Jimma University

College of natural sciences

Biology department

Woody species composition and diversity in agricultural landscape: the case of Kachabiradistrict, KembataTembaro Zone, South Nation Nationality and peoples' region

BY:

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MARCH, 2023

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A thesis submitted to department of biology, college ofnatural sciences Jimma University, for the partial fulfillment of the requirement for the degree of masters of Science (botanical stream).

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SCHOOL OF GRADUATE STUDIES

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ADVISORS' APPROVAL SHEET 1

The thesis entitled with woody species composition and diversity in agricultural landscape case of Kachabira district**,** southern Ethiopia", in partial fulfilment of the requirement of a master's degree in botanical science, Jimma University College of Natural science, and is a record of the thesis by Mulatu Markos under my supervision part of the thesis has been submitted for any other degree or diploma. The assistance and help received during the course of this investigation have been properly acknowledged. Therefore, I recommend that it be accepted as fulfilling the thesis requirements.

Name of Advisor	Signature	Date
Kitessa Hundera (Prof)	_________	_____________
Name of Co-Advisor	Signature	Date
Netsane t Gonfa (MSc)	_________	_____________

APPROVAL SHEET-II

We, the undersigned, members of the board of examiners of the final open defence by ________________________________ have read and evaluated his thesis entitled woody species composition and diversity in agricultural landscape the case of Kachabira district**,** southern Ethiopia "and examined the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirement of master's degree in botanical science

Name of the Chairperson Signature Date

________________________________ ______________________ _________________

Name of Major advisor Signature Date

__________________________________ ______________________

Name of Internal Examiner Signature Date

__________________________________ ______________________

Name of External Examiner Signature Date________________________________ ____________________

DECLARATION

The piece of work entitled woody species “composition and diversity in agricultural landscapeall sources of information other than my own have been acknowledged. This work has not been previously submitted to any other university for award of any type academic degree.

Name of Student Signature Date

Mulatu Markos ____________________ ____________________

Place: Jimma University College of natural science Biology department

DEDICATION

This thesis is dedicated to my beloved family (my father, mother and brothers & sister).

Acknowledgments

Above all, I thank the Almighty God throughout my life for his help and guidance during different hardships in my life. “The Almighty God makes all things beautiful in His time”. I would like to express my deepest gratitude to my advisors, Professor Kitessa Hundera and Mrs. Netsanet Gonfa for their endeavors, continuous guidance, devotion, and support throughout the preparation of the thesis. Finally, I am grateful to the of study site who assisted me in facilitating community-level data collection by devoting their precious time during the critical scaling up training time. Also, I thank Jimma University Department of Biology they offered me comprehensive moral as well as financial support and treatment that enabled me succeed throughout my academic life.

LIST OF ACRONYMS

CSA	Central Statistics Agency
DA	Development Agents
DBH	Diameter at Breast Height
KCO	Kachabira Communication Office
KLNRM	Kachabira Land and Natural Resource Management
E’	Shannon Evenness
FAO	Food and Agricultural Organization
GPS	Geographical Position System
H	Shannon Diversity Index
BA	Basal Area
IVI	Importance Value Index
NMA	National Metrology Agency
SPSS	Statistical Package for Social Sciences
NMA	National Metrology Agency
SS	Sorenson Similarity
GHBP	Gross home-based product

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ABSTRACT

Woody species composition & diversity in the agricultural landscape was an issue of scientific, economic, ecological, and political concern at the global level. The main objective of this study was to investigate wood species composition diversity in agricultural landscape practice in three study areas Kachabira district, Kambata, South Ethiopia. Atonal 59 woody species belonging to 56 genera and 36 families were recorded across the farmlands, parklands, and live fences in the study area. Among the woody species composition constituted21 (36%), shrubs 38(64%), from recorded woody species, 39(66%) were native and the remainders 20(34%) were introduced species. The mean Shannon diversity index of rich, medium, and poor households in the three different agroforestry practices were 1.75, 1.57, and 1.62 in farmland0.36, 0.30, and 0.49 in parkland, and 0.84, 0.99, and 1.00 in live fence respectively. A total of 42 sample plots, (14 plots in each site) 14 sample plots of 50 m × 50 m were established in farmland and 14 sample plots of 40 m × 40 m were established in parklands while 14 plots of 10 m × 10 m were for saplings and for seedlings were laid *along* a transect at a distance of 40 m between each transect lines plots put in the live fence the farmland was standardized to hectare for later comparison with each six land use types. The first transect line and plot would be set purposely. Woody species composition data include woody species abundance, diversity, richness, basal area, frequency, dominance, importance value index, and traditional composition practices on farmland, parkland, and live fence at three study sites. Finally, the investigator gave recommendations to the stakeholders on the basis of the findings; it is necessary that the government recognizes the role that farmers play in biodiversity conservation through planting and managing trees on their farmwoodyspecies.

