Participatory Forest Management in the Eastern Arc Mountain area of Tanzania: Who is benefiting?

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Abstract

A study was conducted in the Eastern Arc Mountain area of Tanzania to investigate the impacts of participatory forest management (PFM) on livelihoods. Nine villages were purposively selected to include two basic models of PFM: Joint Forest Management (JFM) [four villages] and Community Based Forest Management (CBFM) [three villages], as well as two non-PFM 'control villages'. Qualitative methods and a structured questionnaire were used with a stratified random sample of households in four well-being groups. In all case study villages, the primary motivation for PFM was concern about forest degradation rather than poverty alleviation. JFM, and its associated restrictions on use, reduced the average contribution of forest products to household incomes from 19% to 13.3% with no changes in control and CBFM communities. The reduced income was partly compensated by the fact that it was considered more sustainable in the long term, with all PFM community members perceiving an improvement in the condition of their forest. This was associated, however, with increased wild animal damage to crops and, in two of the JFM cases, with degradation of non-JFM forest to which uses had been displaced.

Gini coefficient values suggest that forest product incomes are important in reducing overall income inequality within communities. However, PFM sometimes increases inequality because of technical and administrative obstacles that prevent the poorest from taking full advantage of the forest benefits. Thus the high initial investment costs of JFM-linked income-generating activities, such as fishponds and beekeeping, means that they tend to benefit only members of the Village Natural Resource Committees (VNRCs) and/or people from the richer well-being groups. The *de facto* exclusion of the poorest in decision-making meant that their needs are frequently not taken into account. Overall our results suggest that PFM arrangements in Tanzania are improving forest conservation but not realising their potential to contribute to reducing poverty and social exclusion. We conclude with recommendations for ways in which PFM implementation can be improved to achieve a better balance between these two facets.

Key words: *PFM, CBNRM, forest conservation, livelihood, forest incomes, income inequality, social exclusion*

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INTRODUCTION

Background

Recent global trends in forest management have focused on the devolution of forest tenure and management from state authorities to local communities through participatory forest management (PFM) (FAO, 2003). PFM provides opportunities to communities living in and around forests to take direct control of the forests they use or co-manage forest resources with state authorities on some agreed benefit and cost sharing mechanisms. Despite the rhetoric of participation, ownership, improved local governance, empowerment and poverty alleviation that instills the discourse on PFM (Wily *et al*., 2000; Hobley, 2006), yet it lacks wider transformation of forest administration structures (Hobley, 2006) particularly in sub-Saharan African countries; Tanzania included (Owino and Ndinga, 2004). At the same time, even if the forest administration structure would have undergone necessary transformation this in practice could not quickly change ordinary relationships between forest department officials and communities living in or around forests (Crook and Manor, 1998 cited in Ellis and Freeman, 2007) that has historically been of mistrust, and characterized by "*fences and fines*".

Participatory Forest Management in Tanzania

A key element of the new Tanzanian Forest Policy (URT, 1998) and Forest Act (URT, 2002) is the devolution of ownership of and management responsibilities over forest resources to local communities. Thus community-based approaches to securing and managing forests, generally referred to as Participatory Forest Management (PFM), has become a central strategy of the Forestry and Beekeeping Division (FBD) of Tanzania to ensure sustainable management and conservation of Tanzania's forests.

In Tanzania, there are two forms of PFM: community-based forest management (CBFM) and joint forest management (JFM). Each differs greatly in terms of forest ownership and cost/benefit flows. CBFM takes place on village land or private land, and the trees are owned and managed by a village government through a Village Natural Resource Committee (VNRC), a group, or an individual. In this case the owner carries most of the costs and accrues most of the benefits relating to management and utilization. The role of central government is minimal while the district authorities only have a role in monitoring. On the other hand, JFM takes place on "reserved land" that is owned and managed by either central or local government. Villagers typically enter into management agreements to share responsibilities for the management with the forest owner (FBD, 2006).

The *Forest Act* (URT, 2002) provides for three categories of CBFM (URT, 2002):
   a) Village Land Forest Reserve (VLFR) managed by entire community
   b) Community Forest Reserves (CFR) managed by a particular designated group in the community granted ownership rights by the village government, and
   c) Private Forest (PF) managed by designated individual households granted ownership rights by the village government.

However, in practice only the VLFR exists, and thus all CBFM case studies presented in this paper are of VLFR type.

PFM was envisioned to help deliver two broad policy outcomes: improved forest condition and improved people's livelihoods (Blomley and Ramadhani, 2006), in a manner congruent with the general national poverty reduction process (URT, 2005). Available evidence suggests that PFM (in either of its two forms in Tanzania) indeed contributes to the rehabilitation and maintenance of forest condition including biodiversity. However, the contribution of PFM, particularly JFM, to improving livelihoods is still questionable (Blomley and Ramadhani, 2006) with conflicting results reported (Topp-Jørgensen *et al*., 2005; Luoga *et al*., 2006b). Although PFM has been acclaimed to be successful in Tanzania (Wily *et al*., 2000) there is growing concern that such claim could be vulnerable to the wrong conception of community as a homogeneous group of people with a single identity of interest, and that, in some cases, PFM could mean "token" participation for the poorest community members (Agarwal, 2000; Allison, 2004 cited in Ellis and Freeman, 2007). This paper summarizes results of research undertaken through Socio-economic Monitoring (SEMP)[1] to assess poverty impacts of PFM[2] in nine case study villages within or adjacent to the forests of Tanzania's Eastern Arc Mountains, and was guided by two research questions:

1. *Can PFM contribute to livelihood and poverty reduction by providing rural people with a sustainable and equitably distributed stream of benefits greater than those obtained under a non-PFM situation?*

2. *How do the impacts (both positive and negative) on poverty and equity of different forms of PFM compare?*

The year when PFM became operational for each case study was used as a point of reference to determine what impact, if any, PFM had on livelihoods and poverty within the nine case study villages.

Theoretical framework

This study employed a modified DFID Sustainable Livelihoods Framework approach and drew on a number of other livelihood frameworks, models and approaches (Figure 1), including: CARE International's Livelihood Model, UNDP's approach to promoting Sustainable Livelihoods (SL), and Oxfam's SL framework. The SL framework distinguishes the economic, natural, physical, social/political and human factors that influence the strategies that people employ to predict the possible set of outcomes that may be achieved.

Figure 1 here

The underlying postulation in the study is that from a thorough understanding of the forest benefits and livelihood outcomes in relation to the PFM model in use it becomes possible to assess the model's effectiveness in addressing poverty, and where

necessary, makes necessary modifications. The livelihood outcomes are derived from these strategies and can be measured by criteria such as income level, increased value of the forest, reliable water supply, increased well-being and reduced vulnerability.

RESEARCH METHODOLOGY

Sampling, data collection and locations

This study applied a combination of qualitative and quantitative methods where the qualitative methods addressed were used to capture the social and institutional context of people's lives (Booth *et al*., 1998) and changing livelihood scenarios in relation to forest use at community level (Ellis and Mdoe, 2003). Quantitative data were collected using a structured questionnaire and as noted by Ellis and Mdoe (2003) addressed impacts of changing livelihood scenarios in relation to forest use on assets, activities, incomes, trends and vulnerability factors at the household level. In the absence of written records on the activity under investigation, both qualitative and quantitative methods (structured questionnaire) employed recall questions[3], with the year when PFM processes started taken as a reference point. Participatory rural appraisal (PRA) tools were used at village meetings held in each village, with women's, men's and youth groups conducting separate exercises where appropriate. Groups consisted of 10-12 persons each. Exercises were conducted over a three to four day period in each village. During meetings, resource maps were drawn, transect walks were conducted and group discussions and key informant interviews were held. The rationale for these exercises is described in detail by Schreckenberg and Luttrell (2006).

Participating communities were selected from within the project area of the Conservation and Management of the Eastern Arc Mountain Forests (CMEAMF), whose activities are limited to the mountains of the Eastern Arc of Tanzania. Three regions that have been, since 1999, practicing or have initiated a PFM process were purposively selected to cover a range of institutions facilitating PFM in the area. Where possible, one community engaged in JFM and one community engaged in CBFM were selected from each region. In addition, with the exception of one region (Morogoro) one control community without PFM initiatives was selected per region making a total of 9 study villages. A list of sample villages and their main attributes, the locations of the districts in which they are located are presented in Table 1 and Figure 2, respectively.

Table 1 here

Figure 2 here

Upon arriving in each village, a participatory well-being ranking (PWR) exercise was conducted with 4-6 people who knew the village well; these individuals were selected with the help of village leaders. Four well-being categories were identified i.e. very poor, poor, rich and very rich. After setting criteria, each household in a village list extracted from the village register was assigned to a well-being class. This list served as the

sampling frame for a stratified random sample. Thereafter stratified random sampling in proportion to the size of the categories was applied. Whenever possible the minimum number of households for each category was five, except in cases where some well-being categories had fewer than five households. The number of households sampled in each well-being category in each study village is shown in Table 2. Overall, 368 households in nine villages in six districts within the Eastern Arc area were researched. Sample household heads were interviewed using a structured questionnaire. Data on sources of livelihoods before PFM and during the study period were obtained, and included cash and non cash income, and natural resource management and use.

