Status and prospects of farm forestry practices in central Ethiopia, a case of western Guraghe Highlands

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Abstract

The objective of the present study is to assess farm forestry decision-making strategies of smallholder farmers and to identify major choice constraints. It attempts to determine the potential of integrating multipurpose tree and shrub species into the existing land use units and its contribution to the objective of guaranteeing food self-sufficiency and sustainable livelihood. It also sheds some light on the deficiencies of current extension packages in helping farmers exploit the potentials of agroforestry innovations.

Farmers in the study area mainly employ eucalypt as major on-farm tree species both for meeting household wood demands and generating cash revenues. Farmers' decisions to plant multipurpose tree and shrub species are constrained mainly by lack of sufficient knowledge and planting materials. Inadequate or absence of marketing infrastructure, exploitative marketing arrangements, poor organizational support, weak provision of inputs, callous credit facilities, etc. represent institutional deficiencies. Among ecological factors, erratic rainfall patterns stand prominent. Related problems such as shortage of farmland, ruinous wild animals, destructive crop diseases and pests, seriously debilitate targets of achieving food self-sufficiency. Cultivation of enset, the staple food crop in the region, and other food crops is threatened by lack of manure and draught power.

Genuine institutional support in helping farmers reap the rewards of their efforts and overcome major farm constraints is the primary means of achieving sustainable livelihoods. Critical farm constraints such as deteriorating soil quality, loss of biodiversity, and excessive soil erosion can be ameliorated via well-planned agroforestry practices. Strengthening extension services with qualified personnel and judicious provisions of appropriate agricultural technologies significantly contribute to efforts of achieving food self-sufficiency.

Key words: smallholder, farm forestry, eucalypts, multi-purpose tree species, sustainable livelihood

1 Problem statements and justification

Ethiopia is believed to have lost much of its original forest ecosystems. The most frequently quoted figure on the extent of original forest resources seems to have emerged from the assumption that most (about 88 ~~%)~~ per cent of the highland areas over 1500 meters above sea level (masl) (that cover about 44 ~~%~~ per cent of the total land area) were once covered with natural high forests (von Breitenbach 1963; Conn 1991; SFCDD 1990; EFAP 1994).

As a result of massive clearance of its natural vegetation, Ethiopia is characterized by excessive land resource degradations, low agricultural productivity, intense demands ~~on~~ for productive natural resources, and recurring food insecurity problems. These have in turn contributed to unsustainable use of natural resources, accelerated soil erosion, and widening of desert-like drought conditions.

According to MNRDEP (1994), the only solution to arrest the worsening environmental deterioration and wood shortage crises in Ethiopia is to adopt stringent environmental protection schemes and embark on aggressive plantation establishment programs. In view of the rather limited experiences in and resource-intensive nature of large-scale plantation management, integration of multipurpose tree and shrub species (MPTSs) in the existing land use systems holds great potential. In connection to this, Buck (1992) notes the indispensability of genuine farmer participation for the success of farm forestry and integrated farming initiatives. Integration of multipurpose tree and/or shrub species in the farm units can also significantly contribute to sustainable land management and livelihood.

2 Plantation forestry experiences in Ethiopia

Ethiopia is said to have a long history and experience in plantation establishment and management. Watershed plantations have reportedly commenced about 550 years ago. Nevertheless, in contrast to the long deforestation history, concerted tree planting efforts remained either entirely overlooked or regarded dispensable until late ~~19~~th nineteenth century (Pohjonen and Pukkala, 1990; Wolde-Mariam 1972, cited in Eshetu and Högberg, 2000). Well-organized plantation establishment efforts and modern afforestation schemes were not initiated until late 1890s following the introduction of *Eucalyptus* species in 1894/95. Plantations of *Eucalyptus globulus* and *E. camaldulensis,* the two most successful species, could not be restricted to the initial town-plantation, but quickly spread to the countryside through private initiatives. Sjoholm (1986) argues that the widespread planting of eucalypts at all levels was the most valuable asset in advancing community forestry programs.

According to EFAP (1994), out of the total plantation area of about 200,000 ha, industrial plantations, peri-urban plantations, community woodlots, and catchment/protection plantations constitute 95,000 ha, 35,000 ha, 20,000 ha, and 50,000 ha respectively. FAO (2001) reports that the total plantation area in Ethiopia covers about 216,000 ha. On the basis of these ~~last two~~ figures, Ethiopia was able to establish only 16,000 ha of additional plantation size in about ~~10~~ ten years. No attempt has been made, however, to estimate the size of on-farm plantations. The reported total plantation size is quite low in comparison to the estimated annual loss of natural forests at a rate of 150,000 to 200,000 ha.

3 Research rationale

Indiscriminate destruction of forest vegetations and ground cover exacerbated the problem of land degradation and dwindling agricultural yields. With respect to land resources, the most serious problem is soil erosion (Dubale 2001) which according to Teketay (2001) in turn causes annual dropout of 100,000 to 250,000 ha of croplands from agricultural uses. The immediate viable means of reversing the current trends of worsening climatic upsets and land degradation problems is embarking on assertive tree planting programs with multipurpose species and coherent supplementary conservation works.

Past ambitious plantation establishment targets were never achieved with contemporary levels of awareness and administrative commitments. There is thus a need to strengthen resource capabilities and institutional commitments along with identifying and capitalizing on alternative approaches. This study was conducted to identify major envisaged goals and constraining factors of farm forestry practices in the Guraghe Highlands. This paper, therefore, dwells on assessing current farm forestry activities and identifying alternative agroforestry schemes that enhance sustainable resource management and production systems. It also highlights major policy deficiencies in promoting the integration of multipurpose tree/shrub species in farmlands and draws conclusions regarding alternative policy approaches.

4 Research strategy

4.1 Materials and Methods

Three reasons underlie the selection of the Guraghe Highlands for this study.

First, the Guraghe Highlands, apart from being little explored in the past, were quite appealing in terms of the rapidly expanding farm forestry practices with *Eucalyptus* as a dominant planting species. Interest has grown to find out the rationale behind such a heavy reliance on eucalypt species whose ecological and social merits have been under intense controversy in various parts of the world.

Second, while it is imperative to evaluate specific factors that are responsible for the growing problems of drought and food shortages, the study district may give an excellent opportunity to develop contrasting scenarios between drought-hit and transitional regions.

Third, the fact that conducting diagnostic surveys on farmers' attitudes, perception, knowledge and socio-economic variables in farm forestry was within the immediate priority settings of the newly structured Forestry Research Department of the Ethiopian Agricultural Research Organization (EARO).

Selection of the study district within the Guraghe Zone was necessitated by its advantage of having considerable regional diversity in terms of agro-ecological zones and farm forestry practices. Enemor and Ener district, apart from representing diverse agrarian regions, has a salient man-made woody vegetation cover and a relatively well-developed market for eucalypt poles in the middle altitude. It is thus believed that a study of villages from different agro-ecological zones would likely explain variations in farm forestry management practices and major constraints as well as potentials.

4.2 Data collection phases, methods and tools

Fresco *et al*. (1994) attribute the accuracy and reliability of survey methods to the depth (regular visits) rather than the coverage (single-shot visits) with which they are conducted. This clearly implies the extent of trade-offs between single-shot visits and repeated visits. Field surveys were thus carried out in two phases as a compromise between ensuring the reliability and representativeness of the acquired information and optimizing the survey resources (financial and time budgets, etc.). Figure 1 highlights major data collection phases and tools employed.