Key words: Wood species composition, Woody species diversity, farmland, parkland, live fence.

1. INTRODUCTION

1.1. Background of the Study

Agricultural landscapes are environmental systems advanced with great participation of man, used by man, and conserved in the world the state of internal balance (Kizos and Koulouris 2005). They are defined as the visual result of land uses. At present, the role of country areas does not mean only food matters production. The sustainable country areasadvanceessentialcontainconserving the balance between the productive, economic, and social of woody of the agricultural landscape and its ecological function, including conserving biodiversity. The basic elements of the country area landscapes are the agro ecosystems. Those are mainly grasslands and cultivated fields. The correct structure allows agricultural production and maintains environmental values (Kovalev et al. 2004).

Woody species composition of the agricultural landscape in Africa productions diverse roles in the improvement of agricultural productivity, maintenance of the agro-ecosystem stability, and improvement of livelihood of the people of the rural communities. An understanding of the diversity of woody species on agricultural landscapes is crucial to the landscape approach to woody species biodiversity conservation. This study is carried out to investigate the diversity of woody tree species in agricultural landscapes in Africa.

Agricultural landscapes are the spatial link of agricultural, semi-natural traditional agricultural plots, agroforestry plots, and fallow lands, and natural takes of forest lands habitats. Scattered trees are characteristics of agricultural landscapes in sub–Saharan Africa. (Bayala et al., 2011). At the time of converting woodlands to farmlands, farmers remove most of the vegetation leaving behind selected multipurpose tree species for their diverse functions (Bayala et al, 2011). Such as product income, food, wood, construction materials, fodder, medicine climatic amelioration, and soil fertility improvement (Faye et al., 2010). Although, there has been increased awareness of the contribution of agroforestry systems to overall tree canopy cover over the landscapes (Mustapha and Jimoh, 2012). The extent of woody species diversity in agricultural landscapes in Africa is insufficiently documented

Agriculture is the main backbone of the economy then also the major occupation of Ethiopian population. Rapid population growth and long history of inactive agriculture have changed the land use/land cover systems and caused environmental degradation in many developing countries including Ethiopia. Population growth and environmental degradation on woodyspecies composition forest main to loss of tree area, habitat fragmentation, soil degradation, and biodiversity losses.

Agro forestry is a dynamic ecologically based natural resources management system through integration of woody species on farms that diversifies agricultural landscapes and sustains production for increased social, economic, and environmental benefits. Agro forestry systems are known to bring about changes in edaphic, microclimatic, floral, faunal, and other components of the ecosystem through bio recycling of mineral elements, environmental modifications, and changes in floral and faunal composition.

Woody species variety in a changing land in the south-imperative highlands of Ethiopia Agriculture, Ecosystems and environment, soil development, erosion control, fuel wood, wood, drug treatments and meals that thousands and thousands of humans in growing international locations and background values. Regardless of the existing of those elevations, many woody species are threatened and declining. As result, there is a need to conserve the variety of trees species in addition to other plant species in environment. The primary intention for woody species conservation is biodiversity safety (FAO, 2009).

Farmers with little get entry to resources, especially land, have been additionally awareness on the production of few essential food vegetation, depending on their person comparative benefit in addition farm size performs a role within the desire of tree species, association and density, as well as universal management practices of the device (Zebene, and Agren2007). Farmer’s local information and highpoint soil residences of agro forestry practices unrelated land-use practices and land, combined with bad market get entry to and lack of local foundations for farm useful resource control brought approximately a rapid decline in tree cover and lack of organic range.

Different factors inclusive positive to records and extension enter and biophysical environmental conditions, are also regarded to have an effect on tree species diversity control. So, this study was conducted at Kachabira district, KambataTambar zone, southern Ethiopia with the objective to assess the woody species composition& diversity in agricultural landscape affecting variety in farm land.

