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Does Decentralised Forest Management Improve Livelihood of the Rural community?
Comparing joint and community based forest management in Babati, Tanzania

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ABSTRACT

Since 1980s, scholars have increased their attention on studies linking livelihoods and conservation objectives. Some studies have indicated that decentralized forest management have not enhanced income- livelihoods of the rural poor and conservation of forest resources. In contrast, some studies have reported improved income of local people in successful conserved forest commons. However, most studies assessing contribution of both community based forest management (CBFM) and joint forest management (JFM) have compared the two regimes practiced in different ecological environments. In such studies, comparison of CBFM and JFM becomes faulty because ecological environment varies in each regime. This study aims at improving our knowledge on contribution of CBFM and JFM on income by comparing household income of the rural people in the two regimes implemented in same ecological environment. The study was conducted in four villages in Babati District, two implementing CBFM and other two practising JFM. Three research questions were developed (i) what access do rural people have to forest products under CBFM and JFM regimes for generating household income, (ii) what is the actual contribution of CBFM and JFM on household income, (iii) how does household income obtained from forest related activities in the two schemes vary amongst different households' wealth categories? Quantitative methods were used as main approach for collecting and analyzing data with qualitative methods supplementing the quantitative methods. Findings of the study indicated that no major differences in income generation exist between the two governance arrangements. However, income of rich and middle categories was higher than those of the poor category although their difference was not significant. Access to forest resources by the local community was restricted mainly to non timber forest products. In both regimes, wealthier group had a little bit more access to timber forest products than poor group who were mainly used as labourers by the wealthier group.

Key words - Decentralization, income, livelihoods, rural poor, community based forest management, joint forest management, Babati, Tanzania

1.0 INTRODUCTION

Since 1980s, scholars have increased their attention on decentralized forest management (DFM) following failure of conventional protectionist and centralized management, also known as fine and fences approach in which forest resources turned into open access (Imperial, 1999; Alden Wily and Mbaya, 2001). The focus on decentralization has several justifications including the need to address issues of efficiency, equity, good governance, resource conservation and rural livelihoods (Agrawal and Gupta, 2005; Arnold, 2002; Arnold, 1998; Havnevik, 2006; Webster, 1992; Sundar, 2001; Zahabu, (2008).

An increased interest in decentralized natural resource management was largely related to efforts of linking environment and development. The idea of linking conservation and development received special attention after World Commission on Environment and Development (WCED) in 1987 which produced Brundtland report called our common future (WCED, 1987). The WCED report revealed conservation and development linkage as a global challenge and was optimistic that achieving the two objectives at local levels would lead to sustaining development at global level as well (WCED, 1987). In 1992, the Rio de Janeiro *Earth Summit*- the UN Conference on Environment and Development (UNCED) carried forward the WCED idea of linking environment and development (UNCED, 1992). The UNCED maintained that peoples centered conservation would contribute to sustaining development. This led to adoption of decentralized forest management (DFM) as an approach for enhancing livelihoods of the local people and as an incentive for conserving the resources.

Since adoption of DFM approach literature presents different types of its effects on livelihoods of rural communities. Some literature indicates negative consequences of decentralized forest management on livelihoods of the rural poor (Blaikie, 2006; Kumar, 2002; Wunder, 2001; Springate-Baginski, *et al*., 1999). Another category of the effect shows that DFM have improved livelihoods of the rural poor (Lund, 2007; Nygren, 2005). Nygren (2005) reported findings from Leparterique Municipality, Honduras that household's total income of local people participating in logging enterprise in forest under DFM doubled from 20-30% in 1992 to 50-60% in 1997.

Other scholars indicate that adoption of decentralized forest management have little effect on livelihoods of the rural poor. For instance, less tangible benefits were observed from forest under JFM in Iringa, Tanzania where annual income from forest reserve was USD 189 (Topp-Jorgensen *et al*., 2005). Other studies show ambiguous effects of decentralized forest management on rural livelihoods (Lund and Treue, 2008). Those contradicting findings suggest that decentralization is still an evolving paradigm (Tacconi, 2007) and its effects on livelihoods need further attention.

As for most developing countries, the need for addressing deforestation and enhancing livelihood of the rural communities motivated Tanzania Government to adopt decentralized forest management (DFM) in 1990s. Since then, a total of 3.7 million ha of forest in the country were under DFM as known as participatory or collaborative forest management (Blomley and Ramadhani, 2006). Of the total area under participatory forest

management (PFM), 1.6 million ha was under joint forest management (JFM) while 2.1 million ha fell under community based forest management (CBFM). Until 2007, out of 120 districts in Tanzania, 57 districts had on going PFM activities. By that period, number of declared village land forest reserves was 329 while 53 of them were already gazetted.

Adoption of DFM in Tanzania was associated with formulation of new forest policy which endorsed idea of collaboration of relevant stakeholders in the management of forest resources (URT, 1998). This policy was thereafter enacted in 1998 by Tanzania cabinet. The overall goal of the policy was to enhance contribution of the forest sector to sustainable development of Tanzania and conservation of natural resources for future generation. Objectives of the policy were (i) to ensure sustainable supply of forest products and services by maintaining sufficient forest area under effective management (ii) to increase employment and foreign exchange earnings through sustainable development of forest-based industry and trade (iii) to ensure ecosystems stability through conservation of forest biodiversity, water catchments and soil fertility (iv) to enhance national capacity to manage and develop the forest sector in collaboration with other stakeholders. In the policy, two major types of collaborative forest management or participatory forest management are identified namely joint forest management (JFM) and community based forest management (CBFM).

Tanzania and Babati District, in particular, present a case where the two kinds of decentralized forest management (DFM) have been implemented simultaneously since 1994 for CBFM and 1998 for JFM. The two approaches take place in village forest land and government reserves, respectively. The CBFM is largely implemented by village communities while the JFM is executed jointly by local communities and the government.

This paper draws on findings from empirical research conducted in four villages, two implementing CBFM and other two practising JFM (Table 1). All four villages are in Babati District and belong to the same Gorowa Division, which is an example of the next lower level administrative unit below the district.

Table 1: Decentralized forest management regimes in four study villages

Regimes	CBFM	JFM
Villages	Ayasanda	Haraa
	Endanachan	Boay

This paper aims to contribute to the discussion on effects of CBFM and JFM on household income-livelihoods.

