Participatory forest management and its impacts on livelihoods and forest status: the case of Bonga forest in Ethiopia

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SUMMARY

The forest resources in Ethiopia have suffered decades of mismanagement due mainly to loosely defined property relations over these resources. As one of the solutions, Participatory Forest Management (PFM) scheme was introduced during the early 1990s by some NGOs. Nearly two decades of experience now exists in the country. However systematic assessments of the performance of the scheme are scanty. This study reports the experience from Bonga PFM project, which is one of the oldest pilot sites. Forest inventory and socio-economic survey were conducted to collect data. The study was conducted during a transition from NGO - Community to State - Community based management of the PFM project. PFM is shown to have positive impacts both on the state of the forest and living condition of participant households at least within the project life time. Forest conditions such as seedling and sapling densities improved. PFM also (i) promoted awareness about forest, (ii) capacitated locals to form new institutional arrangement that increased their participation in forest management, helped to reduce open access and assisted a regulated forest use, and (iii) contributed towards social equity in terms of gender and minority ethnic groups. When accompanied with complementary non-forest based livelihood activities, PFM helped to diversify income sources, increase household income level, and build household assets. This reduced dependence of communities on forests for livelihoods. A challenge threatening the sustainability of the PFM program in Ethiopia is the weak government support for the scheme. PFM is still far from being mainstreamed in the forest management system of the country. Thus, it will be appropriate to assess how the PFM programs would perform few years after the support of the NGOs terminates.

Keywords: Community participation, income, livelihoods, NGOs, regeneration

Gestion forestière de participation et ses impacts sur les revenus et le statut forestier: le cas de la forêt de Bonga en Ethiopie

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Les ressources forestières de l'Ethiopie ont subi des décennies de mauvaise gestion due principalement à la définition lâche des relations de propriété de ces ressources. Un projet de gestion forestière de participation (PFM) fut introduit au début des années 90 par quelques organisations non gouvernementales. Le pays possède maintenant presque deux décennies d'expérience dans ce domaine, mais les évaluations systémayiques de la performance du projet sont sommaires. Cette étude brosse un rapport de l'expérience du projet de PFM de Bonga, qui est un des sites pilotes les plus anciens. Un inventaire forestier et une recherche socio-économique ont été effectués pour relever des données. L'étude a été conduite durant une transition du projet PFM, d'une gestion organisations non gouvernementales-communauté à une gestion état-communauté. La PFM prouve avoir des impacts positifs sur l'état de la forêt et les conditions de vie des foyers participants pendant au moins la durée de vie du projet. Les conditions de la forêt telles que les densités de plants et de jeunes arbres se sont améliorées. La PFM a aussi (i) promu une prise de conscience de la forêt, (ii) a donné aux locaux le pouvoir de former un nouvel arrangement constitutionnel augmentant leur participation dans la gestion de la forêt, (iii) a offert une contibution vers l'équité sociale en termes de sexe et de groupes ethniques minoritaires. Quand elle a été acompagnée par des activités complémentaires pour créer des revenus non basés sur la forêt, la PFM a aidé à diversifier les sources de revenus, à élargir le niveau de revenu des foyers, et à fortifier leur avoir. Cela a réduit la dépendance des commmunautés sur la forêt. Le défi menaçant la durabilité du programme de PMF en Ethiopie est le faible soutien gouvernemental pour le projet. La PFM est encore loin d'être courante dans le système de gestion forestière du pays. Il sera par conséquent approprié d'évaluer la performance des programmes de PFM quelques années après la fin de leur soutien par les organisations non-gouvernementales.

La gestión forestal participativa y sus impactos sobre el nivel de vida y el estado del bosque: un estudio del bosque de Bonga, Etiopía

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Los recursos forestales de Etiopía han sufrido décadas de mala administración, debido sobre todo a una definición poco precisa de los títulos de propiedad de estos recursos. Un programa de Gestión Forestal Participativa fue introducido por parte de algunas ONGs durante la primera parte de la década de los 1990 como solución para esta situación, y ahora el país ha tenido casi dos décadas de experiencia de este modelo. Sin embargo, existen pocas evaluaciones sistemáticas del programa. Este estudio informa sobre las experiencias del proyecto de Gestión Forestal Participativa de Bonga, uno de los primeros lugares piloto, y con el objeto de reunir datos se realizaron un inventario forestal y una encuesta de carácter socioeconómico. El estudio se llevó a cabo durante el proceso de transición del proyecto, desde la gestión por parte de la ONG hacia una gestión comunitaria. Se demuestra que la Gestión Forestal Participativa tiene impactos positivos sobre el estado del bosque y las condiciones de vida de los hogares participantes, al menos mientras continuaba el proyecto. Se notó una mejora en ciertas condiciones forestales como la densidad de plantas de semillero y de árboles jóvenes, y la Gestión Forestal Participativa (i) promovía la conciencia forestal; (ii) capacitaba a la población local a formar nuevos organismos institucionales que aumentaban su participación en la gestión forestal, ayudaban a reducir el acceso libre y a regular el uso del bosque; y (iii) contribuía a la justicia social en cuanto al género y a los grupos étnicos minoritarios. Cuando fue acompañada de actividades complementarias no forestales, la Gestión Forestal Participativa contribuía a la diversificación de las fuentes de ingresos, al aumento de los ingresos y a la acumulación de bienes del hogar, lo cual reducía la dependencia de la población local de los bosques. La falta de apoyo gubernamental, sin embargo, amenaza la sostenibilidad del programa de Gestión Forestal Participativa en Etiopía, ya que la Gestión Forestal Participativa dista mucho aún de formar parte de la corriente dominante del sistema de gestión forestal del país. Por eso se aconseja volver a evaluar el rendimiento de los programas de Gestión Forestal Participativa algunos años después de que se acabe el apoyo financiero de las ONGs.

