



## The importance of local forest benefits: Economic valuation of Non-Timber Forest Products in the Eastern Arc Mountains in Tanzania



M. Schaafsma<sup>a,\*</sup>, S. Morse-Jones<sup>a,b</sup>, P. Posen<sup>a</sup>, R.D. Swetnam<sup>c,d</sup>, A. Balmford<sup>c</sup>, I.J. Bateman<sup>a</sup>, N.D. Burgess<sup>c,e,f</sup>, S.A.O. Chamshama<sup>g</sup>, B. Fisher<sup>a,h</sup>, T. Freeman<sup>i</sup>, V. Geoffrey<sup>j</sup>, R.E. Green<sup>c,k</sup>, A.S. Hepelwa<sup>l</sup>, A. Hernández-Sirvent<sup>m</sup>, S. Hess<sup>n</sup>, G.C. Kajembe<sup>g</sup>, G. Kayharara<sup>j</sup>, M. Kilonzo<sup>g</sup>, K. Kulindwa<sup>l,o</sup>, J.F. Lund<sup>p</sup>, S.S. Madoffe<sup>g</sup>, L. Mbwambo<sup>q</sup>, H. Meilby<sup>p</sup>, Y.M. Ngaga<sup>g</sup>, I. Theilade<sup>p</sup>, T. Treue<sup>p</sup>, P. van Beukering<sup>r</sup>, V.G. Vyamana<sup>g</sup>, R.K. Turner<sup>a</sup>

<sup>a</sup> Centre for Social and Economic Research on the Global Environment, University of East Anglia, Norwich NR4 7TJ, UK

<sup>b</sup> Environmental Markets, Fauna & Flora International, 14 Buckingham St, London, WC2N 6DF, UK

<sup>c</sup> Conservation Science Group, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

<sup>d</sup> Department of Geography, Staffordshire University, Leek Road, Stoke-on-Trent ST4 2DF, UK

<sup>e</sup> Conservation Science Program, World Wildlife Fund, P.O. Box 97180, Washington DC, USA

<sup>f</sup> Centre for Macroecology, Evolution and Climate, Department of Biology, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen, Denmark

<sup>g</sup> Sokoine University of Agriculture (SUA), P.O. Box 3000, Morogoro, Tanzania

<sup>h</sup> Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ 08544-1013, USA

<sup>i</sup> School of Applied Sciences, Cranfield University, Cranfield MK43 0AL, UK

<sup>j</sup> Centre for Environmental Economics and Development Research (CEDR), Dar-es-Salaam, Tanzania

<sup>k</sup> Conservation Science Department, RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL, UK

<sup>l</sup> Department of Economics, University of Dar es Salaam, P.O. Box 35096, Dar es Salaam, Tanzania

<sup>m</sup> School of Geography and the Environment, University of Oxford, Oxford OX1 3QY, UK

<sup>n</sup> Hess Environmental Economic Analyst, Elzenlaan 17, 1214 KJ Hilversum, The Netherlands

<sup>o</sup> Department of International Environment and Development Studies, Norwegian University of Life Sciences (UMB), P.O. Box 5003, NO-1432 Aas, Norway

<sup>p</sup> Institute of Food and Resource Economics, Faculty of Science, University of Copenhagen, DK-1958 Copenhagen, Denmark

<sup>q</sup> Tanzania Forest Research Institute (TAFORI), P.O. Box 1854, Morogoro, Tanzania

<sup>r</sup> Department of Environmental Economics, Institute for Environmental Studies (IVM), VU University Amsterdam, De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