1.1 Problem statement

Achieving conservation and livelihood objectives remains one of the genuine challenges facing the world at present. At global level, depletion of natural resources in particular forest resources is reported to occur at high rate posing environment and livelihoods challenges. FAO (2000) reports that nearly 13 million ha of natural forest have declined

in developing countries. At the same time poverty is still deep amid plenty, particularly in developing countries. It is estimated that of the world 6 billion people, 2.8 billion – almost half live on less that I USD a day (World Bank, 2001). In Tanzania, about 50% of the country's population can be defined as poor with a percapita income of less than 1 USD per day (URT/WB 2002). Most of these poor people in Tanzania (80%) live in rural areas and depend on agriculture and extraction of natural resources for their livelihood.

Apart from the poverty predicament, Tanzania is facing increasing rate of depletion of forest resources. It estimated that deforestation in Tanzania takes place at the rate of 130000 to 500,000 ha per year and mostly occur in non-reserved forest land. Recognizing the potential linkage of poverty and environmental challenges, recently, countries have formulated millennium development goals which constitute goal one of eradicating extreme poverty and hunger and goal seven of ensuring environment sustainability (Ros-Tonen and Wiersum 2007). The two goal are reflected in Tanzania forest policy which is also linked to 2025 Tanzania development vision and National Strategy for Growth and Reduction of Poverty (NSGRP – also known as MKUKUTA in Swahili) (URT 2005) which both seek to overcome poverty. The Tanzania policy adopted decentralized policy to conserve forest and secure livelihoods of the poor people (URT, 1998)

Despite the efforts to promote decentralized management worldwide, there is lack of consensus whether the approach could enhance livelihood of the poor in the face of differing interests of stakeholders. Some existing literature indicates that the shift in forest management from centralized to decentralized management has not necessarily benefited the poor (Graner 1997; Springate-Baginski, Soussan *et al.* 1999; Wunder 2001; Kumar 2002; Blaikie 2006), *et al*., 1999). In contrast, other research findings confirm that decentralized forest management have improved livelihoods of the rural poor (Lund, 2007; Nygren, 2005). Arnold (2002) suggests that it is timely to conduct researches that focus on the linkage between forest and poverty because it seem still unclear about what can be realistically proposed that would enhance security for the large number of the poor unable to realize significant benefit from forest. In line with Arnold' suggestion, the world is in the situation where countries had adopted decentralization as a strategy to achieve the two objectives.

Although DFM was adopted since three decades ago, most studies assessing the effects of DFM on livelihoods have focused on livelihoods outcomes from either CBFM or JFM (Kumar, 2002, Lund and Treue, 2008; Topp-Jorgensen *et al*., 2005). Few of them have attempted to simultaneously compare the effect of CBFM and JFM regimes on the livelihoods of the rural poor. Such few studies however, have compared the two regimes from different regions (e.g. Kajembe *et al*. 2005; Vyamana, 2007). Controlling variability is an important methodological pre-requisite for studying phenomena in different study groups. Kumar (2002) for example compared JFM and non JFM from the same district to minimize ecological variability. The current literature lacks information on contribution of CBFM and JFM on household income of rural people implementing the two forest regimes in same ecological environments. This paper contributes to debate on the effects of decentralized forest management on income-livelihoods of the rural poor by

comparing within and between CBFM and JFM occurring in the same ecological location and same lowest possible administrative level in Babati District, Tanzania.

1.2 Objectives and research questions

1.2.1. Objectives

The general objective of this paper is to contribute to debate on the effects of decentralized forest management on income-livelihoods of the rural poor by comparing within and between CBFM and JFM occurring in the same ecological location and same lowest possible administrative level in Babati District, Tanzania.

Specific objectives are (i) to identify access of local people to forest resources under CBFM and JFM (ii) to determine direct contribution of forest under CBFM and JFM on the household income of the local people (iii) to find out household income of the people from different wealth categories.

1.2.2. Research questions

Research question of the study were (i) what access do rural people have to forest products under CBFM and JFM regimes for generating household income, (ii) what is the actual contribution of CBFM and JFM on household income, (iii) how does household income obtained from forest related activities in the two management regimes vary amongst different households' wealth categories?

In the next part of this paper, we present literature review, results, discussion and conclusions. Section three covers results on effects of decentralization on access to forest products and income-livelihoods of the rural people. In section four we discuss results and conclude in section five

2. Literature review on decentralization and livelihoods concepts

This section focus on exploring the concept of decentralization and livelihoods. Decentralization is perceived as transfer of powers from the central government to lower level actors and organizations (Agrawal and Ribot, 1999). Initially, decentralization was promoted primarily as an intervention for meeting dual objectives of conservation of forest resources and achieving livelihoods of the rural poor particularly in most developing countries, including Africa (Blaikie, 2006; Byron and Arnold, 1999; Lund and Treue, 2008); OECD, 1997; Ribot *et al*., 2006).

The concept of decentralization has been defined differently in literature (Ribot, *et al*., 2006; Tacconi, 2007; Rondinelli *et al.,* 1989). In general sense, decentralization is defined as transfer of powers from the central government to lower level actors and organizations (Agrawal and Ribot, 1999). However, depending on how the concept is perceived, decentralization does not necessarily lead to real transfer of decision making powers to lower level government authority but may lead to extending central government control to lower levels authorities (Ribot, *et al*, 2006). Therefore, there is a need to clarify the concept of decentralization and its related terms.

First related term is recentralization which is used to express reluctance of the central government to transfer meaningful power to lower level by re-gaining the same in the process of decentralizing. Recentralization is achieved through limiting the kind of powers that are transferred and by choosing local organization that serve and answer to central interests (Ribot, *et al*., 2006). The recently introduced forest governance projects on emissions from deforestation and degradation (REDD) which aim to prevent carbon emissions from deforestation and degradation consists ideas of centralized and protectionist forest management (Wiersum, 2009). Another related concept is deconcentration or administrative decentralization which is said to occur when appointee of central government receives powers previous held by the central government agencies (Agrawal and Ribot, 1999). Mawhood (1983) defined decentralization as constituting deconcentration only. The third term is democratic decentralization or political decentralization which involves transfer of power from central government to actors or organizations that are accountable to local population in their jurisdiction usually through electoral process (Ribot, *et al*., 2006). Devolution is also used in the literature to refer to political decentralization that indeed involves transfer of meaningful management responsibility and other resources to local levels (Thanh and Sikor, 2006). However, other scholars define decentralization to include aspect of transfer of power from the central government to not only local government but also private sector- privatisation (Post and Snel, 2003). Political or democratic decentralization is a form of decentralization that suits our current study.

