# FOREST- HOME GARDEN INTERFACE IN MASHA WOREDA, SHEKA ZONE, SOUTH WESTERN ETHIOPIA

**MSc. THESIS**

**BY**

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**JIMMA, ETHIOPIA**

**JULY 2017**

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A Thesis Submitted to School of Graduate Studies, Jimma University College of Agriculture and Veterinary Medicine in Partial Fulfillment for the Requirements for the Degree of Master of Science in Natural Resource Management (Forest and Nature Conservation) Course Code NFNM512)

JIMMA, ETHIOPIA

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# Approval Sheet

**Jimma University College of Agriculture and Veterinary Medicine**

**Department of Natural Resource Management**

**Thesis l Submission Form (F-01)**

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**Title:** Forest- Home Garden Iterface in Masha Woreda, Sheka zone, South West Ethiopia

I declare that the proposed research work has not been done anywhere else before or is not part of any ongoing work.

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We have agreed to supervise the proposed research work. We have evaluated the contents of the proposal, found to be satisfactory, complete, and according to the standards and formats of the University. We have also verified that the work has not been done anywhere else before.

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Chairperson, DGC Signature Date

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Chairperson, CGS Signature Date

## Dedication

I dedicate this work to my family and friends.  I thank you all so much for your endless prayers and encouragement to hold firm to my dreams.

## Statement of Author

First, I declare that this thesis entitled "**Forest Home Garden Interface in Masha Woreda, Sheka Zone, South Western Ethiopia**" is my own work and that all sources of materials used for writing have been duly acknowledged. This thesis has been submitted to school of graduate studies of Jimma University College of Agriculture and Veterinary Medicine in partial fulfillment of the requirement for the degree of Master of Science in natural resource manegment (Forest and nature Conservation) and is deposited at the library of the University to be made available to borrowers under the rule and regulation of the library.

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## Abbrevations

| | |
|---|---|
| CSA | Central Statistical Agency |
| GPS | Ground Positioning System |
| HGs | Home Gardens |
| HHs | House Holds |
| NTFP | Non Timber Forest Products |
| SE | Standard Error |
| SNNPR | Southern Nations and Nationalities Peoples Republic of Ethiopia |
| UNESCO | United Nations Educational, Scientific, and Cultural Organization |
| UNICEF | United Nations International Children's Emergency Fund |

## Bibliographical sketch

Meaza Adiraro Kido was born at Abelo Kebele, Masha Woreda, Sheka Zone in 1980. She attended elementary shool at Masha elementary and secondary school, and secondary school at Masha senior secondary and preparatory school. Meaza Adiraro has received BSc in Plant sciences from Mizan Tepi University in 2010. Since then, she worked for Masha Woreda Agriculture and Rural Development Office for four years. Meaza Adiraro has joined JUCAVM, School of Graduate Studies on September 2015/16 to pursue her M.Sc. degree in Natural Resource Management specializing in Forest and Nature Conservation.

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## Abstract

*Conversion of forests to other land uses has significantly reduced the diversity of plant species. Many species are maintained along by home garden agroforestry practices. The present study has been conducted with the aims of assessing woody species across forest home garden agroforestry interface in Masha Woreda Sheka Zone, South Western Ethiopia. Thirty home gardens were selected randomly from the three selected Kebeles (Keja, Uwa and Abelo). 30 plots, 10 from each were selected for woody species assessment. A totlal of 289 households were randomly selected for an interview. The result of the study showed that a total of 90 woody species were recorded, of which 63 in the natural forest and 27 were in the home garden. The Shannon diversity index at natural forest and home garden was calculated and result showed 3.04 and 1.91, for the tree species and 3.12 and 0.69 for the shrubs, respectively.As one travel from home garden to the natural forest more woody species were recorded. There is positive correlation between the distance from the home garden to the natural forest and the number of plant species recorded along it. The covariance association between distance from home garden towards natural forest and plant species richness recorded in natural forest areas shows strong linear relationship* $R^2 = 0.781$ *for Abelo Kebele to* $R^2 = 0.934$ *Uwa Kebele. This indicated that there were few plant species recorded on areas at near distance to home garden and plenty of plant species were recorded as distance far away from home gardens towards center of natural forest increase. 256 respondents have additional extra land in addition to their farm land and they over exploite it. 243 respondents have no trend of replantation of tree in the forest and in their home gardens.Communities of Keja, Abelo and Uwa kebeles total have no alternative energy source other than firewood from forest products and charcoal. From the findings it is possible to conclude that plant species in intrfacing natural forest and home garden sites have great variation in their richness, eveness and dominance values. The trend of community to replace trees is poor and unpracticed.The energy utilization of the communities is totaly based on forest products.Therefore, forest plant species and home garden based trees have been facing problem in the study area and needs special focus from governmments and concerning bodies*



***Key Word: - Home garden, interface, Natural forest, Plant species composition***

# 1. Introduction

## 1.1. Background

Home gardens are a system of production of diverse crop plant species, which can be adjacent to house hold or slightly further away and easily accessible (Sunwar *et al*., 2005). Globally, home gardens have been recognized as an important additional source contributing to food and nutritional security and livelihoods (Ninez, 1987). Home gardens have been an integral part of local food systems in developing countries around the world. Many studies provided descriptive evidence and analysis of home gardens in developing countries and pinpointed their numerous benefits to communities and families (Dilrukshi *et al*.,2013).

Although there is no direct evidence as to when home gardening started in Ethiopia, based on the antiquity of agriculture, crop composition, oral literature and rich vernacular descriptions in different local languages, it is assumed to have long history (Mekonen *et al*., 2015).
Threate of tustainable development and management has been increasing due to population growth in natural foreste of tropics. Like many countries in the tropics forest destruction, land degradation and loss of biodiversity are major environmental problems in Ethiopia. For instance, the annual deforestation rate of the natural forest is estimated at 150,000 – 200, 000 ha (EFAP, 1994).

In Ethiopia agroforestry has been traditionally practiced long years ago by villagers on farmlands, grazing grounds, on farmhouse (such as home garden), as a wind break and shelter belt etc. But the scientific principles of agro forestry have been given due consideration only in recent years (Haileselasie and Hiwot 2012). Ethiopia as one of the fast developing country with having pillar aim of agriculture lead industrialization, economy of the country is dependent on agriculture up which more than 75% of the population is reliant on agriculture and rural development.

Extensive areas of traditional agroforestry homegardens exist in the south and southwestern parts of Ethiopia. These areas characterized by moisture and temperature conditions in which

they are widely favorable for different agricultural activities. In most cases, these home gardens characterized by combinations of two perennial crops; coffee and enset. The areas in which both coffee and enset crops dominate home garden among the rest areas not clearly identified in most places. Most of these home gardens evolved from forest interfacing places (Abebe, 2013). Farmers maintain the upper storey trees and clear the undergrowth to open up space for planting enset, coffee and other crops. Gradually, more species and varieties of crops and trees introduced. Partial harvesting of the upper storey trees also takes place to obtain wood and to create favorable growing condition for the other crops (Abebe, 2013).
Ecological and socital degradation and disturbances resulted in loss of biodiversity that in turns significant impacts on ecosystem function and reduces opportunities to avert production related risks (Power and Flecker, 2001).

## 1.2. Problem Statement

Diversity of plant species, crops and trees in agro ecosystems bring up different soil nutrient and enhance growth of different crops and plant species. Species composition, handling and ways of managing forest and home gardens and fundamental factors like biophysical nature of the area and socioeconomic environment of particular place can determine variability of a given home garden. Only few studies were adopted in areas of Forest-home garden interface and the driving factor for conversion of natural forest in to home garden is not well known in detail in study area. Agro forestery practices, activities on interface side of natural forest, compostion,diversities and richness of trees and shrubs on home gardens, natural forest and interface areas in Masha Woreda not been studied.

The relation ship bettwen practicing agrofrestery activites and the distance of human settlemnt from the the agroforestery site is studied in Masha Woreda. Usually, our community's natural resource utilization and land use and management practice is not similar from place to place.

Continious population growth rate will result in conversion of forest in to human dominated system.The socio-economy, land-owning activities and dependence of the community on natural resource products is also not well studied in Masha Woreda.

Therefore, this research is important;

- To identify and record plant species in the home gardens
- To assess the diversity of plant species in the home gard
- To determine particular socio economic significance of the plant for the home gardens.

## 1.3. Objective

### 1.3.1. General objective

- To assess forest home garden interface in Masha Woreda, Sheka zone, in South Western Ethiopia.

### 1.3.2. Specific objectives

- To identify and record plant species diversity and compostion in the home gardens
- To assess plant species composition and diversity in the home gardens
- To assess the drivers of natural forest to home garden in the study area

## 1.4. Siginificance of the study

Practicing home garden agroforestry activity in scientitfic manner with protecting surrounding ecology is important for maintaining biodiversity. It is important for development and improvement of socioeconomic activity of community.Conducting research on forest home garden interface is also important to identify and record agroforestry species in the home gardens, to asses determine habits and uses of the agroforestry species in the home gardens, to assess the diversity of plant species in the home gardens, to determine bio-physical advantage of crop species to the environment and to determine particular socio economic significance of the plant species for the home gardens.This research is important by providing better handling, management land-use practice in line with community representative and policy makers.

# 2. Literature Review

## 2.1. Diversities in Home Gardens (HGs) Plant Species

A study which was conducted on Holleta town, Oromiya National Regional State, Ethiopia by Degefu (2015) showed that a total of 112 plant species were identified by their finding and documented from the study area. These plant species were classified into 93 genera and 43 families. Home garden owners and other people in Holleta town have the tradition of using various tree species found in their home gardens for different purposes ( Degefu ,2015). The commonly represented families were Fabaceae, which contains 11 species, followed by Rutaceae and Poaceae in the second rank, which contain eight species each, and Solanaceae in the third with seven plant species. The richest home garden contained 47 species; whereas, the poorest garden contained four species and the mean was 22 species per home garden. Among the recorded species, only 34 species (26.79%) were found in all study sites and 5 species in only two home gardens. From 112 plants species identified, 6.25% were indigenous plants such as *E.ventricosum, Juniperus procera*; 35 species were wild plants that grow and 70 species were cultivated crops. The growth form of the species were 49 (43%) herb species, 32 (29%) tree species, 28 (25%) shrub species, and 3% were climber plants. *E.camaldulensis, C. lusitanica,* and *Prunus persica* were the top tree species. *Rhamnus prinoides, Catha edulis,* and *Dovyalis caffra* were the most prominent shrub species in the study area. The home garden flora is composed of both food and nonfood plants, accounting for 41.07% and 58.93% of the total of species respectively (Degefu , 2015).

Study which was conducted by Mekonen et al.(2014) shows, a total of 69 plant species (44 woody and 25 herbaceous), belonging to 40 families and different functional groups were recorded. Among the woody species, families *Euphorbiaceae, Myrtaceae, Mimosoideae* and *Rutaceae* were the most diverse each having four species. Farmers in the study villages retain various tree components based on spaces available and their compatibility with agricultural crops and household objectives and the highest and lowest number of species (woody and herbaceous) was recorded at Atahagne and Debohela village, respectively (Mekonen *et al*. 2014).

The finding obtained by Guyassa and Raj (2013) from study conducted in the dry land areas of Tigray region Ethiopia, reported that agricultural landscapes host high number of woody species. In particular, the highest number of woody species was recorded in home gardens as compared to crop fields, grazing lands and the natural forest.

The Shannon diversity indices showed high value in the natural forest as compared to the agricultural landscapes. This is because of the high evenness value of the woody species in the natural forest. The low evenness in agricultural lands could be attributed to the dominance of some species in terms of total population such as Eucalyptus species *Faidherbia albida*, *Euclea racemosa* and *Acacia etbaica*, which farmers often plant/retain and tend deliberately in high density. The number of common woody species in natural forest and home gardens and similarly in natural forest and grazing land were highest while lowest values were recorded in cropland and homestead (Guyassa and Raj, 2013)

The high woody species richness in agricultural landscapes in the present study indicates that human managed agricultural landscapes can play a vital role in preserving woody species diversity. Agroforestry bring onto farmland some of the biodiversity benefits associated with woodland (Stamps and Limit, 1998). The diversity of woody species has a direct relation with other biological diversity. The presence of woody species serves as a nesting, roosting and feeding site for a variety of birds and it also enriches faunal biodiversity (Harvey and Haber, 1999, Guyassa and Raj, 2013).

Management of home garden by People in Sebbeta-Hawas, Ethiopia, have developed home garden (locally called eddo) with considerable diversity and flexibility that support production of major livelihood crops. They have managed to select crops that co-adapt the local environment and that give multiple benefits. Some home- garden owners reported that they grew vegetables during the rainy season as well as the dry season by fetching water from where it is available. Some home garden owners stated that they continuously manage plants for economic as well as ecological benefits. Crop residues, weeds, ashes and manures were reported to be used as fertilizers in home gardens. Few home garden owners reported efforts

made to reduce soil depletion in erosion prone areas by planting shrubs (e.g., *Rosmarinus officinalis*) near the homestead(Mekonen *et al*., 2015).