1.2. Statement of the Problem

In farmlands isolatedwoody species composition & diversity in agricultural land scapeproduction a number of maintenance capacities, among others they participate in pollution control of the environment, change the life stream and matter circulation, and reduce soil disintegration (Orłowski, 2003). By large, making stages the tree cover in these cultivating systems through both common recovery and planting was vitally required to modification the degradation of the biological system, increase strength and make advances nearby people's livelihood. Diversifying the composition of cultivate woody species too promotions the balance and efficiency of agro-ecosystems (Kindt& Coe, 2005). Combines the targets of realizing picks up in food security and in preservation of biodiversity (Atta-Krah et al, 2004).

Some of the current contributing reasons that accelerated the decline of woody species composition & diversity in agricultural landscape Ethiopia are, the size and distribution pattern of human and domestic animal populations, the level of resource consumption, market reasons and rules. Forestry focuses mostly on tree in forests not on scattered trees that are found on farm land. Understanding and the attention on woody species conservation and sustainable use has so far been insufficient.

Therefore, this study was designed to assess the woody species composition &diversity in agricultural landscape of Kachabira district to fill this gap. The major threats to woody species composition would have been identified to provide information about traditional controlling and users of woody species diversity on farm land of study area. Practical information and clear understanding of agricultural landscape component was considered to be essential for planning and sustainable controlling of the systems.

1.3. Objectives of the Study

1.4. General objective

The objective of this study was to investigate woody species, composition, andfactors affecting diversity in agricultural landscape in Kachabiradistrict.

1.4.1. Specific Objectives

1. To assess the composition of woody species in agricultural landscape in Kachabira District.
2. To assess local knowledge on woody species; in various Agro forestry practices.

3. To determine factors affecting woody species composition diversity in the agricultural landscapes.

1.4. 2.Research Question

To achieve the stated objectives, the study has focused on the following research questions.

1. What is the current composition of woody species found on farmland within the study area?
2. What types of woody species diversity and composition found on farmland? Under various Agro forestry practices?
3. What are the factors that can impact woody species compositionand diversity? Differingqualities of in agricultural section in consider zone**?**

1.4.3. Significance of the Study

The result of this expression at present’s information on type of woody species variety, their relative. Abundance, species of composition and threats of woody species in agricultural landscape of in Kachabira district. The importance of this study has been conducted: To identify current status of woody species found in agricultural landscape of the district. To design suitable conservation and sustainable use strategies to farmland woody species. The outcome was serving as an input for future ecological studies in the study area. The important threats to woody vegetation have been recognized to provide facts about woody species diversity in agricultural landscape at location it has been used for maintained and sustainable use of this farm land.

1.4.4. Scope of the Study

The content was to assessment woody species diversity and composition in agricultural landscape in 21 Kebles of Kachabira district, southern Ethiopia.

2. LITERATURE REVIEW

2.1. Concept of Woody Species on Farmlands

Woody species can be observed in agricultural land in various directions. As an instance, bushes that contribute positively to agricultural plants are grown dispersed in crop fields while timber that compete with plants are planted one at a time in block arrangements. One of the features of on farm tree controlling is that the organic traits of bushes are frequently taken into consideration to decide where it must be grown. Isolated timber grown in farmlands characterizes a huge part of the Ethiopian agricultural landscape. Timbers have been grown in a scattered form over a crop area, generally among 1–20 trees in line with hectare to reduce effect on the companion cropFentahun Mengistu, (2008).

The landscape-scale function of scattered trees is that they make contributions to the overall amount of tree cowl in a landscape. Further to the neighborhood-scale ecological features of a given individual scattered tree, in mixture, multiple bushes scattered during a landscape provide additional ecological features. Scattered trees make a crucial contribution to universal tree cover in lots of cultural and currently modified landscapes. The system has sufficiently potential for supplying food, poles, farm equipment, and fuel wooden and contributes to agricultural production. Some feasible studies need include soil-plant interactions, soil fertility and N-fixation studied. son wide variety of species, crop tree yield studies and optimum tree density, socioeconomic research, and species selection and screening including seed assessments, established order, and management (Campbell *et al.*, 1991 cited in Motuma, 2006).

2.2. Agriculture and WoodySpecies

Agriculture is the main strength of the economy however also the most important occupation of Ethiopian population. Speedy population growth and long history of inactive agriculture have modified the land use/land cover structures and precipitated environmental degradation in lots of growing nations including Ethiopia according to (Molla and Kewessa, 2015). The substantial destruction of woodlands because of agriculture and different human activity at some stage in the savannas makes the biodiversity losses inside parks even more concerning. One of the reasons for the destruction of natural forests is the expansion of agriculture.