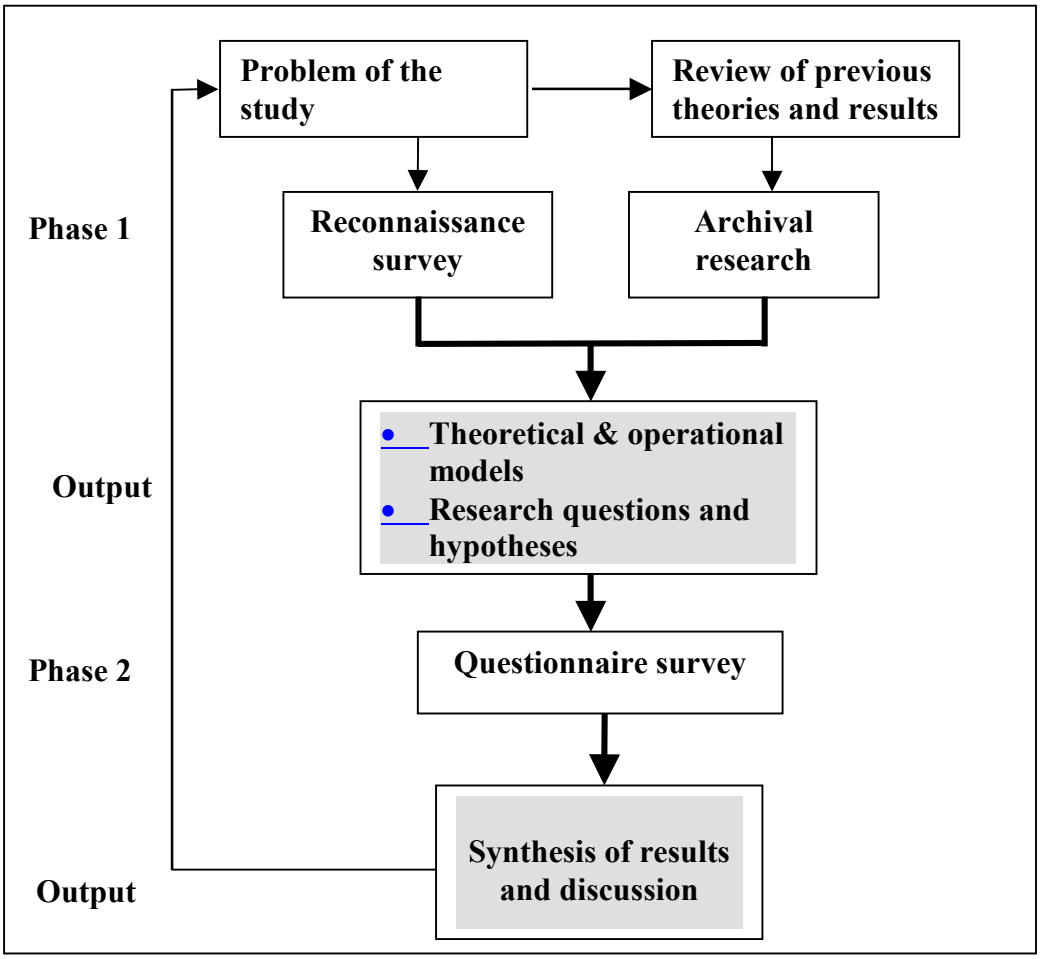

Figure 1: Research phases and data collection tools

During the preliminary survey phase, pertinent information was gathered and revealed through in-depth, open-ended interviews with heads of selected farm households, Development Agents (DAas), traditional and political leaders, and other relevant personnel. Results of this phase were used to draw research questions and to build research

hypotheses. Major data collection exercise was carried out during the second phase of the fieldwork. This phase also involved participatory on-farm discussions and observations, extensive household questionnaire surveys, in-depth interviews with key informants, market surveys, and plantation management surveys. Data was collected from ~~10~~ ten randomly selected Peasant Associations (PAs) of three agro-ecological zones.

5 Results

5.1 Socio-economic and demographic characteristics

Three factors are of significant relevance and importance in on-farm tree/shrub planting and management operations. These are the landholding size, household labor force status, and access to marketing infrastructure for wood products. Whereas landholding is a constant factor, the physical area of which cannot be altered, the other two factors can be adjusted to the needs and resources endowment levels of the households. Improvement of marketing infrastructure demands a considerable government support and institutional commitments.

Landholding size plays a vital role in smallholders' decision to integrate trees/shrubs in the existing land use patterns. The size of landholding will get smaller with time. This is mainly attributed to the high annual population growth rate of the Guraghe community, which according to NCS (1993) amounts to ~~3~~three ~~%~~per cent and low education rate of the ~~new~~ upcoming generation. Figure 2 portrays the current mean holding size of households and standard error bars in three agro-ecological zones.

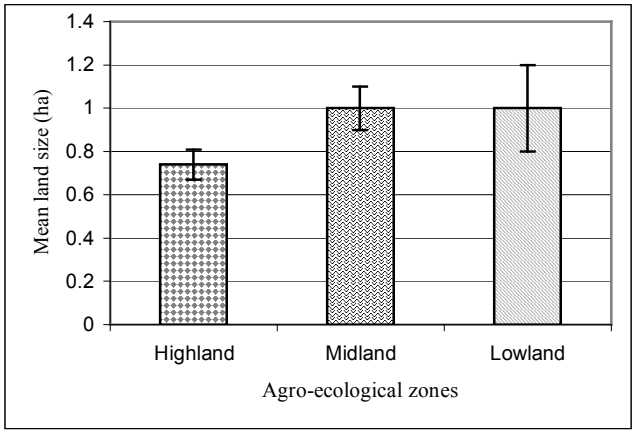

Figure 2: Mean holding size of households in three agro-ecological zones

Majority (70 ~~%)~~ per cent) of the farmers in the district possess landholding size of ~~1~~ one ha or less and only ~~6~~six ~~%~~per cent possess more than ~~2~~ two ha. Land scarcity problem is more severe in the highlands where population density is exceedingly high (Figure 2). In contrast to the overall figure, about 81 ~~%~~per cent of the households in the highland possess landholding size of ~~1~~ one ha or less. Lowland farmers seize opportunities of expanding farmlands although crop and animal diseases and pests restrict such desires. There is tremendous variation in landholding sizes of the households in the lowland. Households

with adequate size of labor force can own several hectares of land by clearing woody vegetations in the valleys.
Household labor force represents an important constraint in fostering on-farm tree/shrub management activities. This is particularly important for households of the study region since almost all tree management works are performed by adult men. Women are mostly occupied with cooking for the household, house cleaning, marketing activities, and caring for young children. They also devote a considerable time ~~in~~to enset processing and weaving of local mats, mostly in labor exchange groups. Female-headed households and households with disabled or aged male-heads and with no grown up male children often face severe challenges. Some ~~7~~seven ~~%~~per cent of the total households are entirely run by female heads. Figure 3 exhibits distribution of household members by age and sex. High rate of out-migration of, particularly, males in the active working age exposes many of the households to chronic shortage of labor force.