Table 2 here

Data analysis

PRA data were analysed thematically with the help of villagers in each community. Validation was performed through triangulation and feedback meetings with community members, village leaders, VNRC members and key informants from forest departments within the central and local government authorities. Triangulation was ensured by judicious use of various RRA tools, which inevitably led to some overlap between the tools (e.g. the checklists for different group exercises in the Field Manual by Schreckenberg and Luttrell (2006)). This takes into account the fact that it was not always possible to get through all the desired questions with a single tool or with one set of people. Also feedback meetings were held with representatives of the community members to ascertain validity of the qualitative information.

Questionnaire data were analysed using a Microsoft excel spread sheet to provide means, frequency and charts. In addition, GINI coefficient values were calculated for income data using equation 1:

$$G = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} |x_i - x_j|}{2 n^2 \mu}$$

Where n=sample size and μ is the sample average. The GINI coefficient for income inequality is therefore the relative mean difference between all possible income pairs *i* and *j* in the sample. For small samples, the expression should be multiplied with n/(n-1) to provide an unbiased estimate. If G=0, then all people have an equal income. If G is closer to 1, then incomes are distributed very unequally.

RESULTS AND DISCUSSION

Comparative overview

Role of PFM linked income generating activities in reducing poverty

Introduction of various income generating activities (IGAs) with PFM is based on premises that rural people are dependent on forest products (FAO, 1999) and that

forest degradation happens because the consumptive forest use is the only option for income generation for raising their incomes (Chinguwo, 2001). Chinguwo (2001) argued that degradation caused by people striving to raise their incomes is responsible for their continued poverty because once the resource base is degraded the poor remain with no any other livelihood option so felling back into their original poverty. Thus communities must be compensated for their restricted access to the protected area through introduced IGAs so that as they refrain from environmentally destructive process they are given alternative opportunity to earn incomes (Scherl *et al.,* 2004). In Tanzania, the most common income generating activities include beekeeping, fish farming, butterfly farming, tree seedling production and mushroom production. However, our results suggest that they only benefit a very small number of elite village members who can afford initial investment costs.

Results from this study showed that IGAs varied within and between PFM types with eco-tourism predominantly practiced in JFM areas but involving either VNRC members or very rich and rich households at the expense of the poor and very poor households. The Village chairman of Mikwinini village reported (September, 2007):

"*Amani Nature Reserve Authority has promoted IGAs such as beekeeping, fish ponds and tree nurseries and I am involved in all of these IGAs. The poor and very poor households however, are not participating in these IGAs because they cannot afford initial investment costs attached to these IGAs. For example in beekeeping, individuals or groups are required to either construct beehives or buy beehives. In addition, the poor and very poor cannot afford to provide their labour for these IGAs and wait for many months before benefits accrue because they need immediate money to meet their immediate daily subsistence needs. The only option for them is to sell their labour in tea estates".*

One woman in Mikwinini village-JFM (40 years classified as poor in participatory well-being category), reported (September, 2007):
"*ANRA has promoted beekeeping and fish ponds as IGAs accompanying JFM. However, I have failed to join any of the IGA groups because I cannot afford. I understand that through ANRA if you buy one beehive you are given one more for free. That is good thing but I cannot afford to pay for it. I have decided to sell labour to the tea estate hoping that I will manage to save some money for joining the IGA groups".*

The village chairman of Mgambo village-CBFM, reported (September, 2007):
"*Tanzania Forest Conservation Group (TFCG) is promoting fish ponds and tree nurseries as IGAs associated with our CBFM approach. We have only one group for both IGAs and I am a member with other eight colleagues. TFCG provide fish fingerlings and nursery equipment free of charge but we have to dig the pond and do nursery operations. The poor and very poor people are not participating because they don't have time and money to invest".*

In addition, our results revealed that in some cases decisions over which IGAs to promote were reached without consultation or consideration of communities' interests (Box 1).

Box 1 here

Some studies have reported positive impacts of IGAs on poverty reduction under PFM (Luoga *et al*., 2006b; Mrosso, 2006) but our results suggest that PFM IGAs exclude the poor with negative impacts on poverty reduction. These contradictory results are attributable to methodological differences. The studies that reported positive impacts of PFM IGAs on poverty reduction did not stratify communities into well-being categories and were therefore unable to reveal differential impacts of PFM on the poor.

Motivation of PFM in case study villages

Table 3 summarizes the original motivation and objectives for initiating either JFM or CBFM in each of the case study villages.

Table 3 here

For both JFM and CBFM types, the primary objective was to conserve forest. CBFM had room for livelihood improvement through controlled utilization. Even in "control" communities, the government had already intervened in forest utilization arrangements to encourage forest management by village government. The government's interest in bringing forests on the general land under management by village governments would indicate a sincere commitment to achieve its policy objectives of ensuring that all forests in general land are brought under effective community management as an incentive for communities to conserve forests on the general land some kind of management (URT, 1998).

The asset status among well-being groups

Findings of the wealth ranking conducted in the nine case-study communities showed considerable overlap in the characteristics that were considered by community members themselves to define relative poverty and wealth across case study communities. Table 4 summarizes the common characteristics in the definition of well-being categories across case study communities.

Table 4 here

Overall, the very rich[5] are characterised by having houses made of brick walls, cement floor and iron roofs; land holdings of 2-10 hectares, up to 60 indigenous or dairy cattle or both, 5-30 goats, 50-60 chicken, non-dependence on remittances, sending their children to high quality schools up to secondary education, hiring labour, owning

bicycles; sometimes owning various motorbikes, vehicles and non-farm businesses, and normally being food sufficient all the year. The rich and poor are characterised by increasingly fewer of all these assets, increased reliance on remittances and selling labour, and worsening ephemeral food insecurity. The very poor have little or no land, no livestock; rely entirely on remittances, selling labour or food aid; and are food insecure almost the whole year.

Use of asset ownership to characterize well-being the rural households observed in this study is consistent with other studies that applied PWR in rural areas of Tanzania (Ellis and Mdoe, 2003) and other countries in the Sub-Saharan Africa (Delgado *et al*., 1998; Ellis and Freeman, 2007). Thus improvement in well-being is often associated with asset accumulation that involves trading-up assets in sequence, for example guinea pigs-to-goats-to-cattle (Ellis and Freeman, 2007). This indicates reliability of PWR for elucidating changes in well-beings in rural areas of Sub-Saharan Africa.

PFM impacts on livelihood assets at community level

Economic capital
Average share of forest and non-forest income portfolios for JFM, CBFM and control communities after PFM initiatives are shown in Figure 3.

Figure 3 here

Regardless of the forest tenure, agriculture, livestock keeping, forest products and off-farm activities were the main income portfolios. After PFM implementation the average contribution of forest products to average total household incomes was identical for both JFM and CBFM communities but slightly higher in control communities. Forests in control communities were effectively treated as open access resources, whereas in JFM and CBFM case studies utilization of the forest was regulated by PFM bylaws formulated in each of respective village that were more strict in JFM than CBFM communities.

Figure 4 shows average contribution of various income portfolios for JFM, CBFM and control communities just before PFM initiatives.

Figure 4 here

Comparing Figures 3 and 4 it shows that JFM had slightly reduced the average contribution of forest products to average total household incomes from 18% before to 13% after JFM but unchanged for CBFM and control communities. Thus taking communities as a whole, CBFM does not change the share of forest-based income.

Village government in PFM communities generated income and revenue through forest user fee charges that did not exist before PFM, and in control communities. Forest uses were predominantly consumptive for CBFM such as commercial harvesting of firewood

and charcoal making, and non-consumptive notably eco-tourism for JFM communities. Table 5 shows revenues collected by village governments in the case study communities with active PFM forest utilization.

Table 5 here

Opportunities to collect forest revenues existed in 2 out of the 4 JFM case studies and 2 out of 3 CBFM communities[7]. Respective village records and qualitative data indicated that one (Mfyome village-CBFM) collected forest revenues through fees paid by commercial harvesters of forest products whereas another village (Mgambo village-CBFM) had temporary banned harvesting in their CBFM forest that was degraded prior to CBFM to allow regeneration but supported by Amani Nature Reserve Authority (ANRA)[8] to collect some forest revenues from fees paid by researchers and eco-tourists.

Results further showed a considerable variation within and between PFM types in the revenue collected. On average, CBFM communities with harvestable forests or eco-tourism opportunities collected USD1405 per year against USD 88 and USD 0 collected by JFM and control communities, respectively. These findings agree with past PFM studies in Tanzania that consistently reported higher forest contribution to community level incomes in CBFM than JFM, attributing this to the fact that there tend to be greater restrictions placed on the harvesting of forest products in JFM than CBFM (Topp-Jørgensen *et al*., 2005; Blomley and Ramadhanai, 2006).

Physical capital

Table 6 shows changes in community level physical capital. Physical capital improved in both JFM and CBFM areas but improved more significantly in CBFM.

Table 6 here

Interviews with village officials revealed that, in PFM communities, funds generated from PFM-related activities were used to construct school buildings and repair community infrastructure.

By contrast, there was no evidence of changes in physical capital in control communities. Perhaps because there was no formal, institutional link between forest revenue and community investment priorities, and in spite of the higher revenue from forest products, control communities were unable to benefit collectively from forest resources in their vicinity.

Human capital

Human capital consists of health, food security and education/skills. Our data showed that only health and skills were found to be associated with PFM. In terms of skills, in all communities, community members reported to have received some training. However, the focus of training varied between PFM and non-PFM control communities. The

former were trained in both environmental conservation and agriculture, while the latter were trained in agriculture alone. PFM could therefore be said to have led to some improvements in human capital beyond that received in control communities.

