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Distribution of Fishery Income Between Fishers and Gear Owners in Lake Tanganyika: A Case of Kigoma Urban in Tanzania

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Abstract

Community-based forest management (CBFM) has resulted in improvement of forest conditions in many parts of Tanzania including village forest reserves in Mufindi district, Iringa region. This improvement is a result of use of bylaws that restrict forest use, including the need for a licence for certain products. These regulations may result in increased distances to sources of forest products and thus increased time spent on collection of forest products. The cost of these changes may be higher for the poor than for the better-off sections of the community because the poor are usually more dependent on community forests than the better-off. Differences in ability to afford a license among forest users may result in bias in distribution of benefits of CBFM through harvesting and utilisation of products from the forests. This study aimed to assess the relationship between poverty and access and use of resources from community forests in Mufindi district in order to inform policy and form a basis for gendering CBFM in Tanzania. Specifically, the study sought to: determine types, quantities, values, costs and benefits of products collected from community forests; examine differences in types, quantities, values, costs and benefits of products collected among different wealth ranks in communities with forests; analyze the dependence level of different wealth ranks on community forests and; determine factors (in addition to wealth ranks) that influence equity in access and use of resources from these forests. It was hypothesized that there is inequity in distribution of benefits and costs associated with utilization of resources from community forests among different wealth groups. Data were obtained through Participatory Rural Appraisal (PRA) and a household questionnaire survey. Villages for inclusion in the study were purposively selected on the

basis of wealth level of the village and dependence on community forests such that one village came from each of the four categories, namely poor and highly dependent on community forests, poor and less dependent on community forests, well off and highly dependent on community forests and well-off and less dependent on community forests. Participatory wealth-ranking of the community households were conducted for each village. For the questionnaire survey, wealth ranks were used as sampling strata. From each wealth rank, ten households were randomly sampled for each village. Data on types, quantities, values, costs and benefits of products collected and dependence on community forests were collected. The aim of the questionnaire survey was to analyse the household-level variations in the studied aspects whereas PRA provided community-level information. Generalized Linear Models (GLM) Analysis of Covariance (ANCOVA) was used to analyse the effect of wealth-rank on types, quantities, values, costs and benefits of products collected and dependence on community forests. Other socio-economic factors than wealth-rank were used as covariates in the ANCOVA model. The results show that wealth-rank influences the amounts, value and time of forest products collected. The results of the research will be shared through a workshop involving representatives from the studied communities and relevant district authorities, a report to REPOA, brochures (that will be distributed to villages in Mufindi), publications in refereed journals and internet publication. The participatory nature of the research and the feedback of the research results to the studied communities will enhance discussion of equity and enlighten the disadvantaged groups to claim their rights.

Introduction and Background

Community-Based Forest Management (CBFM) is one of the forms of Participatory Forest Management (PFM) that have been opted for in forest management in Tanzania, starting in the 1990s (Wily, 2002). CBFM is supported by the National Forest Policy of Tanzania (URT, 1998) and Forest Act of 2002 (URT, 2002) and is implemented using guidelines published by the government (MNRT, 2001). Under CBFM, communities are given the legal right to own and/or manage forests within their villages (URT, 1998; 2002). CBFM in particular and PFM in general were adopted as alternatives to the policing approach to forest management whereby the communities were viewed by the government as enemies of forests (Kajembe and Mgoo, 1999; Wily and Dewees, 2001). This occurred because policing resulted in uncontrolled forest exploitation and resultant degradation partly due to lack of incentives for the local communities to manage the forests (Kajembe and Mgoo, 1999; Wily and Dewees, 2001). In addition, the policing approach could not work due to limited ability of the government to implement it as a result of limited number of personnel, shortage of funds and scarcity of resources. On the other hand, under CBFM communities are viewed by the government as partners in forest management (Kajembe and Mgoo, 1999; Wily and Dewees, 2001). It was believed that this gives sufficient motivation for communities to conserve their forests (URT, 1998). The aim of CBFM is to achieve the dual objective of forest conservation and poverty alleviation through equitable use of the resources.

The advantage of CBFM to villagers is that under CBFM the village is granted executive jurisdiction to implement objectives of management plans, such as planning and undertaking forest management operations including patrols, fire control and tree planting (Lund, 2007).

More importantly, the village collects and retains revenues from extraction of forest products (Lund, 2007). Compared to management arrangements prior to CBFM, CBFM results in more effective revenue collection (Lund, 2007; Milledge *et al*., 2007) and better protection of forest resources (Zahabu, 2006 a & b).

Mufindi is among the districts that are in the forefront in implementing CBFM. Under CBFM there are more than 30 village forest reserves in Mufindi, that have been surveyed and gazetted with the support from HIMA-Mufindi (HIMA = Hifadhi Mazingira) and CONCERN[1] projects (FORCONSULT, 2003). The total area of village forest reserves is more than 5,600 hectares with the area of individual forests ranging from 11 to 1,485 hectares (FORCONSULT, 2003). As a result of CBFM there are improvements in conditions of forests that have been designated for management under CBFM (District Forest Officer, *pers. comm*. 2003).

Strategies that are used to achieve objectives of CBFM include setting rules that regulate access and use of forests under CBFM. Four broad categories of the rules may be identified (MNRT, 2001): (i) uses of the forest which are prohibited; (ii) uses of the forest which are permitted through a license; (iii) uses of the forest which need permission but no fee and (iv) uses of the forest which are freely available. For uses that need a licence, the difference in the ability to obtain a license may result in bias in benefit distribution whereby community members who can afford the license get more benefits. Furthermore, better-off members of the community may have higher capability of using the forests even for items that do not require a license. The bias in benefit distribution could result in disincentive to manage the forests by the disadvantaged groups.

[1] CONCERN is an Irish Agency for International Development

In general, because CBFM involves community members who have different wealth status, it is likely that the poorer members of the community bear more costs of CBFM while at the same time enjoy less in terms of benefits. This study was conducted to investigate the distribution of benefits and costs of CBFM as influenced by wealth and other socio-economic attributes among members involved in CBFM. The study was conducted in Mufindi district and involved communities from villages that practise CBFM.

Statement and Significance of the Research Problem

Equitable distribution of costs and benefits of forest management is a basis for sustainable CBFM (Yajie *et al*., 1997; Ducey and Larson, 1999; World Bank, 2005; Cheng et al., 2011). Although CBFM tends to suggest sustainable and equitable forest management, it has failed to properly identify and account for the sets of benefits and costs accruing to different members of the same communities, despite the fact that this is key to both poverty alleviation and sustainable forest management (Pulhin and Dressler, 2008). The claims that there might be inequity in forest utilization in Mufindi district are basically anecdotal. The observations are also mainly unsystematic and cannot be used to assess equity situation in a way that can precisely inform policy. There is therefore a need for a systematic and quantitative study in order to understand equity in CBFM in Mufindi district. Understanding the way in which benefits and costs are distributed among community members involved in CBFM is key to understanding how to promote equitable sustainable forestry whereby all

the stakeholders are motivated to conserve forests and the costs and benefits of forest management are equitably distributed and contribute to poverty alleviation (Masozera *et al*., 2006).