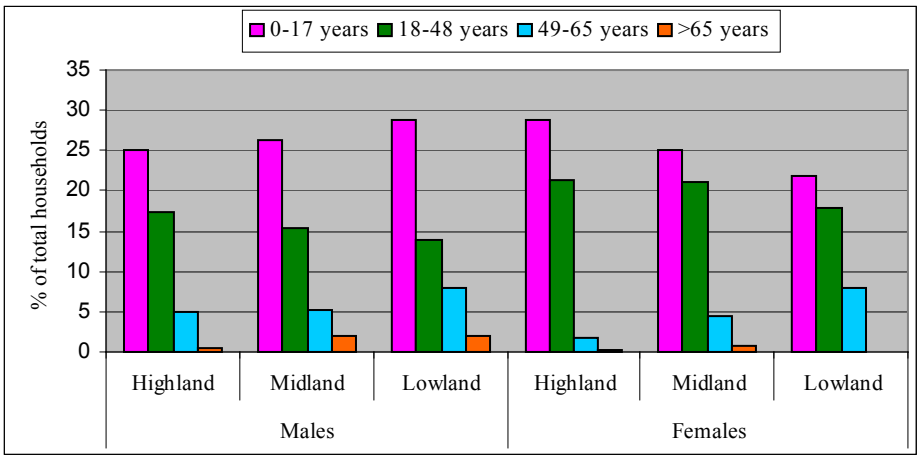

Figure 3: Distribution of male- and female-headed household members by age and sex in various agro-ecological zones

An important consideration in relation to household labor force is the availability of draught power. In this regard, about 87 ~~%~~per cent of the total households do not possess access to draught power. Whereas only ~~2~~two ~~%~~per cent of the households possess a pair of oxen, 11 ~~%~~per cent own only one ox. Availability of draught power enhances the efficiency of male labor forces in preparing seedbeds and plantation areas.

5.2 Farm forestry practices

5.2.1 Major on-farm plantation species

Unlike the findings by Price and Campbell (1998), all farmers in the study area grow at least ~~5~~ five exotic tree species. Survey farmers grow a total of 35 different tree and/or shrub species on their landholding. The total number of various tree and/or shrub species grown by individual households ranges between ~~1~~ one and eleven~~1~~. About 34 ~~%~~per cent of the total on-farm tree/shrub species are exotic of which 75 ~~%~~per cent are fruit species grown in the home compound. The lowest and highest ranges are recorded respectively in the

highland and midland households. Mean number of tree and shrub species grown by the survey households was found to be 4.6. The Chi-square test confirmed a highly significant (χ^2=41.267; P≤0.003) relationship between the agro-ecological zones and the number of planted species ~~planted~~.

The number of indigenous tree species planted by each household varies between ~~0~~ zero and ~~7~~seven, with the mean value of 2.6. The statistical relationship between the number of indigenous tree species per household and the three agro-ecological zones is highly significant (χ^2=43.375; P≤0.000). Mean number of indigenous tree species per household for the high, mid, and low altitudes amounts to 1.7, 3.1, and 2.9 respectively. The analysis, however, failed to reveal any association between the number of planted indigenous tree species per household and sex of household head.

Whereas eucalypts are planted by all households, species like *Ficus, Albizia, Vernonia, Milletia, Justitia,* etc. are grown only by less than ~~3~~three ~~%~~per cent of the households each. Many of the tree and shrub species with the exception of *Cordia. africana, Sesbania. Sesban*, and fruit trees are planted either in the woodlots, hedges along the border or along soil embankments, and *'dicher'* that are erected around home compound to deter infringements of wild animals. Some farmers also maintain a small size of closed forest that is dominated by naturally grown shrub and tree species at the extreme side of the homegarden.

Plantation species and intensities: Households in different agro-ecological zones plant various tree/shrub species in quite small numbers. Generally, whereas fruit trees are grown within the homegardens and indigenous tree species are grown along farm and/or farm plot boundaries, exotic tree species are grown widely separated from crop fields. Farmers also maintain naturally regenerated tree species within hedgerows or outside crop fields. Eucalypts represent not only the most widely planted species by all households but also the most abundantly grown species within the western Guraghe region (Table 1).

Table 1: Distribution of various on-farm tree species by agro-ecological zones

On-farm tree/shrub species	~~%~~Per cent of total respondents and mean number of trees/shrubs					
	Highland (n=52)		Midland (n=81)		Lowland (n=17)	
	~~%~~Per cent	Mean N~~n~~o.	~~%~~Per cent	Mean N~~n~~o.	~~%~~Per cent	Mean N~~n~~o.
Eucalyptus species	100.0	501.6	100.0	884.5	100.0	1001.8
Coffea ~~arabica~~Arabica	13.5	62.7	92.6	203.4	88.2	734.7
Catha edulis	17.3	260.1	63.0	318.5	70.6	485.0
Rhamnus prenoides	9.6	2.8	24.7	10.9	0.0	0.0
Cordia africana	5.8	2.7	43.2	3.2	94.1	6.9
Prunus persica	11.5	5.0	9.9	1.6	0.0	0.0
Milletia ferruginea	0.0	0.0	2.5	2.5	5.9	10.0
Podocarpus gracilior	0.0	0.0	14.8	6.9	0.0	0.0
Carica papaya	0.0	0.0	18.5	3.8	35.3	2.2
Citrus sinensis	1.9	4.0	23.5	3.8	64.7	4.5
Mangifera indica	1.9	1.0	4.9	1.8	0.0	0.0
Persea Americana	9.6	4.2	17.3	3.2	52.9	3.1

Cupressus lusitanica	59.6	63.4	16.0	34.4	5.9	5.0
Juniperus procera	53.8	25.3	23.5	11.1	5.9	5.0
Citrus aurantifolia	0.0	0.0	3.7	1.3	29.4	1.6
Hagenia abyssinica	11.5	6.3	0.0	0.0	0.0	0.0
Arundinaria alpina	34.6	66.8	2.5	23.0	0.0	0.0
Psidium guajava	1.9	2.0	6.2	1.4	0.0	0.0
Sesbania sesban	0.0	0.0	6.2	167.6	17.6	10.0
Croton macrostachys	1.9	10.0	6.2	4.8	0.0	0.0
Erythrina abyssinica	15.4	39.4	0.0	0.0	0.0	0.0
Albizia schimperiana	0.0	0.0	1.2	2.0	5.9	2.0

The number of on-farm plantation species increases with decgreasing altitude due mainly to better growth conditions and larger landholding sizes. In addition, conspicuously differentiated farming systems resulted in more number of trees and/or shrubs integrated into ~~landholdings~~ farm units of the lowland households. However on-farm trees and/or shrubs have more pronounced economic roles in the middle altitudes due to better marketing opportunities. Many of the species, however, are non-leguminous and thus neither enrich soil fertility through nitrogen fixation nor produce nutritious fodder.

Fruit trees, although largely succumb to the scourges of diseases and pests, are much more popular in the lowlands than in the higher altitudes. In the highlands, both ecological limitations and the predominantly cereal-based farming system restrict integration of trees/shrubs into cultivated lands. As clearly depicted in Table 1, eucalypt species, coffee, and t'chat represent the three most copiously planted woody species and thus briefly highlighted below.

Leguminous species like *Milletia, Albizia*, and *Erythrina* are mostly managed by retaining naturally regenerated seedlings either in grazing lands, along hedges, or rarely in crop fields. Indigenous species like *Juniperus* are intentionally planted in fewer numbers for its superior quality wood for construction purposes.