Regardless of the forest tenure, access to conventional health services was limited or non-existing (Table 7). Some communities had no dispensaries or health centres in their village and had to walk a long distance in search for the conventional health services. Only three out of 9 communities studied (33%) had dispensary within their village. The remaining 6 villages (77%) had to walk between 2 and 32 km to reach dispensaries or health centres.

Table 7 here

Even in areas where health centres or dispensaries were accessible within the village still affordability particularly for the poor and very poor may have been difficult due to high costs involved. Discussion with community members revealed that they relied on use of forest medicinal herbs for their primary health needs mainly through purchase from traditional healers. The perception of JFM community members was that access to forest medicinal herbs and hence health was improved as a result of JFM that legalized collection of medicinal herbs but community members perceived no change in CBFM and control communities. However, the fact that CBFM enhanced sustainable utilization of the respective forest medicinal herbs means that it ensured sustainability.

Social and Political capital

Social capital is the level of networking (both formal organisations and informal self-help relationships) existing in a community. This is often linked to political capital, which describes how well the community is able to negotiate with external actors.

Institutions at the community level included VNRCs, village governments and religious organizations as formal institutions. Informal institutions entailed community norms and culture. VNRCs and village government were the most influential institutions with powers to enact and enforce by-laws.

Accountability, transparency and effectiveness were generally higher in PFM communities than non-PFM control communities. These attributes tended to be more prominent in those PFM communities with PFM funds. Communities did not report any natural resource-related conflict although they did confirm the existence of conflict resolution mechanisms within each village government – typically involving elders and village leaders in dispute resolution.

Natural capital

For both JFM and CBFM, community members perceived improvements in natural capital, judged on the basis of forest regeneration, aesthetic values and increased number of wild animals. All these changes were attributed to PFM. Key informant

interviews with DLNROs, catchment forest project staff and Amani Nature Reserve staff indicated that improvements in natural capital were perceived to be higher in JFM than CBFM forests and least or negative in control communities. Similar observations have been reported in other CBFM and JFM forests in Tanzania (Sauer and Abdallah, 2007; Blomley and Ramadhani, 2006). If such perceptions of the improvement in natural capital are proven empirically, it would be a sure sign that PFM presents the possibility of sustaining benefit flows more than a non-PFM situation where the natural resource base is unmanaged.

Table 8 shows policy and regulations applied in different forest tenure types in the study communities.

Table 8 here

Results indicated that 25% of JFM communities and 66% of CBFM communities had forests other than PFM forests. By-laws for CBFM forests were also applicable for other forests but this was not the case with JFM by-laws. For instance, community members in Changa village in Morogoro district reported that, other than the JFM forest, there were no regulations to control use of forests, a situation which has appeared to increase pressures on and degradation of non-JFM forests. One of the VRNC members in Changa reported (March, 2006):

……….."*We are not concerned with the forest patches across the middle of our village that are sources of forest products for most people. These forest patches however, are degrading while the JFM forest is improving*"

Impacts on livelihood assets at household level

Results could not establish any linkage between PFM and physical capital at the household level. Thus we are not going to discuss physical capital at the household level impacts.

Economic capital

In Mfyome village, with productive CBFM forest, VNRC members and community members reported that very poor and poor households were not able to exercise their right to harvest forest products for sale because they could not afford to pay the user fees (Table 9) that must be paid in advance of gaining forest access for commercial reasons. Fees were not the only obstacle; these people also lacked access to tools like carts for carrying firewood to town or money to pay for transport charges.

Table 9 here

Two (Mikwinini and Kilama villages) out of four JFM communities were using their JFM forest. Whereas the other two JFM communities shifted their forest uses to alternative forest patches in avoidance of restrictions imposed on JFM forests. Conversely, two out

of the three CBFM communities i.e. Mfyome[10] and Gombero[11] were using their CBFM forests. For the four communities that were using PFM forest, 'forest product' income data were disaggregated to elucidate earnings from PFM forests before and after PFM. Results indicated considerable variations of changes in earnings from PFM forests between and within PFM types, and well-being categories (Table 10).

Table 10 here

In Kilama village, there was a general decline in forest incomes as a result of JFM implementation. Average household annual earnings from JFM forest decreased from TShs 9,200 before to TShs 0 after JFM implementation (100% decrease) and from TShs 15,310 to TShs 2,653 (83% decrease) for rich and poor households, respectively. Unexpectedly, the very rich and very poor households neither used JFM before JFM implementation nor after JFM implementation. This weirdness could be due to the fact that JFM forest in Kilama village is very close to Udzungwa National Park and with Tanzania National Parks (TANAPA) having a stake in its management before and after JFM implementation. In Tanzania, law enforcement is stricter in National Parks with sufficient human resources compared to Forest Reserves where human resources are insufficient (Rytkönen, 2004) with some human (illegal) utilization happening (Pelkey *et al*., 2000). Even with the current positive stance to involve local communities in management of National Parks direct uses are not allowed instead communities benefit from income generated through non-consumptive uses notably tourisms, which are invested in community development projects such as school building (Alcon *et al*., 2002). Thus the restrictions imposed by TANAPA could have been responsible for dissuading the very rich and very poor community members from using the forest in either case.

Mikwinini was quite different from Kilama village where the general tendency was increased average household annual earnings from JFM forest with JFM implementation, the increase being higher for the very poor and poor households than very rich and rich households. Implementation of JFM increased the average household annual earnings from JFM forest by 55%, 137% and 21% for very poor, poor and rich households, respectively. This suggests that JFM in this village was progressive, that is it provides relatively more opportunities for the poorest than the rich. Less variation between well-being categories in the contribution of JFM forest products to the households' incomes can be explained by the harvesting restrictions that exist in JFM forests. With these restrictions every household, regardless of their well-being, could only use the forest for subsistence or harvesting of NTFPs (e.g. *Allanblackia stuhlmannii* fruits and mushrooms) as per the JFM arrangements which prohibit commercial harvesting of valuable timber products.

In Mfyome village, with exception of the very rich household, CBFM implementation tended to increase average household annual earnings from CBFM forest with rich households experiencing significantly highest increase than the very poor and poor households. CBFM implementation decreased average household annual earnings from CBFM by10% for the very rich households while it increased the average annual

earnings from CBFM forest by 101%, 23% and 52% for the rich, poor and very poor households, respectively. The significantly highest increase in earnings from CBFM forest for the rich than the poor and very poor observed in Mfyome can be explained by institutional arrangements in CBFM communities that require payment of fees prior to harvesting forest products for sale (see also Table 9 above). This requirement and lack of tools like carts for carrying firewood, and/or charcoal to town or money to pay for transport charges prohibit very poor and poor households from exercising their right to harvest forest products for sale.

However, it is interesting to note that in Mfyome village the very rich were not benefiting significantly from commercial harvesting opportunities in CBFM forests, despite being in a position to pay the requisite harvesting fees upfront. This is in keeping with the literature on livelihood diversification which suggests that the nature of income source diversification differs greatly between the better off and poorer households. Better off households tend to engage in relatively more paying, non-farm business than poorer households (Barret et al., 2001; Ellis and Freeman, 2007). In Mfyome village, the very rich households did not earn much from the CBFM forest because they were engaged more in intensive agriculture and other non-farm activities such as transport and shop keeping that were potentially more lucrative than the trade in forest products. Indeed, study data showed that in Mfyome village the average total household annual income of the very rich was 44 % higher than that of rich households.

Similar to JFM of Mikwinini village, in Gombero village CBFM tended to increase average household annual earnings from CBFM forest for all well-being categories with the very poor experiencing the highest relative increase of 62% whereas the very rich experienced the least relative increase of 13%. The highest relative increase in average annual household earnings from CBFM forest for the poorest observed in Gombero village suggest that, similar to JFM in Miwkinini village, CBFM in this village was progressive. This happened because the CBFM forest was only used for subsistence uses notably firewood and forest medicinal herbs that did not require payment of upfront fees, and limited to two days a week and each household allowed maximum of two head loads per harvesting day. The lower average household earning from CBFM (TShs 32,200) for the rich compared to the poor (50,530) could be due to the fact that these households had access to forest products in their private woodlots, and given regulated access the rich could have probably resorted to private forests where they could use freely.

Overall, the results have shown that either of JFM or CBFM could be progressive or regressive depending on governance situation[12], and/or the institution governing the PFM process. In addition, relationship of the lead institution and the village appears to influence the progressive or regressive nature of any type of PFM. In this study, both progressive JFM and CBFM   were associated with ANRA that had relatively good relationship with the communities. Regressive JFM and CBFM were associated with Catchment Forest Project and District Authority with historical bad relationship with communities. Thus investing in programmes targeting improved village or VNRC

governance and relationship between foresters and communities could make positive change towards impacts on the poorest.

These results are in contrast with past studies on PFM in Tanzania that highlighted CBFM as better for improving the incomes of the poor than JFM, given JFM restrictions which often tend to impact more heavily on the poor (Boiesen and Lund, 2003; Topp-Jørgensen *et al*., 2005; Blomley and Ramadhani, 2006). Findings from this study suggest that current CBFM arrangements particularly in productive forests are biased toward the rich by creating obstacles that prevent poor and very poor households from earning cash incomes from the forest, a situation that appears to be increasing income inequality within the CBFM village where commercial harvesting is taking place (See Gini coefficient values calculated with and without incomes from all types of forest for different PFM types in Table 11).