### 2.2. Home Gardens Features Influencing Plant Diversity in Home Gardens

An exploratory survey was conducted in Benin on 60 randomly selected informants in different Kebele. They develop exploratory survey intended to determine the proportion of HG owner per bio-geographical zones. 285 plant species were recorded in the 235 inventoried home gardens spanning the three bio-geographical zones. The average number of species per home gardens was 10.1 species with a coefficient of variation of 58.15 % indicating some discrepancies among HGs. The richest HG hosted 52 plant species, whereas the poorest HG held one plant species. The average value of plant diversity was 9.97 ± 1.03 SE species for young, 10.23 ± 0.50 SE species for adult and 10.17 ± 0.80 SE species for old HGs owners. Similarly, the average value of plant diversity was 9.81 ± 0.46 SE species for women HG owners versus 10.48 ± 0.59 SE species for men (Gbedomon *et al.* 2015).

Farmers close to markets grew relatively fewer crop species, because market access encouraged them to focus on easily marketable, often high-value products and to purchase other products necessary for household consumption Abebe, (2013) . The findings obtained by Abebe, (2013) confirms earlier reports which indicated that species diversity of agro forestry home gardens located nearby market areas was low because farmers concentrated on few commercial crops (Wiersum, 1982; Marten and Abdoellah, 1988; Jensen, 1993; Abdoellah et al., 2006; Peyre et al., 2006;Wiersum, 2006).

Altitude and slope of the farms affected heterogeneity of crop species. In the lower altitude sites where temperatures are high, the share of such crops as sweet potato and pineapple was increased because of their good adaptability to the climatic conditions. However, this was also associated with road access, because most of the low-altitude sites also had better access to the roads that facilitate marketing (Abebe ,2013).

## 2.3. Home Gardens as a Promising Means of Households Food Security

Home gardens are found in both rural and urban areas in predominantly small-scale subsistence agricultural systems. Multiple social benefits of home gardens include enhancing food and nutritional security in many socio-economic and political situations, improving family health and human capacity, empowering women, promoting social justice and equity, and preserving indigenous knowledge and culture (Galhena *et al*., 2013). The most fundamental social benefit of home gardens stems from their direct contributions to household food security by increasing availability, accessibility, and utilization of food products. Home gardens are maintained for easy access to fresh plant and animal food sources in both rural and urban locales. Food items from home gardens add substantially to the family energy and nutritive requirements on a continuous basis (Galhena *et al*., 2013). Foods from home gardens varied from horticultural crops to roots to palm and animal products; further plants from the gardens are also used as spices, herbs, medicines, and fodder for the animals.

## 2.4. Role of Home-garden in Agro-eecosystem

Home garden agro-forestry plays an important role for agro-ecosystem service mainly through providing raw material for compost production. Using HGAF for compost production 94% of the respondents (n = 48) say that, the fertility status of the soil stays up to a minimum of three years and a maximum of four years in addition to soil moisture conservation while rainfall shortage happens crop recoded out of the 48 interview respondents households in two successive years at each village . The high diversity of species in home garden have a wide socioeconomic and agro-ecological roles including production of food and a wide range of other products such as firewood, fodders, spices, medicinal plants and ornamentals (Ewuketu Linger, 2014).

# 3. Methods and Materials

## 3.1. Description of the Study Area

The research site is located at about 670 kms from Addis Ababa towards southwest Ethiopia in Sheka Zone of SNNP Regional state. Masha Woreda is bordered on the South by Anderacha, on the West and North by the Oromia National Regional State and on the East by Kaffa Zone (Fig: 1). Based on the 2008 demographic data of Masha Woreda, this Woreda has a total population of 40,810, of whom 20,116 are men and 20,694 women; 6,787 or 16.63% of its population are urban dwellers. Masha Woreda has an average elevation of 2223 meters above sea level.

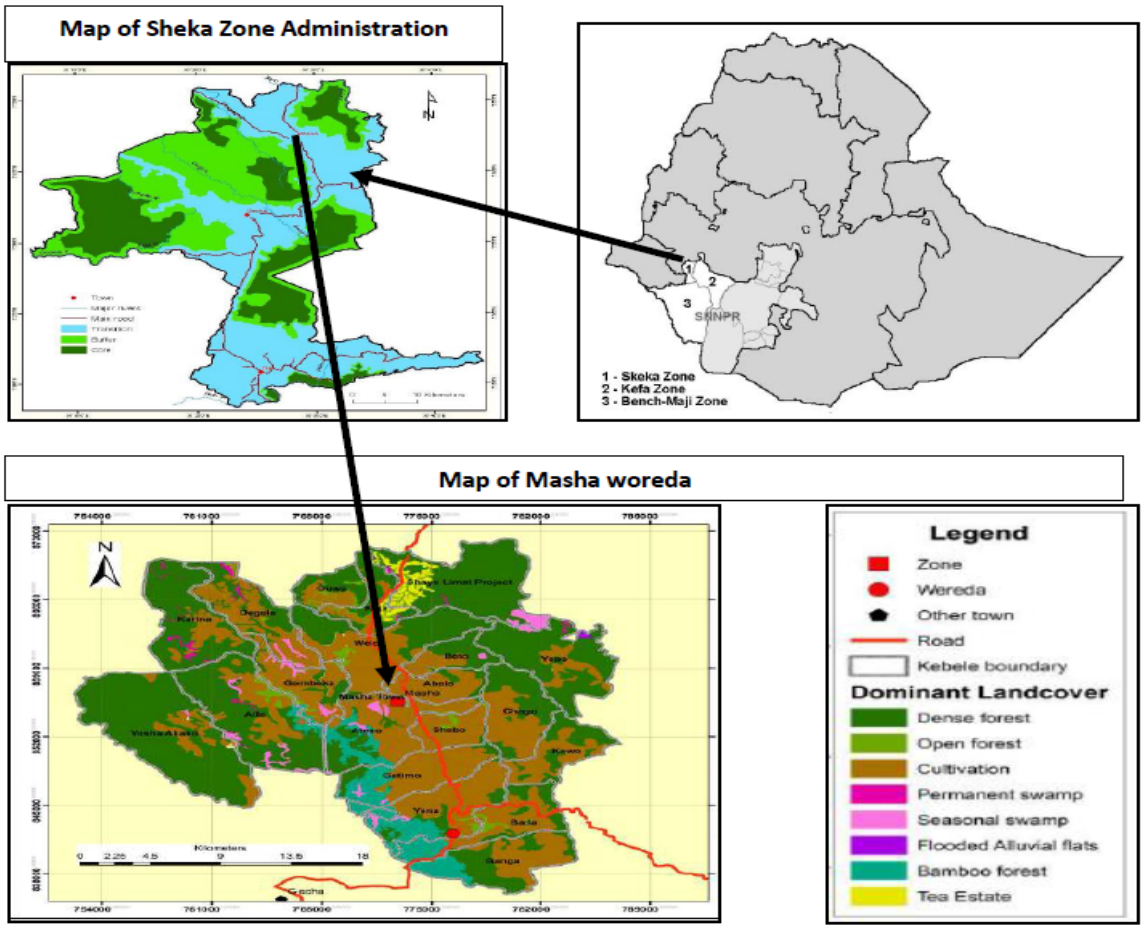


Figure 1 Map of the study area

**Source**: Woldemariam *et al.*, 2005

### 3.1.1. Geology and soil

The Cenozoic and Proterozoic volcanic sedements underlie most parts of the SouthWestern Ethiopia (Schluter, 2008).Generally the soil of area is red or brownish terrisols derived from volicanic parent material. The prevalence of high rainfall has masked of parent materials.Other soil groups in the area include nitosoil, acrisols, vertisols and cambisols (Tefesse, 1996).

### 3.1.2. Climate

The study area has Dega and Woyna-dega agro ecological Zones but most dominant agro ecology is Woyna-dega with an altitude ranging from 1500 to 2300 m.a.s.l. The Dega agro ecology has average altitude above 2300 m.a.s.l. The mean annual rainfall of the study area is 2200 mm. The mean maximum temperature is in between 25 and $34^0$C and the mean minimum temperature are in between 10 and $15^0$C (Woldemariam *et al*. 2005).

### 3.1.3. Socio economic activity

Economically, the communitie of Masha Woreda leaving in rural Kebeles are based on agriculture, livestock and also use forest product as the main sources of their income.

## 3.2. Methods

### 3.2.1. Site selection

The research is conducted in Masha Woreda and this study specifically focused at rural Kebeles and populations.The study site was focused on three Kebeles by using purposive sampling method, restriction of the number of Kebeles was due to constraints in cost, time, and labor factors.Then the three (Keja, Uwa and Abelo) Kebeles were selected by lotory method among total of nignteen Kebeles. Number of house respondents in each Kebeles was determined by simple random sampling technique by finite population proportion formula. Then giving equal probability for households to be surveyed each household and respondents were determined. Based on the finite population determination formula, 289 households were selected from Keja, Uwa and Abelo Kebeles. This sampling technique is used because of the total number of population in study area is less than 50,000 (Table: 1).

### 3.2.2. Sample size and sampling procedure

Cross sectional study, design with random sampling technique was conducted in the study area. The sample size was determined based on the 2008 CSA'S demographic data of Masha Woreda.

Finite population sample size determination formula was used because of the total population of the study area is less than 50,000.The formula to calculate the sample size was following Israel (1992).

$$SS = \frac{Z^2 \times (p) \times (1-p)}{C^2}$$

**Where**

SS = Sample size

Z = Z-value (1.96 for 95% confidence interval)

p = percentage of population picking (0.5) or 50% since of this provide maximum sample size

C = confidence interval (0.05)

SS= ss / (1+ (ss-1))/pop ➔ 384 / (1+ (384-1))/1166 = **289** (Table 1)

Table 1 Population data of study Kebeles

| No | Kebeles | Total HHs in the Kebele | Total HHs to be surveyed from each kebels |
|---|---|---|---|
| 1 | Uwa | 234 | 58 |
| 2 | Abelo | 336 | 83 |
| 3 | Keja | 596 | 148 |
| Total | | 1166 | 289 |

### 3.2.3. Data collection processes

Four complementary data collection methods namely household survey (individual interview), FGD, observation on informants field and direct field level observation were used. Recording and identify tree and shrubs species in selected natural forest sites, at home gardens of selected house holds and at different interface site were employed on the field. The interface sites were selected at different distance from homegarden of community towards natural forest to see on which distance the plant species is decreasing or increasing.

Field level data was gathered by direct observation and measurement in addition to numeration of some necessary parameters (Annex 1). Secondary data was taken from written documents and books from Woreda Agriculture and Natural Resource office and internet acess was browsed for additional references. At the Kebele community and household level, data were collected by direct or face-to-face contact with respondents to gather socio economic data. Field level observation was employed to recored trees and shrub species.

In all of three Kebeles a total of 90 plots (30 plots on HG, 30 plots on NF and 30 plots on interfaces) with a size of 20m X 20m were established and selected in natural forest, in home gardens and in interface places to record tree and shrub plant species (Figure 2).

Scientific and family name of tree and shrub plant species was obtained from secondary data (A document prepared by Melca Ethiopia edited by Masresha Fetene by the tile of «Forest of

Sheka» in 2007 from page 221-229). Local (Sheki nono) name of all trees and shrubs were obtained from elder respondents of the residing communities.

Figure **2**) **M**easurement of plots of land for recording plants on the field

Distance of natural forest plots up on which different plant species recorded was measured by measuring tape and GPS distance tracking system. Plots coordinates location, distance from home garden to natural forest and elevation points were recorded by GARMIN GPS 72 instrument. For recording tree and shrub plant species on interface, natural forest and at home garden of Keja,Uwa and Abelo Kebeles, a total of 90 plots having 20 meter length and 20 meter width were selected in Keja,Uwa and Abelo Kebeles. However, the selection of site was at different distance from home garden towards natural forest.

### 3.2.4. Data analysis

The collected data was analyzed using Micro soft excel 2013 and descriptive analysis were used to describe main outcome. Shannon diversity index Shannon and Wiener (1949) and Evenness (E) was used for these purposes of diversity deternaton (Pielou ,1969; Magurran ,1988); Huston, 1995 cited by Degefu, 2015)) . Shannon diversity index formula was employed to determine species richness and evenness.

The Shannon diversity index (H') can be calculated by using the formula,

$$H' = - \Sigma \, pi \ln pi \text{ (Magurran 1988)} \quad \text{----------1}$$

Where pi is the proportion of crop area composed of species i.e. an additional measure of diversity, which compares the observed distribution with the maximum possible even distribution of the number of species in the sample (Pielou 1969)..

The measure of Evenness (E) is the ratio of observed diversity to maximum diversity and it is calculated as;

$$E = H'/Hmax, = H' /lnS \text{ (Magurran 1988). ----------2}$$

Evenness (E) has values between 0 and 1.0, where 1.0 represents a situation in which all species are equally abundant. S is total number of species in the community (richness).

Richness and diversity of plant species was calculated using Shannon diversity and Evenness indices.

Simpson Index an index used to determine dominance of species. i.e the degree that a community is dominated by one or few common species. The value is in between 0 and 1. Dominace can be calculated by;

$$D= \sum_{1}^{S} (pi)^2 \text{----------3}$$

Where pi is the proportion of crop area composed of species

Measurement of regression analysis; a parameter that is used to relate distance of each plots from home garden and number of plant species on each plots was determined by coefficient of determination ($R^2$). Coefficient of determination (Covariance) is used to determine the relationship between two data sets.

$$Cov(X, Y) = \Sigma(X- \overline{X}) (Y-\overline{Y})/n \text{ ----------4}$$

Where X and Y are sample means and n is sample size.