5.2.2 Eucalypt woodlots

Current status

Eucalypt was introduced to the Guraghe region by the Amhara settlers during the 1950s (Deheuvels and Derrey 1998). However, eucalypt plantations rapidly expanded in recent years in response to increasing market demands. Figure 4 displays mean number of eucalypt trees per household and standard error bars in three agro-ecological zones. Chi-square tests, however, failed to reveal any significant association between mean total number of eucalypt trees per household and the three agro-ecological zones. A significant ~~anomalies~~anomaly in the mean number of eucalypt trees per household between various sample PAs has been demonstrated.

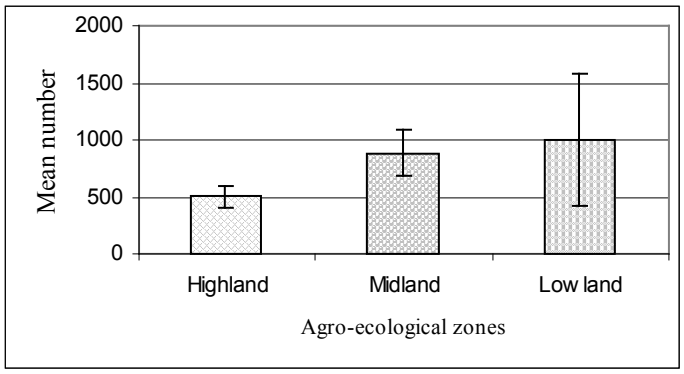

Figure 4: Mean number of eucalypt trees per household

Unlike other tree crops that have limited ecological ranges and thus can be planted only within restricted altitudinal belts, various eucalypt species perfectly fit into the prevailing agro-ecological zones of the Guraghe region. Whereas *Eucalyptus camaldulensis* is mainly planted in the low and middle altitudes, *E. globulus* is popular in the highlands with some degree of overlapping between 2400 and 2650 masl.

Goals of eucalypt woodlots

The overriding goal of eucalypt woodlots management is meeting the increasing demands for wood products. Fuelwood represents the sole source of household energy supply for cooking, heating, and lighting. Kerosene fuels supplement only a fraction of the household light energy demands. Moreover, the Guraghes rely on eucalypt wood as the most preferred construction material (for all hut, indoor, and outdoor construction works). The heavy reliance on eucalypt wood for construction slightly decreases from lowland to the highland. Households in the highlands also employ split bamboo stems in hut construction works. In general, Guraghes' huts are highly wood extensive and more beautiful than those of other regions. On the basis of detailed discussions with selected household heads, the total amount of eucalypt wood needed for an average size hut in the middle and low altitudes is estimated to be 40 to 50 m^3 representing trees of ~~3~~ three to 40 years of age.
Next to meeting household wood demands, eucalypts are also valued among some midland and highland households for generating the critically demanded cash revenues. For instance, in the study district alone, a total of about 420~~,~~000 poles of various sizes were sold to external traders between November 1999 and June 2000 (excluding data for April) (DBA 2000). In the same year the District Finance Office (DFO) generated about 435~~,~~000 Birr from tax of eucalypt poles (Pers. Comm.). Table 2 displays percentage of households that sold eucalypts, coffee, and t'chat between 1995/96 and 1999~~/00~~/2000 as well as mean revenues generated from the respective crops.

Table 2: Percentage of households that sold coffee, t'chat, and eucalypts between 1995/96 and 1999/2000 and mean revenue generated from the sales~~.~~

Year	Per cent~~No.~~ of households and mean revenue (Birr) (n=150)					
	Coffee	Revenue	T'chat	Revenue	Eucalypts	Revenue

1995/96	4.7	174.00	4.0	91.67	2.7	185.00
1996/97	4.0	156.67	5.3	87.50	3.3	169.00
1997/98	2.7	268.75	6.0	87.22	4.0	225.00
1998/99	2.0	116.67	6.7	89.00	4.7	132.14
1999~~/00~~/2000	0.7	220.00	10.0	155.00	8.7	118.31

Villages with ready access to transportation infrastructure and nearby major wood consumption centers possess great potential of marketing eucalypt products. However, major pole hauling routes to the central market is often confined to few middle altitude PAs. In addition to the formal marketing of eucalypt poles, households have some possibilities of selling in local markets.

Constraints

Establishment and management of eucalypt woodlot for the market are constrained by various internal and external factors. Among others, household decision to establish additional woodlot is seriously constrained by its landholding size. Although 62 %per cent of the households indicated shortage of land as one of the main constraints in eucalypts woodlots management, Figure 2 depicts that highland households are the most affected. Bulky nature of wood products necessitates adequate~~easy~~ access to transportation networks, an indispensable prerequisite for eucalypt planting for the market. Highland and lowland households are constrained by lack of access to road networks. In contrast, households in the middle altitude are currently under increasing pressure of local authorities and extension personnel that discourage further expansion of eucalypt woodlots. Although they claim ecological concern as a major reason, the rush for food self-sufficiency target is a much more credible motive of swaying farmers adrift from promoting eucalypt as a cash crop.

An added constraint that compels farmers not to plant euclypt trees near and/or within croplands is its excessive competition for soil nutrients and moisture. This has been proved by low performance of crop species within short radius around eucalypt trees. Likewise, some 43 %per cent and 41 %per cent of the total survey households are respectively constrained by shortage of labor and lack of seedlings. Lack of seedling, generally, is not a crucial constraining factor since majority of the farmers either raise the seedling themselves or buy from local markets at very cheap prices. Among those who planted eucalypts during the 1998/99 and 1999/2000 years, respectively 73 %per cent and 70 %per cent used seedlings from own nurseries.

In some middle altitude PAs, access to transportation network is relatively well developed and large tracts of uncultivated land are still available for eucalypt woodlots establishment. Eucalypt planting for the market is, nevertheless, decelerated by highly exploitive distribution of net revenues among the various product-marketing stakeholders (Table 3).

Table 3: Interest compounded value (ICV) and net benefits of eucalypt poles ha^{-1}.

Costs	**Years**							
	1	2	3	4	5	6	7	NCV (year 7)
Farmer	1982.55	25.40	25.40	25.40	25.40	25.40	25.40	4801.94
Second trader	0.00	0.00	0.00	0.00	0.00	0.00	66666.60	66666.60
Third trader	0.00	0.00	0.00	0.00	0.00	0.00	73333.26	73333.26
Revenue								
Farmer	0.00	0.00	0.00	0.00	0.00	0.00	16666.65	16666.65
Second trader	0.00	0.00	0.00	0.00	0.00	0.00	73333.26	73333.26
Third trader	0.00	0.00	0.00	0.00	0.00	0.00	130000.00	130000.00
Interest (15 %per cent) compounded profit [1]								
Farmer	0.00	0.00	0.00	0.00	0.00	0.00	11166.76	11141.29
Second trader	0.00	0.00	0.00	0.00	0.00	0.00	6666.66	6666.66
Third trader	0.00	0.00	0.00	0.00	0.00	0.00	56666.74	56666.74

[1] In computing the profit, minor costs of the brokers are not considered.

