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# Transaction costs of community-based forest management: empirical evidence from Tanzania

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## Abstract

Levels of transaction costs in community-based forest management (CBFM) in four communities adjacent to the Ambangulu mountain forests of the north-east of Tanzania were assessed through questionnaire responses from 120 households. Costs and benefits of CBFM to the rich, medium and poor groups of forest users were estimated. Costs of CBFM were participation in forest monitoring and time spent in meetings. Benefits included forest products consumed at household level. Transaction costs relative to benefits for CBFM were found to be higher for poorer households compared with medium income and richer households. Higher income groups obtained the most net benefits followed by medium and poorer households. Community involvement in forest management may lower the transaction costs incurred by government, but a large proportion of these costs are borne by poorer members of the community. Transaction costs are critical factors in the success or failure of CBFM and need to be incorporated into policies and legislation related to community-based natural resource management.

*Key words:* Ambangulu, community-based forest management, Eastern Arc, Tanzania, transaction costs, wealth criteria

## Résumé

On a évalué les frais de transactions dans la gestion communautaire de la forêt (*community-based forest management* – CBFM) au moyen de questionnaires distribués dans 120 foyers de quatre communautés voisines des forêts des monts Ambangulu, au nord-est de la Tanzanie. Les coûts et bénéfices de la CBFM ont été évalués pour les groupes riches, moyens et pauvres d'utilisateurs de la forêt.

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Les coûts de la CBFM concernaient la participation au monitoring de la forêt et le temps consacré aux réunions. Les bénéfices incluaient les produits forestiers consommés au niveau de chaque famille. Le rapport entre le coût des transactions et les bénéfices de la CBFM s'est révélé plus élevé pour les foyers pauvres que pour les moyens et les riches. Les groupes aux revenus les plus élevés tiraient le bénéfice net le plus haut, suivis par les groupes aux revenus moyens, puis les pauvres. L'implication communautaire dans la gestion forestière peut faire baisser les frais de transactions couverts par le gouvernement, mais une grande partie de ces coûts sont supportés par les plus pauvres membres de la communauté. Or ces frais sont des facteurs critiques de la réussite ou de l'échec de la CBFM, et il faut les intégrer dans des politiques et une législation liées à la gestion communautaire des ressources naturelles.

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## Introduction

Community-based forest management (CBFM) has the potential to provide a 'win-win' management strategy in which local communities receive benefits from forests whilst ecosystem integrity and biodiversity are maintained (Bray *et al.*, 2002). However, some studies have shown that natural resource management by local communities may not be a panacea that delivers both equity and ecology. For example, it may be a means for government to retain control over a natural resource whilst transferring management costs to local communities, or elites may gain most of the benefits (Songorwa, 1999; Campbell *et al.*, 2001). A key factor that determines success or failure of an institutional arrangement is the cost of transactions undertaken in enforcing property rights over these resources (Coase, 1937, 1960; Alchian & Demsetz, 1972; Cheung, 1983; North, 1990). These costs are particularly

important in CBFM as there are many stakeholders involved in a wide range of activities and some costs may be borne disproportionately by certain members of the community.

However, measurement of transaction costs can be problematic. Transaction costs are the costs of arranging, bargaining, monitoring or enforcing agreements and the cost associated with all the exchanges that take place within an economy (Eggertsson, 1990; North, 1990). Veltheim & Kijazi (2002) consider transaction costs to be the costs of resolving situations where involved parties have conflicting interests such as different definitions of boundaries. Benham & Benham (2000) point out four factors that make empirical measurement of transaction costs difficult. These include: lack of a clear-cut definition of transaction costs; difficulties in separating transaction costs from production costs as they are often jointly determined; many forms of transaction may not take place when the cost of transacting is very high; and many estimates may be required as individuals and groups in any given society face various opportunities and thus transaction costs. In understanding why any particular transaction is likely to be adopted by an individual, knowledge of the opportunity costs faced by that individual is required (Benham & Benham, 2000). Hanna (1995) also observed that in many field settings, efficient management of common pool resources is often challenged by the various sources of uncertainty that result in high transaction costs. Despite variation in the concept of transaction costs, a number of useful definitions are available in the literature (Coase, 1960; Cheung, 1969; Randall, 1972; Williamson, 1973, 1981; North, 1990; Birner & Wittmer, 2000; Holloway *et al.*, 2000). In this study, the transaction costs are defined as the costs incurred by individual households in attending meetings and implementation of the agreed decisions to enforce community-based property rights over local forests. Production costs have also been shown to be another category of cost in community-based resource management, incurred because of the opportunity cost of land set aside for community forests as well as establishing infrastructure to manage the resources (Mburu, Birner & Zeller, 2003).