Research Objectives

The general objective was to assess the effect of poverty on equity in community-based forest management in Mufindi district in Iringa region of Tanzania.

The specific objectives were:

a. To determine types and quantities of products collected, values of the products, costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among forest users.
b. To examine differences in types and quantities of products collected, values of the products, costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among different wealth ranks of the forest users.
c. To analyse the contribution of different sources of forest products to types and quantities of products collected, values of the products, costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among different wealth ranks of the forest users.

d. To evaluate the influence of selected household characteristics (in addition to wealth rank) on types, quantities and sources of products collected, values of the products, costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among forest users.
e. To determine the proportion of the population that falls under each of the major wealth ranks.

Research Questions

The proposed research addressed the following questions:

a. What are the types and quantities of products collected, values of the products, costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among forest users.
b. Does poverty level influence the types and quantities of products accessed, values of the products, cash costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among forest users?
c. Does the contribution of different sources of forest products to types and quantities of products collected, values of the products, cash costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization vary among different wealth ranks of forest users?

d. What is the role of other socio-economic characteristics than poverty in determining the types, quantities and sources of products collected, values of the products, cash costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization among forest users?
e. What proportion of the population belongs to each of the major wealth ranks?

Hypotheses

The following hypotheses were tested by this study:

a. Poorer members of the community and women and children incur more costs of forest utilisation while they benefit less than better off members and men.
b. Poorer members of the community and women and children are more dependent on community forests than better off members and men.
c. Small families with a young family head who has few years of schooling incur more costs and benefit less from community forests than the converse.
d. Small families with a young family head who has few years of schooling are more dependent on community forests than the converse.
e. The distribution of households into wealth categories follows a normal distribution pattern.

Conceptual framework

The research was based on the tenet that the level of dependence on community forests and the distribution by wealth category and other household characteristics among community members of the types, quantities, values and costs of forest products from community forests indicate the level of equity in community-based forest management (Figure 1). The wealthier members of the community are more likely to get more benefits from community forests than the poorer members. Furthermore, the poorer members are expected to be more dependent on community forests than the wealthier members of the community.

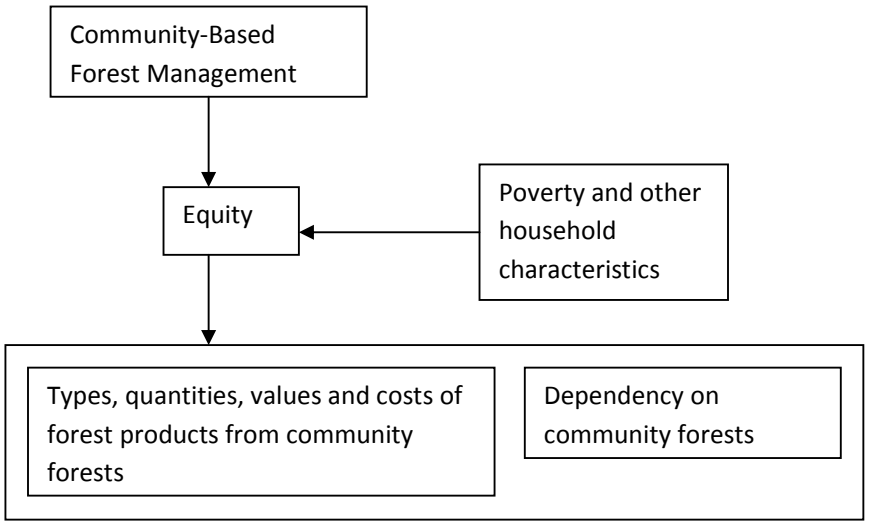

Figure 1: Conceptual framework underlying the study of the effect of poverty on equity in Mufindi district, Tanzania

Theoretical Background and Literature Review

Equity, poverty, gender and other socio-economic attributes

The definition of equity varies by country and discipline (World Bank, 2006). Economists link equity to questions of distribution. Lawyers to principles meant to correct the strict application of the law, which may lead to an outcome judged to be unfair in specific circumstances. Philosophers have provided the basis for concepts of equity writing on just and fair society as exemplified by Plato's *Republic* and Aristotle's *Politics*. Equity is central to world's great religions: Buddhism, Christianity, Hinduism, Islam and Judaism and other faith traditions (World Bank, 2006). Recently, social choice theory and the closely related domain of welfare economics define equity in terms of aggregation of preferences into some form of "social optimum" (World Bank, 2006).

In political economic circles, equity has been defined in a relatively narrow sense of income distribution (Lal and Myint, 1996) and a relatively broader sense of distribution of capability (Sen, 1999). There are two perspectives of equity in the income distribution approach: the functional and personal perspective (Lal and Myint, 1996). The functional perspective of equity is defined by distribution of primary factors of production, namely capital, labour and land. On the other hand, the personal perspective of equity is defined by distribution of wages, profits and rents. Using the functional distribution in analyzing equity allows one to

link the purely economic effects from changing factor proportions and hence relative factor prices to broader questions of political economy (Lal and Myint, 1996).

The definition of equity in terms of capability encompasses many aspects that determine the functioning of a person such as opportunities, freedom to participate in politics and other affairs, health, opportunity for self-fulfilment and ability to participate in social activities such as parties (Sen, 1999). Accordingly, societies with equal distribution of income may have low equity if the distributions of other aspects such as the freedom to vote are considered in case the society has restrictions on who should vote based on, for instance, race or class (Sen, 1999). Furthermore, inequality of opportunity may depend on race, region of birth, parental education, paternal occupation at birth and residual share (Sen, 1981; World Bank, 2006). Other factors are gender, family wealth and the quality of (primary) schools attended. The richer may enjoy more opportunities than the poorer and women have traditionally had more restricted opportunities than men in most parts of the world (World Bank, 2006).

Equity may be promoted by two principles: equal opportunity and avoidance of absolute deprivation (World Bank, 2006). Using the equal opportunity principle, the outcome of a person's life, in many dimensions, should reflect mostly his or her efforts and talents, not his or her background. Predetermined circumstances – gender, race, place of birth, family origins – and the social groups a person in born into should not help determine whether people succeed economically, socially and politically. The equal opportunity principle states

that “circumstances at birth should not matter for a person’s chances in life”. Predetermined circumstances or membership in prespecified groups may affect opportunities in two ways: First, the circumstances of one’s birth affect the endowments one starts with, including all kinds of private assets, such as physical wealth (e.g. land and financial assets), family background (the human, social and cultural capital of one’s parents), and access to public services and infrastructure (sometimes referred to as geographic capital). Secondly, group membership and initial circumstances affect how one is treated by the institutions with which one must interact. On the other hand, using the avoidance of absolute deprivation principle, the society decides to help the needy even if their need is a result of their own failings.

Endowments that are less unequal, processes that are fair and protection from deprivation are not always mutually consistent (Sen, 1999; Worlk Bank, 2006). At policy level, there may be tradeoffs among them (Sen, 1999; Worlk Bank, 2006). Policies or institutions developed to further one of the principles may compromise the other e.g. affirmative action that seeks to correct past inequities may create new inequities (Sen, 1999; World Bank, 2006). Inequity prevails when the interests of dominant groups are not aligned with broader collective goals (World Bank, 2006).