INTRODUCTION

Ethiopia is a landlocked and predominantly agrarian country. Agriculture, including forestry, accounts for 54% of the Gross Domestic Product (GDP), employs 85% of the population, accounts for about 90% of the export and supplies over 90% of the raw materials for the agro-industries (MoFED 2006). Ethiopia owns diverse vegetation resources that include high forests, woodlands, bushlands, plantations, and trees outside forests. Each of these vegetation resources variously contributes to the production, protection and conservation functions, and play significant role in the national and local economy. There are six key economic roles that forest resources play in Ethiopia: (i) foreign currency earnings, mainly from export of non-wood forest products; (ii) import substitution for energy; (iii) contribution to the GDP; (iv) employment generation; v) livelihood support for millions of citizens, and vi) provision of environmental services that support other sectors, particularly agriculture, construction and energy. At local level forests and trees provide food, medicine, energy, fodder, farm implement and construction materials. Upon conversion forestlands have been offering fertile croplands to sustain crop production. When protected forests are used as rangelands, act as biological measures to conserve soil and water and provide watershed protection. Studies show that 90% of the energy used in Ethiopia originates from biomass, and nearly 80% of human and 90% of livestock populations in Ethiopia depend on traditional herbal medicine for primary health care (WHO 2002 and Yinger *et al*. 2007). FAO (2002) estimated that Ethiopia's fuel wood consumption amounts to 84 million m^3 per year.

Despite their wide reaching significance, forest resources of the country have been declining both in size (deforestation) and quality (degradation) (Reusing, 1998 and WBISPP, 2004). The annual deforestation rates declined over time, from 800 000 ha during the 1950s (Pohjonen and Pukkala 1990) to 200 000 – 300 000 ha between 1967 and 1979 (Achalu 1995), 163 600 ha between 1986 and 1990 (Reusing 1998) and 141 000 ha between 1990 and 2005 (FAO 2006). Regardless of the high rate of deforestation, Ethiopia still owns some forest resources. According to WBISPP (2004) Ethiopia owns 4.072 million ha of high forests, 29.24 million ha of woodlands, 26.4 million ha of bushlands and 0.216 million ha of plantations. These forest resources together cover about 53% of the country's landmass.

Overwhelmingly, the human factor is responsible for forest degradation in the country. Population growth, poverty, unstable land-tenure system, property right over forests, lack of forest and land-use policies (Bekele 2003) and socio-political instability (Yirdaw 2002) are among the major driving factors often listed. In general, the sector is characterized by weak governance and regulatory frameworks expressed in terms of lack of policy, weak law enforcement, institutional instability, poor human and logistic capacity, and meager budgetary allocation. The sector experienced 45 rounds of organizational restructuring since 1935, which has resulted in fast turn over of employees, discontinuation of programmes and projects, confusion of responsibilities and mandates, misplacement of documents and files, and progressive weakening of operations (Yemishaw 2002).

Furthermore, in Ethiopia, property relations over such resources like forests, water bodies, aquatic resources notably fish, wildlife, and other natural resources remained loosely defined and indecisively enforced. The lack of stability of rural institutions and subsequent confusions over tenure and access rights have affected people's willingness to invest on land management practices and on tree planting (Bekele *et al*. in press). The Imperial government that ruled

the country from 1930s to 1970s encouraged agricultural expansion through indiscriminate individualization of the forest resources to increase its tax revenue. The Socialist government, from 1974 to 1991, nationalized all forest resources of the country, making itself, not only the exclusive owner, but also the sole forest developer. From 1991 up to the present, in sharp contrast to the previous years, the State retreated from obligations it had assumed in previous years as forest custodian and developer without putting appropriate institutions in place (Bekele 2003).

The centralized approach of the State adopted by the successive governments in Ethiopia to manage and develop forest resources appeared not compatible with communities' perception of access rights to forest products and their demands for forest ownership. The approach also undermined the roles of local communities, their traditional institutions and knowledge in forest management practices, and considered local communities as enemies (destroyers) of the forests. Without the legal recognition of the right to use forest products, local people have neither the interest nor the courage in protecting and developing forests. Such systems would rather generate an incentive structure that force locals to irresponsibly exploit forests. Successive governments also failed to allocate sufficient human and economic resources to sustainably manage nationalized forests. Consequently, forest resources belong to the State *de jure* but they are *de facto* open access for all sorts of exploitation.

Participatory Forest Managements (PFM) was introduced as one of the solutions to solve the problem of open access to forest resources and promote sustainable forest management in the country through community participation. Some experiences from around the world show that shifts from state-centered policies toward solutions at the local level, such as PFM, resulted in successful forest conservation and development (e.g. Fisher 1999; Wily 2002 and Khanal 2007). Based on lessons learnt elsewhere, PFM was introduced to Ethiopia by some NGOs and donor agencies, notably FARM Africa, SOS Sahel, GTZ and JICA. These non-State actors attempted to respond to the prevailing forest management problems in Ethiopia through the introduction, adaptation and establishment of PFM projects. The few PFM pilot activities that started in Ethiopia include projects at Chilimo and Bonga forests by FARM Africa, at Borana by FARM Africa and SOS Sahel, at Adaba Dodolla by GTZ, and Belete Gera forest by JICA (Temesgen *et al*. 2007 and Terefe 2002). These pilot PFM projects attempted to introduce the following: (i) devolution of certain bundles of property rights from the state to the community, (ii) allowing local people to manage the forest resources sustainably, and (iii) partial utilization of the forest resources for livelihood support. Indeed, the introduction of PFM was expected to achieve the dual goal of contributing to the sustainable management of the forest resources and the improvement of the socio-economic status of the local community. Nonetheless, systematic studies are lacking that examined whether the PFM initiatives in Ethiopia have achieved their objectives as expected, and to draw lessons that can be used in the future in applying the experiences to other areas in terms of the contribution of PFM to forest conservation and the improvement of the socioeconomic conditions of the forest dependent people.

The objectives of this study are (i) to examine the contribution of PFM to local livelihoods in terms of incomes of households organized under the program; (ii) to assess the effects of PFM in empowering poor women and minorities in terms of participation, benefit sharing and decision making, and (iii) to determine and quantify the changes in forest status by comparing forests under and outside PFM.

