

Local Community Perception on the Social Significances of Sustainable Forest Management: "The Case of Debre-Lebanos Forest, Ethiopia"

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Abstract

Deforestation and subsequent loss of biodiversity and the ensuing environmental crisis are the global problems that are receiving the attention of humanity. The aim of the current study was to assess the socio economic importance of the woody species, factors affecting forest conditions in the church, government and private forests. Systematic random sampling method was used in order to collect socio economic data. The forest of Debre-libanos were found to be diverse socio-economic significant in the area as indicated by 83% of the respondents. However, utilization of trees for burial ground purposes was found to be the greatest threat to the sustainability of the forest. It was noted that the forests of Debre-libanos were of great socioeconomic significance to the inhabitants of the town serving as sources of a number of benefits as confirmed by the responses of 83% of the respondents. The lowest level of human interferences from the surrounding communities was observed in the church forest, while the government forest was the most affected due to illegal tree cutting as indicated by 67% the responses. It was also concluded that the overall population structure of the Debre-libanos forest was fairly stable but some species like *O. europiae* need active intervention.

Keywords: Church forest; Community perception; Socioeconomics; Conservation

Introduction

Historical sources indicate that the loss of forest cover in Ethiopia has been dramatic decries time to time [1,2]. Some reports indicate that close to 40% of Ethiopia might have been covered by high forests as recently as the 16th century [1]. According to Reusing, about 42 million hectares (35%) of the country's land area might have been once covered with natural high forests. Analysis of the satellite images from 1973 to 1976 indicate that up to 4.75% of the country was then covered with high forests [3].

The causes of forest loss in Ethiopia are many and interlinked [1]. They include demand for agricultural land, uncontrolled grazing, high population growth, settlements, fires and unrestrained harvesting of forest products [4].

As well as urbanization or growth of urban area in size and urban center it is taking place in the urban fringe, on former agricultural land or in the urban green resource such as urban and peri-urban forests, orchards and woodlots [4].

The population growth in urban area increased the demand of housing and fire wood; these conditions forced the dweller to depend highly on forest resources. Because of this great dependency; the urban and peri urban forest area was depleted, the urban ecosystem was disturbed and loss of genetic resources was some of the outcome of this dependency in Addis Ababa [5].

The rapid forest depletion on high land areas is much more severe than the low lands [6]. This is because the highlands of Ethiopia, in contrast to most mountain systems outside Africa, are very suitable for human habitation [7].

For instance, the transformation of natural high forests into cultivated lands and grass lands has been most intensive in the northern and north eastern parts of Ethiopia over the last few centuries [8]. Consequently, most of the remaining high forests are nowadays concentrated in the western, southern and south eastern parts of the country [9,10].

Tropical forests are valued for their direct economic benefits and for the host of intangible benefits they bestowed on society. Tropical wood products contribute approximately US \$100 billion annually, about 0.5% of global gross domestic product [11]. Forestry is one of the tools through which poverty alleviation is possible [12].

During the 1990s, over 150 non-wood forest products were traded in international markets, the estimated value of which ranged between US \$ 5 and 10 billion per annum, in addition to the value of non-wood forest products traded in local markets [13].

Most of the 500 million people living in or at the edge of forests are fully dependent on them, not only for their livelihood, but also for their cultural and spiritual values [14].

Forests and trees provide a wide range of economic opportunities for tens of thousands of people in Ethiopia. About 80,000 people from Addis Ababa are estimated to depend entirely or partly on sales of leaves and twigs of trees from the Eucalyptus forests around Addis Ababa [15,16].

Urban and peri urban forests can reduce the effects of urban storm water i.e. the presence of trees in urban settings reduce storm water flows through uptake and storage of waters in leaves and bark in

addition to these their roots facilitate by creating infiltration pathway into the soil and improve ground water recharge [17].

Trees in the urban context can increase biodiversity and give various other benefits such as aesthetic, psychological and socio-economic nature and provide a host of environmental, social, economic, aesthetic, and health benefits [18].

It is estimated that 90% of the world's poor depend on forests for at least a portion of their income [19].