The decentralization in forest sector often involves two types of management of forest commons (Wily, 2001). These include joint forest management (JFM) and community based forest management (CBFM) that are examples of community based natural resources management (CBNRM) according to Armitage (2005). Joint forest management (JFM) refer to situation where forest management responsibility and benefits are divided between government either local or central government and forest adjacent communities (Blomley and Ramadhani, 2006). The term community based forest management (CBFM) is used to refer to forest under ownership and active management of local community (Wily, 2001; Wily, 1996).

Decentralization is related to efforts of ensuring access of the rural poor to forest resources for their livelihoods (Arnold, 2002; Lund and Treue, 2008). The logic for decentralization is that increasing livelihoods benefits to local people provides incentive for them to protect the forest resources (Ribot *et. al*., 2006). Thus, acquisition of tangible benefits to the rural poor is among important elements for effective management of DFM. However, literature shows that different wealth groups benefit from forest resources differently with wealthier groups having more access and earning more income from the resources than poor wealth categories (Adhikari, *et al*, 2004; Lund and Treue, 2008).

Evolutionary, the term livelihood is related to efforts for fighting poverty that have evolved over time. These efforts have been associated with various perceptions of poverty. However, the definition of poverty mostly embraces three components (Arnold, 2002). The first component include a situation of having insufficient food, income and other inputs to maintain an adequate standard of living or assets to reach this standard.

Second component is vulnerability to shocks to livelihood systems and inability to cope with and recover from them. Third component is weakness of the poor to exercise options that a resource endowment could make available. In the earliest efforts, the aim for fighting poverty was to attain overall economic growth. Later focus was on distributional impact and improving welfare of the poorer.

Recently more focuses are on meeting basic needs, food security and latter livelihood enhancement (Arnold, 2002). The concept of livelihood is thought as capabilities, assets including both material and social resources and activities required for a means of living (Chamber and Conway, 1991). Livelihood is said to be sustainable when it can cope with and recover from stress and shocks and maintains or enhance its capacities and assets both now and in the future, while not undermining the natural resources base. IDS (2000) define livelihood as activities, the assets and access that jointly determine the living gained by individual or household. Livelihoods include capabilities, assets including both material and social resources and activities required for a means of living (Chamber and Conway, 1991). Thus, Livelihoods concept is broader than poverty alleviation. Angelsen and Wunder (2003) suggested that for research purposes, it may be convenient to think poverty in terms of the livelihoods concept but at the same time to measure material indicators that are closer to the meaning of poverty. This study operationalized the livelihood concept by including access to forest resources, income and activities.

The reviewed literature above can be summarized in the conceptual framework below (Figure 1). The conceptual framework shows that decentralization paradigm has resulted into two CBFM and JFM approaches. These two approaches have effect on livelihoods of the rural poor in terms access to forest resources, activities and income.

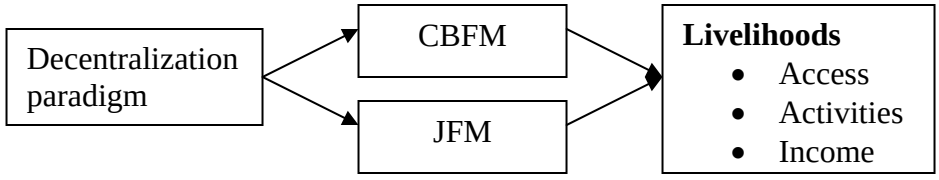


Figure 1: Conceptual framework of the paper

3. METHODOLOGY

(i) Location of the study area

Babati District is located in the Northern part of Tanzania along latitude $4^0$15'S and longitude $35^0$45'E (URT, 2003). The district is a head quarter of Manyara region and is about 167 km from Arusha. Babati has a human population of about 303,000 and has 60,000 households (URT, 2003).

The district is divided into four divisions namely Gorowa, Babati, Bashneti and Mbugwe. The study villages fall under Gorowa division (Table 2). Ayasanda which implement both CBFM and JFM was among studied village. However, in this village, the study focused on CBFM only. Ayasanda village is located 18.5 km from Babati district and 2.5 km

from Babati – Dodoma road. The second village studied was Endanachan which implemented CBFM. The village is located 21km from Babati town and 5km away from the main road of Babati to Dodoma. Another village was Haraa which implemented JFM. The village is located 23km South of Babati town. Administratively, the village was part of Bonga ward. Boay is a second village that practised JFM. The village is located 32km South of Babati town and was part of Gidas ward.

(ii) Selection of study area

Babati District was selected based on presence of CBFM and JFM management approaches and period of at least five years of practising the two approaches for showing effects on income-livelihoods. By the time of the fieldwork, Ayasanda and Endanachan had already practiced CBFM for 13 years while Boay and Haraa had practice JFM for about 5 years. Another selection criterion was homogeneity in ecological characteristics.

(iii) Data collection and analysis

A combination of quantitative and qualitative methods was used in collecting data in 2007 and 2008. Qualitative methods used include participatory group meetings in each village comprising 15-20 people. The groups comprised people from different wealth categories and were engaged in wealth ranking and identified forest products which each wealthy category of local people had access to forests under JFM and CBFM. Other qualitative methods used to explore information on access to forest resources were interviews during informal meetings, in-depth interviews with key informants (forest officers, village chairpersons and village executive officers), and participant observation.

Quantitative data on income was collected through household questionnaire administered to a minimum of 90 people per village. The total sample size was 384. Selection of sample size aimed at arriving at 30 people representing each category of poor, rich and medium. Decision to include 30 people as minimum number of respondents in each wealth category was consistent to fulfilling requirement for normality in statistical analysis (Motulsky, 1999). The sample size was obtained from sampling frame that constituted a list of all heads of households in the village. From the sampling frame, farmers categorized villagers according to their wealth status during participatory meeting. Using wealth ranking criteria that local people developed, the farmers created three wealth strata-the poor, rich and middle categories. Stratified random sampling was then applied to obtain 30 respondent for each category when such minimum number of was available. Analysis of qualitative data was done through abstraction of information collected while quantitative data was analysed using descriptive statistics and t-test with the help of SPSS computer programme.

4.0 RESULTS

(i) General livelihoods context in the study area

The PRA, focus group discussions and participant observation showed that inhabitants of Babati District were agro-silvo-pastoralist. However, traditionally, the people in Babati were not tree growers (Kahurananga, 1999). Tree planting activity in Babati was introduced through forest extension and learning from other places outside the district.

