FOREST PRODUCTS SCARCITY PERCEPTION AND RESPONSE BY TREE PLANTING IN THE RURAL LANDSCAPES: FARMERS' VIEWS IN CENTRAL HIGHLANDS OF ETHIOPIA

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Abstract

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A study was conducted in farmers living in central highlands of Ethiopia to assess how they perceive the forest products scarcity and their views concerning tree planting in their rural landscapes as a remedy to the problem. Further, the tree planting methods they chose were elicited with the underlying reasons. It was found out that there is an acute scarcity of forest products among the community living in central highlands of Ethiopia. The scarcity perception is influenced by the proximity to the remnant forest resources. The farther away the farm households are from the state forest, the more they perceive the scarcity problem. Other factors like settlement history and tenure conditions also play a vital role on the farmers' scarcity rating. Farmers have selected tree planting in their areas as the best choice to alleviate the scarcity problem. However, still about one-third of the farmers failed to choose tree planting as a solution due to land shortage. The small-scale woodlots followed by boundary tree planting were chosen as the best methods to increase the declined tree components of the landscape. The current market demand for construction wood, the familiarity of the farmers only to few fast growing species, the effect of the trees on the crops and the spatial arrangements of the trees in relation to crops were among the major factors that affect the choice of tree planting methods.

Key words: forest products, scarcity, tree planting, rural landscapes, perception

Introduction

Rural landscapes are characterized by multiple land use components like forest, meadows, farmlands, residences and others. Changes in the landscapes are taking place everywhere whether "developed" (Lapka et al., 2008) or "developing" nations. The

rural landscapes especially in the developing world are losing their structure, composition, and aesthetic values mainly due to poverty that prevails in the region. They are targeted for the production of food and wood to sustain the life of the increasing rural population. Forests were the major targets in this change because of the presumed fertility of the forestlands and hence, were cleared and converted into agricultural lands. This paved way for the monotonous farmlands to dominate the whole central Ethiopian highlands, where trees had less chance to exist in the farms. Such transitions in general undermine the other potential goods and services that the landscape could provide on long-term basis.

The conversion of the forestlands in to farmlands has finally resulted in forest products scarcity nationally. Bekele (2001) and EFAP (1994) have indicated that there is a wide gap between the demand and supply potentials for the various forest products. For example, the fuelwood demand for the year 2008 was predicted to be 74.9×10^6 m³ while the supply potential was estimated to be 9.8×10^6 m³ (EFAP, 1994). For construction wood, Bekele (2001) predicted a supply of 0.936×10^6 m³ by year 2014 while the demand would be 4.3×10^6 m³. Both the above studies showed that there is a great wood deficit and it is going to continue due to the sharp population increment and the declining forest resource in the country. Ethiopia had a high annual population growth rate of 2.62% in 2006 (MoFED, 2007) while the forest cover has dropped below 2.7% of the land area in 2000 (EARO, 2002). However, 90% of the fuelwood and construction wood comes from the remnant natural forests (Bekele, 2001). Hence, the community is very reliant on forest resources for energy, and construction. Even due to the poor livelihood condition, the communities around forests depend very much on them for economic purposes too (Babulo et al., 2008; Mamo et al., 2007). Such high reliance has led to severe utilization of the remnant forest resources, where in contrary no successful rehabilitation activities were done. Though there are such clear documents concerning the scarcity of forest products nationally, locally no studies have so far indicated how the farming community perceives the problem.

Many have stated tree planting as a remedy to the problem. Efforts were made nationally by governmental and non-governmental organizations to increase the incorporation of trees into the rural landscapes as a remedy to the forest products scarcity. However, they almost failed because the rural community was not consulted or asked how they prefer to do, but rather suggestions by the officials and other professionals were given a credit i.e. top-down planning problem (Bekele, Holden, 1999).

The current study has assessed: 1) how the local communities perceive the scarcity problem and whether there are variations based on proximity to the remnant forest resources, 2) to what extent farmers believe in tree planting in the rural landscapes as a remedy to the problem, and 3) methods or approaches farmers prefer in planting trees in their rural landscapes and the associated reasons for the choices made. This study has tried to answer these questions because of their importance for related problems in other sections of the world where such problems exist.