The destruction of natural forests ends in the loss of biodiversity. The lack of biodiversity in flip has a number of ecological and societal consequences. Extra straight away, lack of biodiversity may have good sized effects on surroundings characteristic and reduces opportunities to prevent manufacturing related risks (Power and Flecker, 2001). Now a day's diminution of biodiversity due to converting primary forest to unsustainable agricultural landscape has extended in many growing countries.

In farmlands scattered timber play a number of protective features, among others they take parting pollution manipulates of the surroundings, modify the power float and rely move, and diminish soil erosion (Orłowski, 2003). The presence of wooden species diversities improves soil conditions inside the surrounding crop fields, as a result of successful of organic depend inside the soil and number and interest of soil microorganisms. Agriculture has influential position in facilitating and stimulating growth of other sectors of the economy the land use changes natural woodland to crop land. Land use in Africa has been differentiating through a huge quantity of land degradation and conversion to agricultural land use apparatus. Sustainable agriculture has acquired growing interest because expanding agriculture is globally the main driving force of biodiversity decline (Brussaard et al, 2010), IAASTD 2009). In current years interest has been given to a new standard of Eco-agriculture or included conservation agriculture, which finds to integrate biodiversity conservation with rural improvement. This standard is being clearly considered in shaping conservation techniques with certainly recognized economic and ecological relationships that consist of atmosphere services.

2.2.1. Physical environment

The growth diversity and types of woody plant species developing in a given land use are affected by altitude and weather. Temperature and rainfall are two critical climatic elements which are inspired through altitude which further have an effect on the diversity of species. Natural woodland and wooded area ecosystems, a huge quantity of nutrients circulates yearly between plant life and the soil; in a climax community the plant soil system as an entire is in equilibrium and the inputs and outputs of vitamins are small. Mono cropping, in assessment, has inputs finished fertilizer balanced through huge losses through elevated herbal strategies leaching, gaseous losses, and erosion and elimination in harvest(Kang &Akinnifesi, 2000; Neupane *et al.,* 2002). The detail of recycling, through decomposition of roots and crop residues is extraordinarily small. Amassing and processing of woody species produce may function a main source of incomes, or provide supplementary incomes for people generally concerned in activities outside the wooded area, including farming. The money produced in this means were consumed on food, or invested in agricultural property consisting of farm animals or seed to at ease purpose food supplies (FAO2010).

2.2.3. Woody Species in Crop Fields

The woody species range and composition which exist at the crop fields can also alternate over time due to changes in values which farmers attach to one of a kind woody species at one-of-a-kind times. The cost of a species may additionally change with adjustments within the market values. Therefore, crop fields which has been converted while there has been sufficient herbal wooded area district and much less restriction of utilizing wood resources from the natural wooded area might also have had a low initial diversity and composition of woody species in comparison to the newly transformed crop fields. The presence of numerous tree species on farms that serve exceptional socio-financial and ecological capabilities could make contributions to the sustainability of agricultural structures. At the identical time, the diversification of on-farm timber provides biological property for maximizing on-farm resources, for that reason reducing the value of manufacturing. Bushes on-farms, in the form of agro forestry, are uniquely applicable to provide Eco-agricultural answers that correctly combine the objectives of multiplied food safety and conservation profits, particularly through promoting the greater use of native tree species (Atta-Krah et al, 2004).

2.2. 4.Threats of Woody Species Diversity in Agricultural Landscape

Scattered timber in herbal, cultural and currently changed landscapes face some comparable threats, as nicely as some threats which can be unique to precise ecosystems. The most direct danger to all scattered woody bushes is clearing through human beings. For evidence, the prison and illegal removal of scattered trees are huge (Gibbons, 2002). A slower, but similarly complicated, danger to scattered bushes is the shortage of herbal regeneration. is frequently associated with excessive grazing and cultivation stress, and has been a problem in natural, cultural and currently changed landscapes with scattered bushes. some of the present-day contributing motives that increased the decline of woody species range and composition of woody species in Ethiopia are, the scale and distribution sample of human and domestic animal populations, the level of resource intake, marketplace motives and regulations. Information and the eye on woody species conservation and sustainable use has up to now been insufficient.

Similarly, agricultural investment, resettlement schemes, charcoal, production and expansion of forceful invasive alien species are having a profound and determinant impact at the woody plant resource availability (Awas, 2007).