Although transaction costs are a key factor in sustainable functioning of natural resource management institutions and their role in determining the division of power and access, there are relatively few empirical analyses of transaction costs and very limited comparative estimates of costs and benefits (Crocker, 1971; Kuperan *et al.*, 1998; Richards *et al.*, 1999; Aggarwal, 2000; Falconer, 2000;

Adhikari, 2001; Mburu *et al.*, 2003; Adhikari & Lovett, 2006). Crocker's (1971) study on transaction costs in natural resource transfer using the case of the impact of air pollution on agricultural land use concluded that the transaction costs to affected farmland owners of bargaining with polluters were very high. Support for high levels of transaction costs also comes from other studies such as Leer & Rucker (1991) who applied transaction cost analysis to the structure of timber harvesting contracts and established empirical evidence for the influence of specific types of transaction costs on contractual provisions. Falconer's (2000) study on transaction costs of participation in agri-environmental programmes in some EU member states concluded that a significant level of transaction costs was associated with participation in these schemes, which at present are borne to a nontrivial degree by participants themselves, although the magnitudes, relative importance and perceptions vary widely (Falconer, 2000). Kumm & Drake (1998) estimated around 12% private transaction costs for participating in the Swedish agri-environmental programme.

In Tanzania, CBFM has become the most important programme within the forestry sector following its inclusion in the National Forest Policy in 1998 and Forest Act 2002 (Lovett, 2003a,b) and recent introduction of CBFM guidelines (Government of Tanzania, 2001a). The move towards CBFM has been driven by two factors. First, recognition that neither central government nor local government has the capacity to manage the nation's forest resources in a sustainable way without the support of communities living close to the forest. Second, there has been a political move to decentralize government functions to the lowest level of government capable of taking them on (Wily, 2002). By the end of the year 2000, it was estimated that Tanzania had 318,335 ha of forests under CBFM and 70,135 ha under joint forest management mainly in catchment forest reserves (Masanyika & Mgoo, 2001). To date, more than 600 communities are managing community forests in the country (Wily, 2002).

With the expansion of CBFM, the question of equity in sharing benefits and the costs of CBFM is more pressing than ever before. The government largely dominates community decision-making fora through district authorities (Masanyika & Mgoo, 2001). Communities are rarely in a position to voice arguments for forest management activities that maximize their net benefits from the forest and fulfil local livelihood needs. As a result, the situation of poor and disadvantaged users could potentially

deteriorate due to limited access to the forest. To explore this issue further, a study was carried out to assess transaction costs and to obtain estimates of net benefits of CBFM in four communities adjacent to a single area of forest. The study had three objectives. First, to identify costs and benefits of community forest management to the rich, middle and poor groups of users. Second, to quantify costs and benefits for these subgroups based on prevailing economic conditions. Third, to assess the comparative flow of benefits and costs for each income group. The overall aim of the study was to contribute to the understanding of transaction costs in CBFM and make suggestions for more equitable community forest management practices in Tanzania.

## Methods

### *Study site*

The study was conducted in four out of the twenty villages which border Ambangulu forest, which is situated in the West Usambara mountains, north-east Tanzania (5°09'S, 38°45'E). The Usambara mountains are part of the biodiversity- and endemic-rich Eastern Arc mountains (Myers *et al.*, 2000). The forest is located in Vagara ward of Korogwe District, Tanga Region. The main ethnic group is the Wasambaa with a population of about 30,000 in the twenty villages. Ambangulu forest is one of the few remaining tracts of natural forest between 800 and 1250 m in the West Usambara mountains of Tanzania and is home to a number of Eastern Arc endemic species including the frogs *Arthroleptides martiensseni* and *Callulina kreffti* (Mosha & Doggart, 2002). Over the last 20 years, the forest has been reduced by illegal felling of timber trees, grazing and collection of fuel wood and building poles (Lovett, 1991; Goodman *et al.*, 1995). Agriculture and animal husbandry, both of which are supported by forestry systems, form the backbone of the local economy. The Ambangulu forest has an area of about 20 km<sup>2</sup> and is under various ownership regimes that include the Ambangulu Tea Estate (16 km<sup>2</sup>), government forest reserve (2.8 km<sup>2</sup>) and communities (1.2 km<sup>2</sup>).

Forests are the main source of natural resources in the study sites. There are three main categories of forests: those under community forest reserve; those under ownership of the tea estate; and government forest reserves. The latter has the management objective of water catchment protection. Through joint forest management

with communities, the district government and the Ambangulu Tea Estate, the Tanzania Forest Conservation Group (TFCG) is leading the process to protect this important site (Mosha & Doggart, 2002). The key management activities carried out include monitoring through patrolling, provision of extension services, alternative sources of forest resources and facilitation of forest management plans and by-law development. The implementation and success of these activities depend heavily on the involvement of communities.