Oromia regional state
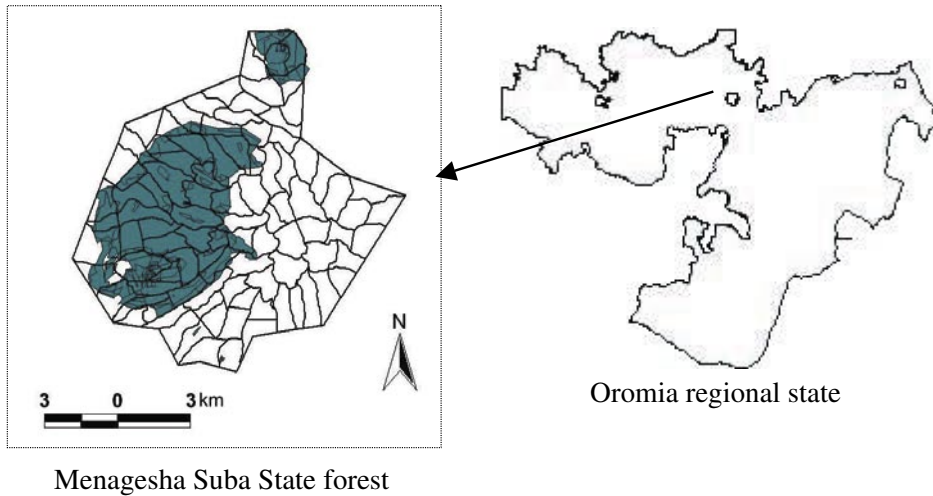
Menagesha Suba State forest

Fig. 1. The location the study area with respect to the regional state (the shaded area shows the remnant forest in the state forest designated area).

Study area

This study was conducted in Suba area located between 8°56´ – 9°02´ N and 38°28´– 38°36´ E in Walmera and Alamgana districts, Oromia regional state, Ethiopia (Fig. 1). The altitude ranges from 2500 to 3385 m a.s.l (Gazahegn et al., 1988). The mean annual temperature ranges from 11–22 °C and the mean annual rainfall is 1156 mm (SFCDD, 1991). It has a bimodal rainfall with the main one from June to September and the short rain from April to November.

The community is wholly agrarian and lives in poor livelihood condition. The area is characterised by high population density, which subsequently led to farmland shortage due to which the available farmlands were continuously cultivated for decades without proper management. Almost all the pieces of land available are under cultivation. Now the community is even encroaching the surrounding state forest due to shortage of farmland (Alemayehu, 2005).

There are only few trees scattered on the farms, which are mostly associated with religious purposes. Unless otherwise, there is no woodland or forest in this two districts except Menagesha Suba state forest, which is legally protected for any use. The remnant forests were depleted due to intensive harvesting and clearing for farmland. In Suba area, no tree planting effort was made due to lack of awareness of the problem caused by the shadowing effect of the existence of state forest, which the community rarely uses legally.

Material and methods

Two hundred eighty-six farm households (154 males and 132 females) were selected from two major groups namely border farmers (n = 213) and far outsiders (n = 73) which were classified based on proximity to the state forest. Border farmers are those living in the area from the state forest boundary to 1.7 km aerial distance from the forest boundary. The far outsiders are those living farther than 1.7 km from the state forest boundary. The marking of the farm households was done on map. The farm households were randomly selected and were used as sampling units. Gender balance was controlled by interchangeably interviewing male and female household heads from the respective households. A survey questionnaire, which focuses on forest products scarcity conditions and the choice of tree incorporation into their landscape as a solution to the problems associated with scarcity, was used.