2.2.5. Woody Species Preference and Management on Farmland

2.2.6. Woody species preference

The selection of tree species depends on at the advantage that would have been drawn from preserving the tree on a farm. The importance of timber in addressing the production and provider function problems has been properly understood by using farmers done the periods and has been surely demonstrated in traditional tree-based agricultural farming and land-use structures, including transferring cultivation inside the humid tropics and grazing inside the semi-arid savanna regions. Well adapted timber has the potential to rehabilitate degraded lands and ecosystems, restructure the landscape, offer a number of advantages and products (timber and non-timber products for meals and drugs), and render environmental and socio-monetary offerings.

This consists of products used at once by way of the agricultural households, such as food, gasoline, production materials, and so forth. Inputs to agricultural implements and garage structures; and merchandise or activities that provide family participants with employment and earnings (Getachew and Mesfin 2014). Woody Species diversity and their possibilities on Farmers 'Land protecting.

2.2.7. Woody species controlling

Diversifying the composition of farmland woody species additionally complements the stability and productiveness of agro-ecosystems (Kindt and Coe, 2005). Based on traditional and technical understanding (Getahun, et al, 2014). Known four Basic control practices or harvesting methods for biomass, firewood, forage, poles, etc. which can be described as follows:

I. Coppicing

When a woody perennial is cut near floor stage and could sprout a large number of latest shoots. Similarly, it is the procedure of slicing timber down, permitting the stumps to regenerate for a

Wide variety of years after which harvesting the ensuing stems. It entails slicing down the entire tree leaving a stump 10 – 30 cm above ground degree (Arnold, J.E. and Dewees, P.A. 1999). Trees in controlled landscapes: factors in farmer selection making.

II. Pollarding

It's far much like Coppicing except that the main stem is cut about 2m above the ground. Its miles a Method of encouraging lateral branches by reducing off the entire crown of the tree meters or so above ground degree. Entails reducing the entire of the tree's crown as a way to encourage Regeneration and the method applies to trees that may be without problems climbed. It has also more than one uses of trees placed on farmland or in pasture (Asfaw, Z., and Hulten, H., 2003).

Tree variety management within the conventional Agro forestry Land use of Sidama, Southern Ethiopia. Act Universities Agriculture truly one of the most important uses of pollarded trees become to offer grazing for home animals and, at the equal time, pollarded stands continuously supplied stove wood for home intake or timber for carving which, however, required an extended, pruning cycle

III. Lopping

It's far where the outer components of the branches are reduced. The primary use is to stimulate fruit production but, by way of controlling the cover unfold; lopping also can be used to regulate light achieving understory vegetation.

IV. Branch pruning

This method is specific to ago forestry. Decided on branches are removed, either some of essential branches from the stem or where the main branches are cut. This composition method is done to enhance the boom charge or health of the remaining timber and pruning of Indigenous species maintain in crop fields is mean for; reducing the impact on plants, getting fodder for animals, and gathering wood to be used for fencing, building homes, firewood and also for income (Motuma et al., 2008).

2.2.8. Factors Influencing Woody Species Diversity on Farmland

Farmer's woody species composition & diversification and conservation on their farmlands influenced by through some of socio-economic, biophysical environmental conditions.

Institutional and extension inputs (Mulu, &Gebeyehu, 2010). Factors Affecting modifications in woody Species range composition on Farmers.

Landholdings as an example, the conventional in the past forestry systems of southern Ethiopia have been taken into consideration as a sustainable farming system throughout recent centuries, mainly owing to the diversification of products and services from various trees and other agricultural vegetation. However, in latest years, the growing common people has increased strain on such conventional in the past forestry structures, threatening their sustainability. Following the woody species composition & diversity on farmland major factors that have an effect on on-farm tree species range and composition.

a. Wealth status

Wealth is one factor of interest that influences tree-species variety on farmlands. Lack of capital may additionally prevent a farmer from acquiring a favored species or a massive range of seedlings, although it does no longer save you him from planting trees (Tewodros, W, W., 2008). Elements affecting the expertise, mind-set and exercise of woodland based manja community closer to forest conservation has indicated that wealth reputation in itself does no longer have an effect on tree-species variety. For example, richer families had fewer medicinal species, in line with the survey performed via which could suggest that the richer household's option to buy medicine from off-farm sources, and aren't inquisitive about having medicinal timber on their farms.