### *Data collection*

Data were collected from four villages adjacent to the Ambangulu forest. In this paper, we call them Mekwalo, Vagara, Ngale and Mahale, but these are not their real names in order to protect identities of the sources of data. The TFCG has been supporting the community forestry process since 1997. These communities were selected for two reasons: first, they conduct a variety of forest management activities; and second, the three distinct classes of forest users were easily identified. The study was conducted between mid-June and early July 2003. The questionnaire was adapted from the one used to obtain similar information in Nepal (Adhikari, Di Falco & Lovett, 2004; Adhikari, 2005). Ten per cent of the total households were randomly sampled for the study in each village and the questionnaire was administered to a total of 120 households. Economic status of rural households could not be measured by a single criterion. Participatory wealth ranking, which allows communities themselves to define wealth according to their own perceptions, was performed to identify the three economic groups (Pretty *et al.*, 1995). Participants were asked to categorize households based on the amount of land owned, number of livestock owned and income from business and off-farm agricultural activities. In addition to household survey, participatory rural appraisal methods provided the opportunity for representatives of all the three groups to clarify issues of costs and benefits related to their participation in CBFM. Data were also collected from interviews with the village government and through field observations. Information on household respondents by gender, education level, age and source of income was collected through a structured household survey.

As discussed earlier, two types of costs incurred by users of the forest were identified for analysis. The first category of costs was transaction costs (calculated as an oppor-

tunity cost of time, i.e. number of days participating in various decision-making activities multiplied by farm daily wage rate) of time spent in meetings, assemblies for planning and management of CBFM, by-law formulation and awareness creating and conflict resolution. This method was used because all income groups in the study area had the possibility to work in the tea estate throughout the year. The second category of costs was production costs of forest management activities that included forest boundary clearing and fire-line planting and clearing. Although production costs also include opportunity costs of land allocated for a community forestry programme (Mburu *et al.*, 2003), we could not measure these components of costs which were unfortunately not envisaged during the fieldwork.

Forest benefits were defined as all those perceived by the users. All harvested materials or products from the forest were considered as benefits. Value of the products was obtained by listing and quantifying the products consumed at household level and then assigning a monetary value to each item. Using costs and benefits thus obtained, the net benefit was calculated for each of the economic groups defined by the wealth ranking.

The most important constraint to the study was the recall of past information because of the failure of farmers to clearly remember unrecorded information about their past income. To minimize this limitation, more time was spent per respondent and only detailed data for the previous year were collected.

## Results

### Wealth ranking

Three economic groups, rich, middle and poor, were identified by a range of criteria rather than a single criterion such as income. Criteria that were considered important were: area of productive land, business ownership, type of house, type of crops grown, livestock ownership and dependence on selling casual labour. The 'rich' group was defined as those with 2.8–4 ha of productive lands, a business (e.g. a kiosk, brewing local liquor or restaurant), a modern house roofed with corrugated iron, cash crops, livestock and year-round food availability. The 'middle' income group was defined as those with 1.6–2.7 ha of productive land, half of the other 'rich' criteria and year-round food availability. The 'poor' group was defined as those with 0.4–1.5 ha of productive land, a mud

house with thatched grass roof, one or two goats/sheep, sells forest products and depends on selling casual labour for income and food (i.e. does not have a year-round food availability). It should be noted that the terms used here are relative to the situation in Ambangulu. All the groups would be considered poor by many criteria.

### Characteristics of the respondents

The Ambangulu forest site has a population of more than 30,000. A sample of 120 households was taken in this survey. 61.7% of respondents were male and 38.3% were female. The average number of people in households in the study area was seven. This is above the average of rural households in Tanzania (Government of Tanzania, 2001b). Education level of respondents was generally low: 9% were illiterate (i.e. had not gone to school), 41% were below Standard VII (had attended school but had not completed primary education), 39% had attained Standard VII, 11% had reached secondary education or above. Forty-two per cent of the respondents were in age class 18–40 years, 32% in the age class 41–60 years and 26% in the age class >60 years.

The study revealed that there were six main sources of household income in the study area: agriculture, livestock, business, labour, forest utilization and sale of forest products (Fig. 1). Forest utilization values are forest products collected freely from the forest and consumed at household level. Their monetary value was based on local market values and amounts determined according to household

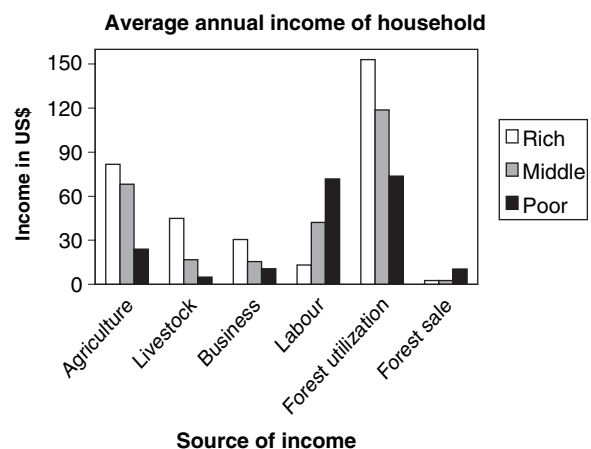


Fig 1 Sources and average amount of annual household income for each of the three wealth groups of rich, middle and poor

**Table 1** Annual transaction cost days differentiated by income groups in each village

Village	Poor	Middle	Rich
Mekwalo	23	58	47
Vagara	51	64	74
Ngale	35	32	27
Mahale	57	36	46

consumption per year. Forest sales are the products collected freely from the forests for the purpose of selling them so as to obtain income. Forest utilization was found to be the main source of income with average annual income of about US\$150, 118 and 73 for rich, middle and poor income groups, respectively. Relative to other groups, income from daily labour work was most important for the poor group with an annual average of US\$72. Forest utilization included forest products such as fuel wood, thatching grass, building poles and fodder. Poor groups also obtained income from the sale of forest products through collection of forest products such as fuel wood and grass fodder and sale to the people owning small restaurants and livestock. Data on other nonwood products collected without charge by villagers were difficult to estimate. For example, it was not possible to accurately quantify the amount of fruit and vegetable products obtained from the forest, so they were not included in the analysis.