Microsoft exell 2013 was used for analysis of coefficient of determination (Covariance analysis), analysis of plant species diversity, species richness, species eveness and species+ dominance values. Household, socioeconomic data was analysed by using Microsoft exell.

# 4. Result and Disscusion

## 4.1. Vegetation (different plant) species recorded on study area

### 4.1.1. Tree species in interfacing natural forest and on home gardens of communities

Conversion of forests to other land uses has significantly reduced the diversity of plants. Forest areas of Masha Woreda cleared by the East African Agri-business Chewaka Tea plantation project (EAA) Company has converted to monocultures of tea and Eucalypts plantations. This is the most devastating in terms of reducing diversity, even more than agriculture. Farmers normally leave trees of diverse species on agricultural plots, mostly on farm plot boundaries. On agricultural landscapes, steep slope areas are always kept under forest cover. However, on tea plantations, even steep slopes are cleared and planted with eucalypts for fuel Tadesse and Masresha ( 2005).The same scholars wrote in 2005 that, in south western part of Ethiopia around 235,400 ha of closed and slightly disturbed forest areas were deforested between 1971 and 1997, a loss of about 10,000 ha forest every year.

Even though the study area has very high forest cover and it is believed as the center of origin for many spices and tuber food crops, the area is becoming known by exceptionally high rate of deforestation in the area in recent years. The area was exposed to all causes of forest cover change, ranging from conversion to agriculture by smallholder farmers to large-scale coffee and tea plantations of their first kind in the country. The process of forestland allocation for investments in plantation has continued without any environmental impact assessment, and the impact on the livelihood of the people has been increasing.

Scientific and family name of tree and shrub plant species was obtained from secondary data (A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229). Local name of trees and shrubs were obtained from elder respondents of the residing communities. In Keja, Uwa and Abelo Kebeles at different distance from home gardens; different plant types having different growth habits (Trees and Shrubs or small trees) were recorded. In natural forest of three Kebeles 37, tree plant species having 1089 individuals belonging to 23 families were recorded (Table 2).

Table 2 Total trees recorded in natural forest plots of three Kebeles

| No | Local Name | Scientific name | Family name | Growth | No. of plot on | Number |
|---|---|---|---|---|---|---|
| 1 | Ambilato | *Vangueria volkensii* | *Rubiaceae* | Tree | 2 | 3 |
| 2 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree | 22 | 258 |
| 3 | Bero | *Erythrina abyssinica* | *Fabaceae* | Tree | 4 | 7 |
| 4 | Bo'aro | *Dombeya torrida* | *Sterculiaceae* | Tree | 15 | 25 |
| 5 | Booko | *Bersama abyssinica* | *Melianthaceae* | Tree | 5 | 10 |
| 6 | C'ato | *Albizia gummifera* | *Fabaceae* | Tree | 6 | 15 |
| 7 | Di'o | *Cordia africana* | *Boraginaceae* | Tree | 2 | 2 |
| 8 | Donbirako | *Solanecio gigas* | *Asteraceae* | Tree | 3 | 6 |
| 9 | Emo | *Dracaena fragrans* | *Dracaenaceae* | Tree | 11 | 18 |
| 10 | Et'o | *Ficus sur* | *Moraceae* | Tree | 8 | 15 |
| 11 | Fishino | *Dracaena afromontana* | *Dracaenaceae* | Tree | 16 | 18 |
| 12 | Gawo | *Vernonia amygdalina* | *Asteraceae* | Tree | 9 | 13 |
| 13 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree | 2 | 5 |
| 14 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree | 21 | 49 |
| 15 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree | 10 | 31 |
| 16 | Mergeto | *Vepris daniellii* | *Rutaceae* | Tree | 19 | 36 |
| 17 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree | 4 | 8 |
| 18 | Omo | *Prunus africana* | *Rosaceae* | Tree | 8 | 21 |
| 19 | Oppo | *Hallea stipulosation* | *Rubiaceae* | Tree | 7 | 12 |
| 20 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree | 7 | 17 |
| 21 | Qakaro | *Euphorbia polyphylla* | *Euphorbiaceae* | Tree | 14 | 30 |
| 22 | Qero | *schefflera volkensii* | *Araliaceae* | Tree | 11 | 33 |
| 23 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree | 26 | 69 |
| 24 | Sesino | *Cyathea manniana* | *Cyatheaceaceae* | Tree | 24 | 70 |
| 25 | Shaayo | *Lepidotrichilia volkensiine* | *Meliaceae* | Tree | 9 | 17 |
| 26 | Sha'o | *Pouteria adolf -frienderichie* | *Sapotaceae* | Tree | 8 | 11 |
| 27 | She'o | *Allophylus abyssinicus* | *Sapindaceae* | Tree | 9 | 11 |
| 28 | Shigawo | *chionanthus mildbraedii* | *Oleaceae* | Tree | 13 | 19 |
| 29 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree | 19 | 49 |
| 30 | Shotto | *Alangium chinense* | *Alangiaceae* | Tree | 3 | 7 |
| 31 | Waraallo | *Cassipourea malosana* | *Rhizophoraceae* | Tree | 16 | 27 |
| 32 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree | 13 | 70 |
| 33 | Wundabo | *Apodytes dimidiata* | *Lcacinaceaceae* | Tree | 11 | 21 |
| 34 | Yaago | *Millettia ferruginea* | *Fabaceae* | Tree | 5 | 13 |
| 35 | Yeho | *Olea welwitschii* | *Oleaceae* | Tree | 6 | 14 |
| 36 | Yino | *Syzygium guineense* | *Myrtaceae* | Tree | 23 | 44 |
| 37 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree | 6 | 15 |
| Number of individuals | | | | | | 1089 |

**Source**: - (A document prepared by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Note**: - Local (Sheki nono) name of all trees and shrubs were obtained from elder respondents of the residing communities.

As it is stated on the above table 2 in Keja, Uwa and Abelo Kebeles of Masha Woreda up on which the study was conducted, the largest value or 258 tree plant species belonging to *Myrtaceae* were recorded from the 1089 plant species of different families. The next largest tree plant species recorded in natural forest plots of three Kebeles were Cyatheaceaceae and Euphorbiaceae family's plant species in which both have 70 individual species respectivlly. Cordia Africana a plant of Boraginaceae family plant species, which is locally named as "Dio" was the least number (only 2) tree plant were recorded in three Kebeles of Masha Woreda. This plant (*Cordia africana*) with Amharic local name called" Wanza" is endemic tree plant species, which has been critically endangering status. People are over exploiting and cutting it for different furniture as it is easily the most widely used timber product from forest.

### 4.1.2. Tree species recorded in home gardens of communities

There were 16 plant species with individual count of 635 under total of 11 families (Table 3)

Table **3** Trees recorded in home garden plots of **Keja, Uwa and Abelo** Kebeles

| No | Local Name | Scientific Name | Family Name | Growth habit | Frequence y | Indviduals |
|---|---|---|---|---|---|---|
| 1 | She'o | *Allophylus abyssinicus* | *Sapindaceae* | Tree | 7 | 10 |
| 2 | Yino | *syzygium guineense* | *Myrtaceae* | Tree | 29 | 42 |
| 3 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree | 4 | 10 |
| 4 | Oppo | *Hallea stipulosa* | *Rubiaceae* | Tree | 2 | 9 |
| 5 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree | 10 | 19 |
| 6 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree | 19 | 28 |
| 7 | Di'o | *Cordia africana* | *Boraginaceae* | Tree | 4 | 7 |
| 8 | Omo | *Prunus Africana* | *Rosaceae* | Tree | 5 | 7 |
| 9 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree | 8 | 23 |
| 10 | Qero | *Scheffelera volkensi* | *Araliaceae* | Tree | 13 | 17 |
| 11 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree | 27 | 45 |
| 12 | Qakaro | *Euphorhia epiphyllan* | *Euphorbiaceae* | Tree | 20 | 39 |
| 13 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree | 10 | 11 |
| 14 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree | 4 | 9 |
| 15 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree | 34 | 327 |
| 16 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree | 13 | 32 |
| Total | | | | | | 635 |

**Source:-** (A document prepared by Melca Ethiopa by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

Most of tree (369) plants on the home garden of community were grouped under *Myrtaceae* family and the next large number (107) of plants on home garden grouped under *Euphorbiaceae* family. The least number representing only seven tree plant individuals were grouped under both Rosaceae and Boraginaceae simultaneously. The reason why plant species was few on home gardens of community will be lack of trend of replanting different

types of trees around their territory. Only few types of tree plant species have been delivered from natural forest and planted around their home gardens. Those trees which are assumed to be economically very important for bee hives, hanging bee hives (*Polyscias fulva* or Karasho) and other trees which exists longer and used as shade for live stocks. A tree like *Syzygium quineense* or Yino which is used to hang different crops after harvesting.Most of tree and shrub plant species on the home garden of communities were found to be those, which exist naturally there. The communities of Keja, Uwa and Abelo Kebeles leave different woody plants species untouched and treat them for their economic purpose. Especially trees which are usefull for bee hive making (*Cordia africana, Polyscias fulva, Euphorhia capensis, Ekebergia capensis,Euphorhia epiphyllan, Croton macrostcrostachyus*), hanging of bee hive for honey production (*Cordia Africana, Polyscias fulva, Schefflera abyssinica, Euphorhia capensis, Schefflera volkenisi, Iexi mitis, Croton macrostcrostachyus, Syzygium guineense*), Special flowering trees, (*Schefflera abysiiinica, Vernonia amygdalina, Cordia africana, Syzygium guineense* and *Croton macro stcrostachyus*), trees used for fuel wood, home infrastructures and other economically valuable trees (*Leximitis,Allophylus abyssiicus, Croton macrostcrostachyus, Macaranga capensis, Syzygium quineense, Eucalyptus camaldulensis and Corodia africana*) are kept free and treated by the communities. Except *Eucalyptus camaldulensis* tree. From the above listed plant species most of them are those which exist by nature and few of them like *Cordia africana, Ekebergia capensis* and *Polyscias fulva)* are brought to home from natural forests. Even though most of the communities have no trend of replanting trees deliberately removed trees, they can bring seeds of these trees and germinated on their home garden or they can bring the germinate tree species and plant on their fields. In the high lands of Central and Eastern part of Africa, varieties of home garden exist in the form of integrated farming systems within itself. In these home gardens multiple farming activities around home gardens and for existence of livelihoods of community. The traditional agro forestry home gardens in southern part of Ethiopia are located at altitude of 1500 to 2300 m above sea level where moisture and temperature are favorable for agriculture (Tesfaye, 2005).Currently, *Eucalyptus camaldulensis* is the one that peoples are planting deliberately in and around their home garden.

According to the finding of this research in all of three Kebeles most of the respondents are practicing plantation of *Eucalyptus camaldulensis* tree around their home gardens especially in interfacing land filled to the natural forests. As it is shown on Table 3, among all 635 trees recorded on all home-garden plots of three Kebeles, maximum of them (327) tree plants were those which belongs to *Myrtaceae* family and it is scientifically named as "*Eucalyptus camaldulensis*".The next large number (45) individual plants species is *Croton macrostachyus* which belongs to that of *Euphorbiaceae* family. Tree plant species having the list value is the one with *Asteraceae* family with value of only 6 plant individuals. *Eucalyptus camaldulensis* is not indiginious plant and communities for its economic income value have planted it. Most of the communities in all Keja, Uwa and Abelo Kebeles have been planting *Eucalyptus camaldulensis* tree by removing other indigenous plants from their home gardens and from nearby of their home garden. *Cordia africana* from *Boraginaceae* family and *Prunus Africana* from *Rosaceae* family were those tree plants found to be few in number in the home garden plots of Keja, Uwa and Abelo Kebeles.

### 4.1.3. Shrubs or small tree plants recorded in home gardens of communities

There were also varieties of shrub plants recoreded from home garden of community at 30 plots. 11 different plant species of 422 individuals with 9 family groups were registered from home gardens of the study area (Table 4)

Table 4 Shrubs recorded in home garden plots of three Kebeles

| No | Local Name | Scientific name | Family Name | Growth habit | No. of plot on species available | No of shrubs on the plots |
|---|---|---|---|---|---|---|
| 1 | Ermicho | *Clausena anisata* | *Rutaceae* | Shrub | 14 | 20 |
| 2 | Ho'o | *Arundinaria alpina* | *Poaceae* | Shrub | 8 | 32 |
| 3 | Peecho | *Acanthus eminens* | *Acanthaceae* | Shrub | 4 | 4 |
| 4 | Chego | *Maesa lanceolata* | *Myrsinaceae* | Shrub | 23 | 31 |
| 5 | Atato | *Maytenus gracilipes* | *Celastracae* | Shrub | 7 | 16 |
| 6 | Diido | *Galiniera saxifrage* | *Rubiaceae* | Shrub | 5 | 8 |
| 7 | Girawo | *Vernonia amygdalina* | *Asteraceae* | Shrub | 21 | 12 |
| 8 | Dengrato | *Vernonia auriculifera* | *Asteraceae* | Shrub | 9 | 30 |
| 9 | Buno | *Coffea Arabica* | *Rubiaceae* | Shrub | 29 | 229 |
| 10 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | Shrub | 15 | 34 |
| 11 | Gedrano | *Lobelia gibberoa* | *Campanulaceae* | Shrub | 5 | 6 |
| Total | | | | | | 422 |

**Source:-** (A document prepared by Melca Ethopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

Maximum number (237) individual shrub plants were registered under *Rubiaceae* family. The next large value was 42 individuals that belong to *Asteraceae* family. The least (4) number of individual shrubs was recorded under *Acanthaceae* family. The number of individuals in each plot was variable. Even though it needs further detail investigation with regeneration study, the variability will be due to different disturbance and uncomfortably of the residing environment.