MATERIALS AND METHODS

Site and project descriptions

The study was conducted in Bonga, which is one of the oldest PFM intervention sites in Ethiopia. The forest in Bonga is one of the two major blocks of broadleaved rainforest remnants in Ethiopia renowned for their rich biodiversity including wild *Coffea arabica* (L.) and several wild spices (Senbeta 2006). Bonga is found in Kafa Zone, *ca.* 430 km south-west of Addis Ababa. It is situated between $7^0\,00' - 7^0\,25'$ N and $35^0\,55' - 36^0\,37'$ E, and within the altitudinal range from 1400 to 1650 m. The mean annual rainfall is 1584 mm. The area is characterized by a long rainy season that extends from March through October. The mean maximum and minimum temperatures are 27.1 ^{0}C and 11.8 ^{0}C, respectively. The soil of the area is characterized by a well-drained, deep, dark reddish top layer overlying a dark red and dark reddish-brown clay loams. The soils are strongly to moderately acidic (Derero 1998).

Bonga District has a total population of 99 847. More than 82 % of the population lives in rural area. About half of the population is animist. Animism requires the presence of forest in which the spirits dwell (FARM Africa 2002a). Kaffa, Kembata, Amhara and Menja are the four ethnic groups in the area. The majority of the people belong to the Kaffa ethnic group, while the Menjas are the most marginalized and ostracized ethnic group. Agriculture is the principal source of livelihood for most of the population. It is characterized by a subsistence mixed farming system, where rain-fed crop faming and livestock production coexist. They cultivate mainly maize (*Zea mays* L.), teff (*Eragrostis tef* (Zucc.) Trotter), beans (*Vicia faba* L.) and false banana (*Enset ventricosum* (Welm). Cheesm) locally called "enset". Cattle, sheep and goats are the main livestock types raised in the area. Harvesting of non-timber forest products such as wild coffee, spices and honey occupies an important place in the household economy in the area (FARM Africa 2002b and Bognetteaul *et al*. 2007). The livelihood of the Menjas was primarily based on selling firewood and charcoal (FARM Africa 2002b).

Bonga PFM is initiated and ran by FARM Africa. The project had two phases: the first phase ran for 8 years between 1995 and 2002. The second phase, which was the focus of this study, lasted between 2002 and 2007 (Temesgen *et al.* 2007). The project introduced PFM as an alternative scheme

of forest management instead of policing the forests using hired guards that had been used for years to exclude local communities (FARM Africa 2002b). The goal of the project was to improve the livelihoods of forest-dependent people, especially the poor, disadvantaged groups and women. The purpose of the project was to improve the efficiency and effectiveness of land use, through participatory forest management. The Bonga PFM project had the following overall objectives:

- To contribute to the long term conservation of forest ecosystems in the area through the development and establishment of new systems of forest management;
- To build the capacity of government staffs and rural communities to manage natural resources in a sustainable way, in management partnership;
- To sustain and /or increase income opportunities from improved natural resources management and diversified livelihoods, and
- To catalyze the adoption of PFM within Ethiopia's forest policy and practice;

The program designed twofold approaches to sustainable forest management. That is, i) establishing community level forest management systems and promoting forest-based livelihoods, and ii) introducing and supporting other non-forest-based alternative livelihoods (Temesgen *et al.* 2007). The key assumption behind the alternative livelihoods approach is that the alternative livelihood activities and associated incomes replace forest-dependent livelihoods and thus reduce the pressure on the forest resources. Non-forest-based livelihood activities focus on the promotion of crop variety improvement, horticulture promotion, poultry breed improvement, sheep fattening, soil and water conservation, and goat rearing. Forest-based livelihood activities focus on NTFPs products such as honey, spices, and forest coffee. The overall impact that the project sought to achieve was the establishment of a sustainable forest management system for environmental conservation linked to sustainable rural livelihood (FARM Africa 2002b). At the beginning, the project carried out a comprehensive stakeholder analyses and detailed survey of traditional/customary rules governing forest access to identify participants of the project. It also employed participatory criteria development and endorsement against which candidates were screened for membership. By this system forest dependent households were identified and assisted to be organized into Forest User Groups (FUGs). These FUGs were recognized by local authorities and entered into agreement with the State, represented by the District Office of Agriculture and Rural Development (DOARD), to take the responsibility of managing defined areas of the forest in a sustainable way as per the jointly (community – NGO –DOARD) developed forest management plan. Following their establishment and legally endorsed access, FUGs developed their own bylaws that governed their own administration and forest management activities. These FUGs were later promoted to Forest User Cooperatives (FUCs) by the Cooperatives Promotion Desk of the Office of Agriculture. This led them to get legal status that allowed them to sue in courts those who would illegally harvest products in their designated forest areas.

Methods of data collection

Socio-economic survey

A preliminary informal survey was carried out with experts of the Natural Resources Management Department of the District Office of Agriculture and Rural Development, with field staff of Bonga PFM project, and with key informants from the local communities, including from non-participants in the project. The informal discussions focused on perceived trends and changes that PFM achieved on forest status and on household income, the role of external support, the impact of PFM on community empowerment, on the attitude of members and non-members on PFM, on the sustainability of PFM, and on challenges and opportunities of the scheme. A structured questionnaire was then prepared and pre-tested before use to improve its clarity and check for its accuracy to collect the required data. It was then translated into 'Kefinoono', the local language, in which the interview was conducted. Enumerators were recruited from the study area and trained. The formal survey focused mainly on household and demographic characteristics, on the impacts of PFM on local livelihoods in general and in terms of self reported changes in income level, income sources and asset accumulations, on aspects of empowerment before and after PFM, and on the sustainability of FUCs without external support and the like. Three of the six Forest User Cooperatives of the Bonga PFM project were selected randomly. Then among all members of these three cooperatives, the questionnaire was administered on randomly selected 93 households.