This discrepancy could be a result of different research methodology adopted. As opposed to stratification of community members by well-being applied in this study, all studies that reported better improvement of incomes of the poor under CBM than JFM considered communities as a whole without stratification of households by well-being. Thus, as Ellis and Allison (2004) argued, these past studies could have been naive to assume homogeneity of community members because individual livelihood strategies, and endowment or capability varies tremendously among households.

Table 11 here

The GINI coefficient was higher (indicating greater income inequality) when calculated without forest-related incomes in all the study villages except Mikwinini, where it was the same with and without forest-related income. This suggests that irrespective of forest management regime, forest-related incomes are important for reducing income inequality. This seems to be particularly true in the control communities, which saw higher GINI coefficient changes than most other communities. This can be explained because the open access regimes in the control communities give poor people access to all the products they need. Differences were lowest in the CBFM communities; perhaps because the current CBFM arrangements inadvertently increase income inequality as they favour cash income generation from the PFM forest by the rich while restricting the very poor and poor from earning cash incomes. In the JFM communities, changes were very variable. Kilama stands out as having a particularly large change in GINI coefficient when forest-related incomes are included – this may be because the village has access to substantial individual private forests with 100% of both poor and non-poor (data not shown) obtaining firewood from the private forests.

Human capital
Results showed that regardless of the forest tenure very few households reported to actually collect medicinal herbs (Table 12). This is notwithstanding results from community meetings in all communities that revealed medicinal herbs as one of benefits from any forest tenure.

Table 12 here

With exception of Kilama village (JFM), our data did not reveal notable differences in proportion of households collecting forest medicinal herbs prior and after PFM or PFM versus control communities. This suggests that in these communities collection of forest medicinal herbs was limited to few specialized individuals who are traditional healers. However, this does not mean that the community members were not using medicinal herbs as they purchase the herbs from the specialized traditional healers. This pattern of forest medicinal herbs collection and access by the general community corroborates with other studies in Tanzania that reported few traditional healers engaged in actual collection of forest medicinal herbs whereas access by other community members was through purchase (Kitula, 2007; Dery et al., 1999). Our data could not reveal the actual use of the medicinal herbs because the focus was on collection of the medicinal herbs from the forest (incomes) rather than access or actual use through purchase from specialized traditional healers (expenditures). Other studies in Tanzania have reported reliance on medicinal herbs from the forest by at least 80% of rural people as it is cheap compared to conventional health services (Dery et al., 1999).

Political Capital
Results showed that increase in attendance at any kind of meetings did not vary much among PFM types but was slightly higher in CBFM and lower in control communities with JFM falling in between (Figure 5). Meeting attendance amongst the poor was generally slightly higher in PFM communities than in control communities.

Figure 5 here

This could be attributed to the fact that community members in PFM communities had received additional training that increased their understanding (education) and hence acted as an incentive to attend meetings. However, regardless of the forest tenure, the proportion of the poor attending increased numbers of meetings was still lower (25-40%) than for the non-poor (43-68%). This implies that although PFM (both JFM and CBFM) tend to improve attendance in meetings this is likely to benefit the non-poor more.

The lower frequency of the poor attending meetings compared to the non-poor can be explained by the fact that the poor households have a higher opportunity cost of time (as evidenced by the fact that their main source of cash incomes is selling labour and that they are food insecure for most of the year). Our results on this count corroborate other recent studies that have reported low participation of the poor in meetings attributable to high opportunity costs (e.g. Weinberger and Juetting (2002) cited in Behera and Engel, 2006; Behera and Engel, 2004 cited in Behera and Engel, 2006; Behera and Engel, 2006).

Our results presented in Figure 6 show that the proportion of respondents speaking in meetings tended to be highest in JFM with 62% of those attending meetings speaking; in between for CBFM with 57% of meeting participants speaking while it was lowest in control communities with only 43% of meeting participants speaking.

Figure 6 here

The higher proportion of meeting participants speaking in PFM (both JFM and CBFM) communities compared to control communities could be attributed to the fact that community members in PFM had received more training and so were more informed compared to the control community members. The implication of our results is that through training of community members PFM (both JFM and CBFM) can improve the willingness of community members to attend meetings.

However, the variation in proportion of participants speaking in meetings between well-being categories was pertinent. In all cases, very poor and poor tended not to speak in meetings while the rich tended to be more vocal than the very rich. The lower proportion of the very poor and poor speaking in meetings could be attributed to the fact that, as Behera and Engel (2006) argued; these people have a low level of education and are less informed and hence unable to present themselves and their point of views effectively in meetings. This implies that although the very poor and poor may attend meetings they are still *de facto* kept out of the decision-making process, which is likely to have serious repercussions as the rich and very rich would pass decisions biased to their interests which are likely to be different from those of the poor. The low proportion of the very rich speaking in meetings compared to the rich could be because the interests of the very rich are well voiced by the rich or that they take less interest in village meetings because their livelihoods are generally less dependent on village activities.

Social Capital
Table 13 shows various sources of money in times of need by forest tenure types.

Table 13 here

In all cases, people depended on their principal livelihood sources as their insurance in times of need. Very few individuals relied on social networks - such as remittances from relatives, borrowing and assistance from fellow community members - as a form of insurance. A greater number of households in control communities saw social networks as insurance options. This would suggest that PFM, of either type, did not impact positively on social networks.

Natural Capital

Results showed that the majority of individuals in JFM and CBFM communities perceived improved forest condition with time, with each of the two PFM type having 80.9% of responses reporting improved forest conditions. The trend was reversed for control communities where 69.1% of responses perceived that the forest condition had deteriorated over the time under consideration (Table 14).

Table 14 here

These results indicate that both JFM and CBFM are perceived to have had a positive impact on forest condition, which entails improvement in the natural capital. The agreement in perceptions between all the wellbeing groups and communities is strong enough to suggest that this is a real phenomenon. Past ecological/biological studies in Iringa and Tanga regions reported improved forest condition in terms of both forest regeneration and biodiversity (Luoga *et al*., 2006b; Sauer and Abdallah, 2007). Luoga *et al*. (2006b) reported increased tree species stocking, volume and reduced human disturbances in Handei Hill Forest Reserve in Tanga region after five years of JFM implementation. Conversely, high species diversity indices in forest areas under CBFM but lower in forests in non-PFM situations have been reported (Sauer and Abdallah, 2007) and this has been attributed to the absence of or weak property rights (Sauer and Abdallah, 2007) and lack of mechanisms for regulating access (Watts, 2003).

Unfortunately for farmers, the improved forest condition was associated with increased number of wild animals that damaged crops in farms reported in two of the JFM cases and two CBFM case the poorest being more negatively affected than the rich. For example, in Mikwinini village (JFM), crop pests accounted for 50% of responses on shocks for the very poor but only 28.1%, 13.3% and 0% for poor, rich and very rich households. Corresponding responses in Mfyome village (CBFM community) were 6.3%, 0%, 0% and 7.1%.

CONCLUSIONS AND RECOMMENDATIONS
Improved natural capital through regulated forest utilization means that PFM presents the possibility of sustaining benefit flows more than a non-PFM situation where the natural resource base is threatened. However, results from this study indicate that, in their current form, neither JFM nor CBFM is supporting an equitable distribution of the benefits and costs of devolved forest conservation and management. Current administrative arrangements appear to exclude the poor from realizing the full suite of benefits offered by PFM.

Where the implementation of PFM (both JFM and CBFM) is accompanied by IGAs, it inadvertently results in increased inequality. This is because the initial investment costs for participation are too high for the poor, making any benefits associated with IGAs available only to the non-poor.

Although CBFM allows for cash income than JFM, under the current CBFM arrangements, the requirements for pre-paid permits for commercial harvesting in CBFM forest create insurmountable obstacles to the poor, limiting their income generating opportunities from the forest and increasing inequality. In theory, CBFM has a higher potential for income generation, indicating that should these obstacles to the poor be removed, CBFM could make a larger contribution to poverty reduction.

In Tanzania, policy and legislation allow three forms of CBFM i.e. involving the whole community-VLFR, special group of community members involved-CFR and individuals involved-PF. However, in practice only VLFR CBFM type is being implemented. Given the challenges hindering the poorest to benefit from the current CBFM the pro-poor

approach to CBFM would be to make a consideration where the poorest would be given small sections of the forest as a group i.e. CFR with differential fee structure that suit their capability.

PFM in a degraded forest does not benefit community members in the short-term as benefits are not realized until the forest has regenerated sufficiently to allow for sustainable timber off take. In the short term, communities must shoulder management costs on the expectation of future benefits. The situation is different for PFM, particularly CBFM of good condition forest, as incomes generated are used to cover management costs, making it more likely that community members will see a direct benefit for any associated costs (such as labour/time) which they must bear.

PFM can have impact on the non-PFM forest existing in the community. In the case of JFM, any non-JFM forest tends to become degraded once JFM restrictions are in place implying shift (leakage) of degradation efforts to non-JFM forests. In CBFM settings with an adjacent non-CBFM forest, the community responds by applying the rules and regulations of CBFM in all forest patches within their vicinity. Future efforts to conserve forest resources might want to reflect on this, and prioritize the expansion of CBFM coverage instead of JFM or ensure that both forms of PFM are implemented in a manner that encourages broader (landscape) management of natural resources.