Babati District consistently meets its food requirements from its own livelihood activities. However, sale of produce keeps the district in state of deficit (URT, 2006). Livestock, particularly, cattle were important in coping with food insecurity during seasons of low crop production in the district. The main livelihood activities at Ayasanda village were crop production and free grazing livestock keeping. The two activities were also important in defining wealth categories of households at the village. Apart from having agricultural land, the village had forest areas. The forest areas include Wairimb hill forest (50ha) and Haitemba forest (500ha) which form Ayasanda village forest reserve and Bereku government forest reserve (1025.8 ha) (Table 2). The village had other kinds of forests and trees, including qaimanda traditional forests, farm trees, planted woodlots and some indigenous trees protected by traditional elders. The main livelihood activities at Endanachan village were same as those at Ayasanda and were also important for wealth ranking of households. Endanachan village had also village forest reserve, wood lots and traditional forests.

Similar to Ayasanda and Endanachan, crop production and livestock keeping was the main livelihoods activities at Haraa village. However, at the village, livestock including cattle, goats and sheep were mostly kept indoor. Agroforestry system constituting coffee, banana and trees was prominent in the village. Both exotic trees, particularly *Grevillea spps,* and indigenous tree species were part of the system. Several farms at Haraa had contour bunds with planted grass for feeding their indoor livestock. Boay village had similar main livelihoods activities as Ayasanda and Endanachan constituting crop production and free grazing livestock keeping. Pottery was a petty and important activity for women. Boay village was adjacent to the Bereku forest (1491 ha) and had traditional elders' forest and qaimanda forest reserves.

(ii) Wealth ranking and wealth categories

Table 3-7 show different criteria for household's wealth ranking. Land ownership, type of house, household nutrition and number of livestock were common wealth ranking criteria identified in the study villages. Those wealth ranking criteria were related to livelihoods activities in the study area. Clothing, shelter and food which were included in wealth ranking are basic needs of a human being. Education was another criterion mentioned.

The wealth ranking criteria observed in our study were also reported from other studies conducted in Tanzania (Vyamana, 2009; Meshack *et al*., 2006). The findings also conform to observation reported from India which indicated positive relationship between land ownership and wealth status of a household (Kumar, 2002). Adhikari *et al*., (2004) also found that land and livestock holding were among factors that determined wealth status and households access to forest products from forest commons in Nepal.

Table 2: Social economic and ecological characteristics of study villages

District	Division	Ward	Village	Human population	Main livelihood activities	Total land owned (Ha)	Total cattle owned	Distance from Babati town	PFM Regime	Year PFM started	Name of the forest (s) covered	Forest** type	Soil type*	Forest area
Babati	Gorowa	Ayasanda	Ayasanda	2187	Agro-pastoralist	1610	1405	18.5	CBFM	1994	Haitemba and Wairimb	Miombo wood land	dark brown volcanic soils	550*
			Endanachan	2700	Agro-pastoralist	6000	1742	21	CBFM	1994	Endanachan	Miombo wood land	dark brown volcanic soils	400
		Bonga	Haraa	1170	Agro-pastoralist	1040	433	23	JFM	2002	Bereku	Miombo wood land	dark brown volcanic soils	469.6
		Gidas	Boay	1900	Agro-pastoralist	1300	970	32	JFM	2002	Bereku	Miombo wood land	dark brown volcanic soils	1491

* Ayasanda village practise CBFM and JFM but the study focused on CBFM only. The area under JFM was 1025.8 ha.

Source: Fieldwork data, * Johansson (1991), ** Malimbwi (2003).

Table 3: Wealth ranking at Ayasanda village

	Wealth category		
Wealth criteria	**Rich**	**Moderate**	**Poor**
Area of farm land	10-15 acres	2 acres	0 acres
Number of cattle	50-100 cattle	10-15 cattle 5-10 goats/sheep	0 [1]
Type of house	Burnt bricks wall, roofed with iron sheets, cemented floor and furnished	Burnt bricks wall, roofed with grass, earth floor	Earth wall, grass roof and earth floor
Clothing	Wear good clothes, have several clothes to change, buy sheets of clothes to make	Have few clothes to change, buy second hand clothes	Have one cloth
Household nutrition	Afford morning tea everyday , Eat three meals per day and changes food items	Household drinks tea for some days, Eat two main meals but change food occasionally	Do not afford tea at home, have difficulties in getting food, sell labour to obtain food
Capacity to send children to school	Afford costs of primary and secondary education for children	Afford cost for sending children to school	Can not afford the cost of primary education

Table 4: Wealth ranking at Endanachan village

	Wealth category		
Wealth criteria	**Rich**	**Moderate**	**Poor**
Area of farm land (acres)	20	2-5	0 – 1.5
Number of livestock	50-100 cattle	20-30 cattle	0-1 cattle, 2 goats
Type of house	Burnt bricks wall, roofed with iron sheets, cemented floor, plastered	Burnt bricks wall, roofed with iron sheet	Earth wall, grass roof and earth floor
Household nutrition	Food secured through out the year, has own food material	Less food secured compared to the rich, has own food materials with some period of food insufficiency	Food insecure, household food requirement depend on labour selling.

Table 5: Wealth ranking at Haraa village

	Wealth category		
Wealth criteria	**Rich**	**Moderate**	**Poor**
Area of farm land (acres)	> 3	2	0.5-1
Type of house	Spacious house with burnt bricks wall, roofed with iron sheets, cemented floor	Burnt bricks wall, roofed with iron sheet	Earth wall, grass roof and earth floor
Household nutrition	Food secured through out the year, afford good three meals per day	Less food secured compared to the rich, has own food materials with some period of food insufficiency	Food insecure, can afford one meal per day.
Clothing	Have two types of clothes- for work and after work. Have shoes	Have few clothes to wear during work and after work. Do not have shoes	Have one type of clothes used during work and after work

[1] Poor people may keep cattle that belong to another rich household under trustee arrangement that is common in the area. Such animals provide milk and manure for the poor household.

Table 6: Wealth ranking at Boay village

Criteria/Category	Rich	Moderate	Poor
Acreage of farm land	5 acres	2 acres	0.5 – 1 acre
Number of livestock (Cattle)	20	5 cattle	0 or trusted
Type of house	Burnt bricks wall, roofed with iron sheet	Burnt bricks wall roofed with grass	Wall made of earth or earth and poles and roofed with grass
Type of business	Employed with monthly salary, runs kiosk, own diary cattle	Conduct vegetables business, runs tea room	Involved in earth pot business, sell labour

Table 7: Summary of criteria used for ranking wealth of households (HH) in the study villages

Wealth ranking criteria		Farm size owned	Number of cattle	Type of house	Household food security	Clothing	Capacity to send children to school	Type of occupation
Villages	Ayasanda	YES	YES	YES	YES	YES	YES	NO
	Endanachan	YES	YES	YES	YES	NO	NO	NO
	Haraa	YES	NO	YES	YES	YES	YES	NO
	Boay	YES	YES	YES	NO	NO	NO	Yes

Table 7 shows two common wealth ranking criteria for all four villages were farm size and type of house. Other criteria common for three villages of Ayasanda, Endanachan and Boay were household food security and number of cattle. A criterion of type of clothing and capacity to send children to school were shared by Ayasanda and Haraa villages. Type of occupation was a wealth ranking criterion for Boay village only. However, respondents at the village linked type of occupation with household income for acquiring other household's needs.