Forest inventory

Two separate forest patches, one under PFM and the other outside PFM but adjacent to the first, were identified and an inventory was carried out using systematic line transect sampling design. The line transects were laid out across the contour at the regular interval of 300 m. Plots were then laid on the transects at the interval of 150 m. Circular plots of 314 m^2 (10 m radius) were used as the main plot for inventorying mature trees (DBH > 10 cm). For seedlings and saplings, an inner 2.5 m radius sub-plot was used. A total of 40 plots (20 in the PFM forest and 20 in the non-PFM forest blocks) were taken. Seedlings were defined as woody plants with height ≤ 1.5 m, and sapling as those with height > 1.5 m, and DBH < 10 cm (Kelbessa and Soromessa 2004). Vernacular names were identified with the help of knowledgeable individuals from the community. Species identification was attempted in the field by using available references (Bekele *et al*. 1993; Kelecha 1987 and Edwards *et al*. 1995, 1997, 2000). For species found difficult to identify in the field, specimens were collected, pressed and identified at the National Herbarium of Addis Ababa University. Plant nomenclature follows Flora of Ethiopia and Eritrea (Edwards *et al*. 1995, 1997, 2000).

Data treatment and analyses

Socio-economic data analysis

The responses of the key informants and records of Focus Group Discussions were coded and analyzed following the procedure outlined by Miles & Huberman (1994). Accordingly, relevant themes and concepts were identified and summarized. The formal survey data were cleaned, coded and analyzed with the help of SPSS version 13 software and using both descriptive and inferential statistics.

Vegetation data analysis

The density of naturally regenerated woody plant species per hectare was derived from the number of individuals recorded in the sample plots from the PFM and non-PFM areas. Histograms derived from diameter measurements were used to analyze vegetation population structure. Different diversity indices such as Shannon-Wiener index (H'), species abundance, species richness, equitability or evenness, relative density, relative frequency, relative dominance and importance value index (IVI) were computed to compare the status of forests with and without PFM. A two-tailed t-test at 5% level of significance was also used to test differences in tree, sapling and seedling densities between the forests of the two sites.

RESULTS

Changes in income sources and income levels

The study revealed that (i) households in and around Bonga forest depended mainly on forest products, crop farming and, to a limited extent on livestock and (ii) with the adoption of PFM, major income sources of participant households shifted from the predominantly forest based before PFM to agriculture based after PFM (Figure 1). Nearly 73% of the respondent households depended more on forest-based livelihood activities before the introduction of PFM. These households used to derive income from firewood (40%), followed by charcoal (20%), crop farming (13.5%), forest coffee (10%), honey (8.5%), and livestock (6%). After participation in PFM, the proportion of households that derive their major income from forest-based activities decreased to 33%. On the other hand, after PFM the contribution from crop and livestock increased to 30.9 and 13.5% respectively. Not only dependence for income shifted from forest products, but was also the type of product extracted for income from the forest. This shift is from a more fuelwood-based (firewood and charcoal) forest utilization before PFM to a more non-wood-based uses such as wild coffee and honey after PFM (Figure 1).

The amount of income generated from each of the livelihood activities of the households also changed after PFM (Figure 2). Paired analysis of the incomes derived from different forest products after and before PFM revealed a significant difference ($P < 0.05$). For instance, the annual income generated per household from wild coffee and honey was ETB[1] 179 and ETB 127, respectively before PFM. After PFM, these levels rose to ETB 582 and ETB 394, respectively. Similarly, before PFM the total annual household income generated from crop farming and livestock was ETB 214 and ETB 108, respectively. These income levels rose to ETB 750 and ETB 321, respectively, after the introduction of PFM. On the other hand, the annual household income from charcoal and firewood, which was ETB 318 and ETB 612, respectively, before PFM, fell to ETB 84 and ETB 214, respectively, after the introduction of PFM. The mean annual household income which was ETB 1589 before

FIGURE 1 *Shifts in income sources (expressed in percentage of the income before PFM introduction) of households following PFM introduction in Bonga, Southwest Ethiopia (all the axes are drawn to the same scale)*

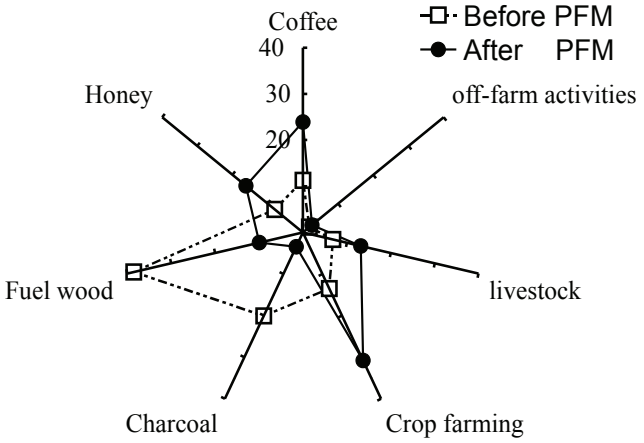
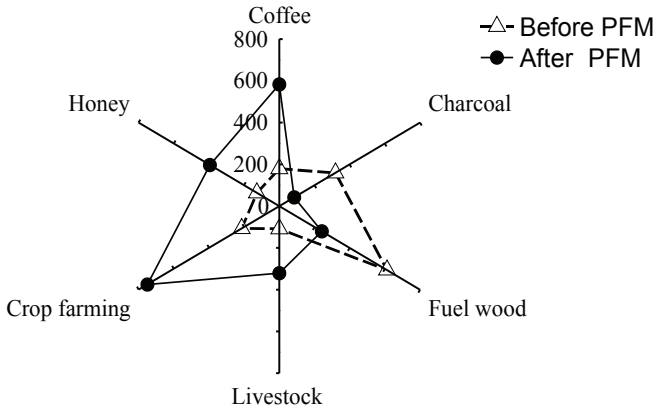


FIGURE 2 *Average incomes from the various livelihood activities of households before and after PFM in Bonga, southwest, Ethiopia (the axes show the mean annual income in Eth. Birr generated by households (all axes are drawn to the same scale)*