### 4.1.4. Shrubs or small tree plant recorded in interfacing natural forest next to home gardens

Shrubs or small trees plant species were also recorded in home-gardens, interfacing places as well as in natural forests of three Kebeles with having different families. While conducting

shrub plant species in natural forest areas, next to interfacing place after home gardens plots, there were 26 types of shrub species or small tree species with 998 individuals recorded with 16 families. *Microglossa* plant species, which is the family of Astraceae, was the largest shrub plant species in number (96 in number) and observed on 15 of natural forest plots in all three Kebeles. *Coffea Arabica, Rubiaceae* family shrub plant was recorded on 28 plots of natural forest. Whereas the least numbers seven individuals on two forest plots were recorded for *Oxyanthus speciousus* shrub plant of *Rubiaceae* family.

Table 5 Total Shrubs recorded in interfacing natural forest plots of three Kebeles

| No | Local name | Scientific name | Family name | Growth habit | Frequencey | Individuals |
|---|---|---|---|---|---|---|
| 1 | A'emato | *Oxyanthus speciosus* | *Rubiaceae* | Shrub | 2 | 7 |
| 2 | Atato | *Maytenus gracilipes* | *Celastracae* | Shrub | 14 | 39 |
| 3 | Buno | *Coffea Arabica* | *Rubiaceae* | Shrub | 28 | 73 |
| 4 | Chego | *Maesa lanceolata* | *Myrsinaceae* | Shrub | 17 | 60 |
| 5 | Dengrato | *vernonia auriculifera* | *Asteraceae* | Shrub | 25 | 61 |
| 6 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | Shrub | 22 | 48 |
| 7 | Diibo | *Galiniera saxifrage* | *Rubiaceae* | Shrub | 2 | 8 |
| 8 | Eho | *Ricinus communis* | *Euphorbiaceae* | Shrub | 12 | 33 |
| 9 | Eqibalo | *Solanecio manni* | *Asteraceae* | Shrub | 22 | 51 |
| 10 | Ermicho | *Clausena anisata* | *Rutaceae* | Shrub | 25 | 49 |
| 11 | Gedrano | *Lobelia gibberoa* | *Campanulaceae* | Shrub | 14 | 45 |
| 12 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | Shrub | 9 | 25 |
| 13 | Girawo | *Vernonia amygdalina* | *Asteraceae* | Shrub | 12 | 53 |
| 14 | Gujimato | *Madagascariensis* | *Rubiaceae* | Shrub | 12 | 20 |
| 15 | Ho'o | *Arundinaria alpina* | *Poaceae* | Shrub | 5 | 38 |
| 16 | Molawo | *Teclea nobilis* | *Rutaceae* | Shrub | 11 | 18 |
| 17 | Nechenimato | *Psychotria orophila* | *Rubiaceae* | Shrub | 12 | 44 |
| 18 | Nibasho | *Microglossa* | *Astraceae* | Shrub | 15 | 96 |
| 19 | Nuqaasho | *Brucea antidysenterica* | *Simaroubaceae* | Shrub | 9 | 16 |
| 20 | Ogiyo | *aframomum corrorima* | *Zingiberaceae* | Shrub | 12 | 36 |
| 21 | Peecho | *acanthus eminens* | *Acanthaceae* | Shrub | 12 | 37 |
| 22 | Qaaso | *Deinbollia Kilimandscharia* | *Sapindaceae* | Shrub | 18 | 24 |
| 23 | Qorbandaro | *Pavetta abyssinica* | *Rubiaceae* | Shrub | 24 | 37 |
| 24 | Shesharo | *Justicia schimperiana* | *Acanthaceae* | Shrub | 16 | 39 |
| 25 | Yingo | *Phytolacca dodecandra* | *Phytolaceae* | Shrub | 11 | 29 |
| 26 | Yoogaamo | *Ehretia cymosa* | *Boraginaceae* | Shrub | 9 | 12 |
| Total | | | | | | 998 |

**Source:-** (A document prepared by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

The maximum value (261) indicates shrubs with a family of Asteraceae. The next larger value (237) is plant species recorded under family of Rubiaceae. The least or minimum value is indicated for shrub plants in natural forest of Masha Woreda was shrubs of Rubiaceae family.

### 4.2. Diversities of plant species in natural forest, interface and on the home garden

Diversity index is a mathematical measure of species diversity in a given community. It can be computed based on the species richness (the number of species present) and species abundance (the number of individuals per species) data obtained from the developed calculation. In Keja, Uwa and Abelo Kebeles of Masha Woreda 37-tree plant (Table 6) and 26 shurb plant species (Table 7) were recored in natural forest and home gardens respectively. The maximum tree species (37) was recoreded in Keja Kebele natural forest while minium tree species (30) was recorede in natural forest of Uwa Kebele (Table 6). The maximum (16) tree species was recorded in homegarden of Masha Woreda in Uwa Kebele (Table 6). While maximum (11) shrub species on home garden was recoreded in Abelo Kebele (Table 7). The minimum tree species (12) (Table 6) and minimum shrub species (7) on home garden (Table 7) were recorded in Abelo and Uwa Kebeles respectively. A total of 53 tree plant species and 37 shurb plants were recorded in natural forest, interface sites and home gardens of the community (Table 6). Maximum richness of tree plant species of interfacing area next to home garden was observed in Keja Kebele, which is 37 total tree plant species. Abelo Kebele has 33 tree species and Uwa Kebele has lowest number of tree species, which is only 30 tree species (Table 6).

Table 6 Tree diversity onNatural forest and Home-gardens of three Kebeles of Masha Woreda

| | Kebele | Richness | Species evenness(E) | Species Diversity (H') | Simpson Index(D) |
|---|---|---|---|---|---|
| Forest | Abelo | 33 | 0.90 | 3.12 | 1.00 |
| | Keja | 37 | 0.86 | 2.97 | 1.00 |
| | Uwa | 30 | 0.90 | 3.07 | 0.96 |
| | **Total** | **37** | **0.84** | **3.04** | **1.00** |
| HG | Abelo | 12 | 0.6 | 1.5 | 1 |
| | Keja | 14 | 0.61 | 1.61 | 1 |
| | Uwa | 16 | 0.69 | 1.87 | 1 |
| | **Total** | **16** | **0.12** | **1.91** | **1** |

The total of (37) tree species were recorded in three Kebeles of Masha Woreda was higher than the study conducted in Tanzania (29) by Rocky and Mligo in 2012). However, it is less than that of woody plants (47) species recorded in Ghana by (Amoha, 2011). The variation in abundance and richness among three Kebeles of Masha Woreda was due to different ecological factors, exposure or variation of the distance from human settlement areas (demographic factor), physical conditions and various factors of the sites and different anthropogenic factors which will make stress on plants to not to develop and exist longer. The site with larger richness value may be due to less stress application on the site or it might be due to low human disturbance.

The abundance and richness of woody plant species in interfacing natural forest next to home garden was also significantly different from that of woody plant species recorded exactly on the home garden of farmers. Shannon Diversity index value and Species evenness values of natural forest interface trees recorded was also different among each Kebeles. The maximum Shannon Diversity Index value was recorded in Abelo Kebele with value of 3.12, the next was Uwa Kebele (3.07) and the least value was recorded for Keja Kebele with value of 2.97.It is known that Shannon Weiner Diversity Index varies between 1.5 and 3.5 but in rare cases it will exceeds up to 4.5. Looking to evenness values of woody plant species of the natural

forest in study sites, it is similar for Abelo and Uwa Kebeles with having 0.90, which is higher than that of Keja Kebele having 0.86. Tree species in Abelo and Uwa Kebeles are more equally abundent in their species i.e. 0.9 (Table 2) but in Keja Kebele tree species are less aboundent (0.86) than two kebeles (Table 6).

Generally, the values for Shannon diversity Index and Evenness Index is in the range of stated standard values. Mola and Asfaw, 2014-referenced different scholar by comparing the results of the study conducted in different sites. Studies from North Western part home gardens of Ethiopia showed (H'= 3.34) (Mekonnin *et al.*, 2014). But the maximum Shannon Diversity Index value in this study is 3.12 which is less than the above value and it is higher than 1.07, 1.44 of enset-coffee home garden agro forestry of Sidama home garden and south high central & southern high lands respectively. The lowest Shannon Diversity Index in our study area is 2.97, which were recorded in Keja Kebele. This value is larger than that of 1.07, 1.44 of enset-coffee home garden agroforestry of Sidama home garden and south high central & southern high lands respectively but less than 3.34 of Northern –Western part home gardens of Ethiopia study conducted by (Mekonnin *et al.*, 2014).

Similar to the interfacing natural forest, the same approach was employed to recorded and analise different tree and shrub plants on home garden of the community. According to the finding, maximum tree species richness were observed in Uwa Kebele in which 16 home garden tree species were recorded. In Keja Kebele, 14 tree plant species were recorded. 12-tree plant species were recorded in Abelo Kebele. Shannon Diversity Index value was also larger for Uwa Kebele, which is 1.87, and the remaining Keja and Abelo Kebeles had 1.61 and 1.5 respectively (Table 2). Trees are more equally aboundent in home garden of Uwa kebele with value of 0.69 and are less equally aboundent for Keja and Abelo Kebeles with value of 0.61 and 0.6 respectivelly (Table 2). Tree plants in home gardens of three kebeles are dominated by one common species with dominance value of one (Table 6).

It is shown that all tree species richness, Shannon diversity index, Evenness and Simpson's dominance indices are different and larger for natural forest plots. Generally, 37 tree species were recoreded on natural forest of three kebeles while only 16 tree plant species were

recorded on home garden plots of three kebeles. Tree plant species on natural forest of three kebeles are more equally aboundent 0.84 (Table 6) while tree species on home garden of three kebeles are less equally aboundent with total eveness value of 0.12 (Table 6). The reason for the decline of tree species on home garden of communities will be due to poor trend of people to replant trees on their home garden site. Most of the communitity members responded that they commomny grew *Eucalyptus* tree in and around their home gardens (Table 10).The communities remove other kind of tree plants from the interfacing natural forest area to plant *Eucalyptus* tree. People can also cultivate forest coffee near to their home garden and they remove different trees, which is not favorable to plant coffee.

Tree plant richness was higher for natural forest intefaces than home garden areas.Maximum tree plant in interface area was 37 that were recorded in Keja Kebele and only 16 plants were recorded on home garden site of Uwa Kebele.Tree plant eveness was maximum in interface area of Abele and Uwa Kebele with the value of 0.9 for each. Minimum eveness (0.86) was recorded in Keja Kebele. Plant eveness value at home garden site was less than that of interface area of three Kebeles. The maximum evenesss values at home garden site were recorded for Uwa Kebele with value of 0.69.Plant diversity was higher interface site than home garden places. Abelo Kebele interface site have 3.12 higher diversity values. The higher diversity index recorded at home garden site was recorded in Uwa Kebele with 1.87. The lowest diversty index values recoreded in natural forest interface sites were 3.07and 2.97 plant in Uwa and Keja Kebele respectivlley (Table 6).

As it is shown in two tables (Table 7), diversities among shrub species in three Kebeles with in interfacing natural forest and home garden of community are still different. Shrubs in interfacing natural forest are more diverse and rich in number of species than that of those on home gardens. 27 shrub plant species were recorded in natural forest sites of three Kebeles. The highest value (27) was recorded in Keja Kebele (Table 7) whereas only 11 shrub plant species were recorded on home gardens and it was the data registered in Abelo Kebele.

In natural forst of three Kebeles the least shrub plant was recorded in in Abelo Kebele with value of 19 (Table 7) and on home garden least shrub plant was recorded in Uwa Kebele with value of seven (Table 7). Large evenness values were recorded for shrubs in home gardens of

three Kebeles ranging from 0.36 for Uwa Kebele to 0.99 to Abeleo Kebele (Table 7). The evenness value of shrubs in natural forest was less than home garden's value. Abelo Kebele has 0.94 evenness value of shrubs where as Uwa and Keja Kebeles have 0.98 (Table 7). This indicate that, shrubs on home gardens of three Kebeles are more equally aboundent than that of shrubs on natural forest of three kebekes.Shrubs on Abelo Kebele are more eaually aboundent on homegarden siteand it is less equally aboundent on homegarden of Uwa Kebele (Table 7). The Shannon Diversity Index value was large for shrubs in natural forests of three Kebeles. Abelo Kebele has 2.76, Keja Kebele has 3.23 and in Uwa Kebele 3.01, Shannon Diversity Index was registered.