In societies with inequality of assets and incomes, the rich will tend to have more influence and an advantage in adapting and distorting institutions to their benefit (World Bank, 2006; Pulhin and Dressler, 2008; Morison and Brown, 2011). Equity in the income and power

domains may be characterised by either a virtuous or vicious cycle: in a virtuous cycle, income equity determines power equity and vice versa whereas the converse is true in vicious cycle (World Bank, 2006).

Poverty is hard to define (Jayasuriya, 2005). In simple terms it is defined on the basis of income as the person's inability to obtain minimum levels of consumption of goods and services (Jayasuriya, 2005). However income is not a reliable predictor of a person's true capacity to obtain specific bundle of goods and services (Sen, 1999; Jayasuriya, 2005). Economists prefer consumption (expenditure) to income as a more reliable indicator of poverty, because economic agents tend to smooth consumption over time in line with their overall net wealth position (Jayasuriya, 2005). Furthermore, poverty also entails deprivation in other aspects such as health, physical ability and freedom (Sen, 1999). Thus, a person with a high income but poor health may be worse off than a person with low income but good health (Sen, 1999).

In the 1970s poverty was defined by some minimum nutritional standard based on the objective calorific needs of an individual (Sen, 1981; Lal and Myint, 1996). This was criticized that it did not take account of individual variability and adaptability and hence overestimated the extent of malnutrition and poverty in developing countries (Sen, 1981; Lal and Myint, 1996). However the use of mal-nutrition as an indicator of poverty is somehow justified because of the link between malnutrition and a number of other social indicators notably infant mortality and life expectancy at birth (Sen, 1981; Lal and Myint, 1996). The

tendency to ignore the use of nutritional indicators in assessment of poverty is an example of misplaced sophistication (Sen, 1981).

Another indicator of poverty is annual per capita income whereby an arbitrary level may be set as a poverty line (Lal and Myint, 1996). The use of a poverty line has two shortcomings (Sen, 1981; Lal and Myint, 1996). The first is that the poverty line ignores the degree of poverty below the poverty line. The second is the fact that the poverty line cannot be appropriate across nations. Absolute poverty may be defined with reference to a nationally invariant real-income standard (Sen, 1981; Lal and Myint, 1996). Alleviating poverty is not synonymous with reducing the inequality of income (Sen, 1981; Lal and Myint, 1996). Rather than using a single attribute to measure poverty, poverty may be defined using a composite index comprising indicators related to such issues as health, nutrition, education, housing, sanitation and clean water (Sen, 1981; Lal and Myint, 1996; Sen, 1999). This approach forms the centre-piece of the basic needs approach to the definition of poverty (Lal and Myint, 1996). One composite index of poverty is the Physical Quality of Life Index (PQLI), which is a simple average of three indices derived from life expectancy, infant mortality and literacy rate (Lal and Myint, 1996).

There are three types of poverty, namely structural mass poverty, destitution and conjunctural poverty (Lal and Myint, 1996). Structural mass poverty is the poverty of all the society or human kind. Historically that was so because people depended on organic production i.e. production that is limited by the productivity of land e.g. dependence on land

for raw materials for food, clothing, housing and fuel. The industrial revolution overcame mass poverty by making production depend on mineral and mineral-based energy. This enabled escape from the problem of the fixed supply of land and of its organic products by using mineral raw materials – particularly coal at first. The result was a world that no longer follows the rhythm of the sun and the seasons; a world in which the people's fortunes depend largely upon how they themselves regulate the economy and not upon the vagaries of weather and harvest; a world in which poverty has become an optional state rather than a reflection of the necessary limitations of human productive powers (Lal and Myint, 1996).

Destitution is poverty of the able-bodied who lack land, work or wages adequate to support the dependents who are partly responsible for their poverty (Lal and Myint, 1996). Conjunctural poverty is linked to climatic crises or political turmoil (Lal and Myint, 1996). One common form of conjunctural poverty is famine, which is largely caused by politics, which determine the distribution of food. This is because there will always be extra food somewhere, but it won't be distributed to the needy because of political reasons (Lal and Myint, 1996).

Equity in forest management

Issues covered by literature on equity in forest management range from discussions on definition and conception (Ducey and Larson, 1999) through qualitative description of its status (Subedi *et al*. 1990) to quantitative assessment (Richards *et al*., 2003). The existing literature is based on studies that have been done outside Tanzania and East Africa, in

environments that are different from those that prevail in this region and hence may not be directly used to inform policy. For forest management and policy decisions to prove successful, they must incorporate ideas and perceptions of equity, despite their ambiguity (Ducey and Larson, 1999). According to Tekwe and Percy (2001) in community forest management there are four key issues, the distribution of which among stakeholders determines equity, namely rights, responsibilities, revenues (or benefits) and the relationship between the different stakeholders. Rights are defined as access and use of forest products – these may be customary or purchased rights, and decisions are needed by community managing the forest on who can obtain such rights and how. Access to employment deriving from the community forest is another form of rights. Responsibilities refer to forest management tasks: measurement, monitoring and control, coordination and decision-making. Implementing decisions on rules, procedures, beneficiaries and abiding by the rules also constitute responsibilities. Revenues comprise direct and indirect benefits. The direct benefits include those arising from proceeds from forest resources accessed and those arising from employment in managing the community forest. Indirect benefits arise from implementation of projects using community development funds accrued from income generated by the community forest.

Awareness of rights, roles and responsibilities has been used as an indicator of institutional development in community forest management (Springate-Baginski *et al*., 2003) underscoring the significance of equity components in community forest management. A forest management strategy that promotes equity provides both management responsibility and economic incentive to local villagers (Yajie *et al*., 1997). Equity (and gender)

consideration was mentioned by about 13% of forest stakeholders in a participatory discussion on indicators of institutional development of community forestry conducted in Nepal by Springate-Baginski *et al*. (2003). The relatively low frequency of mention of equity as an indicator for development of community forestry is due to the fact that most of the forest user groups were primarily preoccupied by basic forest management and user organization processes. Forest user groups with more advanced development (having already attained a certain level of success in forest management, user organization and decision-making) focused on livelihood and community development processes, and issues of gender and equity.

Other studies have considered equity from the perspective of tenure, which is defined as a bundle of rights concerned with ownership, tenancy, usufruct, access, acquisition, partitioning, labour, extraction of products and benefits (Bruce, 1989; Subedi *et al*., 1990). The tenure perspective is close to that considering rights, responsibilities, revenues and relationship among stakeholders discussed by Tekwe and Percy (2001) but it is wider encompassing other aspects like acquisition and ownership. The difference is due to the fact that while Tekwe and Percy (2001) were focusing on natural forests only, which are normally not privately owned in Africa, Bruce (1989) and Subedi *et al*. (1990) focused on broader context of forests including those planted on private land. Tenurial rights may belong to an individual, household or family, neighbourhood group, community, public body or some other defined social entity. According to Subedi *et al*. (1990), precise knowledge of tenure is of great importance to natural resource development policy and to projects, particularly those dealing with landed resources.

The concept of equity has mainly been used in connection to social and economic distribution of costs and benefits in natural resources management. Accordingly, it is thus found in most of the literature. However, few studies have referred to equity in ecological terms (*e.g.* Onal *et al*., 1998; Pfeffer *et al*., 2001). The proposed study will use the term equity in relation to socio-economic phenomena.