In Africa, 600 million people rely on forests and woodlands [20]. There are many definitions and interpretations of livelihood. In the context of sustainable livelihoods approach, livelihood is more than just a person's job or a way to earn a living [21]. Livelihood has been defined as comprising the capacities, assets (including materials and social resources) and activities required for a means of living [22].

In Ethiopia, where the livelihood of 85% of the population is dependent on natural resources (particularly renewable natural resources, such sharp depletion and deterioration of these resources have resulted in reduced agricultural productivity that resulted in reduced quality of life [23].

The loss of forest cover has led to a change in surrounding ecosystem, loss of biodiversity of plant species and the provision of goods and services they used to provide to the surrounding communities [24]. Rural communities have been using the forest traditionally for long time, and hence they must have played an important role in influencing forest structure and diversity (Feyera).

The forest ecosystems in the country are influenced by communities that live in and around them [5]. This includes both the rural as well as the urban and peri-urban communities [25]. However, most of the studies that dealt with the impact of humans on forests considered the rural communities [26].

Generally, communities that live in urban and peri-urban areas also interact with and influence forest ecosystems thereby sharing the benefits from the forest resources [27]. The Debre-libanos forest is a forest that is surrounded by urban and peri-urban population and the extent of influence by the surrounding community on the forest structure and plant species diversity has not been studied and thus needs to be investigated.

Furthermore, information on the socioeconomic significance and contribution of the forests to the livelihood of urban dwellers was not available and it needs to be generated in order to help plan sustainable forest management practices.

The findings can help policy makers and forest users design and implement evidence based forest policies. Therefore, this research is part of an interdisciplinary research carried out to address problems of forest resource management in the Debre-libanos forests.

General objective

The general objective of the study was to generate empirical data that will contribute to the conservation and sustainable use of the forest resources of the study area.

Specific objectives

To assess the significance of Debre-libanos forest to the inhabitants of town.

To assess the major biotic factors affecting forest conditions in the study area.

The Significance of the study had identified the socio-economic benefits of the forest to the inhabitants of Debre-libanos community which will be useful in designing strategies for sustainable use of the forest by concerned bodies.

Materials and Methods

Description of the study area

The Debre-libanos forest is located in North Shoa Zone of the Oromia Regional State, in the central Ethiopia. It is situated at about 106 km from Addis Ababa. Geographically, the area is located within between 38° 82' to 38° 85' E longitude and 9° 71' N to 9° 73' N latitude within the altitudinal range of 2311 to 2538 m a.s.l (Figure 1).

The total area of the study was about 178.03 ha church, 26.26 ha a government and the rest 18.58 ha is a private forest. The Debre-libanos forests encompass two districts and 27 Kebeles, Debere-libnos and Girar Jarso districts, within the boundary of the Debre-libanos forest.

Church forest is located in the Debre-libanos district while the government and private forests are located at Girar Jarso district. The total area of the Debre-libanos and Girar Jarso districts is 29,776 ha and 49,435 ha, respectively. This study was specifically carried out in the church, government and private forests.

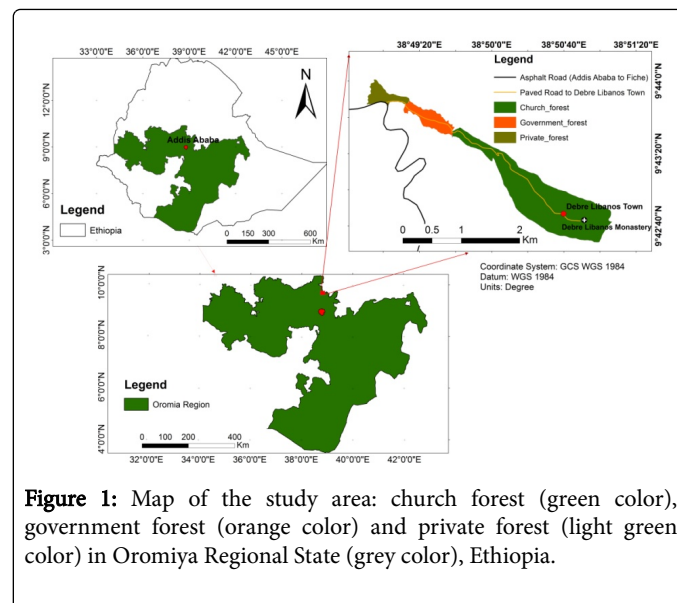


Figure 1: Map of the study area: church forest (green color), government forest (orange color) and private forest (light green color) in Oromiya Regional State (grey color), Ethiopia.

