualitative discussion how the respondents of the household survey subjectively perceive forest resources, e.g. state of the forest, reasons for deforestation, the contribution of forests to the socio-cultural life, or whether more forests can protect irrigation agriculture against flooding and sedimentation. The chapter continues presenting descriptive statistics of forest utilization by local households.

This provides the basis for presenting the results of the two valuation methods in chapter 7. For the market price method, this involves a quantitative analysis of the opportunity costs of forest utilization as well as an econometric exploration of the determinants of forest dependency. For the contingent valuation method, the stated preference results are analyzed at different levels of aggregation. Furthermore, the underlying socio-economic variables influencing the response to the stated preference question are analyzed. Lastly, this chapter compares the results obtained from both valuation methods using descriptive as well as explanatory statistics.

Following, chapter 8 discusses the implications of the valuation exercises for policy analysis. To illustrate this discussion, the results presented in chapter 6 are applied to a case study example that contrasts benefits and costs of alternative forest management strategies. Lastly, relevant conclusions for policy implementation are drawn in chapter 9, which also elaborates on potential areas for future research activities.

1.4. Institutional Framework of the Research Project

This research project was financed and administratively supervised by the Tropical Ecology Support Programme (TÖB) of the German Agency for Technical Cooperation (GTZ). The research period lasted from January 2001 until September 2004. Academically, the research was supervised by Prof. Dr. Manfred Zeller from the Institute of Rural Development at the University of Göttingen, Germany and Prof. Dr. Jürgen Pretzsch from the Institute of International Forestry and Wood Science, Technical University of Dresden at Tharandt.

In Madagascar, the administrative and logistic support was provided by the POLFOR project of GTZ (Projet „Appui à la mise en œuvre de la Nouvelle Politique Forestière). The project POLFOR was a bilateral technical cooperation project financed by the German government with the objective to support the government of Madagascar for implementing the new forest policy of Madagascar which was developed in the late 1990s.

During the field work in the research area, the research tasks were supported by a soil conservation project (Projet Lutte Anti-Erosive, PLAE) that had established strong affiliations with the communities in that area. The PLAE was financed by the German Bank for Reconstruction and Development (KfW) and is executed by a consulting company, AHT-International, based in Essen, Germany.

2. The Political Economy of Forest Management in Madagascar

2.1. Forest Management and Global Public Goods

Biodiversity and climate functions are important global public goods that are provided by forest resources. Once they are provided, no one can be excluded from enjoying the benefits and no one's consumption makes them less available to others (Hanley, Shogren et al. 1997). Even though people may consume the land or ecosystems that provide these goods reducing the total quantity of the public good provided, the benefits that are received by one individual do not reduce the share of benefits received by other individuals. However, the "production" of and the demand for these global public goods is often mutually exclusive with demands expressed at the micro-level, particularly when rural people in developing countries depend on the access to and extractive exploitation of natural resources for a considerable part of their livelihoods (Angelsen and Wunder 2003; Arnold 2002; Wunder 2001). This underlines the general problem that the benefits of global environmental public goods often only accrue to a large part to people that are far removed from its source, whereas the costs involved with the production of them is frequently placed on poor households living adjacent to these resources in developing countries. At both levels, the consumption demands of the parties involved create external effects, i.e. externalities, which are consequences for welfare or opportunity costs not fully accounted for in a price and market system (Hanley, Shogren et al. 1997). These externalities can be either positive or negative.

From a policy point of view, the problems arising from externalities have to be overcome by providing means for internalizing external effects in economic decision making processes. Coase (1960) argued that – under the assumption of perfect markets with perfect information and zero transaction costs – clearly defined property rights are sufficient to enable a bargaining process that leads to an efficient internalization of external costs. In contrast to all other means that were developed to internalize external costs, the Coase-Theorem does not follow a liability or polluters pay principle, because Coase (1960) sees no economic reason why the polluter should be restrained for his action, and he regards the liability principle as a pure normative allocation of responsibilities.[4] Consequently, if property rights are clearly

---

[4] Because the assumptions of a perfect market do not hold in reality, the other means of internalizing external effects are represented by government intervention. Governments can potentially make use of four different policy measures to internalize external effects: taxes, standards, subsidies, and quotas. However, due to various