Quantification of equity in forest management

Equity is one of the aspects that are not quantitative in nature and is therefore usually expressed in qualitative terms (Ducey and Larson, 1999) such as 'there is equity' or 'there is no equity'. Examples of qualitative assessments of equity are provided by Subedi *et al*. (1990) and Tekwe and Percy (2001). Subedi *et al*. (1990) analysed tree and land tenure in Nepal and concluded that different categories of stakeholders had different tenurial rights to tree and land resources, reflecting inequity. Tekwe and Percy (2001) used the 4Rs methodology (4Rs stands for **R**ights, **R**esponsibilities, **R**evenues and **R**elationships) to analyse equity in community forestry in Cameroon by examining who among the many stakeholders had the most and the least of each of the 4Rs. Although revenues, one of the 4Rs as used by Tekwe and Percy, could be measured quantitatively, the quantitative approach was not used.

The fact that an aspect is qualitative does not mean that it completely cannot be measured in quantitative terms especially if the aspect may be broken down into components that are quantitative. Accordingly, equity has been measured using indicators that show distribution of benefits and costs in forest user groups in terms of types and quantities of products collected from forests, values of the products, cash costs of collection, time spent on collection, return to labour efforts and opportunity cost associated with forest utilization (Richards *et al*., 2003).

Equitable forest management and poverty alleviation in Tanzania

The Tanzania National Forest Policy (URT, 1998) and the National Strategy for Growth and Reduction of Poverty (URT, 2005) emphasise the role of equitable management and sustainable utilisation of forests as means of reducing poverty. However, poor forest governance prevents the goal of poverty reduction from being achieved (Milledge *et al.* 2007). Experience from southern Tanzania has shown that trade in forest products, and especially timber can result in a considerable contribution to poverty reduction (Milledge *et al.* 2007). The contribution takes the form of growth in central government forestry revenues, contributions towards local government finances, increase in private investment, increased rural incomes from timber trade and indirect improvements to market access for rural poor (Milledge *et al.* 2007). Accordingly, during the period covered by their study, over 50% of some District Council budgets in southern Tanzania came from forest product revenue, at least 16% of households from villages located near forests benefit from logging

and timber trade, increasing up to 60% during peak logging activity and many distant villages benefited from improved transport and market access, combined with business opportunities (Milledge *et al.* 2007). Apart from timber trade, forests can contribute to poverty reduction through sale of carbon credits (Zahabu, 2007).

Aspects of poor governance that limit the role of forest resources in poverty reduction include undervaluation of contribution of forestry to Gross Domestic Product (GDP) leading to low government investment in forest management, unsustainable harvesting, deficiencies in financial management capacity and inadequate enforcement of laws and regulations (Milledge *et al*. 2007). Further governance bottlenecks include selfishness of village leaders, conflicts in regulations, corruption, low transparency, high levels of illegality, low participation of some stakeholders, insufficient capacity, inadequate integrity and poor accountability mechanisms (Milledge *et al*. 2007).

Methodology

Study villages

The study was conducted in four villages which are under community-Based forest Management in Mufindi district. Among the four villages Lugodalutali and Tambalang'ombe are in Sadani ward while Nyanyembe and Kingenge are in Malangali ward. Lugodalutali and

Tambalang'ombe are located on the road to Madibira. Lugodalutali is 20 km and Tambalang'ombe 40 km from Mafinga. While Nyanyembe and Kingege are located on the road to Mbeya, 50 km and 70 km respectively from Mafinga. Moreover, in Lugodalutali Masuni forest is a reserved forest while Wrila and Chugi are under CBFM, in Tambalang'ombe Mandumbulu is a reserved forest, while Ngombe, Ihanga, Ludaha, Lugema forests are under CBFM, in Nyanyembe Tagisonzo forest is a reserved forest and Msitu wa Kijiji is under general land, and finally in Kingege Kidete and Kingege forest are under CBFM forest. The four villages were selected to provide the categories needed for analysis in this study on the basis of poverty and dependence on CBFM forests (Table 1).

Table 1. Study villages: Poverty and dependence on CBFM forests

Village	Poverty category	Dependence of CBFM forests
Lugodalutali	Poor	High
Tambalang'ombe	Rich	High
Kingege	Poor	Low
Nyanyembe	Rich	Low

Methods

General information about forest management and CBFM in the district was obtained from the District Forest Office (Appendix 1). Other information was captured through

Participatory Rural Appraisal (PRA) (Appendix 2) as well as from household questionnaire survey (Appendix 3).

Participatory rural appraisal

The Participatory Rural Appraisal (PRA) consisted of the following steps:

1) A PRA meeting was held in each study village to explain the objectives and introduce the study team.
2) A wealth-ranking exercise was carried out in which households were divided into stakeholder groups using criteria established by the community. This resulted in a classification into three wealth classes according to the way poverty is locally viewed and termed.
3) Other PRA exercises were carried out with the wealth-ranked stakeholder groups. The exercises included (in different wealth ranks) participatory mapping of forest product flows before and after the advent of CBFM showing main sources of forest products and changes (reference was made to topographic and forest maps); listing, ranking and scoring of livelihood activities and forest benefits (including non-market benefits); discussions of the costs of CBFM (i.e. how people feel they have lost out, including opportunity costs); and labour and activity calendars. This exercise provided an understanding of the objectives and priorities of the stakeholders and the role of forest management in the farming system and household economy. It also gave a picture of the changes in forest sourcing patterns overtime.

4) Researchers facilitated the estimation of the collection and labour use levels of each forest product collected, from the multiple sources of forest products (various CBFM forests, own land, local and central government forests and general land). Cash values of different products were determined.
5) A general discussion was held of the calculations presented by each of the key informant groups. The findings were participatorily harmonised and presented to all the participants. All the records of the findings were kept for use in further activities of the project.

Questionnaire survey

A sample of four villages that practise CBFM were purposively (Miles and Huberman, 1994) selected. The villages were selected on the basis of wealth level of the village and dependence on community forests such that one village came from each of the four categories, namely poor and highly dependent on community forests, poor and less dependent on community forests, well off and highly dependent on community forests and well off and less dependent on community forests. The classification of villages was based on discussions with District Officials and data on village income. Wealth ranks were used as sampling strata to get households to include in the study. Committee members and other key members were given a list of member households and asked to categorize the households using the criteria for wealth ranking established during the PRA. A sample of ten households from each wealth rank was selected randomly. A household survey was conducted with the selected sample and the resulting data processed to get household product collection levels and their costs and values. Data collection was disaggregated by

gender such that information for the male and female parent and male and female children was recorded separately.

The survey form used in questionnaire survey was pre-tested and modified according to the findings of the pre-testing. A list of forest products was developed and used as a checklist for the household survey enumerators, and the multiple forests sources clarified. Respondents were asked to recall how much they collected from each alternative source per week or per month in each main season. Cash cost of collection of the products, opportunity cost of collection, time spent on collection and value of the collected products were recorded.

Data analysis

Data have been analysed into average collection/consumption of each forest product, unit values for each product, hours per day spent in collection, return to labour, opportunity cost and gross margin associated with each forest product. The values have been calculated both per household and per capita for the various product sources (private, community, government) and wealth ranks, and have been disaggregated by gender.