NOTES

1. The Socio-economic Monitoring programme (SEMP) was created within the broader project of the Conservation and Management of Eastern Arc Mountain Forests (CMEAMF), Tanzania: GEF-UNDP-URT/01/00015426. The project is funded by Global Environmental Facility (GEF) through the United Nations Development Programme (UNDP). CARE International in Tanzania (CARE) implements the SEMP component under the terms of an agreed Memorandum of Understanding with the Forest and Beekeeping Division that was signed on the 12th August 2003.
2. This study is part of a multi-country research initiative, Action Research into Poverty Impacts of Participatory Forest Management (ARPIP) that was led by the Overseas Development Institute (ODI), UK, with support from the Ford Foundation and CARE International in Tanzania; that aimed at assessing and comparing the impacts of PFM on poverty reduction across countries. SEMP was mainstreamed in ARPIP for cost effectiveness and efficiency reasons. Other countries involved in ARPIP are Kenya and Nepal, and the technical back up has been from the Overseas Development Institute (ODI), UK. For the purposes of cross-country comparison, it has been necessary to adopt a uniform methodology. This has influenced some of the data collection/analysis choices.
3. Use of recall questions means that validity of the data, particularly for the period just before PFM, relies on the ability of interviewees to remember correctly. This aspect could vary from respondent to respondent.
4. This is one of the pilot *Ujamaa* (traditional socialism in Tanzanian context) villages that was established and supported by Mwalimu Nyerere in the 1970s.
5. The term "very rich" in the context of this study is rather relative and does not necessarily correspond to wealth or income much above the conventional poverty line.

6. In some areas, villagization did not involve much resettlement, either because in-migration prior to the villagization period led to high density areas which did not need to be nucleated for easier social service provision or because strong and politically organized ethnic groups (such as the Waluguru) were able to resist significant displacement. In the latter case, the continued dominance of one cultural group in an area has allowed forest-based cultural practices to continue, or at a minimum, maintained the basis for their revival.
7. Gombero village (CBFM) did not collect any revenues from forest because the forest was temporary closed to allow for regeneration as the forest was degraded prior to CBFM establishment.
8. Amani Nature Reserve attracts many eco-tourists and searchers because of well established infrastructure by ANRA centre. The ANRA supports CBFM in Mgambo village the fact that leads to some spill over of the eco-tourists and researchers to Gombero village

9. Gombero village had a productive flood plain that lied idle for a long time but had been put under rice production, as a cash crop with ready market in the nearby Korogwe town, following extension services provided through the Korowge District Agriculture and Livestock Department under the auspicious of Participatory Agriculture Development Programme (PADEP) implemented in various places of Tanzania but with no link to PFM. Qualitative evidence shows that rice cultivation in Gombero was one of the factors that moved people out of poverty

10. Mfyome village had CBFM forest that was fairly stocked with various forest products that could be harvested.

11. In Gombero village, although community members were not using their forest designated as CBFM forest, they were using CBFM bylaws and regulations to manage the other forest (Shamba-kapori forest) where they got their forests. Only subsistence uses, particularly firewood and medicine, are allowed in Shamba-kapori forest and limited to two days a week and each household allowed two head loads per harvesting day. Although there are no formal patrols, the forest is so close to the village that any intruder would easily be spotted and reported to the VNRC or Village Government who have the power to enforce the by-laws. Because of the use of bylaws and CBFM regulation for managing the Shamba-Kapori forest we considered this forest as CBFM in analysis of the income data.

12. There was an interesting association of good governance scores (data not presented) and progressive or regressive nature of all PFM types studied. Both progressive JFM (Mikwinini village) and CBFM (Gombero village) cases studied recorded equal and highest governance score of 17. The regressive JFM (Kilama village) and CBFM (Mfyome village) cases studied recorded the lowest governance scores of 10 and 14, respectively.

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Table 1: Main socio-economic and ecological characteristics for case study villages in the Eastern Arc Mountain area, Tanzania

District	Village	Village population	Number of households interviewed	Percent of total household sampled	Dates when…			Rainfall (mm/year)	Vegetation
					Community first settled in the area	PFM process started	PFM bylaws approved		
Iringa rural	Mfyome	2598	42	6	1964	1999	2002	600	Miombo woodlands
	Kiponzelo	2489	41	10	1973	Not applicable as it is "control" community		1000	Miombo woodlands
Kilolo	Lulanzi[4]	3642	40	10	1974	1999	2002	1000-1600	Montane forest
Muheza	Mgambo	2110	47	12	1974	1996	1997	600-800	Tropical forest
	Mikwinini	589	40	37	1974	1996	1997	1800-2200	Montane forest
Korogwe	Mswaha	3186	40	13	1975	Not applicable as it is "control" community		≅600	Lowland dry forest
	Gombero	1119	40	13	1966	2001	Not yet approved	781	Lowland dry forest
Morogoro	Changa	3120	36	7	<1925	1999	2004	1700	Low land moist forest
Kilombero	KIlama	2745	42	7	1972	1999	Not yet approved	2000	Montane forest

Table 2: Characterization of sampled households by well-being categories in the Eastern Arc Mountain area, Tanzania

Well-being category (strata)	Number of households sampled								
	Control communities			JFM communities			CBFM communities		
	Kiponzelo	Mswaha	Lulanzi	Mikwinini	Changa	Kilama	Gombero	Mgambo	Mfyome village
Very rich	2*	5	1*	1*	5	5	4*	7	8
Rich	6	8	5	10	10	7	6	19	7
Poor	20	20	22	22	13	25	27	9	6
Very poor	13	7	12	7	8	5	3*	5	21
Total	**41**	**40**	**40**	**40**	**36**	**42**	**40**	**40**	**42**

*Well-being categories with household number less than 5 during participatory wealth ranking

Table 3: Summary facts on motivation for PFM establishment in case study villages within the Eastern Arc Mountain area, Tanzania

PFM Type	Communities	Date PFM process started	Motivation
JFM	Kilama	2000	To reduce Catchment Forest Project expenses by involving communities in forest management
JFM	Lulanzi	1999	
JFM	Mikwinini	1997	
JFM	Changa	1999	
CBFM	Gombero	1999	Concern by DLNRO over degradation of forest and control of revenues from the forest
CBFM	Mfyome	1999	Response by government (local and central) to serious degradation of the woodlands
CBFM	Mgambo	1997	To reduce forest degradation through establishment of CBFM for sustainable use of natural resources
Control	Kiponzelo	NA	To reduce rate of deforestation of woodland and environmental degradation
Control	Mswaha-darajani	NA	Community fear of losing ownership as a result of mismanagement Protection of sacred tree species by local communities Opportunity to collect more forest revenue at community level by the village government

Source: Respective village records; discussion with respective village leaders and foresters (2006)

Table 4: Characteristics of well-being groups of the case study communities within the Eastern Arc Mountain area, Tanzania

Assets	Well-being categories			
	Very rich	Rich	Poor	Very poor
House	Brick walls, cement floor and iron roof	Brick wall, cement or mud floor and iron roof	Pole and mud walls, mud floor and thatched roof	Dilapidated houses with pole and mud walls, mud floor and grass thatched roof
Land owned	2-10 hectares or more; some of the land may be suitable for irrigation	1-3.4 hectares or slightly more; may rent in land; some of the land may be suitable for irrigation	0.4-2.5 hectares; may rent in land; no land suitable for irrigation	0-0.5 hectares; may rent in land
Livestock	1- 60 indigenous or dairy cattle or both; 5-30 goats; 50-60 chicken	0-50 indigenous cattle; 1-7 goats; 10-50 chicken	No cattle; 0-5 goats; 4-30 chicken; may own guinea pigs	No livestock in most cases but occasionally may own up to 4 chicken
Food security	Food secure all the year; 3 meals a day; may sell some crops	Food secure only for 5-8 months a year then food insecure; 3 meals a day but may not choose what to eat	Food secure for up to 5 months a year then food insecure	Food insecure most of the year
Labour market	Hires labour during cropping season	May hire labour but sometimes also sell labour	Sell labour	Sell labour
Dependence on remittances	Never depend on remittances	Sometimes receive remittances	Rely on remittances	Heavily rely on remittances
Other assets	Up to 4 bicycles; Motorbike; vehicle; radio/cassette; sofa set; implements	1-2 bicycles; Ordinary radio; wooden chairs;	1 or no bicycle; sleep on mats; may not have beds	No bicycles; sleep on dilapidated mats; no bed at all
Off-farm activities	May own shops or kiosk; lodging; bar; trading; milling machine; commuter or bus	May do trading and own kiosk; sell timber and charcoal to town	Some do petty trading or tailoring; local beer brewing	Virtually no other off-farm activities apart from selling labour
Access to education	May be able to pay for private and good schools for their children up to secondary education	May be able to pay for public schools for their children up to secondary education	Can only afford to pay for their children up to primary education	Occasionally their children get o primary education

Table 5:   Forest revenues collected at community level by forest tenure in the case study communities within the Eastern Arc Mountain area, Tanzania

PFM type	Communities generating income	Sources of incomes	Annual income per village (USD)*		Source of data
			Average	Range	
JFM	2/4 communities	Eco-tourism and research fees, user fees collected from commercial harvesters of non-timber forest products	88	26-150	Topp-Jørgensen *et al.* (2005) for Lulanzi; Mikwinini village records
CBFM	2/3 communities	Eco-tourism and research fees for one village with degraded forest; user fees collected from commercial harvesters of firewood, charcoal and timber	1405	500-2309	Lund (2007) for Mfyome village; Mgambo village records
Control	0/2	Nil	0	0	Respective Village records; group discussion during feedback meetings