#### *Transaction cost days by different income groups*

Transaction cost days spent in forest management for different categories of users are given in Table 1. These data were obtained by asking households to recall their participation in terms of number of days spent annually

either directly or indirectly for CBFM transaction cost-related tasks. Of the four villages studied, transaction costs of forest management were lower for the poorer households in two villages of Mekwalo and Vagara. Transaction costs for rich households were high, up to 74 labour days in Vagara village. The difference in participation of poor households in forest management activities may be due to the value that poor groups attach to the forest. However, the transaction days for poor income groups were high in the villages of Ngale and Mahale. This suggests that poor households are more active in forest management activities in Ngale and Mahale villages where the forest is not so close as opposed to Mekwalo and Vagara villages. This is partly because of the opportunity cost of labour for the poor groups (as they have to spend their time generating cash for daily subsistence needs).

#### *Transaction costs related to forest management*

The breakdown of transaction costs of forest management on the different forest management activities is given in Table 2. Only those households participating in these activities are included in the analysis. The transaction costs related to attending various meetings, forest monitoring and watching were analysed. The total annual averages for the transaction costs of forest management are higher for the poorer households than for rich and middle groups (Table 2). This indicates that poor households participate more in forest management activities compared with their counterparts. Attending meetings such as environmental awareness, discussion of forest management plans and by-law formulation accounted for high transaction costs in all of the three groups.

**Table 2** Quantification of annual transaction costs of forest management activities for three income classes in US\$ (US\$1 = TSH 1000)

Activities	Income groups			Total
	Poor	Middle	Rich	
Protection (watching, monitoring, etc.)	15.4	6.3	16.1	37.8
Attending meetings <sup>a</sup>	30.8	34.3	30.1	95.2
CBFM-related development activities <sup>b</sup>	6.3	4.9	5.6	16.8
Total annual transaction costs	52.5	45.5	51.8	149.8

CBFM, community-based forest management.

<sup>a</sup>These meetings include environmental awareness, conflict resolution, forest by-law formulation, forest management plans (transaction costs), etc.

<sup>b</sup>Include activities such as attending training and study tours.

### Benefits of forest management

Product type and monetary values of the benefits for each income class are given in Table 3. None of the income groups benefited from two of the products surveyed: timber and medicine. Timber harvesting is no longer permitted in the forest. All the groups obtain benefits from fuel wood. This means that the three groups compete for the same set of products from the forest. The rich group obtains more benefit from fodder grass than other groups due to their higher livestock ownership. Benefits from thatching grass were generally low for almost all groups, suggesting that most groups do not use thatching grass from the forest. Palm leaves from their farms were also used as roofing materials.

### Costs and benefits of forest management

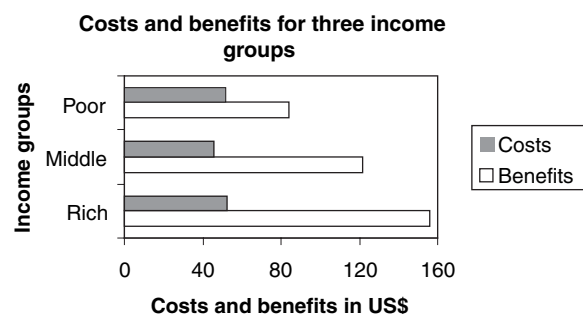
The relative balance between costs and benefits varies between income groups. The average transaction costs for poor, middle and rich groups are US\$ 52.5, 45.5 and 51.8 respectively (Fig. 2). The average benefits are US\$ 84, 121.8 and 155.7 for poor, middle and rich respectively (Fig. 2). This means that poor groups incur relatively higher costs than other groups and benefits were lower for the poorer groups compared with the middle and rich income groups. A similar trend was observed for net benefits. The rich obtain higher net benefit compared with middle and poorer groups (Fig. 3). Poor users gather more low value products such as fuel wood and place emphasis on selling nonforest products to obtain income. The observed higher net benefits of the rich and middle-income groups