The major forest products that are highly valued in the area were fuelwood, construction wood like poles and lumber and animal feed. These products were then rated for scarcity based on a scale of 0–10 where 0 represented excess availability, 10 designated acute shortage and values in between 0 and 10 representing scarcity scale in respective of their magnitude. The preliminary assessment has shown that farmers like to include trees into their landscape by planting them as small-scale woodlot, boundary tree planting and onfarm scattered tree planting. Alley cropping was added to the list by the recommendation of the researchers after looking at the soil condition in which case the trees in the row could provide litter for the soil amelioration. Ranking was used to elicit the farmers' choice of tree planting methods. The ranks ranged from 1 to 4 based on the number of described tree planting methods above. The best choice was ranked 1 and the least option ranked 4.

The collected data was analysed using SPSS (Statistical Package for Social Sciences) software version 15.0 (SPSS, 2006).

Results and discussion

The forest products scarcity

For all the forest products considered, there is a serious scarcity problem (Fig. 2). The highest percentage of farmers in both farmer groups rated the forest products on the last extreme scarcity scale 10. With increasing scarcity rate, the number of people mentioning the forest products scarcity also increased. Thus, it is clear that there is an acute shortage of forest products, which is mainly due to lack of any forest or woodland in the area. The existing state forest is very restricted for any use as mentioned earlier.

There is no significant difference in the scarcity rating of the forest products among the farmer groups. However, the scarcity is more pronounced among the far outsider farmers than the border farmers, except in the case of logs and lumbers (Table 1). The high scarcity rating of the logs and lumber among the border farmers than the far outsiders is because the later groups have already established onfarm trees since early times and they are using these trees for log and lumber somehow. But the border farmers were relying mostly on the state forest and did not plant as many trees as the far outsiders did. However, just recently these use form was completely banned from the state forest. Thus, the scarcity is very pronounced among the border farmers than the farther away ones. The settlement history, which has a direct impact on the land tenure right of the farmers, is also another factor for the scarcity feeling. Seventy-seven percent of the border farmers have undergone resettlement after which they resided at the current place. The nearer they are to the state forest the less

T a b l e 1. Mean ± SD of the scarcity rates for forest products.

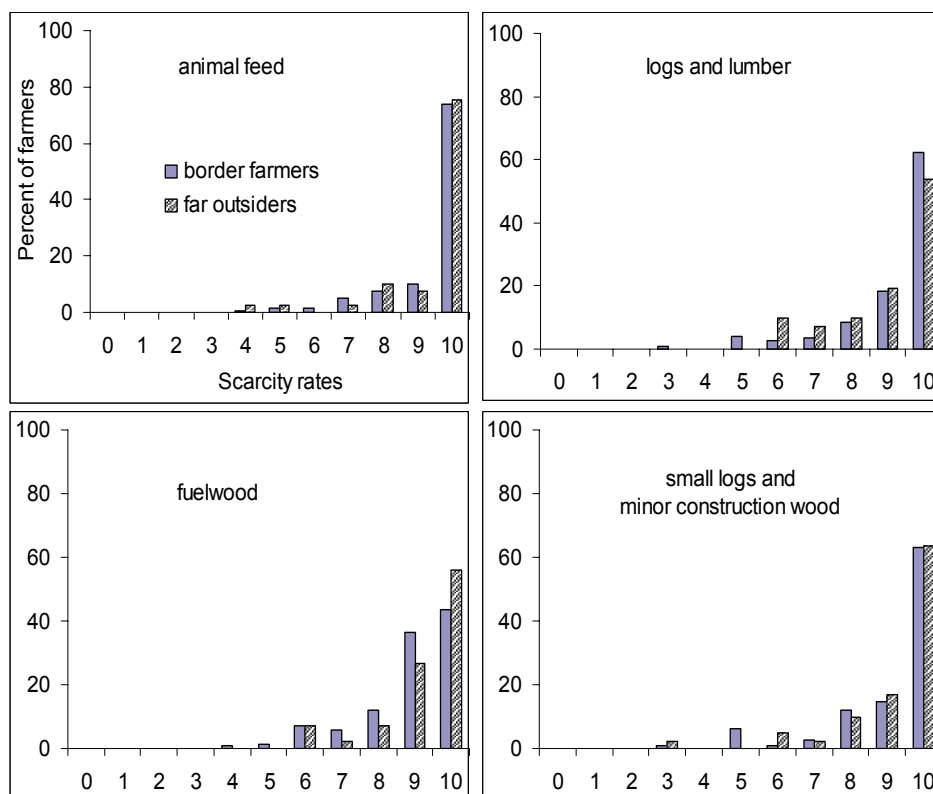| Farmer groups	Fuelwood	Logs and lumbers	Small logs	Animal feed
Border farmers	8.99 ± 1.17	9.17 ± 1.41	9.21 ± 1.46	9.44 ± 1.23
Far outsiders	9.15 ± 1.30	9.08 ± 1.28	9.44 ± 1.24	9.60 ± 1.08
Significance at $\alpha=0.05$	ns	ns	ns	ns
Mean	9.03 ± 1.20	9.15 ± 1.38	9.27 ± 1.41	9.48 ± 1.20