Table 7 Shrub plants diversity onNatural forest and Home-gardens of three Kebeles of Maha Woreda

| | Kebele | Richness | Species evenness (E) | Species Diversity (H') | Simpson Index (D) |
|---|---|---|---|---|---|
| Forest | Abelo | 19 | 0.94 | 2.76 | 0.97 |
| | Keja | 27 | 0.98 | 3.23 | 1 |
| | Uwa | 22 | 0.98 | 3.01 | 1 |
| | **Total** | **27** | **0.96** | **3.12** | **1** |
| HG | Abelo | 11 | 0.99 | 0.83 | 1 |
| | Keja | 10 | 0.8 | 0.78 | 1 |
| | Uwa | 7 | 0.36 | 0.70 | 1 |
| | **Total** | **11** | **0.66** | **0.69** | **1** |

On home gardens of community, small shrubs were registered comparing to natural forest. The Shannon Diversity Index for home garden shrubs was also less than that of natural forest. The largest Shannon Diversity value was registered for shrubs in Abelo Kebele with having value of 0.83. Keja Kebele had 0.78 Shannon diversity value and Uwa had 0.70 diversity value (Table 7).

Large numbers of Shrubs were recorded on interfacing natural forest sites of three Kebeles. The maximum richness (27) was recorded in Keja Kebele interface while Uwa and Abelo Kebeles had 22 and 19 shrubs at their forest interface sites. Home gardens have little number of shrubs than interface places. The highest value (27) shirubs were recorded on interface site of for Keja Kebele. Uwa and Abeleo Kebeles recorded 22 and 19 shirubs respectively. Largest shrub number were recorded on home garden among three Kebeles was 11 which

were in Abeleo Kebele (Table 7). Keja and Uwa Kebeles exihibited 10 and 7 shrubs respectively. Number of plant species and their diversity will be reduced due to different man made and natural disasters. Conversion of forestland to other land use types is the major cause of deforestation.

Eveness of shrubs was maximum on home garden site than that of interfacing natural forest (Table 3). The maximum value of shrub's eveness was recorded in Abelo Kebele with value of 1.99 (Table 7). Keja and Uwa have 1.8 and 1.36 respectivelly. Interface places exihibited shrub eveness of 0.94, 0.98 and 0.98 in Abelo, Keja and Uwa Kebeles respectively (Table 7).

Simpson species dominace (D) value was relatively similar for both shrubs on interfacing natural forests and home gardens of three kebeles (Table 6 and 7).Except shrubs on interface site of Abelo Kebele having dominace value 0.97 all other shrubs on interface places and home garden site of three Kebeles recorded similar value i.e.(Table 7). This indicates that, similar shrub species are more commonly present on interface and home garden sites of keja, uwa and abelo kebeles.

### 4.3. Energy source of community and dependency on forest products

Aiming to know the dependency of community on the forest and availability of alternative energy source, communities were asked to respond whether they have another energy source and level of their dependency on the forest. Based on the asked question, all of the respondents (100%) replied that the energy sources are only from forest wood and charcoal. Even though electric power transmission line passed over Keja Kebele only few communities along the main road line got power supply for lump, television and radio operation only. There is no power supply for the communities leaving out of the main road. As this study is mainly focusing on forest home garden agro forestry interface, there were no community members utilizing electric power among respondents leaving far from the main road from Gore to Maha town.

It was stated by (Zewude, 2005) that the number of Shekacho people who sold fuel wood highly increased from 2001–2005 and the demand for fuel wood increased in Maha town. One horse back of fuel wood fetches 7 to 8 Birr. Hence, people started to buy horses for selling

fuel wood by selling their cattle. But the above cost was in 2005 and currently one horse back fuel wood costs by average 54 birr and one full sack of charcoal costs average of 80 birr. There have been occurrences of forest degradation from year to year in Maha Woreda. The reason for degradation can be seen from different views. It was strongly believed and practiced that the community in the area (Shekacho) people has strong relation with their environment that enabled them to develop their own conception of resource management.

The strong cultural practice and deep-rooted beliefs which will be comparable as religious practice of Shekacho people made the natural forest untouched and conserved for longer years thorough out their generation. The base for the conservation of cultural forests, wetlands and riverine forest and waterfalls is the religious beliefs that impose resource and habitat taboos through the *guudo*[1] and *deedo*[2] belief system. Large forest areas were administered through inherited customary in the *Kobo*[3] system.

However it can be taken as promising fact that the gradual weakening of traditional social organization of Sheka people that consists of the king (*Shekitato*[4]), councils (*mikiracho*[5]), clan leaders (*gepitato*[6]) lead to the increased degradation of natural resources. It was also concluded by (Zewude, 2005) that gradual weakening of traditional and social organization of the shekacho community resulted in the shift of cultural forest management towards government ownership, mainly since October 2004, could not reduce the increasing deforestation. It rather increased deforestation, as the original holders cannot reclaim their own ownership to prevent deforestation. The current religious status of most communities did not order and support to practice different traditional and cultural activities, norms and beliefs

[1] Guudo:- Cultural forest used as worship place

[2] Deedo:- Large tree under which prayer or religious ceremony is conducted

[3] Kobo: - Communities had trees/forest and they had also tenure system in the forest and manage their honey productions

[4] Shekitato: - King of Sheka.

[5] Mikiracho: - ''Councils'' according to traditional leader ship hierarchy of Shekacho.

[6] Gepitato: - Are the clan leaders.

with in and around the natural forest areas. Selling fuel wood and charcoal are one of the factor will reduces forest resources and plant species. This practice with its obvious consequence started in the past few Decades in Maha Woreda. People who sell fuel wood and charcoal greatly increased from 2001–2005. The attitudinal change among people towards selling firewood, the demand for fuel wood from the market and pressing economic problems on very few people and socio-economic problem of the major causes of deforestation related with firewood (Zewude, 2005). The spread of new beliefs and the expansion of unchecked investment coupled with the diminished role of clan leaders in forest management have endangered the traditional resource conservation system aggravating environmental degradation. The beliefs, values, norms and customs related with *guudo* and *deedo* worship promote conservation. However, these traditional beliefs are undermined due to the wide spread of new religion mainly since the 1990s and the diffusion of external cultures to the area.

In the culture and tradition of Sekacho people, it was shame to sell fuel wood and charcoal. But currently in three kebels of the study area due to weakening of traditions and speed of new religion (97.9% of the community's religion is protestant, (Table 8), selling of fuel wood and charcoal has becoming common practice in the study area. Many of the informants stated the importance of the forest for their livelihood by declaring that it is everything for them. A range of values is attached to the forest and non-timber forest products that have socio-economic importance. Honey, wild coffee, climbers and spices are the chief NTFPs they acquire from forest. Honey is the main NTFP that is harvested in May. In some areas, production of honey contributes to the primary income of the family more than 'enset' (NTFP 2004). Informants in Keja, Uwa and Abelo Kebeles indicated that people extract forest coffee and spices for their own consumption and sell the rest to the market.

Figure 3 Tree hacked readily availed for traditional bee hive

It was also stated by informants that there were very few people who planted coffee and spices in the forest. The forest provides climbers and other non-timber construction materials and agricultural tools. The use of large trees is observed only for making traditional beehives (Zewdie, 2007).

Shekacho people have a cultural practice of harvesting traditional medicines from natural forest and around their home gardens. They can traditionally prepare cultural medicines from leafs, roots, seeds and other part of plants for different disease of human being and their livestocks. This culture made the people to depend on the forest resource values. According to the information gathered from Focused Group Discussion (FGD) of Beto and Wollo Kebeles by Zewude Jotte in 2007, eleven types of plant species were recorded as cultural medicinal plants for different disease.

Most (84.1%) of the people in the study area responded that they do not have trend of replanting trees and only 15.9% of respondents have trend to plant trees in place of used or removed trees. Genetically Modified tree species used to be replanted by 12.8% of

respondents and indigenous tree species that can be brought from natural forest replanted by 3.1% of respondents while 84.6% respondents have no trend of replanting trees.

They also asked to respond whether they have trend of treating their additional free land that they use for different activities. 53.6% of the community responded that they have no trend of treating their additional land while 46.4% of them have rend of treating their land by fencing the surrounding of their land. The intention of community to treat their land is different among respondents. 51.3% of the respondents treat their land for the purpose of preventing eucalyptus tree from entry of animals and human being to the garden, 31.8% of respondents treat their land for their cattle grazing, 5.5% treat the land for the purpose of crops on the land while 11.4% respondents do not have land to be treated.

### 4.4. The relation between distance of natural forest from the interfacing home garden and species richness in each plots

It was observed that different plant species were recorded at different distances from the interfacing natural forest and home gardens. As shown in figure 5, at a very short distance to home garden interfacing natural forest area; only six species of plants were recorded in Keja Kebele. However, as distance increase from home garden to the different points of natural forest, the number of plant species increase. The least (Figure 4) was recorded at a distance of 112 meter from home garden and the largest value (37) was recorded at a distance of 1456 meter. The correlation between number of plant spices recorded and distance to which plants recorded indicate that as distance increases, the number of plant species increase. The covariance coefficient value indicated for Keja Kebele had $R^2 = 0.864$ which indicated strong linear relationship between plant species richness and distance of natural forest from human settlement areas.

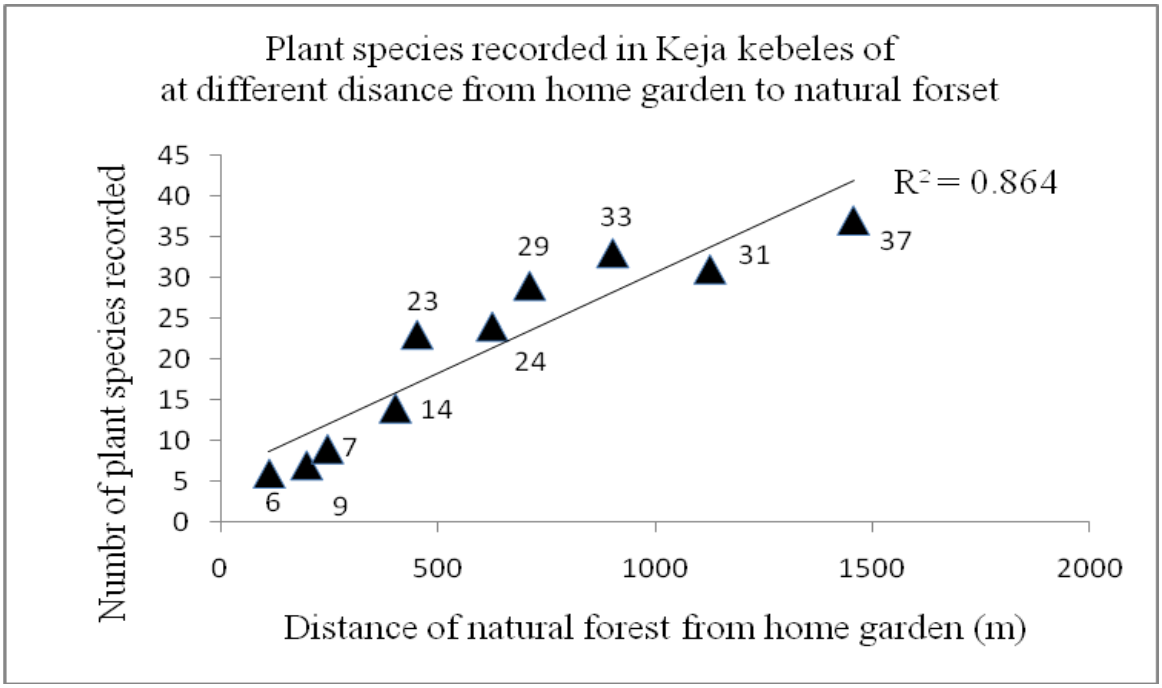


Figure 4 Correlation between Plant species recorded and distance measured in natural forest next to home garden of Keja Kebele

In Abelo Kebele, the least value of plant species recorded was 9 which were at 212 meter from interfacing home garden towards the natural forest areas. Similarly, the number of plants increases as distance increase and the largest number of plant species recorded in Abelo Kebele was 33 at far distance from home garden, which is 1758 meter. This is supported by correlation between distance and number of plant species. Plants species richness in Abelo Kebele and distance to which they recorded was correlated with a covariance coefficient value of $R^2$=0.781 which is known to be as strong linear relationship between distance and species richness.