Values in Table 3 demonstrate hypothetical but empirically founded revenue distribution between various stakeholders involved in eucalypt pole marketing. Total revenue that farmers receive from a bundle of poles of 4 four to 8eight years age is nearly identical to tax charge per bundle of the local government (computed as a cost of the second trader).
The result exhibits that city traders and government offices draw unparalleled rate of revenue just in a matter of few weeks as compared to farmers who cared for the trees for 4 four to eight8 years. With the assumption of 8 eight years rotation period and selling turnover for the second and third traders of 1 one month, farmers make only 1.7 %per cent and 0.2 %per cent of the profits made by the second and third traders respectively (Table 3). This clearly confirms that the closer the product draws to the final consumer the higher the profit it fetches to the holder. In other words, the more the number of intermediate traders the wider the gap between farm gate and consumers prices and the less the reward farmers reap from their produce.

5.2.3 Coffee and t'chat plantations

Culture

Coffee is, by and large, planted within the home compound intercropped with enset, the staple food crop, or various annual crops. In contrast, t'chat is often planted in the next horizontal stratum either in mixture with low growing crops or as a sole crop. There is no, as such, well-defined structure and configuration of coffee and t'chat plantations since individual farmers carefully intermingle different species in their own ways. Nevertheless, farmers generally, plant coffee and to a lesser extent, t'chat in rows between enset plants or in more complex mixtures. Current promotional packages of coffee oblige farmers to follow a stringent site preparation and spacing procedures.
Enset plants provide not only the critically demanded year-round shade but also share the nutrient rich animal dung and farmyard manure to coffee plants. Gedeos ingenious likening of coffee and enset to children of the same parents that, under normal circumstances, never separate from each other (Kanshie 1994) is also shared by the Guraghes. The Guraghes, while upholding the same conviction, accord a partial treatment to the two 'sibling' plants. Enset plants always take the immediate vicinity of the house compound, the seedlings occupying the closest neighborhood for the belief that proximity to the house compound hastens growth rates. In majority of coffee plantations outside enset, farmers intentionally plant or retain various tree/shrub species to provide shade.

Goals

Although the prime goal of coffee and t'chat plantations is to meet household demands, few households plant the latter crop mainly for cash generation. This applies to households that abstain from t'chat chewing on religious grounds (Protestants and few Muslims Muslimsand Protestants). Coffee meets one of the most basic dietary needs of the households and represents a vital means of daily household communications. It also plays an important role in various ceremonies and festive occasions. On the contrary, t'chat is mainly consumed by adult men for its mildly euphoric effects. Moreover, unlike urban

'chewers' farmers also claim to employ t'chat for quenching the hunger as its ephedrine type alkaloids depress appetite.
Products of the two crops are also used to generate cash revenues. Whereas coffee is predominantly used as a cash crop in altitudes less than 1900 m, t'chat is mainly ~~predominantly~~ used as a cash crop in PAs over 1,700 masl. Households in the favorable ecological range generate cash revenues not only by marketing excess produce but also by selling available produce at times of emergencies and to cope with uncertainties.
In general, marketing of tree/shrub products cannot be expected on yearly basis because of various ecological and biological limitations. This is attributed mainly to either the occurrence of good yields at intervals or irregular attractive marketing incentives. Good coffee yields, for instance, are expected every other year after the mother plants are fully recuperated. Good cropping seasons are often followed by price falls thereby dissuading farmers from overproduction and vice versa.
Further, coffee and t'chat plants are claimed to improve soil fertility, control soil erosion, and bestow reputation on the household. Dried branches of the two crops can also be used for fuelwood and fencing purposes. Leaves and twigs of t'chat provide important supplementary feed for animals.

Constraints

Household decisions to grow coffee and t'chat are constrained by multiple and complex factors that vary with altitudinal locations. Generally, although coffee indiscriminately succumbs to coffee berry disease (CBD, locally known as *Yebuna Kolera*) that infests young berries and cause pre-mature shedding, the severity increases with decreasing altitude. It represents the most notorious and destructive coffee problem in the area. Complete removal of subsidies and subsequent intolerable high prices frustrate many farmers from employing chemical treatments. During the 1999/2000-cropping season, none of the survey households admitted using chemicals against pests and diseases and only ~~9~~nine ~~%~~per cent used herbicides in cereal crops. While the survey was conducted in June/July 2001 some coffee growing farmers were incessantly asking the District Bureau of Agriculture (DBA) for a chemical against CBD, as it is very time specific.
Another less serious coffee disease is dying back of the entire bush (locally known as *Bunnaa*) that causes complete drying of a cluster of bushes mainly during the dry season. The cause is not yet known to the farmers. Overall, some 91 ~~%~~per cent of the total coffee-growing households complained about the challenge of coffee diseases. Unlike t'chat growing, most of the farmers are never willing to give up coffee growing, although recent declining price has sparked opposite reactions in other regions (WIC 2002).
Some 68 ~~%~~per cent of the households indicated that the decision to grow coffee is partly or entirely thwarted by lack of seedlings, although some farmers diligently raise seedling under various techniques of moisture conservation (Plate 1). Other constraints in coffee growing include shortage of labor (49 ~~%~~per cent), low rainfall (45 ~~%~~per cent), small landholding (38 ~~%~~per cent), wild animals' damage (27 ~~%~~per cent), and poor soil conditions (19 ~~%~~per cent).
Another important constraint in coffee growing is the recent decline in prices, which according to BBC (2002) has gone down by 70 ~~%~~per cent since 1997. The complaint of only 24 ~~%~~per cent of the households indicates that low price was overshadowed by extreme

devastation of CBD. In other coffee regions of Ethiopia, many farmers were compelled to uproot coffee bushes and replace with t'chat for its attractive price and cereals (WIC 2002). As compared to coffee, t'chat has relatively less challenging biological constraints within its major ecological range. It faces, nevertheless, multiple social constraints among which declining farm gate prices, sanctions of the local authorities, small landholding sizes, and religious beliefs are prominent. Recent decline in farm gate price is attributed neither to the normal market price fluctuations nor decreasing market demands, but to substantial increase in local tax rates that is aimed at discouraging the growers. On the contrary, both local consumer and export market prices are increasing (FAO 1995). Local authorities and extension personnel persuade farmers into monocultural production system that is overwhelmed by imported costly inputs and unverified varieties. Consequently, there is a strong opposition to furthering of market-oriented t'chat plantations. Some 19 ~~%~~per cent of the households confirmed that the decision to grow t'chat is affected by such agitations.
Whereas limited landholding size is a real problem for some t'chat-growing households, lack of manure represents a more significant challenge in expanding farmlands for others. Inherently infertile and clayey nature of some middle altitude soils necessitates excessive tending and farmyard manure applications before they can yield satisfactory produce. Poor soil quality as a constraining factor has been complained by 21 ~~%~~per cent of t'chat growing households. As a result, crop cultivation is restricted to a mere fraction of the total landholding size (Plate 2).

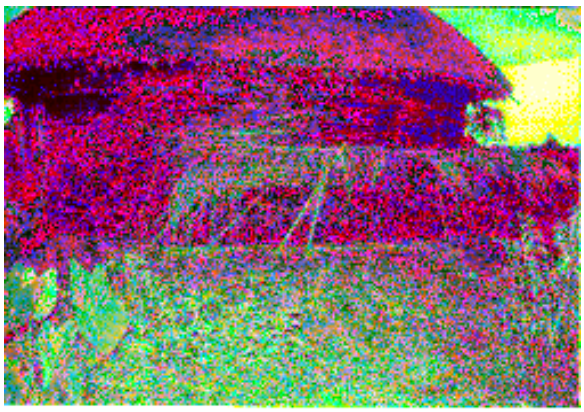

Plate 1. Raising coffee seedlings on site with maximum moisture retention

Plate 2. Crop cultivation is done only on a small tract of land around houses

Wild animals cause light damage to t'chat plants mainly in the lowlands. T'chat is also susceptible to a pest that sucks young leaves. One-quarter of the survey households implicated t'chat growing as labor-intensive farm operation and thus their decision to grow the crop is affected by shortage of labor force. Low rainfall as a constraint has been cited only by 11 ~~%~~per cent of the households.