Data collection and sampling strategy

To collect the socio economic data stratified systematic random sampling strategy was used during data collection. The town was divided into three based on geographical location (Chagel, Wusha gedel and Set debir). It was pre-tested before using it on a wider scale, and some improvement was made to the questionnaire.

From each stratum 5% inhabitants of the town of Debre-libanos were randomly chosen and interviewed. Accordingly 120 household heads, in three villages were interviewed. In addition at least the administrator of the monastery and three randomly selected monks were selected randomly and interviewed with open-ended questions.

Moreover, key informant interviews and focus group discussions were also conducted. Focus group discussion was held with who were the people from the monastery, the government organization and the private sector.

Assessment of the main physical factors affecting forest conditions

The influence of anthropogenic and/or natural factors on forest conditions can be examined through a forest plot [28,29]. Different factors were considered the presence of evidence of active soil erosion was examined within each plot and categorized in to minor erosion when surface vegetation and humus layer is absent, major erosion when deep gullies were observed otherwise absent.

Livestock affects forest condition by browsing, grazing and/or trampling of plants. Hence, evidences of livestock use in a forest was examined by observing livestock, feces of livestock, signs of grazing on vegetation, and/or presence of tracks and recorded with presence or absence. Some insect damage on leaves and stems of plants is considered as normal part of forest ecology. Hence, the impact of insects on forest conditions was recorded with presence when extreme or unusual damage is noted or absent otherwise. Cut stumps within 10 meter circular plots were identified by names and their number of cutting stumps was counted following [30].

Data analysis

Once the biophysical data representing the different forest systems was collected, vegetation data was entered and subsequent analyses of the data were performed using Microsoft excel application for windows 2007. Bar graphs were drawn using Kypplot version 2.0. Microsoft Excel was used in data analysis. Each forest was analyzed based on selected parameters and analysis tool pack employed by vegetation ecologists of woody species encountered within the studied forest systems.

Statistical analysis

All statistical analyses were carried out using SPSS Version 16.0. Descriptive statistics was used to compute the mean values (Mean ± SEM). One way Analysis of Variance with unequal replication was used to test the significance variation among different means. When variations among means were found to be significant, Tukey's LSD test was performed to test significance variations between any two means. Microsoft Excel was used for socioeconomic data analysis such as percentages, charts and tables.

Results

Importance of woody plant species in three forest systems

Church forest: Eighty three percent of the respondents indicated that they benefit from the forests of the church while the remaining 17% responded that they did not derive any benefit from the church forest. Those who obtained the benefit were those that live close to the church forest in terms of their life style.

They usually spent most of their life time in worshipping. As a result, such respondents that they benefited from the church forest. Those who claimed that they didn't obtain any benefit from the forests of the church forest were those live relatively farther from the church in

terms of their life style. Besides they were also economically independent of the church (Figure 2).

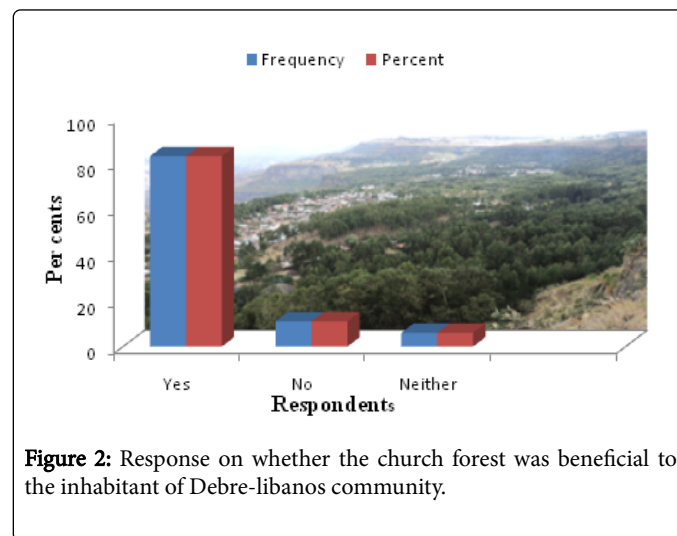


Figure 2: Response on whether the church forest was beneficial to the inhabitant of Debre-libanos community.