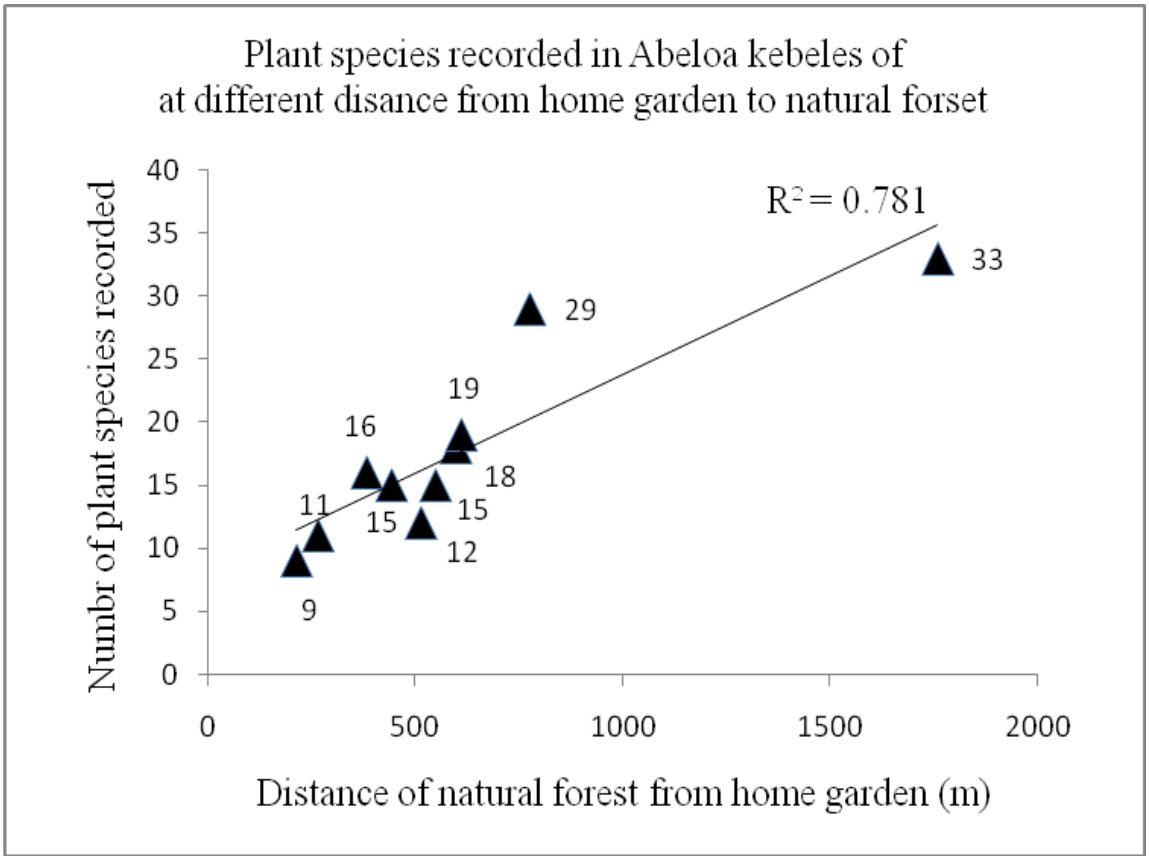


Figure 5 Correlation between Plant species recorded and distance measured in natural forest next to home garden of Abelo Kebele

In Uwa Kebele, the correlation between plant species richness and distance to which they recorded was more related and almost perfectly correlated to each other. At very near distance to home gardens of community 8 plants were recorded on 216 meter distance. The largest plant species richness value was recorded in Uwa Kebele 823 meter distance from the interfacing distance from home gardens.

The covariance value computed to determine the association between two variables for Uwa Kebele to relate plant species and distance is $R^2$=0.934.This value is more linear than all other covariance coefficient values computed for other Kebeles. Therefore, it is better to describe this as best linear relationship between other two Kebeles.

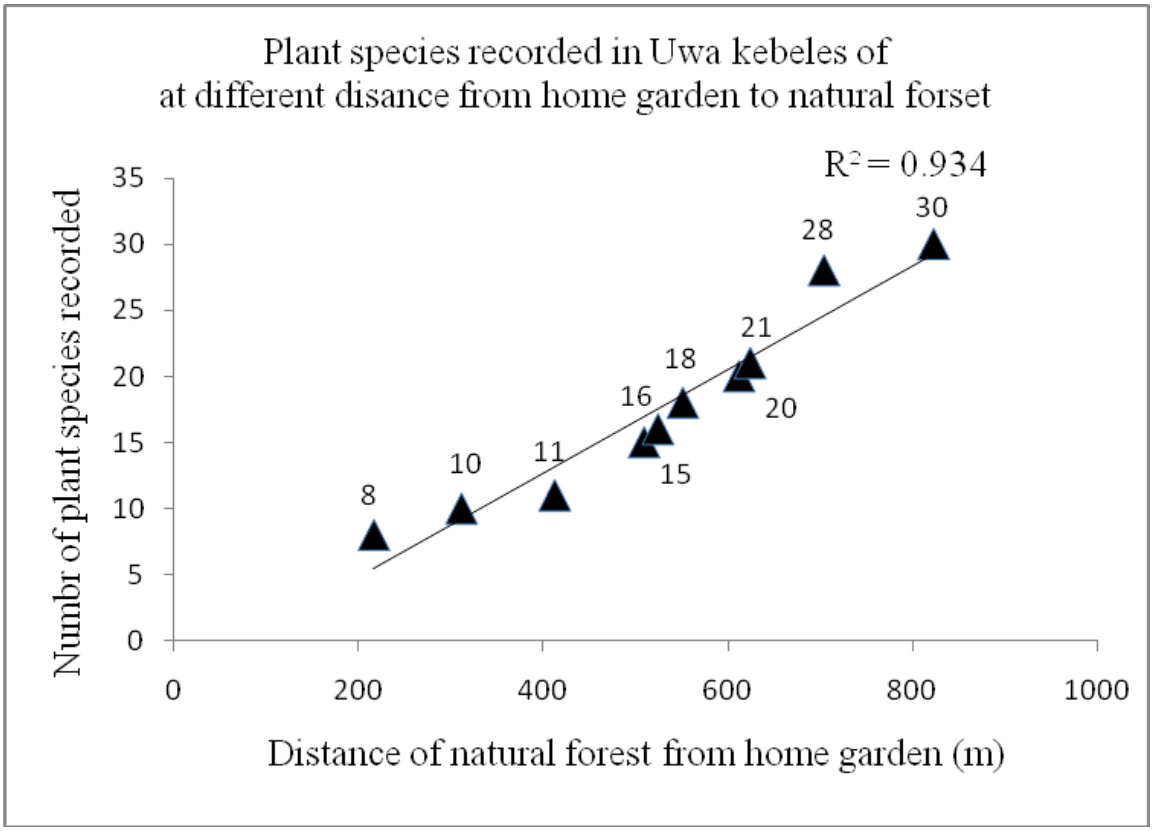


Figure 6 Correlation between Plant species recorded and distance measured in natural forest next to home garden of Uwa Kebele

Generally, the relationship between plant species recorded in all of Kebeles and distance to which they recorded from the interfacing home gardens to center of natural forest areas. Only 6 plant species were recorded at 112-meter distance in Keja Kebele and largest value was recorded at a distance of 37 that is in Keja Kebele at a distance of 1456 meter. The covariance which is used to identify and measure their relationship between variables indicate that, the association is more strong and it is strongly linear association between two variable with value of $R^2 = 0.767$.

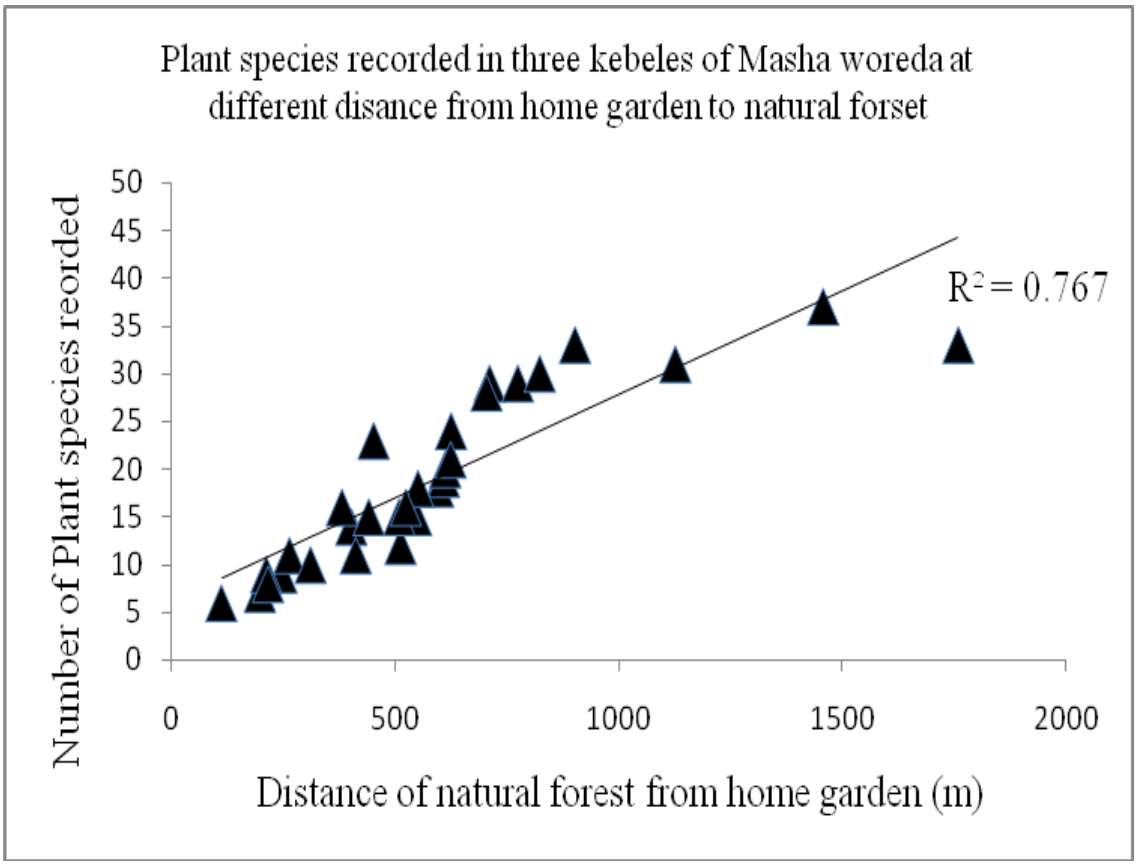


Figure 8 Correlation between Plant species recorded and distance measured in natural forest next to home garden of Keja, Uwa and Abelo Kebeles in Maha Woreda

### 4.5. Major drivers of natural forest transition

The communities of study area  area farmers who's basic econmoy depends on their land,natural forest and on their live stock production. Agriculture is the crutial source of economy in rural areas. In addition to working different agricultural practices on their home gardens; people of the study area highlly depends on the forest resource products like traditional forest honey production, forest coffee production, animal husbundering with perphery of forest, utilization of different woody tools for their house  infrustructures and for their farming activities, collection of fuel wood and chacoal production for their energy souce as well as selling it to support their economy, harvesting and collection of medicinal plants for them and for their livestocks and soon.

The economic over dependecey of the community on the forest resource may results in the purtarbution of the forest and reduction of diversity of plant species. Communityies of the study area also practices animal husbandering that will result in overgrazing condition especially in narrow fields and results in reduction of plant species and makes stress on the area.

The only source of energy for all respondents in three Kebele is fire wood and charcoal from forest source. All of the community members in the study area uses, firewood from forest for themselves and some members of community are practicing selling of firewood and charcoal loading on horseback and transporting to Masha town.

Illegal owning of additional forest land that interfaces natural forest from the home garden of community has been experiencing by most of the community members. Currently according to response from respondents from FGD and key informants, the major reason why people in rural areas seek to have additional land next to their own home garden is, for *Eucalyptus* tree plantation that has been practiced on the field and interface sites of most communities. .

As it has been discussed above, natural forst plots which are near to residents of human settlent are poor in species richness and diversity of plants.This indicate that peoples are applying different stress and actions which reduces plant diversity from the nearbye foerst land. Infact it is known that peole may not move long distance to search for different woody tools and fire wood. Purtubutions and stress have been occuring to short distant forest lands due to over application of human being on them.

Local adminstrations, Woreda and zonal governments including community members, they are not sensitivlly acting in controling illegal land owning, illegal acts and selling of fire wood and charcoal and  over exploitation and utilization of forest resources. Ther is no structured manual or standard document at keblele level to sustainable utilization of foret resources.

# 5. Conclussions and Recommendations

## 5.1.Conclussions

Conversion of forestland to other land use types is the major cause of deforestation. This activity can significantly reduce the diversity of plants with their individual number. Before 2005, forest areas of Masha Woreda cleared by the East African Agri-business Chewaka Tea plantation project (EAA) Company were converted to monocultures of tea and eucalypts plantations. This is the most devastating in terms of reducing diversity, even more than agriculture. Currently numerous local and national investors have been practicing different forest based agricultural investments in Sheka zone especially in Masha Woreda. As a culture and norm Shekacho, people normally leave trees of diverse species on their agricultural plots long years before, mostly on farm plot boundaries. However, currently most of the communities have been planting *Eucalyptus* around and in their home gardens. This activity is more speeding in interfacing lands towards natural forest next to home gardens. One Shekacho's people best culture was isolating forestland by the name of cultural activities like deedo, guudo and kobo. However, except kobo culture in which people can use the forest for their bee hives, coffee plantation and other activities those of deedo and guudo culture which exactly makes forest tree untouched are keep the forest from distruction. Other thing investigated by this research is that almost all respondents have a culture or a trend of replanting trees and they are highly focusing on *Eucalyptus* tree plantation. As it known by research form the response of communities, in keja, uwa and abelo Kebeles of study area people have been using forest wood and charcoal fully as energy source for their home. Due to those listed activities and other related factors the forest diversity and coverage have been reducing.

Even though the Masha Woreda is covered by very dense forest in core areas of forest and it was believed as the center of origin for many spices and tuber food crops, the area is becoming known by exceptionally high rate of deforestation in recent years. The forest has been exposed to all causes of forest cover change, ranging from conversion to agriculture by smallholder farmers to large-scale coffee and tea plantations. The process of owning additional land by community in addition to their home garden also needs regulation and attention because, most community members have been owning lands for *Eucalyptus* tree

plantation which is mainly practiced at interface lands next to home garden by removing other indigenous plant species. The process of forestland allocation for investments by governmental body also needs special consideration of forestland covers to not to allocate forest areas to other investment activities.