Generally, the wealth ranking criteria indicated that physical capital: farm size and number of cattle, social capital: capacity to send children to school, and income were important aspects of livelihoods of households. Also, assets: type of house and clothing were important for livelihoods for people in the study area. Access to forest products contributed to the overall livelihoods in different ways such as livestock grazing, acquiring building materials and cash income. In this paper we focus on relationships between household's income and CBFM and JFM and identify products which local people accessed for their income-livelihoods.

(iii) Access to forest products and income from forest under CBFM and JFM

This section focused on access to forest resources and households income related to forests under CBFM and JFM. Opinion of local people provided information on access by the local people to forest products from forests under CBFM and JFM for contributing to household income.

(a) Access to forest products

A combination of PRA, focus group discussion, and informal and key informant's interviews, was used to identify access to forest products by the local people. Data collected on access indicated that forest resources under the CBFM and JFM supported part of livelihoods of the

local people. The forests were sources of direct income, fuel wood, charcoal and building materials. The resources also provide local medicines and grass for grazing livestock. Some traditional forests for conducting traditional rituals were found in the reserved area. Descriptive statistics (N=384) indicated that overall forest contributed 10%, crop 52%, livestock 17%, petty business 14%, remittance 6%, sell of labour 1% and land rent almost 0% of the total HH mean income in the study area.

Under CBFM, local people had free access to dry firewood, collection of medicinal plants, fruits and mushrooms, tree braches for making cooking utensils and handles for agricultural tools. Some forest products needed a permit from village environmental committee. The products include dry logs for burning bricks and some building poles for roofing and erecting house wall, timber from dry trees for use at households level and public organizations such as schools, and collection of stones for constructing houses. Another observed access was grass for grazing cattle for a specified period of the year. Hanging of beehives was also allowed.

Access to most of forest products identified under CBFM also applied for JFM. A striking difference was lack of access to harvesting of timber from dry trees for use at household level under JFM. Timber harvesting of dry trees was allowed when public organization in villages implementing JFM had construction work. Also, one village under JFM had voluntarily decided to collect grass for feeding livestock indoor instead of free grazing.

Comparing access to different products by different wealth categories, all poor, rich and medium categories had more or less equal access to non-timber forest products. With regards to some illegal harvesting of timber, focus group discussion revealed that timber harvesting was sponsored by rich people who owned pit saws and also provided food to labourers who did pit sawing activity. Local people in the poor and medium categories were used mostly as paid labourers by rich people in undertaking small scale illegal timber harvesting.

In contrast, focus group discussion indicated that people in the poor categories, were ones that directly engaged in charcoal burning. Access to grass for grazing cattle was important to people in all categories. Some poor people accessed grass from forest under JFM and CBFM because they were keeping livestock obtained from rich group through the trustee arrangement. Women and children were mostly involved in collection of firewood. Women also accessed clay soil from the forests for pottery business. The forest under JFM and CBFM were also freely used as foot paths and for conducting traditional ceremonies.

To conclude, access by local people was mostly to non-timber forest products in both CBFM and JFM regimes because harvesting of growing trees was prohibited. Thus, access to growing trees and charcoal burning was to some extent through illegal means. Access to trees products by the local people was more under CBFM than JFM. Activities related to access to forest products were differentiated among wealth categories with wealthier people having a little bit more access to high value forest products than poor people.

(b) Contribution of CBFM and JFM on household income

(i) General differences in household income

In this section, different data analyses explain the effect of JFM and CBFM on household income. Figure 1 indicates opinion of respondents about the impacts of DFM on their income levels.

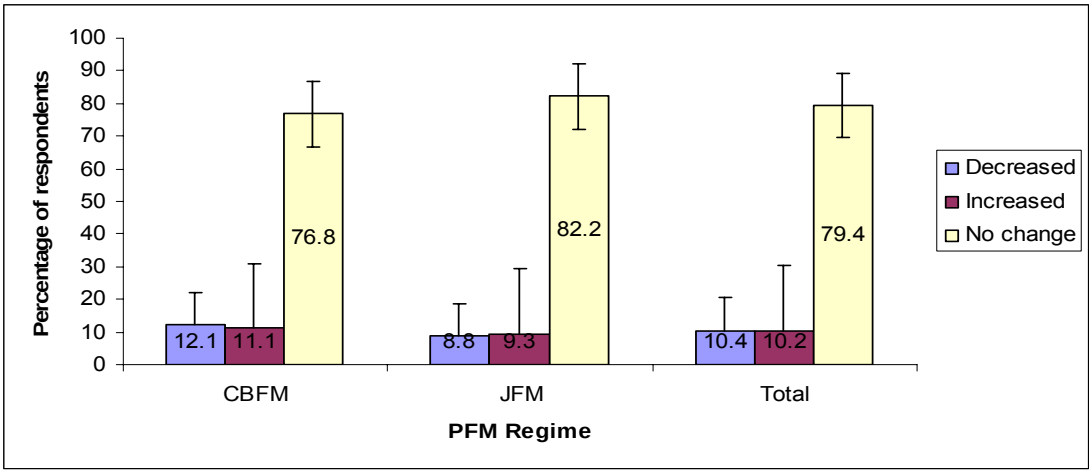


Figure 2: Opinion of respondents under CBFM and JFM on HH income from forest related activities in 2007, N=384.

The bars in Figure 2 show that a significant number of respondents did not experience change of income due to establishment of CBFM and JFM. Percentages of respondents who experienced increase and decrease of income in the two regimes was very low and was the same. Figure 3 shows disaggregated comparison of opinion of local people from four villages on household income. The Figure indicates that significant number of respondents had the opinion that their HH income did not change after adoption of CBFM and JFM. Ayasanda village had lower percentage of respondents who experienced no change of income compared to other villages. However, Ayasanda village had received Tsh. 2,500,000 from REDD under Kyoto: Think Global Act Local programme supported by Netherland government. The money contributed to construction of two class rooms of Duru-Haitemba primary school at the village.