The major benefits of the respondents claimed to have driven from the forest were shade, recreation, fuel wood, food consumption and experience of forest conservation (Figure 3).

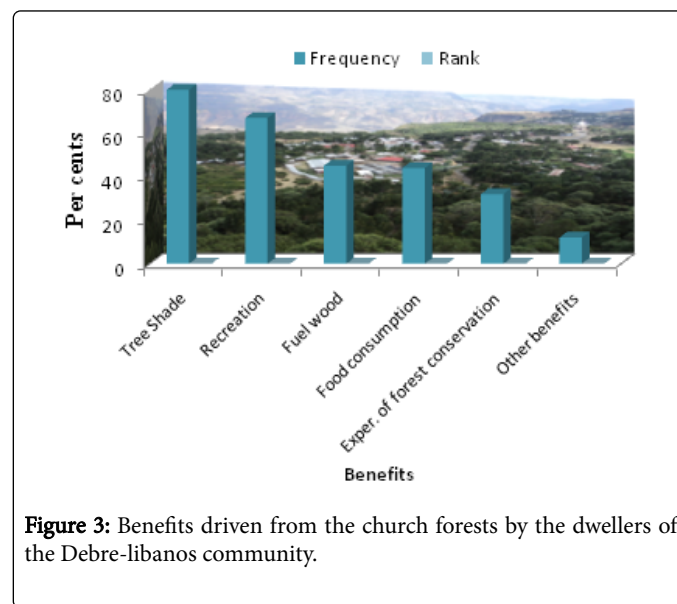


Figure 3: Benefits driven from the church forests by the dwellers of the Debre-libanos community.

The provision of shade by the forest of the church for those who come to the monastery for worshipping and celebrating the religious festive was ranked first followed by the provision of recreational opportunity, while the provision of fuel wood, food, experience on forest conservation and provision of other benefits were ranked 3rd to 6th, respectively (Figure 3).

Government and private forests

Out of the total respondents, 25% and 65% responded that they were benefiting from the government and private forests, respectively while 10% responded that they did not benefit from both of the forest systems some respondent obtained benefit from the government (25%), while high number of the respondent is from private forest (65%) and the remained did not benefit either of (10%).

Those who obtained benefit from the government are directly by cutting trees illegally and indirectly getting job in the forest. Those who obtained benefit legally from the market like: fuel wood and recreation. Those who didn't obtain any benefit are from the church, because, they have already got the benefit from the church forest.

Attitude of the urban dwellers towards forest conservation

Sixty seven per cent of the urban dwellers responded that they have been cutting trees from the government forest and seven percent from the church and 26% from the private forest. Ninety three percent of the respondents that did not cut trees from the church forest indicated that their reason not to have done that was because of fear of religious sanctions and the regulations of the monastery.

Ninety two percent of the respondents, rated the conservation method of the monastery as best while 3% and 5% rated the forest conservation methods of the government and the private forests as the best, respectively (Figure 2). It was indicated that the conservation perspective of the monastery was based their own interests and spiritual strength, while those of the government and the private forest were considered as not fulfilling their interests (according to responded surround the forests).

This is due to the fact that the monastery is considered to be theirs, and is believed as it has spiritual value if it is conserved. Almost all the respondents had tree planting experience in the monastery while tree planting in the government and private forests was done by the government and private workers.

Woody plant species conservation under the three forest systems

According to the discussion with the administrator and monks of the monastery the monastery were using religious sanctions. Planting tree yearly in June and July with the inhabitants of the community, transfer message during the religious festivals on weekend, Sunday about conservation of forest, use of plantation forests when in need of constructing houses and buildings and not utilizing the natural forest rather than the plantation were some of the activities the monastery have been applying.