*TShs 1,200 = 1 USD in 2007

Table 6:   Changes in physical capital over time in different forest tenure types within the Eastern Arc Mountain area, Tanzania

Type of forest tenure	Changes in community level infrastructure		
	Road construction	Construction of school building	Repair of community tractor
JFM (4 communities)	0/4 communities	2/4 communities	0/4 communities
CBFM (3 communities)	0/3 communities	2/3 communities	1/3 communities
Control (2 communities)	0/3 communities	0/3 communities	0/3 communities

Table 7: Summary situation on access to health services in the case study communities within the Eastern Arc Mountain area, Tanzania

PFM type	Community	Distance to nearest dispensary or health centre (km)	Remarks
JFM	Kilama	0	
	Changa	4	
	Lulanzi	5	
	Mikwinini	2	Health services provided by EUTCO-private company hospital
CBFM	Gombero	5	Mobile clinic services provided by the government once a month
	Mgambo	8	Mobile clinic services provided by the government once a month
	Mfyome	0	
Control	Kiponzelo	0	
	Mswaha Darajani	32	Mobile clinic services provided by the government once a month

Table 8:   Regulations applied in different forest tenure types in the case study communities within the Eastern Arc Mountain area, Tanzania

Type of forest tenure	Presence of other forest patches apart from PFM forest	Bylaws applied to both PFM and non-PFM forests
JFM (4 communities)	1/4 communities	0/4 communities
CBFM (3 communities)	3/3 communities	2/3 communities
Control (2 communities)	-	-

Source: PRA in respective villages (March 2006-February 2007)

Table 9: Fee structure for forest products harvested in selected communities with forests under PFM in the Eastern Arc Mountain area, Tanzania[4]

S/N	Forest service/product	Unit of quantity	Fee per unit (TShs)*
	Fee structure for CBFM forest in Mfyome village in Iringa, Tanzania		
1.	Charcoal	70 kilos sack	700
2.	Firewood (dead wood)	7 tones lorry	10,000
3.	Mushroom	20 litres tin	100
4.	Building poles	Pieces	50
5.	**Wood for carvings**		
	Blackwood (*Dalbergia melanoxylon*)	Cubic metres	50,000
	Logs for construction of beehives, mortar, pestle and traditional chairs	Pieces	500
	Wood for construction of tool handles and wooden spoons	Pieces	50
6.	Eco-tourist fee	Per person per day	10,000
7.	Research fee	Per group per day	5,000
8.	Stone quarrying by non community member	7 tone lorry	3,000
9.	Sand quarrying by non community member	7 tone lorry	1,000
10	Sand quarrying by community members	7 tone lorry	500
11.	Grasses for basketry	Head loads	50
12.	Thatching grasses	Head loads	50
13	Firewood for burning bricks or curing tobacco by non-community members	7 tone lorry	4,500
14	Firewood for burning bricks or curing tobacco by community members	7 tone lorry	2,000
15.	Grazing in the CBFM forest by community members	Per flock per year	5,000
16.	Grazing in the CBFM forest by non-community members	Per flock per day	10,000
17	Collection of traditional medicine by traditional healers that are non-community members	Per person per year	5,000
18	Collection of traditional medicine by traditional healers that are community members	Per person per year	1,000
	b) Fee structure for JFM forest in Lulanzi village in Iringa, Tanzania		
1	Honey	Litres	50
2	Grasses for basketry	Head loads (3 kgs)	100
3	Thatching grasses	Head loads (50 kgs)	200
4	Mushrooms	3 tins (60 Litres)	300
5	Vegetables	2 tins (40 Litres)	100
6	Fruits	2 tins (40 Litres)	500
7	Traditional medicine collection	Every visit	2,000
8	Insects (e.g. edible grasshoppers)	Every visit	1,000
9	Hanging modern beehives	Pieces per year	500
10	Hanging traditional (bark) beehives	Pieces per year	1,000
11	Research without taking anything (foreigners)	Per person per day	50,000
12	Research without taking anything (citizens)	Per person per day	3,000
13	Eco-tourist fee (foreigners)	Per group plus tour guide	50,000
14	Eco-tourist fee (citizens)	Per group plus tour guide	3,000
15.	Camping site inside the forest (foreigners)	Per person per day	50,000
16.	Camping site inside the forest (citizens)	Per person per day	3,000
17	Study tour	Per group per day	10,000

*TShs 1200 = USD 1 in 2007

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[4] The fees applies for commercial harvesting, as harvesting for subsistence use is free of charge for all villages

Table 10: Average household annual incomes and earnings from PFM forest before and after PFM by well-being in selected case study communities in the Eastern Arc Mountain area, Tanzania

Community	PFM type	Well-being categories	# of households (% in brackets)	Average annual household income (TShs)**	Average annual household earnings from PFM forests (TShs)**		
					After PFM (TShs)	Before PFM (TShs)	Relative change (%)
Kilama	JFM	Very rich	6(1.8)	2,457,720	0	0	-
		Rich	86(26.2)	1,062,000	0	9,200	-100
		Poor	218(66.5)	508,213	2,653	15,310	-83
		Very poor	18(5.5)	300,650	0	0	-
Mikwinini		Very rich*	10(11.4)	-	-	-	-
		Rich	38(43.2)	1,259,510	57,900	48,000	+21
		Poor	38(43.2)	533,586	65,066	27,484	+137
		Very poor	2(2.3)	226,597	59,571	38,541	+55
Mfyome	CBFM	Very rich	16(2.5)	7,680,987	61,313	68,300	-10
		Rich	60(9.5)	5,316,944	3,235,386	1,607,495	+101
		Poor	173(27.5)	427,771	62,013	50,310	+23
		Very poor	380(60.4)	473,436	70,235	46,205	+52
Gombero		Very rich	18(4.5)	2,668,025	56,561	50,049	+13
		Rich	192(48.1)	1,345,583	32,200	28,000	+15
		Poor	156(39.1)	770,263	50,530	33,174	+52
		Very poor	33(8.3)	438,533	27,200	16,800	+62

*There was only one very rich sample household that was an outlier and therefore excluded from the data; **TShs1200 = USD 1 in 2007

Table 11: GINI Coefficient values[5] calculated with and without forest related incomes for case study communities within the Eastern Arc Mountain area, Tanzania

PFM type or control	Community	Gini coefficient without forest-related income	Gini coefficient including forest-related income	% decrease of Gini coefficient due to forest incomes
JFM	Kilama	0.6	0.47	22
	Changa	0.43	0.42	2
	Lulanzi	0.74	0.7	5
	Mikwinini	0.48	0.48	0
	Overall	**0.56**	**0.52**	**7**
CBFM	Gombero	0.46	0.45	2
	Mgambo	0.65	0.64	2
	Mfyome	0.77	0.75	3
	Overall	**0.63**	**0.61**	**3**
Control	Kiponzelo	0.57	0.54	5
	Mswaha Darajani	0.59	0.52	12
	Overall	**0.58**	**0.53**	**9**

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[5] A Gini coefficient of one (1) indicates a high degree of inequality while a Gini coefficient of zero (0) indicates perfect equality.

Table 12: Summary of households engaged in collection of forest medicinal herbs by forest tenure now compared to Year X in the case study communities within the Eastern Arc Mountain area, Tanzania

PFM type	Now		Year X	
	Communities with households collecting medicinal herbs	Average proportion of household collecting medicinal herbs	Communities with households collecting medicinal herbs	Average proportion of household collecting medicinal herbs
CBFM	3 out of 3	4	3 out of 3	4
JFM	4 out of 4	3	3 out of 4	2
Control	2 out of 2	2	2 out of 2	2

Table 13: Responses on household sources of money in times of need (%) in the case study communities within the Eastern Arc Mountain area, Tanzania

PFM type	Community	Begging	Borrowing	Casual labour	Church aid	Health insurance	Off-farm activities	Remittances[6]	Salary	Savings	Selling crops	Selling forest products[7]	Selling livestock	Selling tree seedlings	No means	Total
JFM	Changa	0	11	9	0	0	0	20	0	11	21	0	29	0	0	100
	Kilama	0	16	16	2	0	8	4	0	0	42	2	8	0	2	100
	Lulanzi	3	16	3	0	0	7	14	3	5	20	4	11	0	15	100
	Mikwinini	0	10	10	0	0	6	17	10	4	38	0	2	2	0	100
	Overall	**1**	**14**	**9**	**0**	**0**	**5**	**14**	**3**	**5**	**29**	**2**	**13**	**0**	**5**	**100**
CBFM	Mfyome	0	13	13	0	0	8	10	0	6	23	3	24	0	0	100
	Mgambo	0	0	2	0	0	16	16	10	12	42	0	2	0	0	100
	Gombero	0	11	9	0	0	0	20	0	9	23	0	29	0	0	100
	Overall	**0**	**8**	**8**	**0**	**0**	**8**	**15**	**3**	**9**	**29**	**1**	**19**	**0**	**0**	**100**
Control	Kiponzelo	0	22	2	0	2	13	13	9	2	24	0	15	0	0	100
	Mswaha-darajani	0	19	0	0	0	8	21	2	4	21	11	15	0	0	100
	Overall	**0**	**20**	**1**	**0**	**1**	**10**	**17**	**6**	**3**	**22**	**6**	**15**	**0**	**0**	**100**