## 5.2. Recommendations

Based on the findings this research it is possible to forward the following recommendations.

- ✓ Even though diversity and species richness of the natural forests indicated it as a good condition, the forest have been facing different anthropogenic stresses and needs to conserve and restore.

- ✓ Both woody and shrub plant species recorded in home garden of communities is less in terms of species richness and diversity. Therefore, it is crucial to focus on planting native species around their home gardens so as it is simultaneously important to wind break for crops on the field, used as fencing, reduces time expense to brought woody tools to home, used as infrastructure tools for households and others.

- ✓ Decision makers and governmental office leaders should critically look over the process and criteria to allocate investment lands.Concerned Non Governmental Organizations (NGOs) has to work in collaboration with other stakeholders to best and sustainable utilization of natural resources.

- ✓ This research has revelead that interfacing forestlands found at near distance to home gardens or human settlement, have few plant species and less diversified. Therefore, it is better to stop over exploitation and over utilization of natural resources especially woody plants.Even though forests found at far distance from home gardens are more diversified and have relatively good species richness, the current approach of community is not promising that they do not over act on it. Therefore, it needs early awareness and conservation activities forest far from homegarden as well.

- ✓ Tree species recorded on homegardens of Keja, Uwa and Abelo kebeles are much smaller than interfacing natural forsts. Shanoon diversity index and eveness values were also minimum. In addition to this, the trend of communities to replant tree is very poor.Therefore it recommended to have good trend of replantation of trees.

- ✓ Govrnent should focus on training communities to planting trees on their homegarden.

- ✓ Communities in the study area have been using traditional beehive activities. It is stronglly recommended to use modern bee hive utilization and honey production activities. Therefore, Woreda agricultural sector experts and agricultural extension workers have to focus on this work.

- ✓ Since the communities in Keja, Uwa and Abelo Kebeles have no any kind of energy source alternatives, they are still dependent on forest wood and charcoal as source of energy. However, it is also strongly recommended that until electric power utilization starts in Keja, Uwa and Abelo Kebeles, it is important to search other energy source like solar energy plates, biogas and composting technologies and others. Concerning to these huge mandates is loaded up on government by creating awareness, providing equipment and by providing fund from small enterprises.Strong regulation and follow up is needed to control illegal deforestation by fire wood and charcoal sellers.

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## Annex

### Annex 1Observation check list

1. Name of Kebele……. Site Name (code)…….
2. GPS location E……..N……. Elevation (m)
3. Measure plot size for the recording of trees and shrubs
4. Measure sub plots for herbaceous plant recording
5. Record plant species on the home gardens
    A. Local name of plants…….
    B. Scientific name of plants……
    C. Family of plants……...
6. Growth habit of the plant
    A. Tree
    B. Shrub
    C. Herb
7. Measure distance between interfacing home garden and natural forest ……(m)
8. Measure plot size for the recording of trees and shrubs
9. Measure sub plots for herbaceous plant recording
10. Site Name (code)…….
11. GPS location E……..N……. Elevation (m)
12. Record plant species on the site (plot of neural forest)
    A. Local name of plants…….
    B. Scientific name of plants……
    C. Family of plants……...

**Annex 2Tree plant species recorded in natural forest of Keja Kebele**

| No | Local Name | Scientific name | Family name | Growth habit |
|---|---|---|---|---|
| 1 | Ambilato | *Vangueria volkensii* | *Rubiaceae* | Tree |
| 2 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 3 | Bero | *Erythrina abyssinica* | *Fabaceae* | Tree |
| 4 | Bo'aro | *Dombeya torrida* | *Sterculiaceae* | Tree |
| 5 | Booko | *Bersama abyssinica* | *melianthaceae* | Tree |
| 6 | C'ato | *Albizia gummifera* | *Fabaceae* | Tree |
| 7 | Di'o | *Cordia africana* | *Boraginaceae* | Tree |
| 8 | Donbirako | *Solanecio gigas* | *Asteraceae* | Tree |
| 9 | Emo | *Dracaena fragrans* | *Dracaenaceae* | Tree |
| 10 | Et'o | *Ficus sur* | *Moraceae* | Tree |
| 11 | Fishino | *Dracaena afromontana* | *Dracaenaceae* | Tree |
| 12 | Gawo | *Vernonia amygdalina* | *Asteraceae* | Tree |
| 13 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 14 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 15 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 16 | Mergeto | *Vepris daniellii* | *Rutaceae* | Tree |
| 17 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 18 | Omo | *Prunus africana* | *Rosaceae* | Tree |
| 19 | Oppo | *Hallea stipulosatione* | *Rubiaceae* | Tree |
| 20 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 21 | Qakaro | *Euphorbia polyphylla* | *Euphorbiaceae* | Tree |
| 22 | Qero | *schefflera volkensii* | *Araliaceae* | Tree |
| 23 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree |
| 24 | Sesino | *Cyathea mannianai* | *Cyatheaceaceae* | Tree |
| 25 | Shaayo | *Lepidotrichilia velkensii* | *Meliaceae* | *Tree* |
| 26 | Sha'o | *Pouteria adolf ifrienderichie* | *Sapotaceae* | Tree |
| 27 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 28 | Shigawo | *chionanthus mildbraedii* | *Oleaceae* | Tree |
| 29 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 30 | Shotto | *Alangium chinense* | *Alangiaceae* | Tree |
| 31 | Waraallo | *Cassipourea malosana* | *Rhizophoraceae* | Tree |
| 32 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 33 | Wundabo | *Apodytes dimidiata* | *Lcacinaceaceae* | Tree |
| 34 | Yaago | *Millettia ferruginea* | *Fabaceae* | Tree |
| 35 | Yeho | *Olea welwitschii* | *Oleaceae* | Tree |
| 36 | Yino | *Syzygium guineense* | *Myrtaceae* | Tree |
| 37 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 3 Tree plant species recorded in natural forest of Abelo Kebele**

| No | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Bero | *Erythrina abyssinica* | *Fabaceae* | Tree |
| 3 | Bo'aro | *Dombeya torrida* | *Sterculiaceae* | Tree |
| 4 | Booko | *Bersama abyssinica* | *melianthaceae* | Tree |
| 5 | C'ato | *Albizia gummifera* | *Fabaceae* | Tree |
| 6 | Donbirako | *Solanecio gigas* | *Asteraceae* | Tree |
| 7 | Emo | *Dracaena fragrans* | *Dracaenaceae* | Tree |
| 8 | Et'o | *Ficus sur* | *Moraceae* | Tree |
| 9 | Fishino | *Dracaena afromontana* | *Dracaenaceae* | Tree |
| 10 | Gawo | *Vernonia amygdalina* | *Asteraceae* | Tree |
| 11 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 12 | kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 13 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 14 | Mergeto | *Vepris dainelli* | *Rutaceae* | Tree |
| 15 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 16 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 17 | Oppo | *Hallea rubrostipulosa* | *Rubiaceae* | Tree |
| 18 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 19 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 20 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 21 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree |
| 22 | Sesino | *Cyathea manniana* | *Cyatheaceaceae* | Tree |
| 23 | Sha'o | *Pouteria adolf-ifrienderichi* | *Sapotaceae* | Tree |
| 24 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 25 | Shigawo | *Chionanthus mildbraedii* | *oleaceae* | Tree |
| 26 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 27 | Shotto | *Alangium chinense* | *Alangiaceae* | Tree |
| 28 | Waraallo | *Cassipourea malosana* | *Rhizophoraceae* | Tree |
| 29 | werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 30 | Wundabo | *Apodytes dimidiate* | *Lcacinaceaceae* | Tree |
| 31 | Yeho | *Olea welalischii* | *oleaceae* | Tree |
| 32 | Yino | *Syzygium guineense* | *Myrtaceae* | Tree |
| 33 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex4 Tree plant species recorded in natural forest of Uwa Kebele**

| No | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Bo'aro | *Erythrina Abyssinia* | *Fabaceae* | Tree |
| 3 | C'ato | *Albizia gummifera* | *Fabaceae* | Tree |
| 4 | Donbirako | *Solanecio gigas* | *Asteraceae* | Tree |
| 5 | Emo | *Dracaena fragans* | *Dracaenaceae* | Tree |
| 6 | Et'o | *Ficus sur* | *Moraceae* | Tree |
| 7 | Fishino | *Dracaena afromontana* | *Dracaenaceae* | Tree |
| 8 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 9 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 10 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 11 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 12 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 13 | Oppo | *Hallea rubrostipulosa* | *Rubiaceae* | Tree |
| 14 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 15 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 16 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 17 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree |
| 18 | Sesino | *Cyathea manniana* | *Cyatheaceaceae* | Tree |
| 19 | Shaayo | *Lepidotrichilia velkensii* | *Meliaceae* | Tree |
| 20 | Sha'o | *Pouteria adolf-ifrienderichi* | *Sapotaceae* | Tree |
| 21 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 22 | Shigawo | *Chionanthus mildbraedii* | *oleaceae* | Tree |
| 23 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 24 | Waraallo | *Cassipourea malosana* | *Rhizophoraceae* | Tree |
| 25 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 26 | Wundabo | *Apodytes dimidiate* | *Lcacinaceaceae* | Tree |
| 27 | Yaago | *Millettia ferruginea* | *Fabaceae* | Tree |
| 28 | Yeho | *Olea welalischii* | *oleaceae* | Tree |
| 29 | Yino | *Syzygium quineense* | *Myrtaceae* | Tree |
| 30 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 5 Tree plant species recorded in natural forest of three Kebeles of Maha Woreda**

| | Local Name | Scientfic name | Family name | Growth habit |
|---|---|---|---|---|
| 1 | Ambilato | *Vangueria volkensiik* | *Rubiaceae* | Tree |
| 2 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 3 | Bero | *Erythrina Abyssinia* | *Fabaceae* | Tree |
| 4 | Bo'aro | *Dombeya forrida* | *Sterculiaceae* | Tree |
| 5 | Booko | *Bersama abyssinica* | *melianthaceae* | Tree |
| 6 | C'ato | *Albizia gummifera* | *Fabaceae* | Tree |
| 7 | Di'o | *Cordia africana* | *Boraginaceae* | Tree |
| 8 | Donbirako | *Solanecio gigas* | *Asteraceae* | Tree |
| 9 | Emo | *Dracaena fragans* | *Dracaenaceae* | Tree |
| 10 | Et'o | *Ficus sur* | *Moraceae* | Tree |
| 11 | Fishino | *Dracaena afromontana* | *Dracaenaceae* | Tree |
| 12 | Gawo | *Vernonia amygdalina* | *Asteraceae* | Tree |
| 13 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 14 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 15 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 16 | Mergeto | *Vepris dainelli* | *Rutaceae* | Tree |
| 17 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 18 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 19 | Oppo | *Hallea rubrostipulosa* | *Rubiaceae* | Tree |
| 20 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 21 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 22 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 23 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree |
| 24 | Sesino | *Cyathea manniana* | *Cyatheaceaceae* | Tree |
| 25 | Shaayo | *Lepidotrichilia velkensii* | *Meliaceae* | *Tree* |
| 26 | Sha'o | *Pouteria adolf-ifrienderichi* | *Sapotaceae* | Tree |
| 27 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 28 | Shigawo | *Chionanthus mildbraedii* | *oleaceae* | Tree |
| 29 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 30 | Shotto | *Alangium chinense* | *Alangiaceae* | Tree |
| 31 | Waraallo | *Cassipourea malosana* | *Rhizophoraceae* | Tree |
| 32 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 33 | Wundabo | *Apodytes dimidiate* | *Lcacinaceaceae* | Tree |
| 34 | Yaago | *Millettia ferruginea* | *Fabaceae* | Tree |
| 35 | Yeho | *Olea welalischii* | *oleaceae* | Tree |
| 36 | Yino | *Syzygium quineense* | *Myrtaceae* | Tree |
| 37 | Yudo | *Dracaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 6 Shrub (Small tree) plant species recorded in natural forest of Keja Kebele**

| No | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | A'emato | *Oxyanthus speciousus* | *Rubiaceae* | Shrub |
| 2 | Atato | *Maytenus gracilipes* | *celastracae* | Shrub |
| 3 | Buno | *Coffea Arabica* | *Rubiaceae* | Shrub |
| 4 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | Shrub |
| 5 | Dengrato | *vernonia auriculifera* | *Asteraceae* | Shrub |
| 6 | Diibo | *Rothmannia urcelliformis* | *Rubiaceae* | Shrub |
| 7 | Diido | *Galiniera saxifrage* | *Rubiaceae* | Shrub |
| 8 | Eho | *Ricinus communis* | *Euphorbiaceae* | Shrub |
| 9 | Eqibalo | *Solanecio manni* | *Asteraceae* | Shrub |
| 10 | Ermicho | *Clausena anisata* | *Rutaceae* | Shrub |
| 11 | Gedrano | *Lobelia giberroa* | *Campanulaceae* | Shrub |
| 12 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | Shrub |
| 13 | Girawo | *Vernonia amygdalina* | *Asteraceae* | Shrub |
| 14 | *Gujimato* | *Madagascariensis* | *Rubiaceae* | Shrub |
| 15 | Ho'o | *Arundinaria alpine* | *poaceae* | Shrub |
| 16 | Molawo | *Teclea nobilis* | *Rutaceae* | Shrub |
| 17 | Nechenimato | *Psychotria orophila* | *Rubiaceae* | Shrub |
| 18 | Nibasho | *Microglossa* | *Astraceae* | Shrub |
| 19 | Nuqaasho | *Brucea antidyserica* | *Simaroubaceae* | Shrub |
| 20 | Ogiyo | *Afframomum corrorima* | *Zingiberaceae* | Shrub |
| 21 | Peecho | *acanthus eminens* | *Acanthaceae* | Shrub |
| 22 | Qaaso | *Deinbollia Kilimandscharia* | *sapindaceae* | Shrub |
| 23 | Qorbandaro | *Pavetta abyssinica* | *Rubiaceae* | Shrub |
| 24 | Shesharo | *Justicia schimperiana* | *Acanthaceae* | Shrub |
| 25 | Yingo | *Phytolacca dedocandra* | *phytolaceae* | Shrub |
| 26 | Yoogaamo | *Ehretia cymosa* | *Boraginaceae* | Shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 7 Shrub (Small tree) plant species recorded in natural forest of Abelo Kebele**