5.3 Preferred and undesirable tree/shrub species

In this study 83 ~~%~~per cent of the households indicated one or more number of preferred on-farm tree/shrub species. About one-third of the farmers selected *Cordia africana* as the most preferred on-farm tree species. ~~*Sesbania sesban and Milletia ferruginea*,~~ The local

leguminous species, *Sesbania sesban* and *Milletia ferruginea*, have been mentioned respectively only by ~~5~~five ~~%~~per cent and ~~2~~two ~~%~~per cent of the households as the first priority (Table 6). In fact, farmers mentioned only the former species for its multiple use values such as improving soil fertility and~~,~~ provision of shade, animal feed, fuelwood, etc. Additional advantages of planting *S. sesban* include fast growth rate, low competition for space and soil nutrients, ~~providing shade for coffee plants~~ and ease of uprooting the stumps.

Table 6: Farmers' prioritized preferences for various tree/shrub species in crop fields

Species	~~%~~per cent of farmers ~~voted for~~selected as		
	First	Second	Third
Don't know	17.3	17.3	17.3
Cordia africana	33.3	8.0	2.0
Coffea arabica	10.7	2.7	1.3
E. abyssinica	8.0	4.0	0.7
Sesbania sesban	5.3	3.3	2.7
C. macrostachys	4.7	3.3	2.0
P. americana	4.0	4.0	2.7
Carica papaya	3.3	4.7	2.0

Species	~~%~~per cent of farmers selected as		
	First	Second	Third
Ficus sur	2.0	0.7	0.7
J. procera	1.3	1.3	1.3
Catha edulis	0.7	3.3	2.0
A. abyssinica	0.7	1,3	0.7
M. ferruginea	2.0	4.7	0.0
R. prenoides	2.0	1.3	0.0
H. abyssinica	1.3	2.0	0.0
No species preferred	2.7	2.0	2.0

The first, second, and third preferred spp. are mentioned by 150, 110, and 67 respondents respectively. Farmers branded a number of indigenous and exotic species as potentially undesirable within and around croplands. In contrast to the will of the promoting agency that produce and distribute seedlings of various timber species, farmers prefer to plant trees and shrubs to simultaneously meet multiple objectives. Likewise, tree/shrub planting for such objective as aesthetics is not on farmers' priority list. As a result trees/shrubs planted for aesthetic purposes receive the least tending operation and thus have the lowest (10-20 ~~%~~per cent) survival rate (Pers. Comm.).

The overwhelming majority of the households rated eucalypt species as the most undesirable species in croplands primarily for intense competition with food crops and drying up of the soil. *Juniperus procera* and *Cupressus lusitanica* are the next most disliked tree species mainly for their drying up effects on the soil and intense competition with crops. The shedding leaves and fruits of *Cordia africana*, were blamed by few farmers for damaging enset plants and other crops.

5.4 Perceived risks and uncertainties in on-farm tree management

For households in the middle and low altitudes, on-farm trees and shrubs are viewed as spots where crop-damaging beasts find refuge. In this regard, 87 ~~%~~per cent of the households expressed concern over the risk of harboring harmful animals and disease organisms. The risk of drying up of young seedlings during extended dry spells is higher in the lowlands. In the highlands, competition of trees and shrubs for the scarce land as well as ecological limitation take precedence.

Risks of tree use right have been evaluated as severe only by 11 %per cent of the households. In contrast to the generally accepted notion on land tenure issues, farmers of the study area do not see the current land tenure as a constraining factor in adopting agroforestry innovations. Only 3three %per cent of the households blamed current land tenure system as a constraint to their farm practices.

The result clearly exhibits that about half of the households still maintain negative attitude towards on-farm trees and shrubs. More than two-thirds of the households expressed concern over long gestation period of on-farm trees. Only half (56 %per cent) of the households possess full conviction in the multiple use values of trees and shrubs. This is attributed to low familiarity with multipurpose species and their agroforestry values. Table 4 summarizes major risks and uncertainties pertaining to on-farm tree management practices.

Table 4: Farmers' perceptions on selected roles of on-farm tree and shrub species

Effects of trees and shrubs	Levels of conviction (%per cent of respondents)			
	Do not know	Agree	It depends	Disagree
Enhance food and financial security	0.0	56.0	16.7	27.3
Labor-intensive work	0.0	68.0	11.3	20.7
Reduce soil erosion and crop damage	2.0	64.7	16.0	17.3
Increase fodder yields	5.3	50.7	15.3	28.7
Harbor harmful pests and diseases	0.7	86.7	5.3	7.3
Long gestation period	0.0	69.3	10.0	20.7

Only 39 %per cent of the farmers mentioned at least one potential tree/shrub species that can be planted within and around farms along with associated constraints. Farmers often mentioned tree and shrub species that are either grown in the area or recently introduced by the DBA. One-quarter of the farmers in the middle altitude express strong desire to plant avocado trees, owing mainly to alleged potential of facilitating easy access to government credit sources. It can be gleaned from Table 5 that on-farm planting of indigenous tree species is constrained, *inter alia*, by lack of seedlings, shortage of land, and long gestation periods. Shortage of seedlings has been mentioned even for species that are being promoted by the DBA. This demonstrates the extent of the gap, which is expected to yawn further, between demand for seedlings and supply from highly centralized nurseries.

Table 5: Potential on-farm tree/shrub species and associated perceived risks in various agro-ecological zones.

Species*	High altitude	Mid altitude	Lowland	Risks**
	%per cent of respondents			
Do not know	51.9	9.9	29.4	-
No other tree spp grown	21.1	43.2	35.3	-
Carica papaya	0.0	17.3	5.9	1, 2,3
Persea americana	3.8	24.7	5.9	1,3,6
Mangifera indica	1.9	13.6	11.8	1,6

Juniperus procera	3.8	4.9	5.9	1,2,3,5,9,
Cordia africana	5.8	6.2	11.8	1,2,3,5,6,7
Cupressus lusitanica	7.7	4.9	0.0	1,2,3,9,
Millettia ferruginea	3.8	1.2	11.8	1,4,7
Podocarpus gracilior	1.9	4.9	0.0	1,2,5,7
Casuarina equsetifolia	1.9	2.5	0.0	1,2
Albizia schimperiana	0.0	1.2	11.8	4,6
Citrus aurantifolia	0.0	3.7	0.0	3,4
Citrus sinensis	0.0	3.7	0.0	1,3,10
Sesbania sesban	0.0	2.5	0.0	4,5

* Other less frequently mentioned species include: *Annona senegalensis, Acacia decurrens, A. abyssinica, Syzygium guineense, Hagenia abyssinica, Eucalyptus camaldulensis, Rhamnus prinoides, Olea europaea, Ficus sur,* and *Psidium guajava.*

** 1 = lack of seedlings; 2 = shortage of land; 3 = shortage of labor; 4 = lack of motivation; 5 = long gestation period; 6 = lack of experience/know-how; 7 = harboring wild animals; 8 = does not grow well; 9 = drying up soil; 10 = poor soil quality.