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[6] Remittances include in-kind or cash contributions from relatives and other community members
[7] Forest products include charcoal, firewood and forest medicinal herbs

Table 14: Percent responses on perceptions of individuals by well-being on changes of forest condition after PFM implementation in the Eastern Arc Mountain area, Tanzania

PFM type or control	Community	Very poor		Poor		Rich		Very rich		All well-being categories	
		Forest condition better today	Forest condition worse today	Forest condition better today	Forest condition worse today	Forest condition better today	Forest condition worse today	Forest condition better today	Forest condition worse today	Forest condition better today	Forest condition worse today
JFM	Changa	66.7*	0	88.9	3.7	100	0	100	0	90	2.5
	Kilama	100	0	65	0	50	0	75	0	69.2	0
	Lulanzi	58.3	8.3	76.2	19	80	20	100	0	71.8	15.4
	Mikwinini	100	0	86.4	0	100	0	100	0	92.5	0
	Overall	**81.3**	**2.1**	**79.1**	**5.7**	**82.5**	**5**	**93.8**	**0**	**80.9**	**4.5**
CBFM	Mfyome	44.4	16.7	83.3	0	55.6	0	100	0	63.4	7.3
	Mgambo	100	0	84.2	10.5	87.5	0	100	0	89.4	4.3
	Gombero	66.7	0	88.9	3.7	100	0	100	0	90	2.5
	Overall	**70.4**	**5.6**	**85.5**	**4.7**	**81**	**0**	**100**	**0**	**80.9**	**4.7**
Control	Kiponzelo	9.1	72.7	20	55	40	60	0	100	18.4	63.2
	Mswaha-Darajani	0	42.9	5.3	78.9	0	88.9	0	80	2.5	75
	Overall	**4.6**	**57.8**	**12.7**	**67**	**20**	**74.5**	**0**	**90**	**10.5**	**69.1**

*Some rows may not add up to 100 because there were some responses on "*no change*" and "*don't know*" that are not included in this Table.

Box 1: Community Views on Income Generating Activities associated with PFM in selected communities within the Eastern Arc Mountain area, Tanzania

"We are advised to generate income through beekeeping and we have been given three bee hives by the forester. Now the bee hives have no bees because we could not take care of them. We would like to keep livestock because we are not used to beekeeping culture in the Uluguru but we are not given that opportunity to choose."
-Discussion with VNRC members in Changa village (JFM), March, 2006

".We are happy with mushroom production project that was promoted by the forester. But we are not able to get the mushroom seeds and the forester could not provide more seeds once we harvested the first crop. Also we wouldn't like beekeeping business because we are not used to it and we waste our energy for doing things for which we have no competency. Look, last year we got only three litres of honey which was divided amongst twelve people."
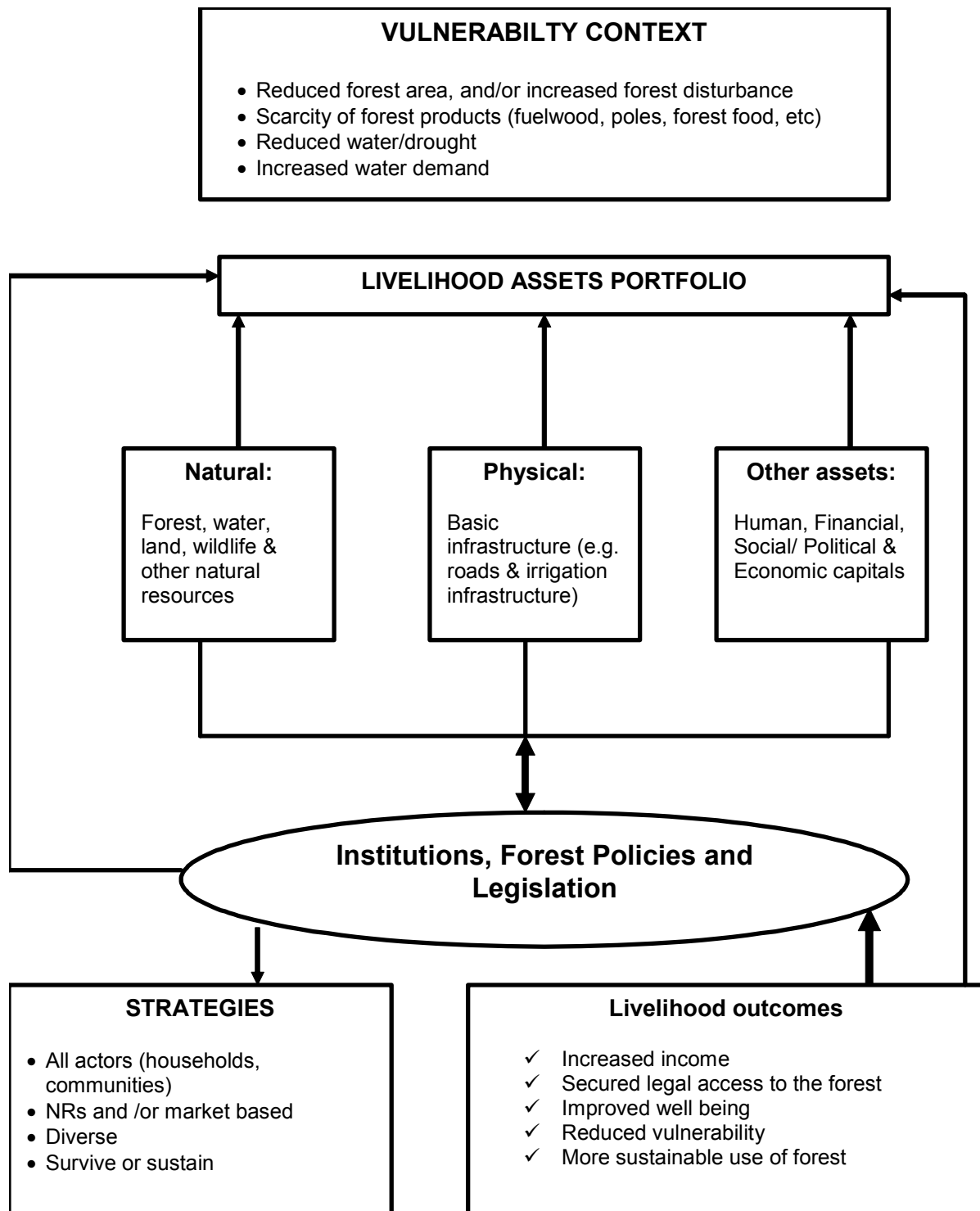-Discussion with VNRC members In Kilama village (JFM) August, 2006

VULNERABILTY CONTEXT

- Reduced forest area, and/or increased forest disturbance
- Scarcity of forest products (fuelwood, poles, forest food, etc)
- Reduced water/drought
- Increased water demand

LIVELIHOOD ASSETS PORTFOLIO

Natural:

Forest, water, land, wildlife & other natural resources

Physical:

Basic infrastructure (e.g. roads & irrigation infrastructure)

Other assets:

Human, Financial, Social/ Political & Economic capitals

Institutions, Forest Policies and Legislation

STRATEGIES

- All actors (households, communities)
- NRs and /or market based
- Diverse
- Survive or sustain

Livelihood outcomes

- ✓ Increased income
- ✓ Secured legal access to the forest
- ✓ Improved well being
- ✓ Reduced vulnerability
- ✓ More sustainable use of forest

Figure 1: The modified sustainable livelihood framework applied in this study
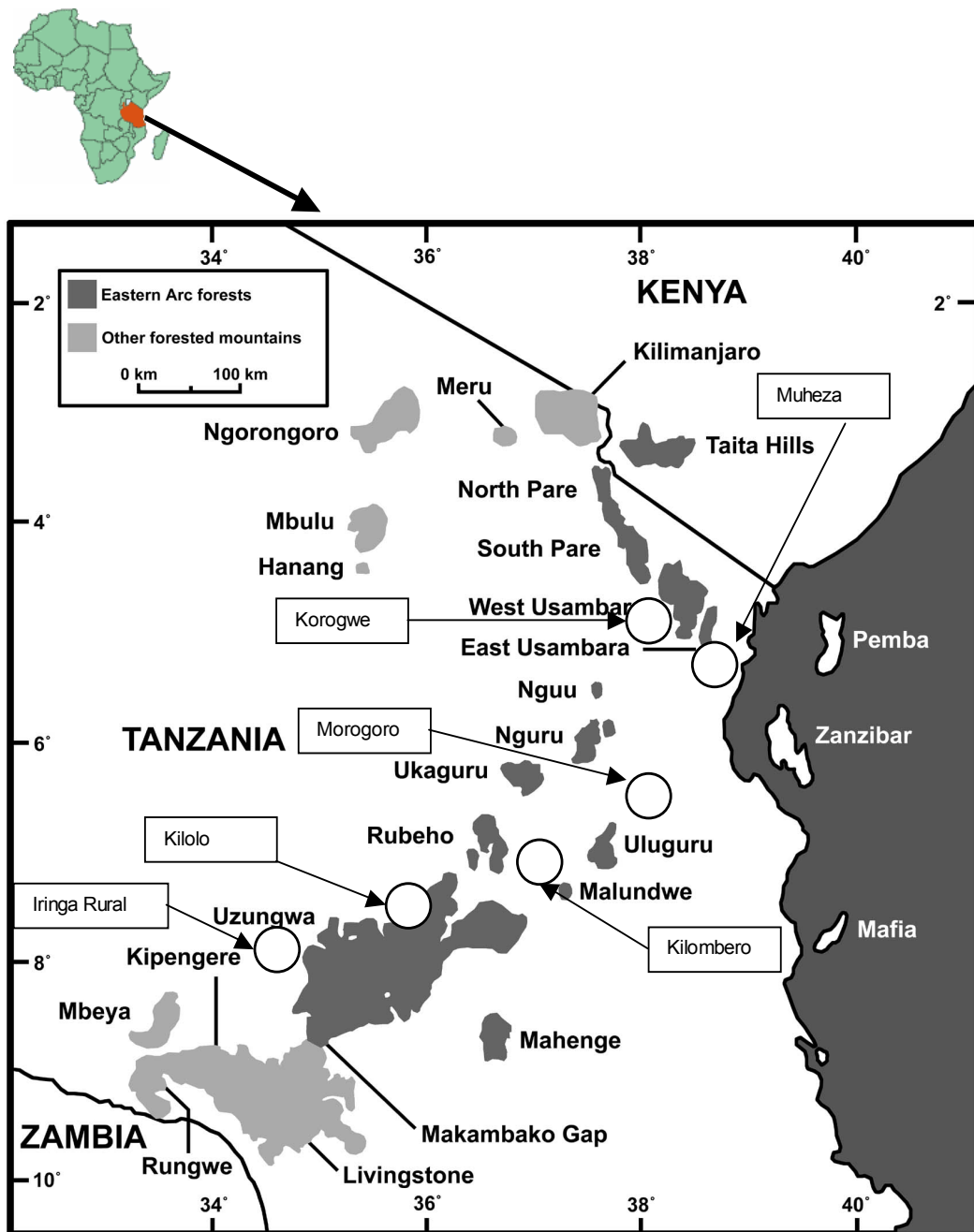
Figure 2: Sketch map showing study districts in the Eastern Arc Mountain area, Tanzania