Fig. 2. Scarcity rating for various forest products among the two farmer groups.

secure they are about the land they own. Thus, the border farmers felt that the state forest may expand into their land area and hence they did not plant trees as the far outsiders did.

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T a b l e 2. Correlation matrix for scarcity rating of forest products.

	Fuelwood	Logs and lumber	Small logs	Animal feed
Fuelwood	1.000			
Logs and lumber	0.418(**)	1.000		
Small logs	0.280(**)	0.590(**)	1.000	
Animal feed	0.403(**)	0.415(**)	0.462(**)	1.000

** denotes highly significant correlation at $\alpha=0.01$ (two-tailed)

For other forest products like fuelwood, small logs and animal feed, the border farmers sometimes get them legally or illegally from the state forest. They collect fuelwood mostly from the state forest. But for the far outsider farmers it is too far to come to the state forest and collect these forest products. Even though it is far, still many people come to the forest to get some forest products because of the acute shortage. Therefore, the far outsiders feel the scarcity more than the border farmers do.

The scarcity ratings for the forest products have shown a positive highly significant correlation (Table 2). This implies that the scarcity ratings are interdependent i.e. when fuelwood is rated scarce, the others are likely to be rated scarce. This is because these forest products all together come from the same source i.e. trees, and when the trees are cut away then it is not possible to get any of the forest products.

Choice of tree planting as a remedy to forest products scarcity

Sixty-four percent of the community believes that tree planting is the remedy for forest products scarcity problems encountered. However, almost one-third of the community claimed that land and seedling shortage are the major bottlenecks not to choose tree planting as a solution. The open grazing lands are used for livestock. Thus, there is no land to grow trees. On the farm plots, it is very difficult to manage the trees and crops together according to the farmers' explanation. They have no experience of doing that and there are no extension services to assist them in doing so.

The far outsiders believe more in tree planting in their landscapes than the border farmers do (Fig. 3). For all the forest products i.e. fuelwood, construction materials and animal feed, more percentage of people from the far outsiders choose tree planting as a promising option. This could be because they have more trees as compared to the border farmers and they knew how much it is helpful for their livelihood. The major problem with the border farmers is still the reliance on the state forest which does not help them any.
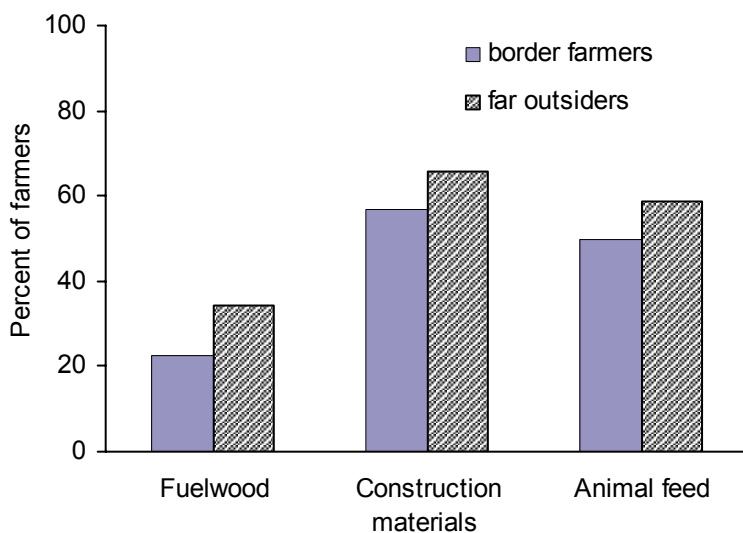
Fig. 3. Percent of farmers choosing tree planting as a solution to forest products scarcity.