**Table 3** Quantification of benefits from forest utilization in US\$ (US\$1 = TSH 1000)

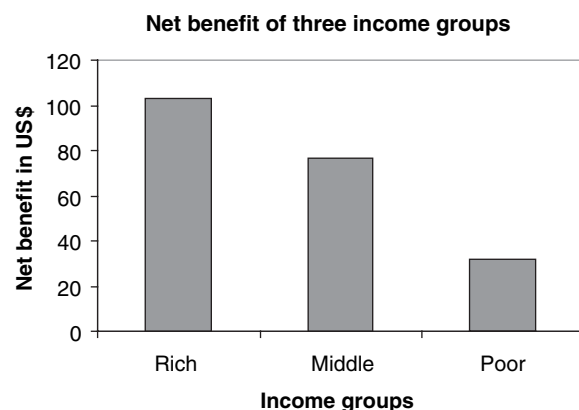
Items	Income groups		
	Rich	Middle	Poor
Fuel wood	64.3	65.8	63.3
Fodder grass	86.4	50.5	7.5
Thatch grass	1.6	0.6	1.7
Bush meat	0.8	0.0	0.0
Building poles (beams, withies)	0.0	2.4	1.2
Forest product sale <sup>a</sup>	2.6	2.6	10.4
Total annual average benefits	155.7	121.8	84.0

Except for forest product sale, monetary estimates are shadow prices estimated from market values of comparable products.

<sup>a</sup>Direct benefits from the sale of forest products. Other listed items are consumed without monetary exchange.



**Fig 2** Costs and benefits of community-based forest management for the three income groups



**Fig 3** Net benefits of community-based forest management for the three income groups

are due to these households having more livestock and consequently consuming more forest products. Higher income households also have more diverse sources of income and use fuel wood for preparing local liquor and cooking in restaurants.

### Impact of CBFM

Respondents in the study area were asked, according to their perceptions, about the changing trends of a series of indicators in the last 5 years. Table 4 summarizes the results. For example, 91% of respondents reported that illegal forest activities were decreasing, about 6% reported no change and 3% said it was increasing. Recalling the past, a village government member of Vagara said:

'I remember in the past you could hear more noise of saws and axes in the forest reserve felling trees as if

**Table 4** Percentage of respondents showing their perceptions to the impact of participatory forest management of the Ambangulu forests over the last 5 years

Indicators	Increasing (%)	No change (%)	Decreasing (%)
Crop production	66.7	10.8	22.5
Illegal forest activities	3.3	5.8	90.8
Forest regeneration/cover	95.0	3.3	1.7
Tree species	90.8	6.7	2.5
Number of water source/spring	89.2	7.5	3.3
Time to collect fuel wood	10.8	20.8	68.3
Trees on private farms	89.2	5.8	5.0
Flooding or land slides	5.0	1.7	93.7
CBFM-related development	75.8	14.2	10.0
Time to fetch water	11.7	9.2	79.2
Vermin	70.8	20.0	9.2

nobody owns the forest. You could also meet/see a number of lorries full of timber going down to town. We thank the project in involving communities in reversing the situation.'

On the other hand, 70.8% of respondents mentioned that vermin was increasing and destroying crops in their farms, 20% mentioned that there was no change and 9.2% said it was decreasing. One farmer in a study area said:

'I like forest conservation but I do not like vermin conservation as I and my families spend most of the time in a year guarding farms and our crops.'

This means that improved conservation creates indirect costs to the households with farms adjacent to protected forests (Songorwa, 1999).

#### Food security

Among the objectives of CBFM are the creation of conditions whereby forest-adjacent communities can benefit from forest products. Respondents in the study area were asked about the period for which field crop production can meet their household food demands. The majority (76.5%) of respondents from the poor group mentioned that their household food needs are met from their own field crops for a period of less than 3 months (Table 5). This means that they have to buy food to meet their needs for the remaining period of the year. Collection and sale of forest

**Table 5** Numbers of households in different income classes with the period that food production meets household needs

Income class	Period in months that food production meets household needs					Total
	<3	3–6	6–9	9–12	>12	
Poor	13 11%	5 4%	17 14%	4 3%	1 1%	40 33%
Middle	3 3%	9 8%	14 12%	11 9%	5 4%	42 4%
Rich	1 1%	5 4%	15 13%	15 13%	2 2%	38 32%
Total	17 14%	19 16%	30 38%	46 25%	8 7%	120

products could potentially help one to meet the costs of this shortfall.

## Discussion

This study has revealed that the principal source of cash income for the majority of households is agriculture. Other significant economic activities are livestock keeping, petty business and casual employment (in particular, working on the tea estate). Forest utilization and sale of forest products are a supplementary source of income to agriculture (Fig. 1). This result is what would be expected in much of Tanzania and other African countries where free access to forest products provides an additional source of household income in rural areas and where fuel wood is the main source of energy (Kaale *et al.*, 2002; Roe *et al.*, 2002). Although the majority of households in the study area practice agriculture, food production of 76.5% of the poor group only meets their needs for less than 3 months (Table 5). This has an impact in terms of forest management as they have to find extra income to buy food for the rest of the year and access to forest products is one way of doing this.

It is clear that time taken in attending various meetings related to CBFM activities and forest protection through monitoring make up the bulk of costs. Spending long periods in meetings is a typical process of CBFM. For example, a study carried out in the East Usambara forest in Tanzania found that settling conflicts related to forest boundaries not only took a long time but also carried a high cost (Veltheim & Kijazi, 2002). The number of days for rich households can be quite high, for example, in Vagara village, a total of 74 days a year is spent on CBFM by the rich income group (Table 1). Interest in forest

management seems to differ in many ways for various income groups. Poor households see forests as an important resource to maintain their livelihood, while for richer households, forests represent not only a source of forest products but also have an environmental value.