### ARTICLE INFO

#### Article history:

Received 3 September 2012

Received in revised form 12 February 2013

Accepted 4 August 2013

#### Keywords:

Non-Timber Forest Products

Environmental valuation

Benefit transfer

Ecosystem services

Forest conservation

### ABSTRACT

Understanding the spatial distribution of the quantity and economic value of Non-Timber Forest Product (NTFP) collection gives insight into the benefits that local communities obtain from forests, and can inform decisions about the selection of forested areas that are eligible for conservation and enforcement of regulations. In this paper we estimate transferable household production functions of NTFP extraction in the Eastern Arc Mountains (EAM) in Tanzania, based on information from seven multi-site datasets related to the behaviour of over 2000 households. The study shows that the total benefit flow of charcoal, firewood, poles and thatch from the EAM to the local population has an estimated value of USD 42 million per year, and provides an important source of additional income for local communities, especially the poorest, who mainly depend on subsistence agriculture. The resulting map of economic values shows that benefits vary highly across space with population density, infrastructure and resource availability. We argue that if further restrictions on forest access to promote conservation are considered, this will require additional policies to prevent a consequent increase in poverty, and an enforced trade-off between conservation and energy supply to rural and urban households.

Crown Copyright © 2013 Published by Elsevier Ltd. All rights reserved.

\* Corresponding author. Tel.: +44 01603 593224; fax: +44 01603 591327.

E-mail address: [m.schaafsma@uea.ac.uk](mailto:m.schaafsma@uea.ac.uk) (M. Schaafsma).

## 1. Introduction

More than 800 million people worldwide live in or near tropical forests and savannas, and rely on these ecosystems and their services and welfare benefits for fuel, food and income (Chomitz et al., 2007; Boyd and Banzhaf, 2007; Fisher et al., 2009). In Tanzania, rural households largely depend on agriculture or natural resources as their main source of income (NBS, 2009). Tanzania is one of the poorest countries in the world, ranked 148th of the 169 countries on the Human Development Index (UNDP, 2010). Eighty-nine percent of the population lives below the USD 1.25/day poverty line (UNDP, 2010). Poverty is mainly a rural phenomenon: 83% of the households below the national food poverty line live in rural areas (NBS, 2009). In Tanzania, direct dependence on ecosystem services is high; 92% of rural households use firewood as their main cooking fuel, whereas over 50% of the urban population uses charcoal (NBS, 2009). The collection of Non-Timber Forest Products (NTFPs) for house construction and household use is also widespread, driven by poverty and a lack of means to invest in better quality housing and non-wood substitute products (World Bank, 2009). For these communities, final ecosystem services benefits in the form of NTFPs provide a source of complementary cash income, or a safety net when agricultural yields are low (Anthon et al., 2008; Ngaga et al., 2009). In addition to timber extraction, the production of building poles, charcoal and firewood has led to overexploitation of forests and is one of the main immediate drivers (alongside agricultural expansion) of forest degradation and deforestation in Tanzania (Hofstad, 1997; Chiesa et al., 2009; Ahrends et al., 2010; URT, 2010). Rapid population growth puts an additional increasing pressure on these natural resources in the country.

The Eastern Arc Mountains (EAM) contain over 21,500 km<sup>2</sup> of woodlands, which are very important for carbon storage on a landscape scale (Willcock et al., 2012), and 4000 km<sup>2</sup> of tropical forests (Platts et al., 2011), recognised as one of the world's biodiversity hotspots (Myers et al., 2000). Tropical forest ecosystems host at least 60% of the terrestrial biodiversity (Dirzo and Raven, 2003; Myers et al., 2000) and contain around 25% of the carbon in the terrestrial biosphere (Bonan, 2008). Their clearance and degradation account for about 17% of annual CO<sub>2</sub> emissions worldwide (IPCC, 2006). Global concerns about biodiversity conservation and climate change mitigation are leading to rising international demand to reduce degradation and deforestation resulting from the harvesting of timber and NTFPs. However, while the benefits from CO<sub>2</sub> sequestration and biodiversity protection accrue to the entire international community (Balmford and Whitten, 2003; Strassburg et al., 2010), the current welfare of people in local communities in developing countries, many of whom already live near the poverty line, is likely to decrease if NTFP harvesting is restricted (Wunder, 2001). Accordingly, the costs of supplying internationally beneficial conservation services would be carried by the poorest and most vulnerable people.