Some 48 ~~%~~per cent of the respondents admitted that they have never used tree/shrub seedlings issued by the DBA. On the other hand, seedlings from centralized nurseries failed short of addressing planting goals of 19 ~~%~~per cent of the households. Accordingly, many of the timber and aesthetic species distributed by the DBA largely miss the prime goals and needs of the households. It is quite encouraging that 79 ~~%~~per cent of the households expressed strong willingness to plant more trees on their farms if planting materials of appropriate multipurpose species are readily accessible.

Extension program of the DBA is not sufficiently promoting integration of leguminous MPTS species in the existing land use system. DAs lack adequate training in agroforestry innovations and species selection for various ecological regions and management objectives. Moreover, DAs are often entrusted with a mandate that is far beyond their physical and technical capabilities. Seedlings are raised without matching the supply with the needs of the farmers and without sensitizing them to the use and functions of the trees. Demonstration plots pertaining to agroforestry roles of trees and shrubs are entirely lacking.

6 Discussion

This study demonstrates that although farmers plant several tree and shrub species, they could not exploit full potential of agroforestry innovations. This is attributed to both low awareness of the farmers and insufficient efforts of the rural development agency in promoting appropriate agroforestry innovations. According to Hildebrand (1981) both motivation and provision of appropriate technology are crucial for adoption of an innovation by smallhoders. Pannell (1999) notes four conditions that determine the adoption of an innovation by a farmer: awareness of the innovation, perception that it is feasible to trail the innovation, perception that the innovation is worth trailing, and perception that the innovation promotes the farmer's objectives.

One of the most critical constraints in integrating multipurpose trees and shrubs into the existing farm units is the lack of planting materials of appropriate species. Farmers generally rely much on the locally known species and are not motivated in experimenting

with different species mainly because of their risk avers behavior. Extension programs largely distribute seedlings of timber and aesthetic species. For instance, from the total seedlings that were raised in the year 2000/01 only 26 %per cent were suitable for planting in croplands. This coupled with low awareness of the farmers on the multiple use of various tree and shrub species decreased exploitation of the potential.

Although the importance of tenure security for agroferstry promotion has been stressed by Caveness and Kurtz (1993) and Neef and Heidhues (1994), it was found irrelevant in this study for promoting tree planting by farmers. About 97 %per cent of the households believe that the land they cultivate belongs to them and can be inherited to their children. Accordingly, some 69 %per cent of the households planted one or more of the following long rotation species on their landholding: *C. africana, P. gracilior, J. procera,* and *P. americana*.

Female-headed households, particularly those with no grownup male children, often face challenging labor shortages in establishing and tending on-farm tree and/or shrub plantations. Labor constraints of female household heads have also been reported from Kenya (Bonnard and Scherr 1994) and Zimbabwe (Price and Campbell 1998). Moreover, many empirical evidences confirm that extension staffs that are concerned with promotion of innovations and distribution of seedlings tend to be biased towards men and wealthy households (Franzel 1999).

Current local policies strongly discourage farmers from expanding plantations of t'chat and eucalypt species. DBA experts alike field extension workers express the danger of expanding eucalypt and t'chat plantations in guaranteeing food security, and in some instances, went to the extent of uprooting planted eucalypt seedlings from farmers' fields. This is attributed to what Arnold (1995) described as little understanding of the role of trees in farming systems and the criteria that farmers use for managing trees. Nair (1993) attributes the disparity between actual farmer circumstances and experts' belief to the little knowledge of the latter about the people whom they are supposed to serve. As Malla (1999) asserts, tree growing issues need to be viewed from the perspective of farmers' overall economic goals and household strategies. In addition, Teketay (2000) argues that careful analysis of the community needs and judicious matching of the species with the site potential are critical prerequisites for the promotion of on-farm tree plantings.

7 Future directions

Despite acute scarcity of land, impoverished soil fertility, and frequent fallowing of farmlands, improved tree fallows are not known in the highlands. Franzel (1999) asserts the significance of improved tree fallows in helping farmers increase incomes, reduce soil degradations, increase wood product supplies, and improve food security. Likewise, adoption of improved tree fallows and other agroforestry practices holds great potential in extensive farming systems of the middle altitudes to convert idle lands into productive use. Large tracts of uncultivated poor lands can be converted to productive farmlands with the use of N-fixing species.

Planting of eucalypt species and replacing the cow dung as a fuel material with eucalypt wood substantially contribute to nutrient cycling, erosion control, and favorable soil conditions. Zerfu (2003) reports that the use of equivalent calorific value of eucalypt wood from one ha saves up to 826 kg and 157 kg net N and P respectively. The significance of

eucalypts for woodlot plantations is attributed not only to its unique value in local construction works and exceedingly fast growth rate but also to its tolerance to browsing, seasonal moisture stresses, and extreme soil conditions.

A new system of woodlot management in which N-fixing species are intermixed with eucalypts substantially improves overall biomass production and soil nitrogen dynamics. According to Khanna *et al*. (2003) mixtures of eucalypts and *Acacia mearnsii* produced ~~5~~five ~~%~~per cent more eucalypt biomass due to increased nitrogen supply. In addition to their positive effects on soil conservation and fertility improvement, mixed species plantations of eucalypts greatly foster maintenance of floral and faunal biodiversity. This would also gradually widen diversification of products and means of cash revenues.

Lastly, there is a need for a paradigm shift from conventional top-down planning system and pouring of imaginative panacea to farmers' food insecurity problems and dwindling well-being to considerate and cohesive participatory planning approach. Selection and dissemination of farm forestry innovations must be preceded by careful identification of farmers' priorities, needs, and constraints. As can be evidenced from hitherto intervention efforts that proved largely failures, innovations succeed in achieving their goals only if they match local demands and priorities.

8 Conclusions

The following conclusions are drawn from the present study.

a) The potential of on-farm tree planting and agroforestry in promo~~contribu~~ting ~~to~~ sustainable production system has been quite underutilized.
b) Promotional efforts largely employ the conventional top-down planning system and dissemination of agricultural and forestry innovations.
c) Currently, no exotic or local species replace the growth and use qualities of eucalypt species. Eucalypt species appear to be the best choice for rural woodlots and narrowing the yawning gap between wood demand and sustainable supply.
d) Farmers' discreet management of eucalypt woodlots needs to be appreciated while developing alternative farm forestry innovations and increasing the provision of planting materials of appropriate species.
e) Sites that are highly degraded and proved hostile to agricultural use should be brought under eucalypt woodlot management with carefully selected mixed species.
f) Current haphazard forestry extension programs call for concerted efforts in setting up able research programs and identifying appropriate agroforestry packages that guarantee sustainable production system while meeting the soaring wood demands. Simultaneous upgrading of the competence of extension personnel needs urgent attention
g) There is a need to set up strong institutional framework that enables farmers to benefit from marketing of wood products.
h) Agroforestry practices possess an immense potential in sustaining the Guraghe farming system and livelihoods.

9 References

Arnold, J. E. M. 1995. Framing the Iissues. *In: Arnold, J.E.M. and Dewees, P.A. (eds.). Tree Mmanagement in Ffarmer Sstrategies: Rresponse to Aagricultural Iintensification*, edited by Arnold, J.E.M. and Dewees, P.A. Oxford University Press. pp. 1-17.