Variation in transaction cost between different income groups can be explained by the forest condition. The extent of transaction costs of forest management activities depends on the quality of the forest resource itself. For example, when the Ambangulu forest was threatened by illegal forest activities (timber harvesting), communities initially spent a considerable amount of time on patrolling, forest boundary demarcation and clearing. Subsequently, they spent more time on attending meetings to develop management plans and formulation of village forest by-laws. Other related activities as a result of CBFM, but not part of the CBFM cost, include alternative income-generating activities such as farm tree planting, fish keeping, constructing improved stoves and making bricks for house building. These activities aim at reducing pressure on protected forest (Mosha & Doggart, 2002) and at the same time these interventions aim at empowering primary users of forest by alleviating poverty.

The goal of CBFM was 'to improve forest conservation and management to ensure equitable sharing of benefits among all stakeholders' (Government of Tanzania, 1998, p. 18). The utilization and management of such forests are to be through approved management plans (Article 39, Forest Act 2002). In the study area, it was found that there is a net benefit for all income classes (Fig. 1) and communities perceived that the forest is improving (Table 4) as a result of CBFM. In the Tanzanian East Usambara forest, Veltheim & Kijazi (2002) point out that it is unrealistic to assume that villagers would take the burden of all forest management activities without any tangible benefits. This indicates that communities will only manage forest if it is in their interest to do so. Generally, this means that they must recoup their costs and be able to protect those values they consider important. In Nepal, Springate-Baginski *et al.* (2001) observed that conservation closure and regulated products extraction have led to reversal of degradation. Yet, the focus on protection rather than production means a significant loss of potential income for Forest User Groups (Brown *et al.*, 2002).

Forest benefit is underestimated in this study as it did not consider ecological services that forests provide at local, national and international levels. These intangible benefits include water catchment, biodiversity value, carbon sink

and so on. Forests that contain high biodiversity value, such as the Ambangulu forests, are worth more for their global existence value than the local services they supply (Godoy *et al.*, 2000; Myers *et al.*, 2000). On the other hand, the transaction costs of scaring vermin from the farms were not included because of the lack of data. Moreover, as the forest cover improves and biodiversity values increase, so does the population of vermin. This then creates costs such as crop damage to the households with farms next to forests (Songorwa, 1999). These costs were not included in this study because such costs are incurred even without CBFM. In addition, crop damage is localized to villagers who cultivate adjacent to forest reserve (Naughton-Treves, 1998).

The results of this study suggest that, when transaction costs are accounted for in the assessment of costs and benefits, the lower income class bears a relatively larger amount of the cost of forest management under the current practices. As discussed by Mburu *et al.* (2003), magnitude of transaction costs is influenced by the attributes of transactions, biophysical and ecological characteristics of the resource systems and characteristics of the households. Any expectation that CBFM would prove a cheap way of obtaining benefits has not been realized. Under the current forest laws in Tanzania, communities have none of the financial incentives from the forest products revenue collected (Lovett, 2003b). In Tanzania, an existing example of revenue sharing is between the Wildlife Division and local communities and is based on the revenue accrued from hunting by tourists. About 25% of the revenue from this industry is channelled through district councils for funding development in villages near to where hunting takes place, but this does not necessarily reach the targeted group (Junge, 2002). Another example is a Joint Forest Management agreement between the Forest and Beekeeping Division and the six communities adjacent to new Dabaga/Ulangambi national forest reserve in Iringa where it has been agreed that 100% of benefits from the forest are to be retained in the communities. Veltheim & Kijazi (2002) suggest that, because the Eastern Arc forests are important for biodiversity conservation, government should continue paying for the intensive labour activities such as border maintenance by casually employing community members, especially the poor groups, to do the clearing. This would be considered as a tangible benefit from CBFM and could help provide poor groups with income to overcome food shortages.

To date, most CBFM projects in Tanzania have had heavy external support (Veltheim & Kijazi, 2002;



Woodcock, 2002; Lovett, 2003b). This raises the question of the global trend towards reduced government involvement in forestry at the very time when communities require additional support to enable them to effect the CBFM process. As the Eastern Arc mountains have a high global value for biodiversity, it is important that conservation costs are shared among the stakeholders. The international community could play a role in providing support to the process of CBFM by funding some of the alternative strategies (Gunatilake, 1998), for example, Integrated Conservation Development Projects and promoting ecotourism.