Preferred methods for tree incorporations into the landscape

Small-scale woodlot is planting of trees on a piece of land for the purpose of fuelwood, construction wood or any other tree products depending on the species used. In Suba, the major species used is *Eucalyptus globulus* L a b i l l . These woodlots are targeted to supply construction wood (poles for house construction and branches for fencing and fuelwood), income generation for the farm households and production of wood for farm and household utensils. Small-scale woodlot is practiced more among the far outsiders than border famers because of the tenure insecurity in the later group of farmers.

In boundary tree planting, the trees are planted on the border or boundaries of farmlands. It also includes roadside tree planting as the roads in this specific community define farm boundary. Kidanu et al. (2004) indicated that such tree planting patterns dominate the highlands of Ethiopia. The main species used are *E. globulus, Acacia mearnsii* D e W i l d., and *Vernonia amygdalina* D e l. It is more frequently used than the other practices under discussion. In addition to its role as a supply source of wood products and erosion control, such planting trees also avoid inter-neighbourhood conflicts on farm boundaries. Thus, farmers' plant trees at least on the four corners of their farm plots around their residences as trees are living evidences, which pass from generation to generation unless cut.

In onfarm-scattered tree growing, the trees are very sparsely planted on the farmlands without any specific patterns. The species used in Suba area are mostly *Acacia albida* D e l*., Croton macrostachyus* H o c h s t., and *Ficus* species. Most of the old trees retained in the farms now are used for religious purposes and no one could cut them.

Alley cropping is an agroforestry intervention in which trees are grown in rows on the farm together with the cereal crops, which are grown in the open lands between the rows of trees. The trees are managed as hedgerows. Often during cropping phase, they are pruned so that the shading effect will not hamper the growth of the annual crops (Kang, Gutteridge, 1994). It is not familiar to the farmers of Suba area, except some farmers, who are living on the hilly slopes, where they use the trees for soil conservation purposes. The practice has many advantages. It facilitates the nutrient cycling (the roots of trees bring up nutrients from deeper soil horizons to the surface for the crops). The tree litter also keeps the soil moist by shading it against the intense sunlight. The trees also reduce soil erosion by keeping the soil together by their root (Kang, Gutteridge, 1994).

Choice of methods for tree incorporations into the landscape

Both farmer groups had similar ranking choices for tree planting approaches in their landscapes though the far outsiders always exceed the border farmers in ranking (Fig. 4). Statistically there was no significant difference among the two indicating a similar choice for the tree planting approaches in the landscapes. This lack of variation could be an indication for the urgency of the need for tree planting whoever the farmers are and wherever they are within the study area.

Most farmers (77.6%) have chosen small-scale woodlot on rank 1 indicating that it is the best choice in the area. There is no difference among the two farmer groups in their selection of small-scale woodlot as the best alternative. Boundary tree planting was chosen as the second best alternative. It is ranked 2 by most farmers (around 55%) and the rest put it on various ranks. Onfarm scattered tree planting was ranked 3 by 42% of the farmers with 31% putting it on rank 2. However, rank 2 is dominantly selected for boundary tree planting. Alley cropping was ranked the least out of all the options with 90% the farmers ranking it 4. This could be due to the unfamiliarity of most of the farmers to this practice. Generally, small-scale woodlot was chosen as the best alternative with mean (SD) rank value of 1.36 (0.77) followed by boundary tree planting with 2.42 (0.85). The onfarm scattered tree planting stood third with a mean (SD) rank value of 2.63 (0.91) followed by the alley cropping, which is least selected with rank 3.91 (0.34).