Furthermore, analysis of covariance (ANCOVA) was used to statistically analyse the relationship between poverty (as measured by wealth ranks) and benefits and costs of community forestry. The ANCOVA model enables the analysis of discrete and continuous

independent variables simultaneously. Other household characteristics than wealth rank were used as covariates in the ANCOVA model. For the ANCOVA, a Generalized Linear Model (GLM) of mixed variables with a Tweedie probability distribution and a log link function was used. Village category (i.e. 1. poor and highly dependent on community forests, 2. poor and less dependent on community forests, 3. well off and highly dependent on community forests and, 4. well off and less dependent on community forests) was used as a blocking factor in the ANCOVA. The deviation from the normal pattern of the distribution of the households into wealth-categories was examined using the *G*-test (which is a better alternative to the χ^2 test (Sokal and Rolf, 1995)).

Results and Discussion

Wealth ranking

Households that belonged to the high wealth category had some of the following: a car, store/shop, good house (cement-floored, iron-roofed and brick-walled), agricultural implements (tractor, power tiller, and oxen plough), donkeys, and farm greater or equal to 20 ha. Furthermore, the high wealth households had a motorbike, could afford three meals per day, have food and surplus to sell, and with education higher or equal to secondary. The medium wealth category households had some of the following: a bicycle, wheelbarrow/trolley/cart, oxen, donkeys, ox plough, small animals (hare/rabbit, goats, fowl, pigs, and guinea pig), farm greater or equal to 3 ha but less than 20 ha, iron roofed house, and food without surplus. Finally households with grass-thatched house, farms less than 3

ha, hand hoe, and some exhaust their food reserve before next harvesting season were considered to be in the low wealth category.

In Nyanyembe village households in high wealth category were considered to possess a good house (burned bricks, iron roofed, better windows and sufficient rooms), expensive mobile phone (TAS 100,000/= and above), sufficient food (to next harvesting season and surplus is set for business), bicycle, radio, more than ten cattle, solar system and planted forest greater than 1 ha. Those in medium wealth category possessed a bicycle, radio, normal house (bricks/mud, grass-thatched), enough food without surplus, motorcycle, less than 10 goats, chicken, guinea pigs, cheap mobile phone (less than TAS 100,000/=). The medium wealth households could also cover secondary school cost for at least one child. Those in the low wealth category possessed insufficient food (exhausted before the next harvest season), poor house (mud, grass thatched and too small for family requirements), chicken, guinea pigs. They also could not afford secondary education and had shortage of clothes.

Similar wealth categorization was obtained for Kingege and Lugodalutali villages. Most of the households in the study villages belonged to the medium wealth category except for Lugodalutali village whereby the medium and low wealth categories had the same number of households (Table 2). For each village and for the whole data set, the distribution of households into wealth categories did not follow normal distribution pattern (Table 2). Where more households are in the high and medium wealth cateogry than expected, it is a good thing because it means more people are better off, even if it is only in relative terms.

The results show that more often the high wealth category had fewer than the expected value (3 cases vs 1case) while the low wealth category had higher than the expected value (3 cases vs 1 case). These deviations from the normal distribution were statistically significant for all the villages ($G > 25$; $P < 0.001$)

Table 2. Distribution of households by wealth category in study villages in Mufindi district, Tanzania. Numbers in brackets show expected values if the the distribution of households into wealth categories followed normal distribution pattern.

Wealth category	Tambalang'ombe	Nyanyembe	Kingege	Lugodalutali	Total
High	30	449	10	27	516
	(73)	(285)	(30)	(52)	(440)
Medium	380	898	149	150	1577
	(324)	(1226)	(129)	(223)	(1892)
Low	50	449	32	150	681
	(73)	(285)	(30)	(52)	(440)

Types and quantities of forest products collected from various sources by different wealth categories

Major forest products collected by the community from different sources in the study villages were firewood, charcoal, timber, poles, withies, thatch grass, fruits and mushrooms (Table 3). Other products collected by a few specialists were honey, traditional medicines and wild meat (rabbit, impala and rodents). By order of importance, most of the products were collected from forests on general land followed by forests under CBFM (Table 3). The

order of importance was reversed only for thatch grass, which was collected mostly from CBFM forests followed by general land forests. No charcoal was collected from private forests. For timber, all the collection was done from general lands for the lowest wealth category members. For all the products except thatch grass, high wealth category households collected the largest total amount (Table 3).

Evaluation of the influence of poverty and selected household characteristics on types and quantities of forest products collected from CBFM forests

Households from high wealth category collected more timber, charcoal, poles, withies from CBFM forest whereas low wealth category collected more thatch grass than the other wealth categories (Table 3 & 4). The amount of firewood, fruit and mushrooms collected from CBFM forests was not influenced by wealth category. . Other socio-economic characteristics than wealth category also influenced the amount of products collected from CBFM forests for some type of products (Table 4). Thus households with older heads collected more thatch grass and fewer withies. Households with more children collected less charcoal and more withies. Households whose head had more years of schooling collected more thatch grass and less charcoal. Households with larger farms collected more charcoal and fewer withies. Households with larger woodlots collected fewer mushrooms, poles and withies. Households with more planted trees collected more from fruit from CBFM forests.

Table 3. Types and quantities of forest products collected from various sources by different wealth ranks in wet and dry season in study villages of Mufindi district

	PF*		GL		CBFM		SF		Total	Percent			
	W	D	W	D	W	D	W	D		PF	GL	CBFM	SF
	Firewood (Bundles per week)												
Low	0	0	3.4	3.0	0.2	0.3	0	0	6.9	0	92.7	7.3	0
Medium	<0.1	<0.1	3.9	3.6	0.9	0.9	<0.1	<0.1	9.3	0.4	80.4	19.1	0.1
High	0.2	0.2	4.0	3.9	1.0	1.0	<0.1	<0.1	10.4	4.7	76.1	18.7	0.5
	Fruits (Buckets per week)												
Low	0	0	0	4.5	0	1.1	0	0.2	5.7	0	78.1	19.3	2.6
Medium	0	0.1	0	7.3	0	3.1	0	1.0	11.5	0.9	63.6	27.0	8.5
High	0.1	0.0	0.6	7.3	0.3	2.4	0.2	0.9	11.9	0.6	66.4	23.1	9.9
	Timber (Pieces[1])												
Low	0	0	0.6	0.6	0	0	0	0	1.2	0.0	100.0	0.0	0.0
Medium	0	0.7	0	0.6	0	0.3	0	0	1.6	40.5	39.9	19.6	0.0
High	0.3	2.4	1.3	1.5	0	0.8	0	0	6.3	42.1	44.6	13.3	0.0
	Charcoal (Sacks per month)												
Low	0	0	0.8	0.8	0	0.0	0	0	1.7	0.0	98.2	1.8	0.0
Medium	0	0	0.4	1.2	0	0.6	0	0	2.3	0.0	74.8	25.2	0.0
High	0	0	0.5	2.2	0.1	1.0	0.1	0.1	3.8	0.0	69.4	27.1	3.5
	Mushrooms (Buckets per month)												
Low	0	0	4.6	0	0.7	0	0.4	0	5.7	0.0	80.0	13.0	6.9
Medium	0	0	6.2	0	2.0	0	0.6	0	8.8	0.0	70.6	23.1	6.4
High	<0.1	0	7.4	0	1.4	0	0.6	0	9.4	0.1	78.8	14.8	6.4
	Poles (Number per week[1])												
Low	0	2.1	0.1	11.7	0	1.2	0	0	15.1	14.0	78.0	8.0	0.0
Medium	0	2.7	0	21.7	0	9.2	0	0	33.6	7.9	64.6	27.5	0.0
High	0	9.4	0	22.7	0	6.0	0	0	38.1	24.8	59.6	15.7	0.0
	Withies (Bundles per construction)												
Low	0	0	0.1	18.2	0	14.2	0	0	32.5	0.0	56.2	43.8	0.0
Medium	0	0	0.1	38.7	0	30.0	0	0	68.8	0.0	56.4	43.6	0.0
High	0	1.1	0.1	119.3	0	76.6	0	0	197.0	0.5	60.6	38.9	0.0
	Thatchgrass (Bundles per week[1])												
Low	0	0	0	2.8	0	15.5	0	0.2	18.5	0.0	15.2	83.8	1.0
Medium	0	<0.1	0	2.0	0	7.6	0	0	9.7	0	0.4	78.9	0
High	0	0	0	2.2	0	8.3	0	0.1	10.6	0.0	21.1	78.4	0.5