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## References

- ADHIKARI, B. (2001) *Literature review on the economics of common property resources: review of common pool resource management in Tanzania*. Report Prepared for NRSP Project R7857. Centre for Ecology, Law and Policy, Environment Department, The University of York, York.
- ADHIKARI, B. (2005) Poverty, property rights and collective action: understanding the distributive aspects of common property resource management. *Environ. Dev. Econ.* **10**, 7–31.
- ADHIKARI, B. & LOVETT, J.C. (2006) Transaction costs and community-based natural resource management in Nepal. *J. Environ. Manage.* **78**, 5–15.
- ADHIKARI, B., DI FALCO, S. & LOVETT, J.C. (2004) Household characteristics and forest dependency: evidence from common property forest management in Nepal. *Ecol. Econ.* **48**, 245–257.
- AGGARWAL, R.M. (2000) Possibilities and limitations to cooperation in small groups: the case of group-owned wells in southern India. *World Dev.* **28**, 1481–1497.
- ALCHIAN, A.A. & DEMSETZ, H. (1972) Production, information costs, and economic organization. *Am. Econ. Rev.* **62**, 777–795.
- BENHAM, A. & BENHAM, L. (2000) Measuring the transaction costs. In: *Institutions, Contracts and Organizations: Perspectives from New Institutional Economics* (Ed. C. MENARD). Edward Elgar Publishing, Cheltenham, pp. 367–375.
- BIRNER, R. & WITTMER, H. (2000) Co-management of natural resources: a transaction cost economic approach to determine the efficient boundary of the state. In: *Proceedings of International Symposium of New Institutional Economics*, 22–24 September 2000, Tübingen, Germany.
- BRAY, D.B., MERINO-PÉREZ, L., NEGREROS-CASTILLO, P., SEGURA-WARNHOLTZ, G., TORRES-ROJO, M. & VESTER, H.F.M. (2002) Mexico's community-managed forests as a global model for sustainable landscapes. *Conserv. Biol.* **17**, 672–677.
- BROWN, D., MALLA, Y., SCHRECKENBERG, K. & SPRINGATE-BAGINSKI, O. (2002) *From Supervising to Supporting 'Citizens': Recent Developments in Community Forestry in Asia and Africa*. Natural Resource Perspectives No. 75, ODI, London.
- CAMPBELL, B., MANDONDO, A., NEMARUNDWE, N., SITHOLE, B., DE JONG, W., LUCKERT, M. & MATOSE, F. (2001) Challenges to proponents of common property resource systems: despairing voices from the social forests of Zimbabwe. *World Dev.* **29**, 589–600.
- CHEUNG, S.N. (1969) Transaction costs, risk aversion and the choice of contractual arrangements. *J. Law Econ.* **18**, 535–554.
- CHEUNG, S.N. (1983) The contractual nature of the firm. *J. Law Econ.* **26**, 1–22.
- COASE, R. (1937) The nature of the firm. *Economica* **16**, 386–406.
- COASE, R. (1960) The problem of social cost. *J. Law Econ.* **3**, 1–44.
- CROCKER, T.D. (1971) Externalities, property rights and transactions costs: an empirical study. *J. Law Econ.* **14**, 451–461.
- EGGERTSSON, T. (1990) *Economic Behaviour and Institutions*. Cambridge University Press, Cambridge.
- FALCONER, K. (2000) Farm-level constraints on agri-environmental scheme participation: a transactional perspective. *J. Rural Stud.* **16**, 379–394.
- GODOY, R., WILKIE, D., OVERMAN, H., CUBAS, A., CUBAS, G., DEMMER, J., MCSWEENEY, K. & BROKAW, N. (2000) Valuation of consumption and sale of forest goods from a central American rain forest. *Nature* **406**, 62–63.
- GOODMAN, S.M., STANLEY, W.T., NEWMARK, W.D. & HOWELL, K.M. (1995) The Ambangulu forest, West Usambara Mountains, Tanzania: a threatened forest. *Oryx* **29**, 212–214.
- GOVERNMENT OF TANZANIA (1998) *National Forest Policy*. Ministry of Natural Resources and Tourism, Dar es Salaam.
- GOVERNMENT OF TANZANIA (2001a) *Community Based Forest Management Guidelines*. Ministry of Natural Resources and Tourism, Dar es Salaam.
- GOVERNMENT OF TANZANIA (2001b) *National Forest Programme in Tanzania 2001–2010*. Ministry of Natural Resources and Tourism, Forestry and Beekeeping Division, Dar es Salaam.
- GUNATILAKE, H.M. (1998) The role of rural development in protecting tropical rainforest rainforests: evidence from Sri Lanka. *J. Environ. Manage.* **53**, 273–292.