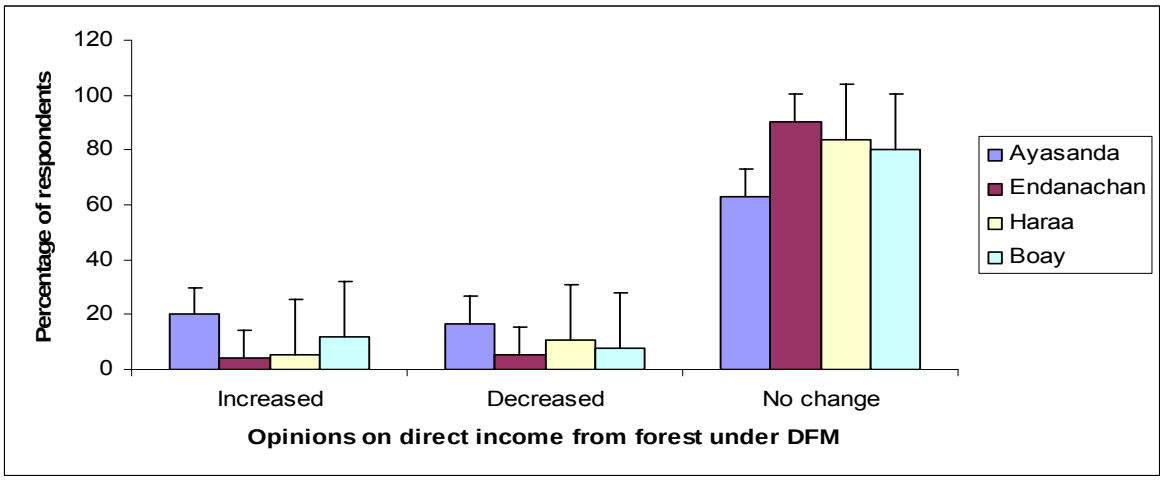


Figure 3: Opinion of respondents under CBFM and JFM on HH income from forest related activities in 2007, N=384.

In Table 8, an independent t test Group Statistics shows the mean household income of respondents in Tanzanian shillings from forest related activities in 2007 under CBFM was more than twice (*M*=35315, *SE*=22954) than mean income of respondents under JFM (*M*=15180, *SE*=11189).

Table 8: Independent t test Group Statistics of household income from forest related activities (FRA) under CBFM and JFM after and before establishment of the two forests management regimes, N=384

Independent variable	Forest management regime	N	Mean	Std. Deviation	Std. Error Mean
Household income after decentralized forest management	CBFM	190	35314.7	316392.5	22953.5
	JFM	194	15180.4	155840.0	11189.4
Household income before decentralized forest management	CBFM	190	32770.5	258783.3	18774.1
	JFM	194	9716.5	91869.2	6595.8

However, Table 9 indicates that the mean difference of the income under the two forest management regimes in the same year was not statistically significant (t (382) = 0.794, p>0.05). Similarly, household mean income of respondents from those activities under CBFM was more than three times as much (*M*=32771, *SE*=18774) than incomes of respondents under JFM (*M*=9717, *SE*=6595) before introduction of the two regimes. The difference in income was, nevertheless, also insignificant (t (235) = 0.244, p>0.05).

Table 9: Independent t test for significance differences in household income from FRA between CBFM and JFM after and before establishment of the two forest management regimes, N=384

Compared groups		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Differences in household income after decentralized forest management	Equal variances assumed	2.226	.137	.794	382	.428	20134.3	25373.6	-29755.0	70023.7
	Equal variances not assumed			.788	274.3	.431	20134.3	25535.6	-30136.3	70404.9
Differences in household income before decentralized forest management	Equal variances assumed	5.020	.026	1.17	382	.244	23054.0	19738.4	-15755.5	61863.5
	Equal variances not assumed			1.16	235	.244	23054.0	19738.4	-15755.5	61863.5

The household mean income in 2007 from livelihoods activities outside forest resources but affected by DFM was about 6,000 TShs higher under CBFM (*M*=16597, *SE*=19318) than the income from those activities under JFM (*M*=10567, *SE*=7614) (Table 10). However, their mean income was not significantly different (t (382) = 0.472, p>0.05) (Table 11). The mean income of the same activities before DFM was almost the same under CBFM (*M*=996, *SE*=681) as under JFM (*M*=1031, *SE*=1031) (Table 10) and their difference was statistically the same (t (333) = -0.028, p>0.05) (Table 11).

Table 10: Independent t test Group Statistics for household income from activities affected by DFM but outside forests under CBFM and JFM regimes, N=384

	Forest management regime	N	Mean	Std. Deviation	Std. Error Mean
Household income after decentralized forest management	CBFM	190	16596.8	142224.2	10318.0
	JFM	194	10567.0	106055.9	7614.4
Household income before decentralized forest management	CBFM	190	995.8	9385.4	680.9
	JFM	194	1030.9	14359.2	1030.9

Table 11: Independent t- test Group Statistics for annual household's income from activities affected by DFM but outside forests under CBFM and JFM regimes, N=384

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Mean difference of household income after DFM	Equal variances assumed	.774	.379	.472	382	.637	6029.8	12785.3	-19108.5	31168.2
	Equal variances not assumed			.470	349.4	.638	6029.8	12823.4	-19190.9	31250.6
Mean difference of household income after DFM	Equal variances assumed	.006	.941	-.028	382	.977	-35.1	1240.7	-2474.5	2404.3
	Equal variances not assumed			-.028	333.3	.977	-35.1	1235.5	-2465.5	2395.2

In conclusion, household income from forest related activities under CBFM was higher than those under JFM before and after DFM although their difference was not statistically different. The household mean income for activities outside forest resources but affected by forest management regimes was almost the same before and after DFM.

(ii) Household income from forests under CBFM and JFM for different wealth categories

This sub-section compares household (HH) income of different wealth categories for forest related activities before and after DFM. Independent t test was the main analysis used to make the comparison. Descriptive statistics is included to provide an initial general overview on the relationship between wealth categories defined by the local people and level of income they obtain from forest resources after decentralized forest management (DFM) based on measure of absolute poverty of 1 USD per day as defined by the World Bank. In addition, Figure 3 provides opinion of local people in three wealthy categories on household income after adoption of decentralized forest management.