There is a very significant negative correlation between the rankings of the tree planting approaches except for alley cropping. With increased choice of small-scale woodlot tree planting method, there was a respective decrease in choosing for boundary tree planting and onfarm scattered tree planting methods. This is because of the very small land holding of the farmers (often less than 0.5 ha) and they could not opt for multiple approaches of tree planting methods. Under rare cases, even if they have the land there are problems like shortage of labour, lack of seedlings, insufficient finances to buy associated requirements
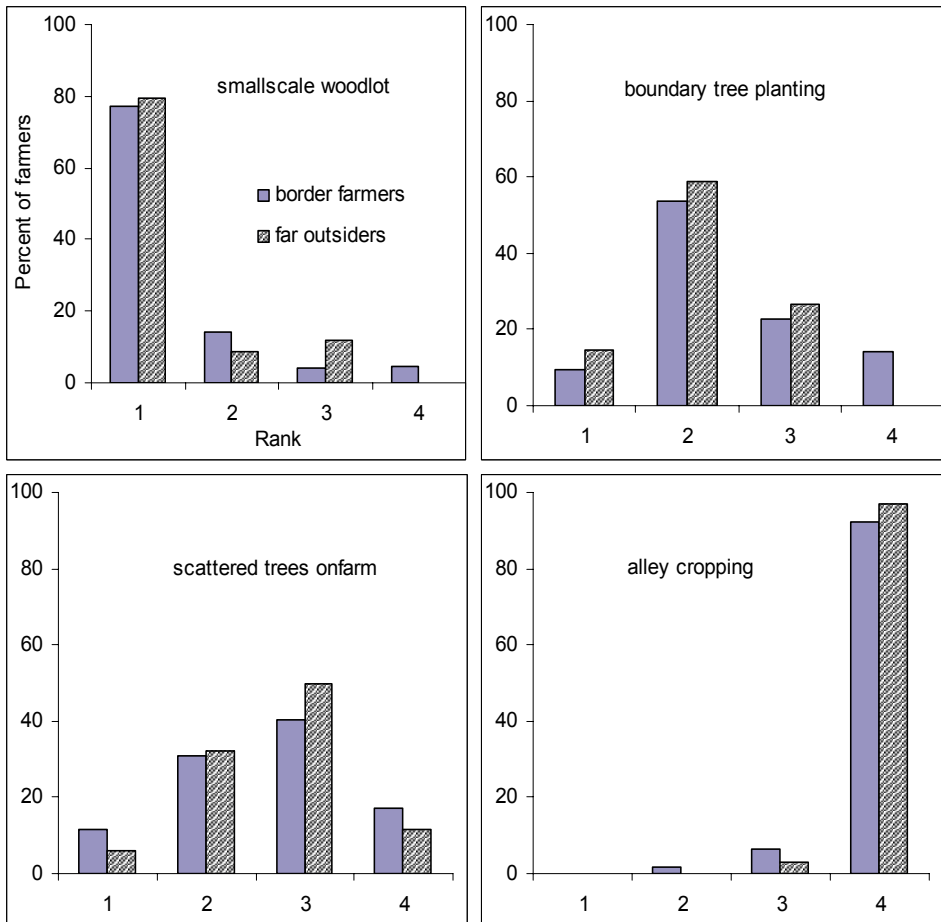
Fig. 4. Ranking of tree planting approaches among the two farmer groups.

like agrochemicals against insect pest and others. Therefore, because of such considerations, farmers focus on single options than multiple ones. That is why we find a decrease in preference of one option when the other is more preferred.