BBC. 2002. Coffee Pprices Bbitter for Ethiopia. http://news.bbc.co.uk/2/hi/africa/2293427.stm

Bonnard, P. and Scherr, S. 1994. Within Ggender Ddifferences in Ttree Mmanagement: Is Ggender Ddistinction a Rreliable Ceoncept? Agroforestry Systems 25: 71-93.

Buck, L. E. 1992. Forestry Eextension Iissues and Ooptions in Ethiopia: A Ddiscussion Ppaper. EFAP, Addis Ababa.

Caveness, F. A. and Kurtz, W. B. 1993. Agroforestry Aadoption and Rrisk Pperception by Ffarmers in Senegal. Agroforestry Systems 21: 11-25.

Conn, G. 1991. Forest Mmanagement in Ethiopia ca. 1600 to the Ppresent. Contribution to the Ttask Fforce, Forest Management, within Conservation and Development of Forest Resources of the TFAP/EFAP of Ethiopia. Addis Ababa.

DBA. 2000. Report on Qquantity of Mmarketed Forrcost Ppproduct and Rrevenue Ggenerated Dduring the Pperiod from July 1999 to June 2000. Forest and Wildlife Development and Conservation Section, Enemor and Ener District, Gunchire. (Original manuscript in Amharic).

Deheuvels, O. and Derry, D. 1998. Study of the Gurage Ffarming Ssystems (Ethiopia). Institut National Agronomique Paris – Grignon.

Dubale, P. 2001. Soil and Wwater Rresources and Ddegradation Ffactors Aaffecting their Ppproductivity in the Ethiopian Highland Aagro-Eecosystems. *In: Asefa, S. and Lemi, A. (eds.) Procceding of EAF –Iinternational Ceonference on Ceontemporary Ddevelopment in Ethiopia, edited by* Asefa, S. and Lemi, A. Vol. 1. August 16-18, 2001, Western Michigan University. Vol. 1. pp. 1-19.

EFAP. 1994. Ethiopian Forestry Action Program, Volume II 2 – The Cehallenge for Ddevelopment. Final Report. MNRDEP, Ethiopian Forestry Action Program Secretariat, Addis Ababa.

Eshetu, Z. and Högberg, P. 2000. Reconstruction of Fforest Ssite Hhistory in Ethiopian Hhighlands Bbased on ^{13}C Nnatural Aabundance of Ssoils. Ambio, A Journal of the Human Environment 29, no. (2): 83-89.

FAO. 1995. Country Information, Aagricultural Ppproduction and Ddiversification Ppprograms: Food and Cash Crops. http://www.africa.upenn.edu/eue_web/fao_agr.htm

FAO. 2001. State of the Wworld's Fforests: 2001. FAO, Rome.

Franzel, S. 1999. Socioeconomic Ffactors Aaffecting the Aadoption Ppotential of Iimproved Ttree fFallows in Africa. Agroforestry Systems 47: 305-321.

Fresco, L. O., Huizing, H. G. J., van Keulen, H. Luning, H. A. and Schipper, R. A. 1994. Land Eevaluation and Ffarming Ssystems Aanalysis for Lland Uuse Pplanning. FAO Working Document. FAO, Rome.

Hailu, Z. 2003. Dung or Fforest Bbiomass as Ffuel – Eeven Pplantation Ttrees with a Bbad Rreputation hHelp Ceonserve Ssoil Ffertility. ETFRN News No 37, Wageningen. pp. 5-8.

Hildebrand, P. E. 1981. Motivating sSmall Ffarmers, Sscientists and Ttechnicians to Aaccept Cehange. Agricultural Administration 8: 375-383.

Kanshie, T. K. 1994. The Gedeo Aagroforests and Bbiodiversity: Aarchitecture and Ffloristics. MSc Thesis, Wageningen Agricultural University, MSc Thesis. Wageningen.

Khanna, P., Bauhus, J., Wichiennopparat, W. and Snowdon, P. 2003. Mixed Ssspecies Pplantations of *Eucalyptus* and *Acacia*: Growth, Nnutrition and Ssoil Cehanges. ETFRN News No 37, Wageningen. pp. 8-811.

Malla, Y. B. 1999. Tree Mmanagement and Hhousehold Sstrategies in a Cehanging Rrural Eeconomy: Beyond the use of Ddirect Iincentives. *In: Sanders, D.W., Huszar P.C., Sombatpanit, S. and Enters, T. (eds.).* *Incentives in soil conservation: From theory to practice*, edited by Sanders, D.W., Huszar P.C., Sombatpanit, S. and Enters, T. Science Publishers Inc. pp. 85-99.

MNRDEP. 1994. National Ppolicy on the Rresources Bbase, its Uutilization and Pplanning for Ssustainability. National Strategy, Vol. 1. National Conservation Strategy Secretariat, Ministry of Natural Resources Development and Environmental Protection. Addis Ababa. Pp 131.

Nair, P. K. R. 1993. An Iintroduction to Aagroforestry. Kluwer Academic Publishers, Dordrecht., The Netherlands.

NCS. 1993. National Ceonservation Sstrategy for the Gurage Zone. Guraghe Zone National Conservation Strategy Study Team, Wolkite.

Neef, A. and Heidhhues, F. 1994. The Rrole of Lland Ttenure in Aagroforestry: Lessons from Benin. Agroforestry Systems 27: 145-161.

Pannell, D. J. 1999. Social and Eeconomic Cehallenges in the Ddevelopment of Ceomplex Ffarming Ssystems. Agroforestry Systems 45: 393-409.

Pohjonen, V and Pukkala, T. 1990. *Eucalyptus globulus* in Ethiopian Fforestry. For. Ecol. and Manage. 36: 19-31.

Price, L. and Campbell, B. 1998. Household Ttree Hholdings: A Cease Sstudy in Mutoko Ceommunal Aarea, Zimbabwe. Agroforestry Systems 39: 205-210.

SFCDD. 1990. Forest Rresource Bbase Iidentification, Ceonservation and Rrational Uuse in Ethiopia. Forestry Sstudy Tteam, State Forest Conservation and Development Department, Natural Resources Conservation and Development – Main Department, Ministry of Agriculture. Addis Ababa.

Sjoholm, H. 1986. A Rreview of Ttree Ceultivation Ppractices in Ethiopia. First Draft. Addis Ababa.

Teketay, D. 2000. Facts and Eexperiences on eEucalypts in Ethiopia and Eelsewhere: Ground for Mmaking Wwise and Iinformed Ddecision. Paper presented at a workshop, on "*Eucalyptus* Ddilemma",. EARO. Addis Ababa, Ethiopia.

Teketay, D. 2001. Deforestation, Wwood Ffamine, and Eenvironmental Ddegradation in Hhighland Eecosystem of Ethiopia: Urgent Nneed for Aaction. *In: Asefa, S. and Lemi, A. (eds.)* *Procceding of EAF international conference on contemporary development in Ethiopia*, edited by Asefa, S. and Lemi, A. Vol. 1., August 16-18, 2001, Western Michigan University. Vol. 1. pp. 34-50.

Von Breitenbach, F. 1963. The Iindigenous Ttrees of Ethiopia. 2d – 2nd ed., Ethiopian Forestry Association, Addis Ababa.

WIC. 2002. Coffee Ggrowers Sshare the Mmisery they Eexperienced Ddue to Ddramatic Ffall in Ceoffee Pprice. http://www.waltainfo.com/EnNews/2002/Sep/23Sep02/Sep23e6.htm