

## Identification of traditional agroforestry practices, their challenges and opportunities, the case of East Belessa Woreda

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### Abstract

*The present study was proposed to inspect the existing indigenous Agroforestry practices, their challenges and opportunities in the east Belessa of north Gondar zone. Both primary and secondary data sources were used for the study. A total of 120 individuals from three kebele were used for the survey work. Open and closed type questionnaire has been used for the interview and it involved stakeholders like DA, woreda's experts and farmers. Moreover, observation of the study area was conducted to examine the different practices. The results showed that scattered trees on farm lands, trees on homestead, wind break, road side plantation and trees on soil conservation structure as the indigenous agroforestry practices. Moreover subsistence crop production and livestock rearing were identified as part of these practices. Different types of exotic and indigenous MPT species were identified in combination with agricultural crops. Farmers use various products from the trees, crop and livestock components for subsistence as well as commercial purpose. The fodder bank around the homestead provides a dry season feed for the livestock. Nevertheless, these practices were struggling to become established and to meet the expectations of households. The practices have the potential to address for the further dissemination and mitigate the natural resource problems and its repercussions. Therefore, there is a need for further investigation of the potentials and bottlenecks in agroforestry practices and in the cultivation of individual components (i.e. trees/shrubs, agricultural crops and animals/pasture), and for the planning of follow-up activities based on the findings of such investigations, so as to be able to reap multiple benefits from the practices.*

**Key words:** Agroforestry practice, livestock, crop, tree, Belessa

### 1. Introduction

One of the greatest challenges currently facing human kinds is the alleviation of poverty while maintaining life support systems on which we depend (Richard et al., 2003). Billions of peoples are dependent on natural resources that are often unsustainably used by poor people themselves or by other powerful stakeholders as a result a range of large scale environmental problems is threatening the long term performance of many of agricultural, forestry, livestock and fisheries system (Campbell, 2003).

Due to socio economic incentives and environmental necessities, agroforestry as a new system come into view for the sustainable management, development and utilization of the natural resources (Richard et al., 2003) with a form of multifunctional and ecological utilization of environmental resources for the combination of agriculture and forestry

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(Young, 1989). It gives an opportunity for intensive land management using of the advantage of the biological interaction that occurs when there is combined cultivation of tree and/or shrubs with crops and/or domestic animals (Garrett et al., 1994 as cited by Richard et al., 2003).

The major environmental and natural resources management issues that Ethiopia has faced is land degradation and the associated threats to the ecological support system underpinning agricultural production (EPA, 1998). Among an array of techniques, the indigenous agroforestry practices are the first coping strategy and one of the pragmatic options of improving land use and could also be taken as an option to mitigate adverse environmental consequences following pressures exerted from any source as agricultural land expansion, people relocation etc to the environment.

Belessa Woreda is one of the dryland areas in the Amhara National Regional State, where the rain fall amount is very low and erratic and natural resource degradation due to anthropological reason is high. However, agroforestry practices with all their virtues as indicated above are likely to evolve in the study area where land degradation threatens to unfold and where multiple benefits are required. Therefore, identification of the indigenous agroforestry practices that serves as the first coping strategy in association to degradation of the environment with their constraints and potential will provide baseline information and opportunity for the future development and dissemination of these technologies in the study area. Thus the objectives of this study underline this idea.

## 2. Objectives

- To identify the indigenous agroforestry practices in the study area
- To see the major challenges and opportunities of the existing agroforestry practices
- To suggest the possible recommendation for the future development and dissemination of the existing practices widely in the study area

## 3. Materials and methods

### 3.1 Description of the study area

East Belessa is one of the Woreda in North Gondar administrative zone of Amhara region. It is bordered with Janamora and wogera in the north, Ebinat in the south, west Belessa in the west and wagehamera zone in the east. Geographically it is located between 35°52' to 38°39'E and 11°38' to 13°32'N. It has a total area of *ca* 1,563km<sup>2</sup>; the capital of the Woreda Gohala is located *ca* 180kms from Bahir Dar the capital of ANRS. The total population of the Woreda estimated to be *ca* 119,000 with average family size and population density of *ca* 6 and 76 persons/km<sup>2</sup> respectively.