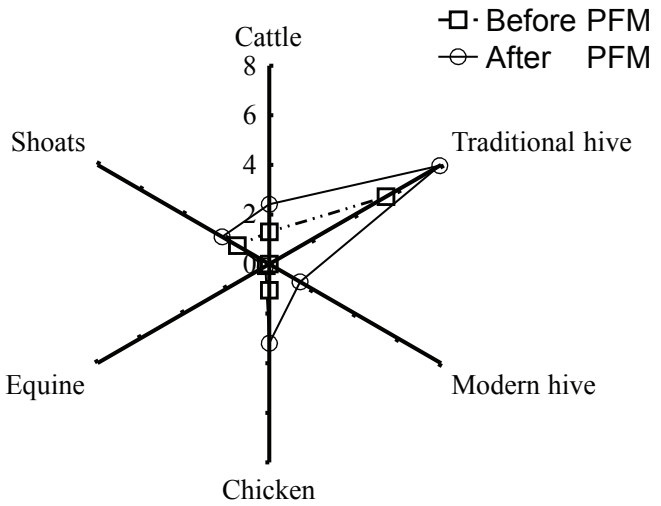
[1] ETB stands for Ethiopian Birr, the local currency. At the time of the field survey 1 ETB = 0.11 USD

the introduction of PFM increased to ETB 2433.6. The trend clearly shows major changes in households' income levels from the various livelihood activities following the introduction of PFM in Bonga.

Changes in food security status and household assets

The ability of households to produce enough to feed their family throughout the year was identified by key informants as the major indicator of the change in food security status of households in the study area. The majority of the respondents reported reduction in vulnerability to food insecurity following the introduction of PFM. Two-thirds of the respondents indicated that, before PFM, they were facing serious food shortages during the months of May and June. This figure decreased to 31% after the introduction of PFM. Major reasons attributed to the change were the introduction and promotion of non-forest-based livelihood activities and the accompanying training received that increased production and income levels. Eighty eight percent of the respondents reported that they had not gained any technical training and agricultural inputs support from any source before the introduction of PFM, while the remaining 12% asserted that they have had received technical assistance from the DOARD. Training provided to PFM participants focused on nursery and forest management, poultry production, beekeeping and the production of crops such as potato and various fruits. Besides, the trainees were assisted to have access to micro-credit. The training and the credit facilities enabled households to diversify their income sources, and increased household income level (Figures 1 and 2). This led to improvement in their asset base (Figure 3). The possession of poultry, shoat, equines, modern hives, traditional hives and cattle, increased with PFM. Total livestock holding increased from 3.9 before the introduction of PFM to 8.0. Respondents associated the above change mainly to the community development fund introduced by the PFM project and the savings and credit scheme implemented by the project.

FIGURE 3 *Changes in the number of households' possessions of various assets before and after PFM introduction in Bonga, southwest Ethiopia (all the axes are drawn to the same scale)*



Trends in forest products utilization

Farmers continued collecting a number of forest products even after the introduction of PFM. The products collected were poles, lianas, timber, firewood, feed for animals, wild coffee, source materials for furniture and farm implements, traditional medicine, etc. With the introduction of improved beehives with PFM, apiary activities increased. Firewood collection for own consumption slightly increased though the amount collected for sale declined significantly as was found out during discussions with key informants and women groups.

The pattern of grazing inside the forest also changed. Before the introduction of PFM, 53% of the respondent households used to graze their cattle freely in the forest, whereas after PFM, only 12% of the respondents indicated that they still allowed their cattle to graze freely in the forest. Some began cut-and-carry system and gather grasses from the forest, mainly during dry season.

Attitude towards forest resources conservation and management

Thirty seven percent of respondents considered PFM as extremely important for their livelihoods, while 49% rated it as important. Similarly, 59% and 41% of the respondents considered that PFM was extremely important and important for promoting forest conservation, respectively. Thus, most participants see PFM as an important arrangement for people and for the forests. Before the introduction of PFM, few of the communities assumed responsibility for protecting the forest against outsiders. The majority (96%) of the respondents pointed out that, following the adoption of PFM, they actively participated in nursery management, tree-planting activities, tending operations and forest protection activities. Nonetheless, some PFM participants reported loss of benefits. About 7%, 13.3% and 9.9% of respondents from the three forest user cooperatives indicated the loss of some kinds of benefit because of the introduction of PFM. These losses relate to the prohibition of timber-harvesting, charcoal making and firewood marketing. Some respondents in Sheka forest cooperative also complained that part of their agricultural land had been demarcated as part of the cooperative forest land without compensation.

Impact on gender and ethnic equity

Women and ethnic minority discrimination was common in the study area. Particularly, the focus group discussion described pre-project Menjas, one of the minority ethnic groups in Bonga, as extremely ostracized and marginalized group and known by the nick name 'fuelwood sellers', due to their high dependence on firewood and charcoal sale for livelihood. The Menjas were not able to sell other produces except firewood and charcoal because other tribes would not greet them, nor would they allow entering their houses.

The group was also alienated from participating in most development activities. After the introduction of PFM, 74%, 78% and 78% of the respondents believed that the Menjas are equal to others in decision making, benefit sharing and participation in forest and other development activities in the area, respectively. Nonetheless, 20%, 16%, 16% of the respondents feel that the Menjas are not still equal to others in decision making, benefit sharing and participation in development activities, respectively. Similarly, involvement of women in decision making, benefit sharing and role in forest management has shown improvement following the introduction of PFM (Table 1). As shown in the table, majority of the respondents perceived the changing role of women.

TABLE 1 *Perceived change of the roles of women following the introduction of PFM in Bonga, Ethiopia*

Types of Role in PFM	Improved		Not improved	
	Number of respondent	Proportion (%)	Number of respondent	Proportion (%)
Access to forest product	62	67	31	33
Access to credit	60	65	33	35
Participating in decision making	79	85	14	15
Access to meetings	77	83	14	15
being a member of FUG	79	85	14	15
Participating in own cash generating activity	71	76	22	24

Changes in forest conditions

Species composition and density

A total of 52 woody species, representing 30 families, were recorded in the forest blocks under PFM and non-PFM (Appendix 1). Of the total woody species recorded, 51 of them were found in the forests of the PFM site, while only 43 were found in the forest of non-PFM sites. Of these 52 species, 42 were common to both places. Only one species encountered in the non-PFM forest was absent from the PFM forest, while 9 species found in PFM forest were not encountered in the non-PFM forest. The PFM forest had a higher Shannon-Wiener Diversity (H) index of 3.46 and a lower evenness (E) value of 0.61 than the non-PFM forest with 3.367 of H and 0.6586 of E, respectively.