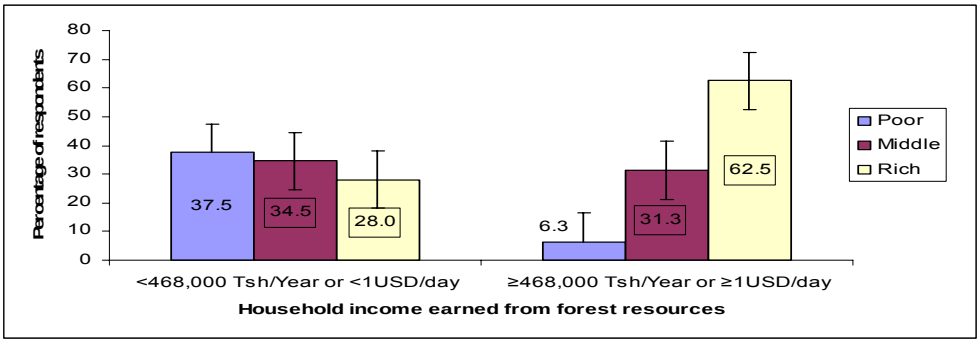
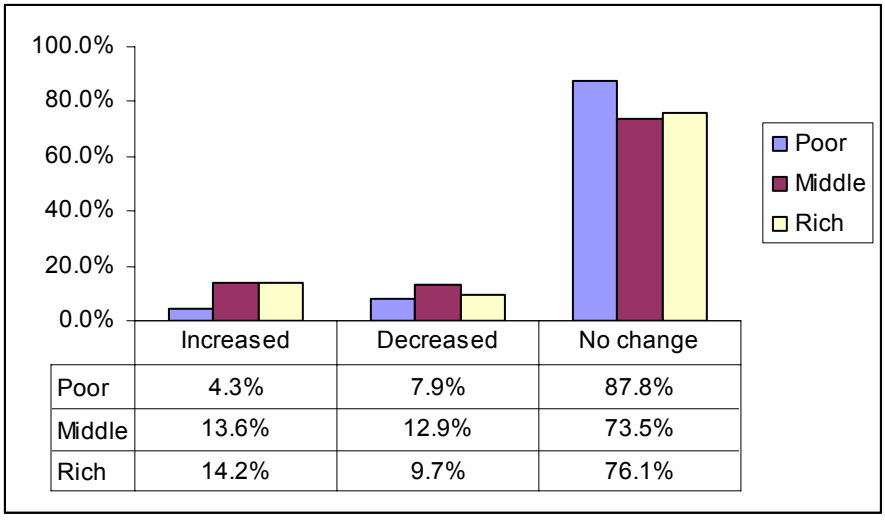


Figure 4: Wealth categories as defined by local people and level of income earned from forest resources after decentralization of forest management, N=384.

Figure 4 shows descriptive statistics indicating that a significant number of people in wealthier categories earned at least 1 USD per day from forest resources after DFM than poor and middle categories. In contrast, higher number of the poor earned an income of less than 1 USD than wealthier groups. The results suggest that stakeholders need to increase their efforts to help the most poor group to benefit from forest resources.

In Figure 5, the error bars show that significant number of respondents had the opinion that they did not experience change of income after establishment of CBFM and JFM. Percentages of respondents who experienced increase and decrease of direct income in the two regimes was similar and less 13%. About 80% of people under CBFM and JFM did not experience change in household income. Between wealth categories, about 70% of middle category, about 80% of rich category and about 90% of poor category did not experience change in income. These results indicate that actors need to increase access of the local people to forest under DFM for their livelihoods.



	Increased	Decreased	No change
Poor	4.3%	7.9%	87.8%
Middle	13.6%	12.9%	73.5%
Rich	14.2%	9.7%	76.1%

Figure 5: Opinions of local people from different wealth categories on household income after DFM, N=384.

Table 12 shows the mean household income of poor and wealthier people from forest related activities before and after decentralized forest management. Data in the table indicate that the mean HH income of the poor under CBFM after DFM was about 18 times less (M=2170, SE= 1420) than the mean income of the rich people (M=38176, SE=19824). Likewise, the income of the poor under CBFM before DFM was about three times less (M=9288, SE=6981) than the mean income of the wealthier people (M=27838, SE=14956).
However, the difference in the mean HH between the two wealth categories under CBFM for both periods was not statistically different at (t 247) = -1.812, p>0.05 after DFM, and at (t (382) = -.903, p>0.05) before the DFM (Table 13).

Similar to CBFM, the HH income of the poor under JFM in 2007 was about four times less (*M*=4791, *SE*=2968) than the mean income of the wealthier people (*M*=18520, *SE*=9860) (Table 12). Likewise, the income of the poor under JFM before DFM was about 1600 less (*M*=0, *SE*=0) than the mean income of the wealthier people (*M*=1589, *SE*=970). Statistically, the mean HH income of the poor and the wealthier group in 2007 under JFM was different (t (286) = -1.333, p<0.05) (Table 13). Also, the difference in mean HH income of the two categories under the JFM regime in the period before DFM was statistically significant (t (244) = -1.638, p<0.05) (Table 14).

Table 12: Group Statistics of HH income from forest related activities for rich and poor wealth categories under CBFM and JFM before and after DFM, N=384.

Household mean income	Wealthy categories defined by local people and Transformed into Dummy variables	N	Mean	Std. Deviation	Std. Error Mean
CBFM in 2007	Poor	139	2169.8	16745.8	1420.4
	Rich	245	38176.3	310293.0	19823.9
Before CBFM	Poor	139	9287.8	82300.5	6980.6
	Rich	245	27838.4	234099.1	14956.0
JFM in 2007	Poor	139	4791.4	34987.1	2967.6
	Rich	245	18520.0	154332.6	9859.9
Before JFM	Poor	139	.0	.0	.0
	Rich	245	1588.6	15179.0	969.7

Table 13: Independent T Test for difference in mean HH income between poor and wealth categories under CBFM and JFM in 2007

Dependent variable		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Household income in all CBFM villages in 2007	Equal variances assumed	7.087	.008	-1.366	382	.173	-36006.6	26355.3	-87826.1	15813.1
	Equal variances not assumed			-1.812	246.5	.071	-36006.5	19874.7	-75152.5	3139.4
Household income in all JFM villages in 2007	Equal variances assumed	4.193	.041	-1.033	382	.302	-13728.6	13286.7	-39852.9	12395.6
	Equal variances not assumed			-1.333	286.1	.183	-13728.6	10296.8	-33995.8	6538.6

Table 14: Independent t test for difference in mean HH income between poor and wealth categories before DFM

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Household income in all CBFM villages before the regime	Equal variances assumed	3.285	.071	-.903	382	.367	-18550.6	20549.9	-58955.7	21854.5
	Equal variances not assumed			-1.124	333.9	.262	-18550.6	16504.9	-51017.4	13916.2
Household income in all JFM villages before the regime	Equal variances assumed	6.148	.014	-1.233	382	.218	-1588.6	1288.2	-4121.4	944.3
	Equal variances not assumed			-1.638	244.000	.103	-1588.6	969.8	-3498.7	321.6

To conclude, the mean household income of the wealthier people from forest related activities before and after decentralized forest management in both CBFM and JFM was consistently higher than that of poor people. The difference was statistically significant under JFM in both periods but not significant under CBFM in both periods.