Like other woredas of the region, agriculture is the mainstay of the Woreda economy and a means of livelihood for more than 95% of the Woreda population. Majority (90%) of the

Woreda is “Kola” agro climatic zone and the rest (10%) is Woyena dega. The mean annual temperature and rainfall ranges between 20 to 25<sup>0</sup>c and 600 to 800mm respectively. Most of the rain falls received in the area during June to the end of August.

Red soils (Litosols) and black Clay soils (Vertisols) are the two major soil types in the Woreda. Owing to the low vegetation cover, intensive cultivation for several years, no addition of nutrients and organic matter, and lack of adequate conservation measures, continued soil erosion have resulted in soils with shallow to very shallow depth and poor fertility.

### **3.2 Methodology**

#### **3.2.1 Data Source, Sample Selection and Data Collection**

Data for the study were collected from both primary and secondary sources. Secondary sources were mainly published and unpublished sources, such as annual reports of the agricultural and rural development office of the Woreda, and a literature review was also used to complement and refine the information that had been collected. On the other hand, the primary sources included both socio-economic survey at household level and interviews with elders and visiting of farmer’s farmland, backyard and homestead. For this study, three representative kebeles were selected with the criteria of accessibility and availability of indigenous agroforestry practices and different agroforestry components. The study kebeles were namely *Hamusit*, *Achekan* and *Dengor*. After selecting representative households, a semi-structured questionnaire was conducted at household level and interviewing also conducted with elders, Woreda experts and developmental agents, with aiming at collecting the necessary information regarding the objective of this study as well as to learn about the indigenous agroforestry practices in the study area. Different household farmlands, homesteads and backyards were also visited to see the different agroforestry practices and components developed by the local farmers. A total of *ca* 120 individuals were used for this purpose from the three kebele.

#### **3.2.2 Data analysis**

The data collected through the interview from the elders, experts and DA from the three kebeles was summarized together. The data collected through household survey, by administering a semi-structured questionnaire were crosschecked to correct errors, summarized and coded for analysis. To analyze the coded data from the semi-structured questionnaire, the Statistical Package for Social Sciences (SPSS) version 11 was used. The open-ended questions in the semi-structured questionnaire were also summarized. Finally the results presented as mean value, and percentage form.

## 4. Result and Discussion

### 4.1 Socio - economic Characteristics

#### 4.1.1 Demographic Characteristics

Among the interviewed households, the average family size is *ca* 6. This ranges from *ca* 4 to 12 individuals per households. Majority (54.17%) of the households has a family size of *ca* 5 – 8 (Table 1). The majority (85%) of the respondents were between 14–50 years of age, while 15% were above 50 years of age, which shows that the majority are in their active working age (15–50 years), so that labour might not be a problem at household level.

Table 1. Family size of the interviewed households in the study area

Family size	Count	%
1–4	21	17.5 %
5–8	65	54.17 %
>8	34	28.33 %

Illiteracy is high; 72.53% of interviewed farmers were uneducated, i.e. unable to read and write, while the rest had attended school and able to read and write.

#### 4.1.2 Subsistence and Land holdings

Only *ca* 1% of the sampled households are known to satisfy their subsistence needs for the entire year from own farm production, and the remaining *ca* 99% indicated that they face seasonal food shortage for an average of 6 months in a year. Out of those interviewed households, about *ca* 91.8 % reported relief and food for work (SWHISA, 2006) as the primary gap filler for household subsistence, and 85.4 % reported livestock sales as the secondary gap filler.

From the survey results it was also known that *ca* 43 % of the respondents have less than 1 ha, *ca* 44% have between 1.0 and 2.0 ha, and the remaining *ca* 14% have greater than 2.0 ha of land. The range lies between *ca* 0.25 and 5ha, and the average land holding across the three kebele was *ca* 1.32 ha.

#### 4.1.3 Livelihood activities and income sources

All the respondents (100%) were farmers, self-employed in farming and have more than one sources of income. However, the major income sources for the households are agriculture (crops, fruits and livestock) and other tree products (fuel wood). In addition to these, farmers involved in other limited sources of income as labor, petty trading and beekeeping. The major source of income in all cases is agriculture, which on aggregate provides *ca* 87% of the gross annual household income.