In terms of tree density, there were 151 and 179 individuals ha^{-1} in the PFM and non-PFM forests, respectively. These differences were not statistically significant ($P > 0.05$). For saplings, a total of 28 woody species were encountered in the PFM forest with the density of 1756 individuals ha^{-1}. In the non-PFM forest, 26 woody species with the density of 1680 saplings ha^{-1} were recorded. These differences were not statistically significant ($P > 0.05$). Concerning seedling population, a total of 29 seedlings of woody species were recorded in the PFM forest with the density of 5167 seedling ha^{-1}. In the non-PFM forest a total of 26 seedlings of woody species with the density of 3258 seedling ha^{-1} were recorded. The difference in seedling density ha^{-1} was statistically significant ($P < 0.05$). Three species, namely *Coffea arabica* L., *Olea capensis* subsp. *macrocarpa,* and *Clausena anisata* (Wild) Benth exhibited the most abundant seedlings in both forests.

Basal area, abundance and IVI

The mean basal areas were 19.6 and 17.4 m^2 ha^{-1} for the non-PFM and PFM forests, respectively. With respect to abundance *Schefflera abyssinica* (Hochst.ex. A. Rich.) Harms and *Millettia ferruginea* (Hochst.) Baker were the two most abundant in the PFM forest while *Margaritaria discoidea* (Baill.) followed by *Albizia gummifera* (Gmel.) C.A. Sm., *Celtis africana* Burmi. and *Ficus ovata* Vahl were the three most abundant in the non-PFM forest. In term of Importance Value Index (IVI), *Schefflera abyssinica, Ficus sur* Forrsk., *Cassipourea malosana* (Baker) Alston, *Croton macrostachyus* Del. and *Albizia gummifera* were the five most important species of the PFM site. In the non-PFM forest, *Ficus sur, Margaritaria discoidea, Albizia gummifera, Cordia africana* (Lam.), *Millettia ferruginea* and *Schefflera abyssinica* were the five most important species. Those species comprised 32.8% and 29.5% of the total importance value indices in the PFM and non-PFM forest, respectively.

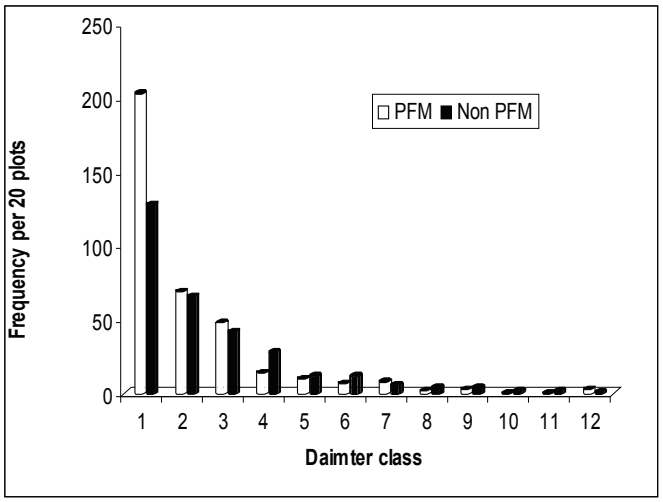
Forest structure

In both cases, the individual distribution in diameter classes displayed an inverted J-shape, showing a normal population structure (Figure 4). However, the PFM site showed a relatively higher proportion of seedling and sapling individuals. This indicates that the population of the PFM forest is more stable, and that reproduction, regeneration and growth of woody species are better in the PFM than in the non-PFM forests.

Challenges facing Bonga forest user cooperatives and the sustainability of PFM scheme

PFM participants in Bonga both in group discussion and individual interview indicated that major challenges that PFM would encounter in the future may emanate mainly from the side of the Government. They suspect that the Government may not be strongly committed to PFM and may not allocate sufficient resources to monitor and support the initiative. Nor

FIGURE 4 *Diameter class distributions for naturally regenerating woody species in forests under PFM and non-PFM in Bonga, southwest Ethiopia (Diameter class: 1= seedling, class 2 sapling, 3 =10 - 19.9cm, 4 = 20 - 29.9 cm, 5 = 30 - 39.9cm, 6=40 - 49.9, 7 = 50 - 59.9cm, 8=60 - 69.9, 9 = 70 - 79.9, 10 = 80 - 89.9, 11= 90 - 99.9 and 12 =>100 cm)*



are there any signs of mainstreaming PFM as an alternative approach to managing forests in the country. Theoretically the government signed up agreement with FUGs to guarantee them a use right but government often fails to abide by the binding rules. For instance, the government is committed to conduct forest status monitoring every two years. But this has rarely been done. Support from the State is also unsatisfactory to provide legal assistance for forest users against encroachers and offenders. This is reflected in the judicial procedure, which is protracted**,** and decisions have reportedly been less deterrent. Because of the weak law enforcement, there is a continuous clash between members of FUGs and others on access to the forest and use of its products. Furthermore, some members of FUGs doubt the accountability of executive committee members of the cooperatives. They cite examples where some committee members have failed to timely repay the loans they took from the cooperative, and even some abandon their membership without paying back. In addition, the executive committees remain less transparent in deciding benefit sharing, allocating training opportunities, and in various decision making processes regarding responsibility sharing in managing the forest.

Despite the challenges surrounding the Bonga PFM, most respondents are optimistic about the sustainability of PFM. Those who doubt the sustainability of PFM base their pessimism on the perceived failures of the government structures to provide the required support. Nearly 83%, 72%, 85%, of the respondents from the three Forest Users Cooperatives believe that PFM is sustainable and will last long after the PFM project life. They feel that these challenges would be resolved slowly over time as experiences build and the institutions strengthen through active community participation. Local government authorities are also optimistic regarding the sustainability of PFM and its impact on people and the forests.