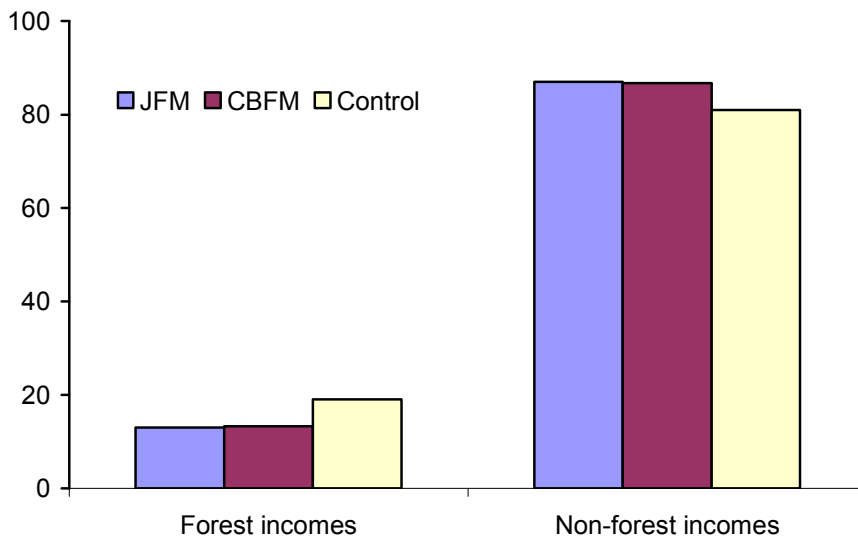Source: [http://www.easternarc.org/html/map.html] and [www.easternarc.or.tz]

Figure 3: Average share of different activities in average household annual incomes after PFM initiatives in the case study communities within the Eastern Arc Mountain area, Tanzania
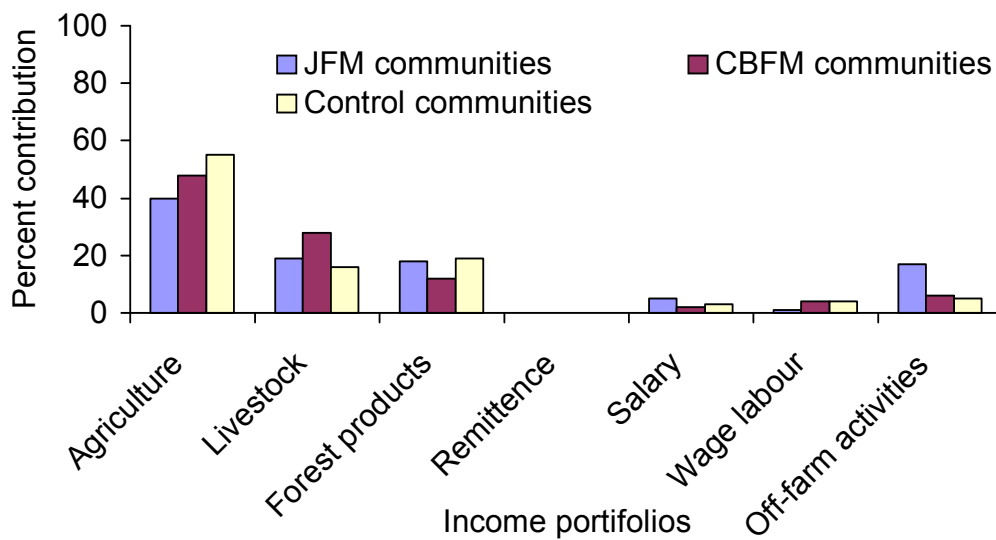

Figure 4: Average share of different activities in average household annual incomes before PFM initiatives in the case study communities within the Eastern Arc Mountain area, Tanzania
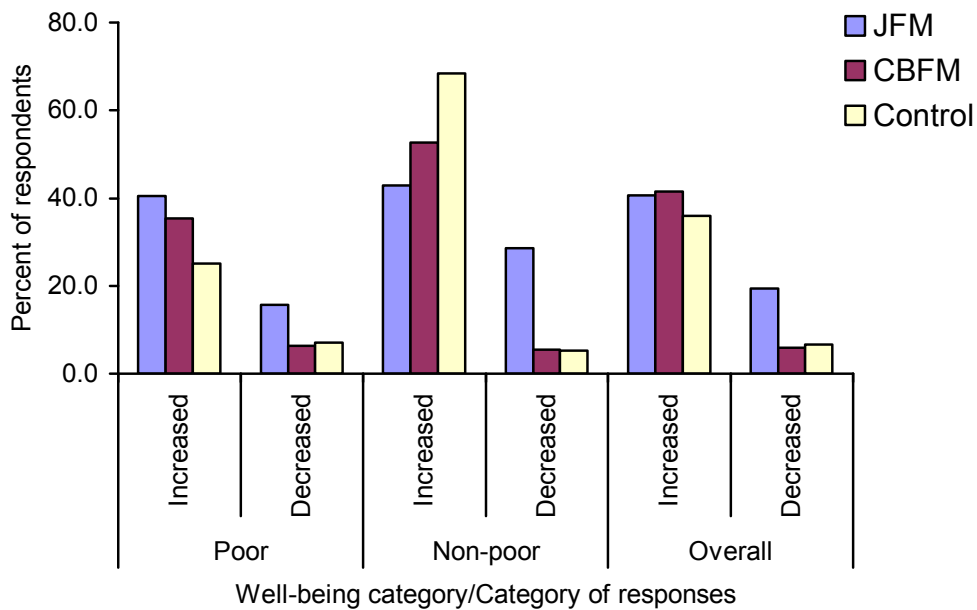
Figure 5: Proportion of respondents in different well-being groups attending more or less meetings today than in Year X in the case study communities within the Eastern Arc Mountain area, Tanzania
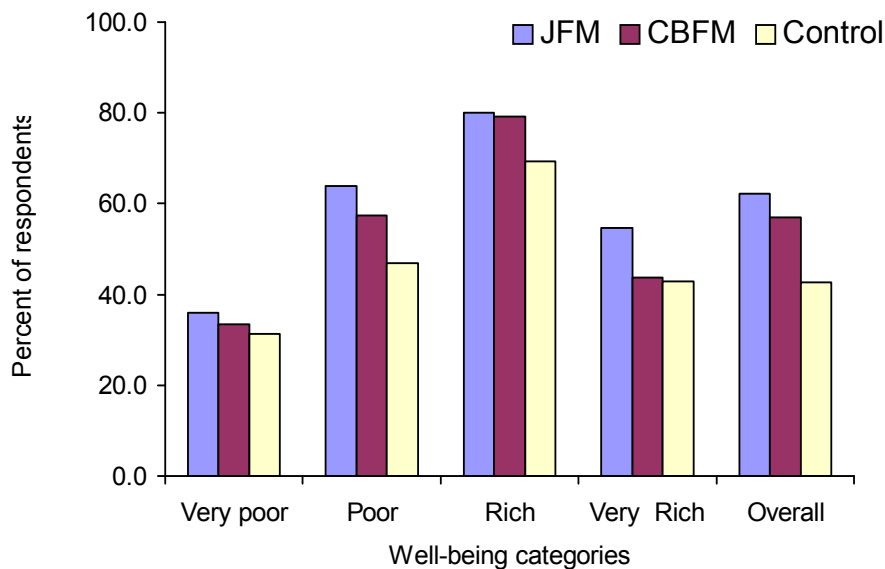

Figure 6: The proportion of respondents in different well-being groups who spoke in village meetings in the case study communities within the Eastern Arc Mountain area, Tanzania