The lack of significant association of the alley cropping choice with other approaches (Table 3) is due to the lack of familiarity of the community to the practice. On the other aspect, the declining land holding by the farm households due to sharp population increase also influenced this choice. The farmers want to utilize the farm more for cereal production than incorporating other forms of plants like trees. The associated land coverage of the tree components in the middle of the farms is thus a great bottleneck for the preference of this

Tree planting choices	Small-scale woodlot	Boundary tree planting	On-farm scattered tree planting	Alley cropping
Small-scale woodlot	1.000			
Boundary tree planting	-0.282(**)	1.000		
On-farm scattered tree planting	-0.404(**)	-0.511(**)	1.000	
Alley cropping	-0.098	-0.054	0.041	1.000

** denotes highly significant correlation at $\alpha=0.01$ (two-tailed)

choice. Farmers also reasoned out that such trees, which are left in the middle of the farms harbour crop damaging animals like mice, birds and rarely apes and monkeys. Thus, the preference for this choice is minimal.

The farming practice, which totally operates using pair of oxen, is another barrier for the inclusion of trees with crops in the farm fields. The farmers explained that the tree roots become obstacles to the plough and on the other hand if the roots are cut the trees could no more grow. The shading effect of trees on the crops is also very influential in farmers' selection of the tree planting methods. Some cereals are light demanding and when shaded, the yield could be low. Rather than such complications, the farmers choose to plant trees in separate piece of land, which is often degraded and no more suitable for cereal production. That is what makes the small-scale woodlot to be very preferred among the farm households in central highlands of Ethiopia.

Nowadays small-scale woodlots are attracting farmers' attention because of the increasing financial income they generate. With the national wood crisis caused by severe deforestation, the demand for construction wood is rising sharply. The woodlots are the basic sources of such forest products. The expansion of urbanization in the country is also a factor that encourages the expansion of woodlots for logs and poles sales. Though there are such applauses for the small-scale woodlot tree growing, still the shortage of land is forcing farmers not to set aside pieces of land for this purpose.

The familiarity of the farmers to only few fast-growing species of trees like *E. globulus* and *Eucalyptus camaldulensis* D e h n h . also has an impact on the method of tree planting they choose. The farmers frequently explained eucalyptus in general retards the growth of crops in its proximity. Therefore, they do not choose to plant such tree in or close to the farms. Lisanework and Michelsen (1993) have indicated the potential allelopathic effects from both eucalyptus species. The right place the farmers suggest is to plant it on separate pieces of land. It has to be noted that the two eucalyptus species mentioned above are the only fast growing species in the area and they are the highly demanded and utilized construction wood species because of the acute scarcity of construction wood locally and nationally. Jagger and Pender (2003) have notably indicated the preference of eucalyptus for income generation among the communities in Northern Ethiopia.

The arrangement of the trees on the farms was also another issue considered in the tree planting choices. The small-scale woodlot and the boundary planting had a uniform spatial structure i.e. in the former one only trees are there and on the later one trees are only around the farms. For the scattered trees onfarm and alley cropping, the trees and crops are mixed up and there appears no uniform structure. Thus they were less favoured by the farmers as compared to the above two methods of tree planting.

Conclusion and recommendations

This study has indicated that there is a severe scarcity of forest products among the community living in central highlands of Ethiopia. The scarcity is influenced by the proximity to the potential sources of forest products. The farther away the farm households are from the state forest the more they perceive the scarcity problem. Other factors like settlement history and tenure conditions also play a vital role on the perception level of forest products scarcity. Farmers have selected tree planting in their areas as the best choice to alleviate the scarcity problem. The farmers have chosen an environmentally friendly option, which could serve them more to compete the forest products scarcity they have today. The increment of the tree composition in the landscape changes the beauty of the area. It also moderates the microclimatic conditions and serves as home for wild animals, which could become an important base for ecotourism. However, still around one-third of the farmers failed to choose tree planting option due to land shortage. Small-scale woodlot was chosen as the best method to increase the declined tree components of the landscape. The current market demand for construction wood, the familiarity of the farmers only to few fast growing species and the effect of the trees on the crops were among the major factors that affect the choice of tree planting methods.

Therefore, interested organizations and other concerned bodies should take into account this farmers choice and be with them for the change they eager for, from monotonous landscape to a diverse landscape with a potential to supply diverse products.

Translated by the authors

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