According to the focus group discussion, the government forest protection method was protective which means there was no involvement of the nearby inhabitants. As a result of exclusion of the nearby inhabitants as observed many times illegally cutting tree was a common place. In the government forest management system, the punishment for committing illegal tree cutting was very weak.

As the analysis revealed from the focus group discussion the private forest was highly protective than the government forest. Protection of the forest while was with utilizing both in consumptive and non-consumptive ways.

Linkage between forest and dwellers

According to the key informant the forest owned under different system were contributing a lot to the development of the community of Debre-libanos. The community dwellers have been using the forests for different purpose.

The inhabitants have used the forest for recreation while in wedding, traditional medicine, environmental values, etc...

The local administration has used the forest as its potential resource it could provide to investors. The local government has also contributing to conservation of the forest in the community. This is because presence of forest to the town has high contribution to the development.

As a result of this the forest of the area is getting attention by the government and related administration body to sustain the forest of the town.

Furthermore, the key informants believe that the forest of the area has been doing its great importance beyond the community. Hence the inhabitants knew the contribution of the forest they have tried to contribute for the conservation of the forest of the area.

Factors affecting woody species conservation in the three forest systems

According to the key informants, much of the trees have been cut for the purpose of getting burial grounds, a factor that was seen as a serious threat to the sustainability of the forests in the monastery. As the analysis of the secondary data revealed five to eight people per day are buried in the monastery.

This is because of the belief held by the worshipers that due to the paradise promised by God to St. Abune Tekle Himanot, people prefer to be buried at Debre-libanos. Because of such a belief, for instance, in the last two years only, 4,380 people were buried in the monastery.

In order to bury one person, at least one tree should be cut. Hence within the last two years, at least 4380 trees must have been cut.

Fuel wood collection was seen to be another threat to the conservation of forest of the monastery. Although the impact appeared to be insignificant at the moment, the activity was illegal, because the trees were cut at their early stage of growth for fuel wood mainly for making local bread called "dabe".

Analysis of some of the factors affecting forest conditions depicted that active erosion, human and livestock encroachments and insects haven't been a problem in the church and private forest.

But there were human encroachments and livestock in the government forests. However, the extent of erosion, livestock interference and damage by insects were not significant in all the study plots.

There was a substantial variation in the number of cut stumps among the different forest systems. A total of 13 woody species stumps were recorded within the three forest systems, of which 25 species (61%) belong to the church, eight species (19.5%) to the government and eight species (19.5%) from private forests (Table 1).

The highest density of woody stumps (80 ha⁻¹) was observed within the church forest, followed by that of the government forest (21 ha⁻¹) and (15 ha⁻¹) from private forest. The most frequently encountered cut stumps within the church forest were of *C. spinarum*, *O. europaea* and *J. procera*, while in the government forest it was that of *J. procera*.

In the private forest, common stumps were of *A. abyssinica* and *C. spinarum* (Table 1). However, the stumps of *A. abyssinica* and *C. spinarum* were not recorded since these species regenerate and also because they were harvested in rotation from different sites within the forests of the monastery.

No.	Botanic name	Average distance from road	Church	Government	Private
1	<i>Acacia abyssinica</i>		3	4	4
2	<i>Carissa spinarum</i>	1 km	46	1	3
3	<i>Croton macrostachys</i>	1 km	4	0	2
4	<i>Dodonea viscosa</i>	1 km	0	3	2
5	<i>Juniperus procera</i>	1 km	9	7	0
6	<i>Maytenus senegalensis</i>	1 km	3	0	0
7	<i>Olea europaea</i>	1 km	10	0	0
8	<i>Osyris compressa</i>	1 km	0	0	0
9	<i>Osyris quadripartita</i>	1 km	0	5	2
10	<i>Phytolaceae dodecandra</i>	1 km	1	0	0
11	<i>premna angolensis</i>	1 km	0	0	1
12	<i>Rhus gluutinasa</i>	1 km	0	0	1
13	<i>Teclea noblis</i>	1 km	4	0	0
	Total	1 km	80	21	15

Table 1: The density (number of dead and coppiced stumps ha⁻¹) of the woody species recorded in the church, government and private forests of Debre-libanos.

Analysis of the population structure of highly tree cut stumps within church forest. But government and private forest cutting indicated those similar trends of removal of woody species (Table 1).