*PF = Private forest, GL = Forest on general land, CBFM = Community-Basest Forest Management forest, SF = State forest (Central goverment or Local Government Authority forest reserve)

[1]Only during house or barn construction

Table 4. Statistical significance of poverty and other socioeconomic variables to quantities of forest products in Mufindi district. Bold type shows significant factors.

		Fruits (dry season)		Timber (dry season)		Charcoal (dry season)		Mushrooms (wet season)		Poles (dry season)		Withies (dry season)		Thatch grass (dry season)	
	df	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P
Intercept	1	4.6	**0.032**	3.7	0.054	0.9	0.349	1.0	0.307	7.5	**0.006**	237.4	**<0.001**	4.3	**0.037**
Wealth category	2	1.8	0.416	16.2	**<0.001**	23.9	**<0.001**	1.5	0.469	16.1	**<0.001**	152.9	**<0.001**	36.7	**<0.001**
Age of household head	1	0.3	0.587	2.8	0.094	1.1	0.304	0.2	0.627	1.1	0.286	10.9	**<0.001**	12.3	**<0.001**
Number of children	1	0.1	0.806	0.1	0.72	8.6	**0.003**	<0.1	0.829	<0.1	0.986	10.7	**0.001**	3.0	0.084
Years of schooling of the household head	1	0.1	0.773	2.8	0.097	5.9	**0.015**	0.2	0.641	3.2	0.072	0.1	0.752	7.6	**0.006**
Farm size	1	1.6	0.21	0.1	0.792	12.0	**0.001**	3.7	0.055	0.9	0.351	150.3	**<0.001**	0.0	0.874
Woodlot size	1	0.7	0.414	0.1	0.768	2.5	0.112	5.7	**0.017**	9.6	**0.002**	12.9	**<0.001**	0.0	0.936
Number of planted trees	1	4.8	**0.029**	1.9	0.165	3.2	0.075	1.3	0.262	0.4	0.533	2.4	0.121	0.1	0.713

Value of forest products collected from CBFM forests

The value of products collected from CBFM was higher for the high wealth category for most of the products, except for thatch grass for which the value was highest for the low wealth category households (Table 5 & 6). Other socio-economic factors than wealth category were also significant in influencing the value of some of the products collected. Households with older heads had higher values for charcoal, withies and thatch grass and lower values for timber and poles. Households with more children had higher values for firewood, poles, withies and thatch grass and lower values for fruit and charcoal. Households with heads with more years of schooling had lower values for firewood, fruit, mushrooms and charcoal and more withies and thatch grass. Households with larger farms had higher values for fruit, charcoal and thatch grass and lower values for timber, poles and withies. Households with larger woodlots had higher values for firewood and charcoal and lower values for poles, withies and thatch grass. Households with more planted trees had higher values for fruit, poles and withies and lower values for timber and charcoal.

Table 5. Value of products collected from CBFM forests by households in Tambalang'ombe village, Mufindi district

Wealth category	Firewood (wet season) (TAS/wk	Firewood (dry season) (TAS/wk)	Fruits (wet season) (TAS/wk)	Fruits (dry season) (TAS/wk)	Timber (dry season) (TAS/wk)	Charcoal (dry season) (TAS/wk)	Mushrooms (wet season) (TAS/wk)	Poles (dry season) (TAS/wk)	Withies (dry season) (TAS/wk)	Thatch grass (dry season) (TAS/wk)
Low	946	1,068	0	1,264	0	71	2,071	2,500	19,857	12,143
Medium	1,257	1,522	0	3,440	883	1,817	4,083	4,683	10,403	6,998
High	2,082	2,082	913	5,221	4,507	2,513	3,394	14,688	39,689	19,040

Cash cost and opportunity cost of collection of forest products

The respondents reported no cash cost of collection of the products from CBFM forests. However, during PRA some cost estimates were made for firewood and poles that are consumed in large quantities. For a lorry of firewood a total cost of TAS 40,000.00 is incurred whereas a total cost of TAS 30,000.00 is incurred for poles sufficient for construction of a single house. The main opportunity cost of the collections is in terms of time because the collection of the products is not a priority during both the dry and wet seasons (during the rain season the priority activity is agriculture whereas the priority activity during the dry season is fetching water).

Time spent on collection

Daily time spent on collection of forest products varied with, village, season, wealth category, gender, age and years of schooling of the household, farm and woodlot, number of trees planted and the interaction of wealth category and gender (Table 7 & 8). For firewood, for instance, higher wealth category adult males spent more time collecting while low wealth category adult females spent more time. In addition, high wealth category households spent more time on firewood collection than low wealth category families mainly because they collected more firewood. It is interesting to note that girls of high wealth category households spent less time collecting firewood, which means they have more time doing other things. The times of collection also show that fruits are collected mainly by children while poles by adult males.

Table 6. Statistical significance of poverty and other socioeconomic variables to value of forest products collected in Tambalang'ombe village, Mufindi district

significant factors.