5. DISCUSSION

In this section we discuss the scientific merit of comparing phenomena under JFM and CBFM groups by keeping constant ecological characteristics. The section also discusses the relationship between access and household income on one hand and CBFM, JFM and wealth status on the other hand within an ecologically similar context.

Starting with controlling variables, scholars compare phenomena in groups by keeping constant some factors. In comparing revenue collection between district council and village governments, Lund (2007) compared the revenue collection of the two local governments by keeping constant the district. The situation could have been different if the two governments compared were drawn from different districts. In such scenario differences in districts could have accounted for the difference in the revenue collection instead of differences in type of local government. Kumar (2002) compared JFM and non JFM from same district to minimize ecological variability. Furthermore, in comparing benefits of different wealth groups obtained from forest under CBFM in Tanzania, Meshack *et al*., (2006) compared four villages bordering the same forest thereby controlling variability in ecological characteristics.

In our study, we achieved comparison of independent variables: CBFM, JFM and wealth categories with dependent variables: access and household income by locating our study in villages in same district and close to each other to keep ecological environment a constant factor. With regard to second objective, dependent and independent variables whose relationship is discussed are presented in Table 15.

Table 15: Dependent and independent variables (INDV) for discussion

INDV	Dependent variable	
	CBFM and JFM	Wealth category
Access	People under CBFM had a little bit more access to high value forest product than those under JFM	Poor people had less access to high value timber forest products than wealthier people
HH income	HH annual mean income under CBFM was higher than the mean income under JFM. However, their difference was not statistically significant	HH annual mean income of the poor was significantly less than that of wealthier group

Table 15 indicates that access to higher value timber products was a little bit more in forest under CBFM than that in forest under JFM. Likewise, wealthier groups had more access of such products than the poor. Lund and Treue (2008) found that wealthier category earned more income from firewood because they had donkey carts to transport the products. Also, in Nepal, less poor group had more access to forest products from forest under community forestry than poor groups. (Adhikari *et al*., 2004). The focus group discussion in our study indicated that timber harvesting was an expensive activity that the poor could not afford. The activity involved expenses in buying pit saws and food

for labourers conducting pit sawing activity. Thus, wealthier people hired the poor people to undertake pit-sawing activity and the former obtained more income from such activity than the poor. The wealthier people had also capacity to buy some dry timber legally harvested from forest resources. Charcoal burning which was poor people activity was difficult to undertake due to monitoring of non compliances with prohibited activities by community members.

With regarding to income-livelihoods, the comparison of household income before and after decentralization of forest management has indicated that the mean household income from forest currently under CBFM was generally higher than the income from JFM. However, the mean differences between the incomes were not statistically different. Furthermore, comparison of local people's opinion on HH mean income of four villages and among three wealthy categories indicated that income of majority of people earned from forest commons did not change after adoption of decentralized forest management. Additionally, people from wealthier categories had more access to valuable timber products than those from poor group. Such findings indicate three insights. First, both CBFM and JFM contributed equally to income of the rural communities. Second, decentralized forest management have focused more on protection than improving livelihoods of the local people. This is reflected on rules that prohibited use of higher value forest products such as timber and trees from the forest reserve. Introduction of REDD projects (in rural villages like Ayasanda in Babati District) which emphasize protection of for trapping carbon has implication on increasing livelihoods of rural communities at village level but decreasing further individual access to forest products and reducing HH income. This way REDD seem to bring back centralized and protectionist approach to management of forest resources (Wiersum, 2009). Third, actors should device ways to help the most poor local people to benefit from forest resources.

The opinion of the local people that decentralized forest management has not improved their HH income can also be attributed to the fact that forest was not a major livelihood activity in the study area. The wealth ranking exercise indicated that crop production and livestock keeping was the major livelihood activities in the study area. However, local people needed access to the forest for additional income, acquiring firewood, medicines, mushrooms, some building poles and timber. However, in most cases, access to forest product was restricted to non timber forest products.

6. CONCLUSION

This paper has compared access to forest resources and household income- livelihood between CBFM and JFM. It compared CBFM and JFM by controlling ecological variability to address the methodological weakness found in literature of comparing management regimes in different environments. The paper has established that access to forest resources by the local community was restricted mainly to non timber forest products. Local people tried to access high value products such as charcoal, timber and tree through illegal activities. Limited access to high value forest products partly explains why local people did not experience change in their household income after decentralized forest management. Local people under CBFM had a little bit more formal access to trees

products than those under JFM. In these regimes, wealthier group had more access to timber products than poor group who were mainly used as labourers.

The mean household income of the wealthier people from forest related activities before and after decentralized forest management in both CBFM and JFM was consistently higher than that of the poor people. However, the difference in the two wealth categories was statistically significant only under JFM in both periods but not significant under CBFM in the two periods. Generally, household income from forest related activities under CBFM was higher than those under JFM during the period before and after DFM although their difference was not statistically different.

In order to increase contribution of household income to local people, access by the local people to higher value forest products such as timber and trees should be increased. As part of strategy to increase access to the products, actors in both regimes and in particular under JFM regime, should actively seek to learn how to put into practice access to timber from dry trees as stipulated in the village management plans. Special consideration should be directed to help the most poor people to access forest resources to improve their livelihoods. However, advent of REDD interventions which aim to protect trees and forests for carbon sequestration (Zahabu, 2008) seem to bring back protectionist idea of managing forest resources. Although, REDD projects have potential to improve livelihoods in terms of social services at village level they may decrease HH livelihoods particularly individual access to forest resources and HH income from the forests under CBFM and JFM thereby compromising policy objective of enhancing livelihoods of the people. Restricted access to forest resources due to REDD requirement may accelerate deforestation because local people won't trust the government due to broken promise of enhancing their livelihoods. Local people were encouraged to conserve forests under CBFM and JFM because the resources would support their livelihoods.

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