DISCUSSION

This study captured the impacts of PFM both on the participant local community's livelihoods and forest status in one of the pilot sites in Ethiopia where PFM has been introduced. The findings indicated that at the present pilot stage the introduction of PFM as a system of forest management appears to have achieved the dual purposes of positively affecting the forest (*i.e*. improved forest conservation and management) and livelihoods of the participant local communities. The continuity of these achievements hinges on the cooperation of the local people**,** which was won through the granting of user-rights to the forest resources, and subsequent empowerment in decision-making regarding the forest.

Compared to the adjacent non-PFM forest site seedling and sapling densities are increasing in the PFM forests. Similarly, the vegetation population structure of the PFM forest exhibited a better structure that show a healthy population distribution across diameter classes compared with the non-PFM forest block. This seems to have been achieved because of the regulated access and the forest development works communities exercised in the forest. These findings conform to several similar studies in other countries. For instance, a study from Tanzania that compared vegetation structure before and after PFM reported a remarkable increase in the density of trees, seedlings and saplings following PFM introduction (Kajembe *et al*. 2005). Similarly, studies in various places throughout India (*e.g*. Gujarat, Andhra Pradesh, Haryana, Madhya Pradesh and West Bengal) have recorded improvements in productivity and diversity of vegetation following the introduction of PFM (Prasad 1999). A study in Ethiopia from the Adaba Dodolla PFM project also reported that seedlings were healthy as they had been neither trampled nor browsed, and more regeneration of indigenous plant species was observed in the PFM forest blocks (Bekele *et al*. 2004).

The study also showed that PFM has improved the asset base of participant households. For instance, the average total livestock holding increased after PFM introduction. Another study conducted in the Adaba Dodolla PFM project site also reported increase in livestock assets of project participant households over time, and this was attributed to better access to grazing within the forest (Bekele *et al*. 2007). The authors also cited this trend as a possible threat to the future of the forest. Unlike the case of Adaba Dodolla, the Bonga PFM project developed a land-use system, established a fodder bank and introduced cut-and-carry system of livestock feeding (FARM Africa 2002a). If these systems are properly attended the increasing number of livestock may not be a threat to Bonga PFM forest.

Another positive observation is that income generation from wood-based products significantly decreased since the introduction of PFM. This reduction is a good indicator of the success in regulating the forest destruction that is common in an open-access system. A similar study in Tanzania indicated that Community Based Forest Management (CBFM) is successfully regulating wood harvesting well within sustainable yield level (Blomley *et al*. 2007). Income

levels have increased but their sources have shifted from predominantly forest dependence, to other diversified sectors or sub-sectors, such as agriculture and NTFPs. For instance, among the respondents 13% were not involved in agriculture before PFM, while they all began to take part in agriculture-related activities following the introduction of PFM. The income derived from agriculture was 2.5 times more than the income derived from that same source before the introduction of PFM. This agrees with a study from Adaba Dodolla, which recorded higher income generated form agriculture by PFM households than by the non-forest user group (Bekele *et al.* 2007). Similarly, the extraction of forest coffee and honey from the forest increased following the introduction of PFM. These observations indicate the success of PFM in redirecting the income sources of the local community from destructive forest use to sustainable forest production system or other complementary activities. Such redirection and improvement of income sources have ultimately achieved better food security as was confirmed by respondents. A similar study conducted in Bangladesh, reported significant poverty reduction among participants in PFM (Safa 2004). Studies in Gujarat, Andhra Pradesh, Haryana, Madhya Pradesh and West Bengal in India recorded improvements in the form of increased income to members of community institutions, from non-timber forest products (Prasad 1999). A study in Adaba Dodolla, Ethiopia also found improvement in the livelihoods of participant households (Terefe 2002).

The Bonga PFM project has also helped in addressing challenges of ethnic and gender inequity in the area. Men and women equally qualified for membership in forming FUGs and FUC provided that they fulfill other criteria for membership. Both men and women equitably shared responsibilities of managing the forest and the benefits accruing from the forest. Men and women also have equal right of vote and participation in FUCs administration. For instance, female members make up *ca*. from 16 to 62% of the three selected FUCs for the study. Similarly, women make up between 14 and 29% of the members of executive committees in the three FUCs of Bonga PFM. Similarly, regardless of ethnic belongingness individuals participated in the project under equal membership right, benefit sharing, voting and other administrative duties within FUCs. These have been confirmed by most of the respondents belonging to the different ethnic groups, and also by men and women respondents. The study on the future scenario of Chilimo Forest which is being managed by FUCs indicated that with out PFM, the resource base would have been severely degraded in less than ten years, and PFM would constitute a win-win scenario for forest and forest dwellers (Kassa *et al*. 2009). In agreement with this study in Chilimo, the present study also reflected an optimistic view of participants on sustainability of PFM arrangements.

CONCLUSIONS

Although much remains to be studied about the impacts of PFM on forests and livelihoods in Ethiopia, the findings of this study indicate the potential of PFM as a vehicle to promote sustainable forest management provided that the capacity of institutions at local level is built and the Government is committed to supporting them. Based on the results of this study, it can be said that PFM is good both for the forest and for the participating people. With regard to the forest, increased seedling and sapling populations were observed in PFM blocks, compared to forests outside PFM. PFM also empowered local people as it enabled them to organize themselves and enhance their participation in decision making regarding the management of the forest resources. Thus, free access to the forest has been regulated well than before. PFM also benefited the people as increased and more diversified income source led to better asset accumulation, and less dependence on the forest. Increased income in the case of Bonga PFM project originated mainly from agriculture, and not from the forest. This indicates that if designed properly, complementary activities to diversify income could help reduce pressure on the forest. However, it can also shadow the potential that forests can play in livelihoods. Thus an appropriate balance is needed to maximize benefits from the forest resources as well so that communities would also have economic incentives to responsibly manage forests. The sustainability of PFM depends on the transparent partnership between the members of the forest users and their leaders on the one hand and between their institutions notably FUGs or FUCs and the State on the other. The State should show its commitment to supporting the efforts of communities and their institutions to responsibly mange these resources by creating enabling environments and ensuring technical and legal support to these institutions in their efforts to become strong and accountable to communities. Although the majority of the PFM members are optimistic about the sustainability of PFM, the post project sustainability of PFM requires monitoring and targeted support, and the Government needs to mainstream PFM as one possible scheme in managing the country's dwindling forest and woodland resources.