	Firewood (wet season)			Firewood (dry season)		Fruits (dry season)		Timber (dry season)		Charcoal (dry season)		Mushrooms (wet season)		Poles (dry season)		Withies (dry season)	
	df	Wald X^2	P	Wald X^2	P	Wald X^2	P	Wald X^2	P	Wald X^2	P	Wald X^2	P	Wald X^2	P	Wald X^2	P
Intercept	1	1174.2	**<0.001**	1235.4	**<0.001**	3903.6	**<0.001**	1848.3	**<0.001**	2462.8	**<0.001**	445.1	**<0.001**	5016.0	**<0.001**	8993.0	**<0.001**
Wealth category	2	42.6	**<0.001**	12.9	**0.002**	435.3	**<0.001**	1310.4	**<0.001**	845.3	**<0.001**	30.4	**<0.001**	1031.5	**<0.001**	2016.5	**<0.001**
Age of household head	1	3.1	0.079	1.8	0.184	1.5	0.216	62.0	**<0.001**	26.1	**<0.001**	0.7	0.398	29.4	**<0.001**	4.3	**0.038**
Number of children	1	18.8	1.437	12.3	**<0.001**	290.8	**<0.001**	0.1	0.747	380.0	**<0.001**	0.3	0.568	708.6	**<0.001**	571.8	**<0.001**
Year of schooling of the household head	1	0.7	0.407	9.6	**0.002**	155.9	**<0.001**	177.0	**<0.001**	504.3	**<0.001**	13.4	**<0.001**	0.0	**0.955**	17.2	**<0.001**
Farm size	1	2.6	0.105	1.9	0.165	12.1	**0.001**	33.4	**<0.001**	21.9	**<0.001**	2.6	0.107	381.8	**<0.001**	1619.0	**<0.001**
Woodlot size	1	7.5	**0.006**	<0.1	0.921	0.5	0.496	0.6	0.457	42.5	**<0.001**	6.0	**0.014**	186.0	**<0.001**	205.9	**<0.001**
Number of trees planted	1	3.7	0.053	<0.1	0.947	221.0	**<0.001**	185.5	**<0.001**	130.2	**<0.001**	0.2	0.693	4.2	**0.042**	68.2	**<0.001**

Table 7. Time spent on collection of forest products by households of different wealth category in Mufindi district

	Firewood (hrs/day)				Fruits (hrs/day)				Timber (hrs/day)				Charcoal (hrs/day)				Mushrooms (hrs/day)				Poles (hrs/day)				Withies (hrs/day)				Thatchgrass (hrs/day)			
	Wet season																															
Wealth category	*MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC
Low	1.5	3.3	3.8	3.8	0.2	0.2	0	0	0	0	0	0	0.2	0.2	0	0.8	1.9	3.6	3.3	2.3	0.3	0	0	0	0	0	0	0	0	0	0	0
Medium	2.2	3.4	4.5	4.5	0.1	0.1	0.3	0.2	0	0	0	0	0.3	0	0.5	0	1.6	4	3.3	1.9	0	0	0	0	0	0	0	0	0	0	0	0
High	2.6	3.2	4	2.9	0	0.6	0.5	0.6	0.5	0.2	0.6	0	0	0	0	0.8	1.4	4.1	2.8	1.7	0	0.4	0	0	0.2	0	0	0	0	0	0	0
	Dry season																															
	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC	MP	FP	MC	FC
Low	1.9	3.8	3.8	4.4	2.2	2.6	3.7	4.7	0.2	0	0	0.3	0	1.1	0	1.3	0	0	0	0	3.7	0.7	2.6	0	2.2	0.6	1.4	0.3	1.3	1.8	1.8	1.1
Medium	2.3	3.6	4.5	4.4	2.5	3.1	3.9	4	1.1	0.3	1.3	0	1.6	0.9	0.8	1	0	0.2	0	0	3.7	1.2	0.6	0.2	1.4	0.4	0.2	0.1	2.2	1.6	0.7	1.4
High	3	3.1	3.9	2.9	2	3.1	4	2.6	1.5	1.1	1.4	0.8	0	0.6	0.8	3	0	0	0	0	3.3	1.6	1.5	0.8	2.5	0.7	0.4	1	1.2	2.4	0.7	0.8

*MP= male parent, FP = female parent, MC = male child, FC = female child

Table 8. Statistical significance of poverty and other socioeconomic variables to time spent on collection of forest products in Mufindi district.

Bold type shows significant factors.

		Firewood (dry season)		Fruits (dry season)		Timber (dry season)		Charcoal (dry season)		Mushrooms (wet season)		Poles (dry season)		Withies (dry season)		Thatch grass (dry season)	
	df	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P	Wald χ^2	P
Intercept	1	82.7	**<0.001**	52.4	**<0.001**	2.6	0.11	30.0	**<0.001**	53.5	**<0.001**	3.7	0.055	17.3	**<0.001**	20.3	**<0.001**
Village	3	114.2	**<0.002**	174.0	**<0.001**	0.8	0.683	0.6	0.725	143.8	**<0.001**	105.1	**<0.001**	113.5	**<0.001**	108.2	**<0.001**
Wealth category (W)	2	3.1	0.211	1.4	0.485	12.4	**0.002**	15.2	**<0.001**	2.1	0.357	4.3	0.117	23.8	**<0.001**	9.8	**0.007**
Gender (G)	3	2.2	0.529	9.6	**0.022**	7.7	0.052	21.2	**<0.001**	17.9	**<0.001**	3.8	0.286	3.3	0.354	8.6	**0.035**
Age of household head	1	13.9	**<0.001**	10.7	**0.001**	0.2	0.695	4.6	**0.032**	0.0	0.935	0.3	0.57	0.2	0.658	0.7	0.396
Number of children	1	1.1	0.291	18.1	**<0.001**	3.6	0.056	0.2	0.639	0.0	0.826	19.5	**<0.001**	3.0	0.084	0.8	0.364
Year of schooling of the household head	1	2.0	0.158	3.1	0.079	4.4	**0.035**	8.1	**0.005**	0.2	0.651	3.0	0.082	2.5	0.117	0.1	0.772
Farm size	1	3.0	0.085	14.1	**<0.001**	5.4	**0.02**	2.4	0.119	2.5	0.116	10.9	**<0.001**	7.0	**0.008**	0.4	0.541
Woodlot size	1	4.9	**0.028**	5.2	**0.023**	1.0	0.323	2.7	0.098	4.2	**0.041**	75.0	**<0.001**	84.6	**<0.001**	0.9	0.354
Number of trees planted	1	0.2	0.625	10.8	**0.001**	9.2	**0.002**	8.7	**0.003**	1.8	0.182	9.7	**0.002**	1.3	0.249	4.5	**0.034**
W × G	6	12.0	0.062	30.3	**<0.001**	21.4	**<0.001**	15.8	**0.001**	7.6	0.27	27.2	**<0.001**	19.5	**0.003**	16.5	**0.011**

Conclusions

From the analysis of the distribution of households into wealth categories and the patterns of collection of forest products in the studies villages, the following conclusions can be made:

- There are more households in low wealth category than in high wealth category. This means that forests are an important source of livelihood for most of the people because usually the poor are more dependent on the local natural resources than the rich.

- Community dependence on CBFM forests is low. They mostly depend on forests on general land for collection of their products. This is because the general land forests can be freely accessed by anyone because there are no rules governing their use. This poses a threat of unsustainable utilization of the forests on the general land.

- Low wealth category households depend more on CBFM forests than households from high wealth category. High wealth category households get products from their private forests in addition to CBFM forests and others. Therefore, if the living standard of the communities is improved, the chances for sustainable natural forest management will increase.

- Low wealth category households collected products of lower value than high wealth category households.

- Low wealth category female adults and children spend more time on firewood collection than high wealth category female adults and children.