| No | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | Atato | *Maytenus gracilipes* | *celastracae* | shrub |
| 2 | Buno | *Coffea Arabica* | *Rubiaceae* | shrub |
| 3 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | shrub |
| 4 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shrub |
| 5 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | shrub |
| 6 | Eho | *Ricinus communis* | *Euphorbiaceae* | shrub |
| 7 | Eqibalo | *Solanecio manni* | *Asteraceae* | shrub |
| 8 | Ermicho | *Clausena anisata* | *Rutaceae* | shrub |
| 9 | Gedrano | *Lobelia giberroa* | *Campanulaceae* | shrub |
| 10 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shrub |
| 11 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shrub |
| 12 | Ho'o | *Arundinaria alpine* | *poaceae* | shrub |
| 13 | Nechenimato | *Psychotria orophila* | *Rubiaceae* | shrub |
| 14 | Nibasho | *Microglossa* | *Astraceae* | shrub |
| 15 | Ogiyo | *Afframomum corrorima* | *Zingiberaceae* | shrub |
| 16 | Peecho | *acanthus eminens* | *Acanthaceae* | shrub |
| 17 | Qorbandaro | *Pavetta abyssinica* | *Rubiaceae* | shrub |
| 18 | Shesharo | *Justicia schimperiana* | *Acanthaceae* | shrub |
| 19 | Yingo | *Phytolacca dedocandra* | *phytolaceae* | shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 8 Shrub (Small tree) plant species recorded in natural forest of Uwa Kebele**

| No | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | Atato | *Maytenus gracilipes* | *celastracae* | shrub |
| 2 | Buno | *Coffea Arabica* | *Rubiaceae* | shrub |
| 3 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | shrub |
| 4 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shrub |
| 5 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | shrub |
| 6 | Eho | *Ricinus communis* | *Euphorbiaceae* | shrub |
| 7 | Eqibalo | *Solanecio manni* | *Asteraceae* | shrub |
| 8 | Ermicho | *Clausena anisata* | *Rutaceae* | shrub |
| 9 | Gedrano | *Lobelia giberroa* | *Campanulaceae* | shrub |
| 10 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shrub |
| 11 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shrub |
| 12 | Gujimato | *Madagascariensis* | *Rubiaceae* | shrub |
| 13 | Molawo | *Teclea nobilis* | *Rutaceae* | shrub |
| 14 | Nechenimato | *Psychotria orophila* | *Rubiaceae* | shrub |
| 15 | Nibasho | *Microglossa* | *Astraceae* | shrub |
| 16 | Nuqaasho | *Brucea antidyserica* | *Simaroubaceae* | shrub |
| 17 | Ogiyo | *Afframomum corrorima* | *Zingiberaceae* | shrub |
| 18 | Peecho | *acanthus eminens* | *Acanthaceae* | shrub |
| 19 | Qaaso | *Deinbollia Kilimandscharia* | *sapindaceae* | shrub |
| 20 | Qorbandaro | *Pavetta abyssinica* | *Rubiaceae* | shrub |
| 21 | Shesharo | *Justicia schimperiana* | *Acanthaceae* | shrub |
| 22 | Yingo | *Phytolacca dedocandra* | *phytolaceae* | shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 9 Shrub (Small tree) plant species recorded in natural forest of three Kebeles of Maha Woreda**

| | Local Name | Scientfic name | Family name | Groth habit |
|---|---|---|---|---|
| 1 | A'emato | *Oxyanthus speciousus* | *Rubiaceae* | shrub |
| 2 | Atato | *Maytenus gracilipes* | *celastracae* | shrub |
| 3 | Buno | *Coffea Arabica* | *Rubiaceae* | shrub |
| 4 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | shrub |
| 5 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shrub |
| 6 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | shrub |
| 7 | Diibo | *Galiniera saxifrage* | *Rubiaceae* | shrub |
| 8 | Eho | *Ricinus communis* | *Euphorbiaceae* | shrub |
| 9 | Eqibalo | *Solanecio manni* | *Asteraceae* | shrub |
| 10 | Ermicho | *Clausena anisata* | *Rutaceae* | shrub |
| 11 | Gedrano | *Lobelia giberroa* | *Campanulaceae* | shrub |
| 12 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shrub |
| 13 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shrub |
| 14 | Gujimato | *Madagascariensis* | *Rubiaceae* | shrub |
| 15 | Ho'o | *Arundinaria alpine* | *poaceae* | shrub |
| 16 | Molawo | *Teclea nobilis* | *Rutaceae* | shrub |
| 17 | Nechenimato | *Psychotria orophila* | *Rubiaceae* | shrub |
| 18 | Nibasho | *Microglossa* | *Astraceae* | shrub |
| 19 | Nuqaasho | *Brucea antidyserica* | *Simaroubaceae* | shrub |
| 20 | Ogiyo | *Afframomum corrorima* | *Zingiberaceae* | shrub |
| 21 | Peecho | *acanthus eminens* | *Acanthaceae* | shrub |
| 22 | Qaaso | *Deinbollia Kilimandscharia* | *sapindaceae* | shrub |
| 23 | Qorbandaro | *Pavetta abyssinica* | *Rubiaceae* | shrub |
| 24 | Shesharo | *Justicia schimperiana* | *Acanthaceae* | shrub |
| 25 | Yingo | *Phytolacca dedocandra* | *phytolaceae* | shrub |
| 26 | Yoogaamo | *Ehretia cymosa* | *Boraginaceae* | shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 1 Tree plant species recorded in home garden of Keja Kebele**

| No | Local Name | Scintific name | Family name | Growth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Di'o | *Cordia africana* | *Boraginaceae* | Tree |
| 3 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 4 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 5 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 6 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 7 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 8 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 9 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 10 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 11 | Qeto | *Llexmitis* | *Aquifoliaceae* | Tree |
| 12 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 13 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 14 | Yino | *Syzygium quineense* | *Myrtaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 2 Tree plant species recorded in home garden of Abelo Kebele**

| No | Local Name | Scintific name | Family name | Growth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 3 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 4 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 5 | Nachato | *Rytigynia neglecta* | *Rubiaceae* | Tree |
| 6 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 7 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 8 | Qeto | *Llexmitis* | *Aquifoliaceae* | Tree |
| 9 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 10 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 11 | Yino | *Syzygium quineense* | *Myrtaceae* | Tree |
| 12 | Yudo | *Draceaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 3 Tree plant species recorded in home garden of Uwa Kebele**

| No | Local Name | Scintific name | Family name | Growth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 3 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 4 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 5 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 6 | Qero | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 7 | Qeto | *scheffelera volkensi* | *Araliaceae* | Tree |
| 8 | Shomo | *Llexmitis* | *Aquifoliaceae* | Tree |
| 9 | Werango | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 10 | Yino | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 11 | Yudo | *Syzygium quineense* | *Myrtaceae* | Tree |
| 12 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 13 | Oppo | *Hallea rubrostipulosa* | *Rubiaceae* | Tree |
| 14 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 15 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 4 Tree plant species recorded in home garden of three Kebeles of Maha Woreda**

| No | Local Name | Scientific Name | Family Name | Growth habit |
|---|---|---|---|---|
| 1 | Barzafo | *Eucalyptus camaldulensis* | *Myrtaceae* | Tree |
| 2 | Di'o | *Cordia africana* | *Boraginaceae* | Tree |
| 3 | Karasho | *Polyscias fulva* | *Araliaceae* | Tree |
| 4 | Kocho | *Erythrina brucei* | *Fabaceae* | Tree |
| 5 | Manjo | *Schefflera abyssinica* | *Araliaceae* | Tree |
| 6 | Omo | *Prunus Africana* | *Rosaceae* | Tree |
| 7 | Oppo | *Hallea rubrostipulosa* | *Rubiaceae* | Tree |
| 8 | Ororo | *Ekebergia Capensis* | *Meliaceae* | Tree |
| 9 | Qakaro | *Euphorhia aphliphylla* | *Euphorbiaceae* | Tree |
| 10 | Qero | *scheffelera volkensi* | *Araliaceae* | Tree |
| 11 | Qeto | *Ilex mitis* | *Aquifoliaceae* | Tree |
| 12 | She'o | *Allophylus abyssinicus* | *sapindaceae* | Tree |
| 13 | Shomo | *Croton macrostachyus* | *Euphorbiaceae* | Tree |
| 14 | Werango | *Macaranga capensis* | *Euphorbiaceae* | Tree |
| 15 | Yino | *Syzygium quineense* | *Myrtaceae* | Tree |
| 16 | Yudo | *Draceaena Steudneri* | *Dracaenaceae* | Tree |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 5 Shrub (Small tree) plant species recorded in home garden of Keja Kebele**

| No | Local Name | Scientific name | Family | Growth habit |
|---|---|---|---|---|
| 1 | Atato | *Maytenus gracilipes* | *celastracae* | shrub |
| 2 | Buno | *Coffea Arabica* | *Rubiaceae* | shrub |
| 3 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | shrub |
| 4 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shrub |
| 5 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | shrub |
| 6 | Ermicho | *Clausena anisata* | *Rutaceae* | shrub |
| 7 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shrub |
| 8 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shrub |
| 9 | Ho'o | *Arundinaria alpine* | *poaceae* | shrub |
| 10 | Yingo | *Phytolacca dedocandra* | *phytolaceae* | shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 6 Shrub (Small tree) plant species recorded in home garden of Abelo Kebele**

| No | Local Name | Scientific Name | Family Name | Growth habit |
|---|---|---|---|---|
| 1 | Ermicho | *Clausena anisata* | *Rutaceae* | shrub |
| 2 | Ho'o | *Arundinaria alpina* | *poaceae* | shrub |
| 3 | Peecho | *Acanthus eminens* | *Acanthaceae* | shrub |
| 4 | Chego | *Macsa lanceoblata* | *Myrsinaceae* | shrub |
| 5 | Atato | *Maytenus gracilipes* | *celastracae* | shrub |
| 6 | Diido | *Galiniera saxifrage* | *Rubiaceae* | shrub |
| 7 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shrub |
| 8 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shrub |
| 9 | Buno | *Coffea Arabica* | *Rubiaceae* | shrub |
| 10 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shrub |
| 11 | Gedrano | *Lobelia giberroa* | *Campanulaceae* | shrub |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 7 Shrub (Small tree) plant species recorded in home garden of Uwa Kebele**

| No | Local Name | Scientific name | Family | Growth habit |
|---|---|---|---|---|
| 1 | Atato | *Maytenus gracilipes* | *celastracae* | shurb |
| 2 | Buno | *Coffea Arabica* | *Rubiaceae* | shurb |
| 3 | Chego | *Maesa lanceolata* | *Myrsinaceae* | shurb |
| 4 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shurb |
| 5 | Gedrano | *Lobelia gibberoa* | *Campanulaceae* | shurb |
| 6 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shurb |
| 7 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shurb |

**Source** :-( A document prepaired by Melca Ethiopia by the title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).

**Annex 8 Shrub (Small tree) plant species recorded in home garden of three Kebeles of Maha Woreda**

| No | Local Name | Scientific name | Family | Growth habit |
|---|---|---|---|---|
| 1 | Atato | *Maytenus gracilipes* | *celastracae* | shurb |
| 2 | Buno | *Coffea Arabica* | *Rubiaceae* | shurb |
| 3 | Chego | *Maesa lanceolata* | *Myrsinaceae* | shurb |
| 4 | Dengrato | *vernonia auriculifera* | *Asteraceae* | shurb |
| 5 | Diido | *Rothmannia urcelliformis* | *Rubiaceae* | shurb |
| 6 | Ermicho | *Clausena anisata* | *Rutaceae* | shurb |
| 7 | Gedrano | *Lobelia gibberoa* | *Campanulaceae* | shurb |
| 8 | Geesho | *Rhamnus prinoides* | *Rhamnaceae* | shurb |
| 9 | Girawo | *Vernonia amygdalina* | *Asteraceae* | shurb |
| 10 | Ho'o | *Arundinaria alpina* | *poaceae* | shurb |
| 11 | Peecho | *Acanthus eminens* | *Acanthaceae* | shurb |

**Source** :-( A document prepaired by Melca Ehiopia title of «Masresha Fetene entitled by Forest of Sheka» in 2007 from page 221-229).