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APPENDIX 1 *List of species encountered in forests under PFM and non-PFM in Bonga, southwest Ethiopia.*

No.	Species full name	Family name	Local name	Life form	PFM	Non PFM
1	*Albizia gummifera* (Gmel.) C.A.Sm	Fabaceae.	Caatto	Tree	+	+
2	*Allophylus abyssinicus* (Hochst.) Radlk.	Sapindaceae	Shee'oo	Tree	+	+
3	*Pouteria adolfi-freiderici* (Engl.) Robyns & Gilbert	Sapotaceae	Kerero	Tree	+	-
4	*Apodytes dimidiata* E.Mey.ex Arn	Icacinaceae	wundifo	Tree/shrub	+	+
5	*Bersama abyssinica* Fresen.	Melianthaceae	Booqqoo	Tree/shrub	+	+
6	*Brucea antidysentrica* J.F. Mill.	Simaroubaceae	Nuuqqishoo	Tree/shrub	+	+
7	*Canthium oligocarpum* Hiern	Rubiaceae	Xiixiribboo	Tree	+	+
8	*Cassipourea malosana* (Baker) Aliston	Rhizophoraceae	Orooroo	Tree	+	+
9	*Celtis africana* Burm.	Ulmaceae	Uffo	Tree	+	+
10	*Clausena anisata* (Wild.) Benth	Rutaceae	Washo	shrub/Tree	+	+
11	*Coffea arabica* L.	Rubiaceae	limich	shrub/Tree	+	+
12	*Combretum molle*	Combretaceae	Bunoo	Tree	+	+
13	*Cordia africana* Lam.	Boraginaceae	Gudimacho	Tree	+	+
14	*Croton macrostachyus* Del.	Euphorbiaceae	DI'oo	Tree	+	+
15	*Dombeya torrida* (J.F.Gmel.) Bamps	Sterculiaceae	Waagoo	Shrub	+	+
16	*Dracaena fragrans* (L.) Ker-Gawl.	Dracenaceae	Shawko	Tree/shrub	+	+
17	*Dracaena Steudneri* Engl.	Dracenaceae	Emoo	Tree/shrub	+	+
18	*Ehretia cymosa* Thonn.	Boraginaceae	Yudo	Shrub	+	+
19	*Ekeberigia capensis* Sparrm.	Meliceae	wagamo	Tree	+	+
20	*Euporbia ampliphyll* Pax	Euphorbiaceae	Gachoo	Tree	+	-
21	*Ficus ovata* Vahl	Moraceae	Caarro	Tree	+	+
22	*Ficus sur* Forrsk.	Moraceae	Capharoo	Tree	+	+
23	*Galiniera saxifraga* (Hochst.) Bridson	Rubiaceae	Diidoo	Tree	+	+
24	*Ilex mitis* (L.) Radlk.	Meliaceae	Shahino	Tree	+	-
25	*Juniperus procera* Endl.	Cuppressaceae	Kubbi cido	Tree	+	-
26	*Lepidotrichilia volkensilia* (Gurke) Leory	Meliaceae	Keto	Tree	+	+
27	*Macaranga capensis* (Baill.) Sim	Euphorbiaceae	Shakkiro	Tree	+	+
28	*Maesa lanceolata* Forssk.	Myrsinaceae	Caggoo	shrub/Tree	+	+
29	*Margaritaria discoidea* (Baill.) Webster	Euphorbiaceae	Gebo	Tree	+	+
30	*Millettia ferruginea* (Hochst.) Baker	Fabaceae	Bibero	Tree	+	+
31	*Ocotea kenyensis* (Chiov.) Robyns & Wilcz	Lauraceae	Najjoo	Tree	+	-
32	*Olea capensis* subsp. *macrocarpa* (C. A. Wright) Verdc.	Oleacea	Shegeo	Tree	+	+
33	*Olea welwitschi* (Knobl.) Gilg & Schellenb.	Oleacea	Yaho	Tree	+	+
34	*Oxyanthus speciosus* DC.	Rubiaceae	Ophero	shrub/Tree	+	-
35	*Psychotria orophila* Petit	Rubiaceae	Aeimato	shrub/Tree	+	+
36	*Phonex reclinata* Jacq.	Arecaceae	Yebo	Tree	+	+
37	*Pittosporum viridiflorum* Sims.	Pittosporaceae	Sholloo	Tree	+	+
38	*Polyscias fulva* (Hiern) Robyns	Araliaceae	Kerasho	Tree	+	+
39	*Prunes africana*	Rosaceae	Oomo	Tree	+	+
40	*Psidium guajava*	Myrtaceae	Zeituna	Shrub/Tree	+	-
41	*Rhamnus prinoides* L'Herit.	Rhamnaceae	Gesho	Shrub/Tree	+	-
42	*Rothmaniaurcelliformis* (Hiern) Robyns	Rubiaceae	Diibo	Shrub	+	+
43	*Rytignia neglecta* (Hiern) Robyns	Rubiaceae	Naxxaachoo	Shrub/Tree	-	+
44	*Sapium ellipticum* (Krauss) Pax	Euphorbiaceae	Sheddoo	Tree	+	+
45	*Schefflera abyssinica* (Hochst.ex.A. Rich.) Harms	Araliaceae	Buto	Tree	+	+
46	*Syzygium guineense* (Wild.) DC	Myrtaceae	Yinoo	Tree	+	+

47	*Teclea nobilis* Del.	Rutaceae	Shengaaro	Tree	+	+
48	*Trichilia dregeana* Sond	Meliaceae	Timo	Tree	+	-
49	*Vepris dainellii* (Pichi. -Serm.) Kokwaro	Rutaceae	Mengrixxoo	Shrub/Tree	+	+
50	*Vernonia amygdalina* Del.	Asteraceae	Gerawo	Shrub/Tree	+	+
51	*Vernonia auriulifera* Hiern	Asteraceae	Dangrettoo	Shrub/Tree	+	+
52	*Zizipus* sp.	Rhamnaceae	Chico	Shrub/Tree	+	+