The agricultural activity mentioned above includes mixed farming system where crops and livestock are managed in combination. The main crop types cultivated in the study area are Tef, sorghum, Chickpea, Shallot and sesame.

#### **4.2 Indigenous Agroforestry practices**

When a formal survey was conducted to assess the traditional agroforestry practices, six practices were reported and observed in the study area. These are scattered trees on farm lands, trees on homestead, wind break, road side plantation and trees on soil conservation structure. Moreover, crop production and livestock rearing were also taken as part of these practices. The detail of each practice is presented below.

##### **4.2.1 Scattered trees on farmlands**

This practice widely exists and dominant in all farmland of the study area. The common tree species are widely scattered haphazardly, or according to some systematic patterns on bunds, terraces or field boundaries. Most of the tree species are left on Tef and sorghum farmlands. Typically farmers prefer the indigenous trees to be left on farmland because of less rivalry with the crops growing together. The most common trees and shrub species were: *Acacia abyssinica*, *Acacia bussei*, *Acacia etbaica*, *Acacia Sieberiana*, *Acacia tortilis*, *Olea species*, *Acacia seyal*, *Balanites aegyptiaca*, *Faidherbia albida*, *Zizyphus spina-christi*, *Schinus molle*, *B.papyrefrea*, *Moringa spp*, and *E.camaldunesis*. In addition to the fertility that these trees provide for the soil on farmland, farmers use the trees for various purposes. These include fuel wood, charcoal, shade, construction materials, farming implements, and fodder for livestock. Furthermore, farmers use some selected trees for putting beehives and traditional medicine uses and food (*A. tortilis*, *B. aegyptiaca* and *Zizyphus spina-christi*)

##### **4.2.2 Trees on Homestead**

Homestead trees are found in the form of live fence, woodlots and intercropped with crops in the backyard of the household. Indigenous multipurpose trees are the most dominant tree component of this practice. Most trees are left in this practice due to their provision of shade, fodder, fuelwood and easily establishment ability of the trees. These all criteria are taken by the farmers to select trees as a homestead tree in the study area. The most common tree species in this practice are *Schinus molle*, *Moringa spp*, *Eucalyptus camaldunesis*, *Acacia abyssinica*, *Acacia etbaica*, *Acacia sieberiana*, *Balanites aegyptiaca*, *Zizyphus spina-christi*, *Faidherbia albida* and *Schinus molle*. Farmers use these trees for the purpose of generating income, development of fodder for dry season feed for livestock and putting beehives around homestead. More over, due to the ever greenness of the trees mentioned, farmers prefer and plant these trees for live fence and shade purpose. The *eucalyptus* tree species grow scattered around the homestead.

##### **4.2.3 Windbreaks**

Windbreaks are agroforestry practices in which trees and/or shrubs are planted in widely spaced rows to minimize negative impacts from excessive wind. This practice is seldom to

see in the study area. However, farmers mentioned some tree species that can be used for windbreaks for their farmland especially. The common trees and shrubs species that been used for this purpose are: *Acacia etbaica*, *Acacia tortilis*, *Zizyphus spina-christi*, *Balanites aegyptiaca*, *Schinus molle*, *Moringa species* and *Faidherbia. albida*.

#### 4.2.4 Road side plantation

Trees planted on the road side are mostly ornamental trees like *Spatoda nilotica* and *Schinus molle* following the main road in the town of the Woreda. However, these trees are deliberately planted by the agricultural and rural development office of the Woreda. Given the temperature of the study area and the fact that trees totally shade their leaves in the dry season, trees which do not shade their leaves in the dry season are planted on the roadside e.g. *Spatoda nilotica*, *Schinus molle* and *melia species*. Such trees also have an ornamental purpose in addition to the main purpose of providing shade.

#### 4.2.5 Trees on soil conservation structure

A soil and water conservation activity has been practicing in the area since a long time with the aim of rehabilitating the degraded lands. Tree species used for this purpose are few and exotics and planted as a biological soil conservation structure in some places. The most common tree species are *susbania* and *grass species*.