- HANNA, S. (1995) Efficiencies of user participation in natural resource management. In: *Property Rights and the Environment: Social and Ecological Issues* (Eds S. HANNA and M. MUNASINGHE). The Beijer International Institute of Ecological Economics and the World Bank, Washington, DC, pp. 59–67.
- HOLLOWAY, G., NICHOLSON, C., DELGADO, C., STAAL, S. & EHUI, S. (2000) Agroindustrialization through institutional innovation: transaction costs, cooperatives, and milk-market development in the East-African highlands. *Agric. Econ.* **23**, 279–288.
- JUNGE, H. (2002) *Decentralisation and community-based natural resource management in Tanzania – the case of local governance and community-based conservation in districts around the Selous Game Reserve*. Wildlife Discussion Paper No. 32. Wildlife Division, Dar es Salaam.
- KAALE, B.K., RAMADHANI, H.K., KIMARIYO, B.T., MARO, R.S. & ABDI, H. (2002) *Participatory Forest Resource Assessment*. Mitsu Yetu Project, CARE – Tanzania, Dar es Salaam.
- KUMM, K.I. & DRAKE, L. (1998) *Transaction costs to farmers of environmental compensation*. Unpublished Report. Department of Economics, SLU, University of Uppsala, Uppsala.
- KUPERAN, K.I., MUSTAPHA, N., ABDULLAH, R., POMEROY, R.S., GENIO, E. & SALAMANCA, A. (1998) *Measuring transaction costs of fisheries co-management*. Paper Presented at the 7th Biennial Conference of the International Association of the Study of Common Property, Vancouver.
- LEFFLER, K. & RUCKER, R. (1991) Transaction costs and the efficient organization of production: a study of timber harvesting contracts. *J. Polit. Econ.* **99**, 1060–1087.
- LOVETT, J.C. (1991) Notes on the forest at Ambangulu and Kunga in the West Usambara Mountains. *East Afr. Nat. Hist. Soc. Bull.* **21**, 29–30.
- LOVETT, J.C. (2003a) Tanzania Forest Act 2002. *J. Afr. Law* **47**, 133–135.
- LOVETT, J.C. (2003b) Tanzanian Forest Law. In: *Environmental Law and Policy in Africa* (Eds B. CHAYTOR and K. GRAY). Kluwer Law International, The Hague, pp. 151–180.
- MASAYANYIKA, S.W. & MGOO, J.S. (2001) *Basic Assessment of Benefits and Costs Sharing and Other Issues Affecting Joint Forest Management (JFM) and Community-based Forest Management (CBFM)*. Ministry of Natural Resources and Tourism, Forestry and Beekeeping Division, Dar es Salaam.
- MBURU, J., BIRNER, R. & ZELLER, M. (2003) Relative importance and determinants of landowners' transaction costs in collaborative wildlife management in Kenya: an empirical analysis. *Ecol. Econ.* **45**, 59–73.
- MOSHA, S. & DOGGART, N. (2002) *The importance of cooperation: joint forest management in Ambangulu*. Arc Journal Issue 14. Tanzania Forest Conservation Group, Dar es Salaam.
- MYERS, N., MITTERMEIER, R.A., MITTERMEIER, C.G., DA FONSECA, G.A.B. & KENT, J. (2000) Biodiversity hotspots for conservation priorities. *Nature* **403**, 853–858.
- NAUGHTON-TREVES, L. (1998) Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conserv. Biol.* **12**, 156–168.
- NORTH, D.C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, Cambridge.
- PRETTY, J.N., GUIJT, I., THOMPSON, J. & SCOONES, I. (1995) *Participatory Learning and Action; A Trainer's Guide*. International Institute for Environment and Development, London.
- RANDALL, A. (1972) Market solutions to externality problems: theory and practice. *Am. J. Agric. Econ.* **54**, 175–183.
- RICHARDS, M., KANEL, K., MAHARJAN, M. & DAVIES, J. (1999) *Towards Participatory Economic Analysis by Forest User Groups in Nepal*. ODI, London.
- ROE, D., MULLIKEN, T., MILLEDGE, S., MREMI, J., MOSHA, S. & GRIEG-GRAN, M. (2002) *Making a killing or making a living? Wildlife trade, trade controls and rural livelihoods*. TRAFFIC. Biodiversity and Livelihoods Issues No. 6. International Institute for Environment and Development, London.
- SONGORWA, A.N. (1999) Community-based wildlife management (CWM) in Tanzania: are communities interested? *World Dev.* **27**, 2061–2079.
- SPRINGATE-BAGINSKI, O., SOUSSAN, J., DEV, O.P. & YADAV, N.P. (2001) *Community Forestry in Nepal – Progress and Potential*. University of Leeds, Leeds.
- VELTHEIM, T. & KIJAZI, M. (2002) *Participatory forest management in the East Usambaras*. East Usambara Catchment Forest Project. Technical Paper No. 61. Forestry and Beekeeping Division and Metsahallitus Consulting, Dar es Salaam, Tanzania and Helsinki, Finland.
- WILLIAMSON, O.E. (1973) Market and hierarchies: some elementary considerations. *Am. Econ. Rev.* **63**, 316–325.
- WILLIAMSON, O.E. (1981) The modern cooperation: origins, evolution, attributes. *J. Econ. Lit.* **4**, 1537–1568.
- WILY, L.A. (2002) *An introductory word on 'community based forest management' and 'joint forest management': what do they mean?* Arc Journal Issue 12. Tanzania Forest Conservation Group, Dar es Salaam.
- WOODCOCK, K. (2002) *Changing Roles in Natural Forest Management: Stakeholder's roles in the Eastern Arc Mountains, Tanzania*. Ashgate Studies in Environmental Policy and Practice. Ashgate, Aldershot.

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