The trade-offs between socio-economic impacts and forest conservation in forest-rich countries with high levels of poverty and forest-dependency are increasingly being considered in international conservation initiatives, including the UN's programme on Reducing Emissions from Deforestation and forest Degradation (REDD+, see UNFCCC, 2006; Strassburg et al., 2009) and the Convention on Biological Diversity (CBD, 2002). REDD+ is aiming to mitigate climate change for the benefits of the global population by reducing forest degradation, with a payment mechanism yielding co-benefits for poverty alleviation. Similarly, the CBD, in aiming to reduce biodiversity loss, recognises the role of biodiversity for human wellbeing and promotes sustainable use and equitable benefit-sharing (CBD, 2010). The CBD objectives

have been integrated in the Millennium Development Goals and its strategies to reduce extreme poverty (Sachs et al., 2009).

To achieve equity and poverty alleviation objectives, effective forest conservation policies should not only be informed by the potential for carbon sequestration and biodiversity protection, but also by the distribution of costs and benefits of forest conservation among stakeholders at different spatial scales (Hein et al., 2006; Turner et al., 2010). This paper aims to provide insight into the distribution of local benefits within the EAM, by modelling and mapping NTFP extraction across a wide spatial scale. A better understanding of the spatial variation in the (opportunity) costs and benefits of conserving ecosystem services, conditioned by factors such as resource availability and population density (Naidoo and Ricketts, 2006; Pagiola and Bosquet, 2009; Turner et al., 2010), can help to define priority areas where limited budgets for forest and biodiversity conservation would have highest overall benefits (Naidoo et al., 2008). This is especially relevant for the montane and sub-montane forests of the EAM in Tanzania, where the benefits of protection of rare and endangered species could render extractive uses of these forests with local and national benefits problematic (Burgess et al., 2007, 2010). However, effective mechanisms for realising stakeholder benefits and their possible redistribution on fairness grounds have to be in place to avoid adverse poverty and equity effects of forest conservation initiatives. The equity effects of conservation management will depend on who is considered to be a stakeholder and how much they gain or lose under a conservation policy.

This paper presents a unique, spatially wide-scale analysis of NTFP collection across the EAM of Tanzania, demonstrating the importance of natural resource extraction for income and sustenance at the local level. Based on a large dataset from a number of household surveys, we estimate spatially explicit, micro-economic models of household NTFP collection, and transfer these models to predict the economic value of the annual flow of NTFPs extracted by 2.3 million households across the study area of 50,000 km<sup>2</sup>. In the next section, we discuss our modelling approach and its main strengths. The case study is described in Section 3 and the results of our analysis are presented in Section 4. In Section 5, we put our results into a wider policy context and discuss the implications of our findings for forest conservation policy and the links with other policy objectives such as poverty reduction.

## 2. Methodological approach

Increasing policy interest since the 1980s in sustainable development, social forestry, indigenous people's rights, and the commercialisation of forest products, has stimulated a rapid growth of the number of studies on socio-economic aspects of NTFP collection and forestry dependence (Neumann and Hirsch, 2000). The use of these studies in assessments of natural resources to inform decision-making at national level has been limited for a number of reasons. Most of the studies are qualitative in nature or describe forest dependency in terms of average quantities extracted by households. They are usually also rather localised, focusing on a particular forest or community (Croitoru, 2007) and the results do not capture heterogeneity across forests, communities and other spatial contexts. This inhibits generalisation of their results and the transfer of the models to other locations, or over more extensive spatial scales (Godoy et al., 1993). This lack of generalisable information induces a risk that NTFP values are omitted from strategic decision-making processes altogether if site-specific information is unavailable, with potentially serious effects on local welfare in forest-dependent areas. There is a growing need at national and international policy levels for projections at large spatial scales of the economic values local

Download English Version:

<https://daneshyari.com/en/article/7470722>

Download Persian Version:

<https://daneshyari.com/article/7470722>

[Daneshyari.com](https://daneshyari.com)