#### 4.2.6 Crop production

Major crops produced by farmers at Belessa include Tef, sorghum, Chickpea, Shallot and sesame. The trend of production per unit area of these crops is reported by almost all of the respondents to be decreasing. A lack of inputs, such as fertilizer and quality seed, the emergence of invasive weeds, erratic rain fall and degradation of land were mentioned as a prime reason for the observed reduction in crop yield. Degradation on farmland is considered as the main factor for decreasing the area under crop production. Other constraints on crop yield mentioned include natural calamities such as flood and pest outbreaks.

Table 2. Average yield (Kg ha<sup>-1</sup>) of major crops in Belessa Woreda (SWHISA, 2006)

Crop	Yield
Tef	600
Sorghum	1200
Chickpea	800
Shallot	6300
Sesame	400

#### 4.2.7 Animal husbandry

Livestock rearing is also practiced by farmers in the study area; almost all respondents were engaged in the activity. Communal lands and natural vegetations were used as a grazing ground for livestock. A combination of the two and other sources such as fodder bank in

the homestead, acted as a source of livestock feed. Constraints on livestock production mentioned included diseases of various kinds and feed shortage during the dry season.

Table 3. Average number of major livestock's of interviewed households

Livestock type	Average Number
Sheep	3
Got	6
Cow	2
Oxen	1
Donkey	1

#### ***4.3 Challenges of Agroforestry practices***

Agroforestry was practiced by most of the respondents (81.31%), while the remaining surveyed households had not been involved in tree-planting at least within the past five years. Those households which did not practice tree-planting as part of agriculture mentioned a lack of technical assistance (such as seedling shortage, and lack of preferred species for planting), dead an early stage (seedling establishment), land shortage, pests, open access to resources and the erratic nature of rainfall as reasons discouraging to incorporate the practice of tree-planting.

On the other hand, a majority (*ca* 65%) of the respondents engaged in tree-planting was not satisfied with the species of seedlings provided to them because they are with less survival rate and are not drought resistance. Moreover, land shortage (planting niche availability), combination of components, tree management and the diversity and number of tree seedlings also not attractive. These all are the challenges for the wider adaptation and development of the practices

#### ***4.4 Opportunities of agroforestry practices***

Agroforestry practices make it possible to achieve multiple objectives, social, economic and environmental, by providing the opportunity to use land by integrating an array of components, such as agricultural crops, trees/shrubs and animals/pasture.

The agroforestry practices observed in the study area provided farmers with items for household consumption and extra produce for the market. It presented an opportunity for farmers to use family labor and less initial investment, thereby easing the requirements on a household to become involved in and to benefit from the practices. For instance, according to the result of this study, some Homegarden were contained: fodder trees, crops, root tubers, vegetables, oil seeds, and fruit trees. In addition feedstuffs, and the much-needed shade for domestic animals, are derived from the agroforestry practices in the area.

It is obvious that Belessa is with much degraded lands and rehabilitation of these lands is imperative. Therefore various techniques are urgently required. In this regard agroforestry

takes important part in Belessa Woreda by mitigating soil erosion, soil fertility decline, forest resources loss, pasture degradation and river degradation due to imbalance in the flow regime and sedimentation (Young, 1989).

Tree planting practice, crop production and livestock production in the study area is also noted encouraging on the face of varied obstacles. The combination of these components will provide starting place for further dissemination and wider adaptation. The low fertility rate of the soil, land degradation, availability of feed, land shortage and other factors mentioned above are opportunities for further development of the existing and new agroforestry practices in the study area to mitigate the natural resource problem and its subsequent serious repercussion by the use of agroforestry practices.

## 5. Conclusion and Recommendation

Agroforestry practices, as seen in the study area, were struggling to become established and to meet the expectations of households in particular. The practices have the potential to address for the further dissemination and mitigate the natural resource problems and its repercussions. Therefore, this study suggests the following recommendations:

- There is a need for further investigation of the potentials and bottlenecks in agroforestry practices and in the cultivation of individual components (i.e. trees/shrubs, agricultural crops and animals/pasture), and for the planning of follow-up activities based on the findings of such investigations, so as to be able to reap multiple benefits from the practices.
- Improvement of the combination of the tree, crop and livestock combination is required for the betterment of the management at household level
- The tree diversity with Adaptation and screening of MPT species and scientific management method should be encouraged
- The existing practices should be backed up with the technical support and demonstration of the model agroforestry practices in the area.

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