Emerging policy implications

A number of policy implications emerge from the patterns observed in this study. First, the low dependence of the communities on CBFM forests and the consequent high dependence on forests on general land indicate a problem in the design of CBFM as a forest conservation strategy. Forests on general land are under open access regime, which results in unsustainable utilization. Thus CBFM forests are protected at the expense of the forests on the general land. Appropriate CBFM should conserve sufficient forest resources in an area that the community would depend mainly on the conserved forests. In the long term, the forests on the general land may get depleted. In that case, the low wealth category households are going to suffer more because they are the more dependent on the forests on the general land.

Secondly, collection of more valuable forest products from CBFM forests may contribute more to poverty reduction than the current situation. The current CBFM is designed more to protect the forests by preservation rather than by conservation (preservation is total protection without use whereas conservation is wise use of resources). This design is not inline with the national forest policy of 1998 (URT, 1998), which emphasises the use of forests for poverty reduction, in addition to ensuring their sustainability.

Thirdly, low wealth category families may learn from their high wealth category counter parts on the issue of division of labour. The burden of firewood collection is heavier on

female adults and children from low wealth category families. Reducing that burden could allow some time for the women and children to do other things, including more time on school issues for children, on farm activities, water fetching and baby care for female adults.

Intended dissemination of results

The results of the study will be communicated to the district forest office and the communities who are involved in forest management. A workshop involving representatives from all the villages involved in the research will be conducted in Mufindi district to present the results of the study. Leaders and politicians at village, ward, division and district levels will be among the participants of the workshop so as to make them aware of the equity issues in CBFM. Leaflets will be prepared in Kiswahili and distributed among the communities and beyond. Furthermore, the results will be published first as a REPOA report and then in a scientific journal and posted on a website for consumption by the international community involved in forest research and management.

Suggested further work

The main work that is further suggested to be done will comprise:

- Perfection of the analysis and presentation of results
- In-depth discussion of the results

- Preparation of dissemination materials
- Workshop to present the results to the studied communities

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Appendix 1

Effect of Poverty on Equity in Community-Based Forest Management in Mufindi District, Tanzania

Checklist of issues for soliciting from the District Forest Office

1) Introduction of the research and explanation of the objectives
2) General forest information for the district
3) Forest reserves, reserve status, year status acquired, areas, location (village/ward/division)
4) Forest maps (other maps will be obtained from the Surveying and Mapping Division and the Institute of Resource Assessment, Dar es Salaam).
5) Categorisation of the CBFM forests and selection of four villages according to the categories:
   (i) Poor and highly dependent on community forests,
   (ii) Poor and less dependent on community forests,
   (iii) Well off and highly dependent on community forests, and
   (iv) Well off and less dependent on community forests.

Appendix 2

Effect of Poverty on Equity in Community-Based Forest Management in Mufindi District, Tanzania

Participatory Rural Appraisal (PRA) checklist of questions/issues

Sixteen people, six women, six men and four children will be involved in the PRA exercises for each village. Here a child is defined as any one who is below 18 years of age. Children between 7 and 17 years will be the target.

1) Introduction of the study and explanation of the study objectives.
2) Wealth-ranking exercise using criteria established by the community.
   Guiding questions include:
   (i) Do you have different term for people with different wealth status in your village?
   (ii) What are the terms?
   (iii) What are the items that people of different wealth status own?
   (iv) What other things than owning items do you use in your classification of people into different wealth categories?
3) Allocation of households to wealth categories using the established criteria and the village list of households.
4) Working with each wealth category separately the following will be carried out:
   (i) Participatory mapping of forest product flows before and after the advent of CBFM showing main sources of forest products and changes (reference will be made to topographic and forest maps)
   (ii) Listing, ranking and scoring of livelihood activities and forest benefits (including non-market benefits) and labour and activity calendars.
   (iii) Discussions of the costs of CBFM (i.e. how people feel they have lost out, including opportunity costs).
   (iv) Estimation of the collection and labour use levels of each forest product collected from the multiple sources of forest products (various CBFM forests, own land, local and central government forests and general land).
   (v) Estimation of the main variable and fixed costs of production (including royalty payments, other cash costs (e.g. hired labour to saw timber), tool depreciation costs and the number of obligatory days per household spent on participatory forestry activities such forest patrol.
   (vi) Determination of cash values of different products.
   (vii) Calculation of gross income (the values of production without deducting costs), costs and the gross margin (gross income less variable costs).

(viii) The aspects to be used in choice experiments (including the items to be used as alternatives to be chosen and the values of the alternatives) will be tested and appropriate corrections made.

(ix) A general discussion will be held of the calculations presented by each of the groups. The findings will be presented to all the participants. The researchers will keep the records of the findings for use in further activities of the project.

Appendix 3

Effect of Poverty on Equity in Community-Based Forest Management in Mufindi District, Tanzania

Household questionnaire

Household number……

Division…… Ward…… Village…….

Name of household head…… Tribe of household head ……..

Age of household head……..(years) Number of children……..

Years of schooling of household head……(years)

Wealth category……

Farm size (ha)……Woodlot size (ha) ……Number of trees planted……

Please indicate the number of implements and other large household items that are owned or rented by the household.

No	Assets	Quantity[1)]	Owned or rented[2)]
1	House(s) (for living)		
2	TV		
3	Radio		
4	Telephone		
5	Bicycle		
6	Motorbike		
7	Car, jeep, pickup, truck etc		
8	Generator		
	Agricultural implements		
9	Hoes		
10	Pangas		
11	Axes		
12	Power tiller		
13	Tractor		

1) *Measure in number. If the HH do not have access to the item, write 0.*
2) *Codes: 1 =owned; 2 =rented*

Number of grazing/browsing livestock:

	Cattle	Goats	Sheep			
Young						
Old						

Table 1. Forest product collection details. These will be recorded for the male and female adults and for male and female children on separate sheets.

Gender……..(1=Male adult, 2=Female adult, 3=Sons, 4=Daughters)

1	2	3		4		5		6		7		8
Product	Source forest category	Amount collected per week		Time spent on collection		Cost of collection		Opportunity cost		Barter value of collection		Comments
		ws*	ds*	ws	ds	ws	ds	ws	ds	ws	ds	

*ws=wet season, ds=dry season

Notes for Table 1.

(i) Column 1 may include timber, logs, poles, withies, thatch grass, fodder etc…
(ii) Column 2 includes private forests, forests on general land, CBFM forests, local and central government forests
(iii) Column 3 will depend on product: bundles of firewood, withies, etc.; number of logs etc. For products that are not collected weekly/daily, the amount collected over the last 5 years (or other specified period) will be stated and a comment on that put in Column 8.
(iv) Column 4 will be in hours
(v) Column 5 will be the amount of money paid to get the product: for license in case of licensed products; for sawing timber, for people to carry the products.
(vi) Column 6 will be the number of hours that the respondent would be doing something else if it were not for collection of forest products.
(vii) Column 7 will be determined using choice experimentation using buckets of maize for comparison against the value of forest products

Number of obligatory days for work for CBFM forests……..

Livestock use of forested areas.

	1	2		1	2		1	2		1	2	
	Forest category	Number of grazing days		Forest category	Number of grazing days		Forest category	Number of grazing days		Forest category	Number of grazing days	
		ws*	ds*		ws	ds		ws	ds		ws	ds
Cattle												
Goats												
Sheep												

*ws=wet season, ds=dry season