Discussion

The forest conservation philosophy of the monastery is based on Holy Scripture which is similar to previous study [31]. While governments and private forests conservation philosophies were based on rules and regulations. The forest of the monastery was in a very good condition while government and private were not.

As the results of the current study showed, the church forest conservation was better than that of the two. The respondents indicated that they would be happy if the government forests were transferred to the church forest to conservation.

The forests of the government and private provide a benefit to the inhabitants of the community of Debre-libanos. Although the main purpose of the churches is to serve as places for worship, burials and meditating religious festivals, the monastery also provides valuable, often unique, and secured habitats for plants and animals, and green spaces for people. It is serving as conservation sites and hot spots of biodiversity, mainly indigenous trees and shrubs of Ethiopia, which, in turn, give prestige to the religious sites.

The forest of the church was providing a lot of benefits to the inhabitants surrounding the monastery. The forest serving, the

followers and believers [8] by giving shade while they gathered for religious celebration in the monastery.

The tree shade has also given advantage to other trees. The large tree species were *J. procera*, *O. earopaea*, *C. macrostachyus* were the ones playing the role prominently. The secondly ranked benefit of the forest to the inhabitants was provision of fuel wood.

This benefit is especially for those who were monks and member of the monastery. They were using some tree species for fuel wood purpose though it is not allowed by the monastery. They used it to cook foods. The impact of cutting tree was insignificant (according to the monks). They use some tree species as their food source and use the forest as their home. The forest is believed to be more convenient for prayer and other spiritual deeds. They have also agreed that the forest is providing shade for those who came to the church for worshipping.

The experience of the church in forest conservation might be exemplary for both the government and private forest managers. The most important aspect being the participatory approach followed by the monastery that involves the inhabitants of the monastery itself and the nearby community.

They explained this by comparing the forest situation of the government owned forest with the monastery's forest in which the monastery's forest is in good condition than the government. The church forest was providing home to many wildlife species. This was witnessed through the observation of many birds and some mammals during the current study.

Furthermore, the forest was contributing its part in mitigating the impact of climate change. It can be said that almost all participant of discussion have appreciated the conservation and management techniques of the monastery which is similar to the report by Alemayehu [31].

In general the Debre-libanos dwellers have good attitude toward forest of the monastery than the government and private forests. This is because the inhabitants considered the forest of the monastery as their own. Beside to this they are very interested in planting trees and contributing to the development of the monastery.

However, their attitude to the forest of the government and the private forest was very less. They saw the forest of the government and private as it is not theirs. In addition, the exclusive method of conservation creates pressure on the inhabitants to have bad feeling on the government and private forests. This is similar to that of the derg regime conservation perspectives that results revenge from the local people from the protected area. As a result of this they were observed while cutting trees and selling in the market place.

Factors affecting woody plant conservation in the three forest systems

In general, the findings revealed that the forest conditions within the church forest haven't been influenced by livestock and/or erosion. This is because of the strict nature of protection of the church forest from inclusion of livestock within the church forest as management to protect the tree plants from damage. Furthermore, no extreme damage by insects was observed within all forest systems.

However, the forest conditions within government forest were influenced by regular removal of woody plants every year. In most cases small trees were removed from the forests. The predominance of

cut stumps by few woody plant individuals might be due to high coppicing ability of the species which necessitates their repeated removal.

The forest of the church is under threat because of woody plant cutting for the purpose of getting free burial ground and cut shrubs for the purpose of fuel wood in order to make local bread called dabe.

The numbers of tombs are increasing from time to time. The need for burial ground at the same time is increased. This in turn forces clearing the trees around the tombs. Clearing the forest for the purpose of finding burial ground by itself is not a threat, but it became a threat whenever there were no planting trees rather than monument.

Conclusion

Among the forests of Debre-libanos, the church forests were found to be of much higher socio-economic significance to the inhabitants of Debre-libanos town than the government and private forests. It is possible to recommend from this study as forest can be more conserved under the management of church rather of either government or private can do. The managements of both the private and government forests of Debre-libanos need to look for mechanisms of creating positive attitude of the local communities in order to avert undesirable negative impacts on the forests coming from the community.

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