Farm size

Farm size is possibly the maximum important issue that limits tree-species richness and diversity on farmlands. There need to be enough land to be had to make tree developing feasible, to cover the cost of tree-planting. Better species-richness and abundance of timber in keeping with unit location of farms provide greater opportunities for tree-species conservation over their use inside the farm. For that reason, the size of the landholding has a critical have an impact on the choice of tree species and their range, association and density, in addition to on the overall composition farm size is an vital element in influencing the diversity and composition of trees species, but the density of men and women consistent with farm quantity of population consistent with farmland must also be taken into consideration because it shows the significance of the pressure on land.

c. Free grazing

Grazing cattle are known as one of the primary elements that influences control exercise of woody species on farmland, for the duration of the ground and it occupies 25% of the worldwide land surface. also, a couple of different physical and organic elements at numerous spatial and temporal scales of influencing woody species balance due to unfastened grazing all bushes seedlings that arise in grazing, farming and communal lands are both grazed on and uprooted, or can be trampled on and die. Seedlings are eliminated and mature timber chewed, bunted and rubbed towards via goats, sheep and cattle. Horses are especially adverse animals and can ring bark a mature tree over night or have been completely get rid of it in remember of days.

d. Loss of capital

As reported by using one of the woody species composition problems to nursery had been loss of capital for the purchase of potting materials, gear and device (specifically watering cans, wheelbarrows and spades), pests and illnesses, and cattle damage. The other irritation changed into related to seed procurement of sure species, in particular Grevillea Robusta, Hakeasaligna, and Olea Africana and Terminalia mentalists. Numerous researches have pronounced the effect of lack of capital on the tree density and tree species-richness on farmlands. There also can be greater essential financial pressures that save you or discourage farmers from coping with bushes into their agricultural practices.

e. Drought

Drought are described because the absence of rainfall for lengthy a time frame sufficient to result in depletion of soil water and harm to woody species. The drought pressure is a very essential limiting aspect all through early seedling growth and status (Jaleel et al., 2009). It influences each elongation and expansion increase of woody species on farmland it suggests that water-deficit strain decreased the increase of woody species by way of restricting leaf formation. Moreover, the impact of drought pressure indicating that shoot increase is extra sensitive to water availability than root boom (Ashraf and fool advert, 2007).

3. MATERIALS AND METHODS

3.1. Study Area Description

3.1.1 Geographical Location

The study was conducted in Kachabira District, Kambata Tambaro Zone southern Ethiopia. Kachabira is bounded by the Angacha district in the north, Kedida-Gamela distracts in the east, Hadiya Zone in the southeast, and southwest with Wolayita Zone in the southwest. The district lies between 07°12'30.1" - 07°17'08.3" N and 37°47'48"– 37°50'30.6"E. The district capital is found 327 Km from Addis Ababa and 117 km away from the regional capital, the city of Hawassa. The district with a total land area of 25,944 hectares. The altitude of the district varies from 1600-2600 meters above sea level. Characterized by two ago-ecological Zones, highlands (2300-2500m.a.s. l) and midland (1500-2300m.a.s.l)

Figure.1: Map of the study area

Source: From Ethio-GIS (2007).

3.1.2. Topography

The district has various topographic features along with flat, gentle, sloping plains &undulating to rolling plains with significant percentage of low to smallimprovementmountains. The Distract has an altitudinal range from 1600 -2600 meter above sea level.

3.1.3. Population of Study Area

According to the 2007 Survey projected for 2014, the total population of the study District is estimated to be115, 579 out of which 56,801 male and 58, 778 female (50.86 %). Zonal population growth rate is 3%. About 52% of the total population was economically active. The total number of households in the district was 25,780, with an average of 6 family members per household. The majority of the peoples are Christians in religion i.e. Protestant (89.88%), followed by Orthodox (5.28%), and Catholics (4.83%) the remaining are (CSA, 2007).

3.1.4. Land use

Total area of land use in the district is 25,944 hectare. The most broadly produced products in the district are crops, Vegetables, fruits and Coffeeis stabilized. The plants cover of the area labeled by means of *Eucalyptus, (E. globluisand E. camaldulensis), P. fulcatus, M. ferruginea* and *Hageniaabyssinia*. The characteristic distribution of vegetation types is controlled by both natural and human factors. Of the natural factors, climate, altitude and soils are important control factors. Therefore, natural vegetation coverage is the vegetation that would develop naturally in the absence of human interference. This development reflects the original vegetation of an area as determined by environmental condition only. From the, Consists agriculture, 46.58%, forest, 5.53%, shrub land 36.89% and grass land 11%, and respectively. (Outline of Kachabira District, 2010-2012).

3.1.5. Climate of the Study Area

District has three agro climatic Zones: kola (7%), woinadega (22.25%) &dega (70.75%). The mean monthly minimum and maximum temperatures are 16.5 and 20°C, respectively (Masha et al., 2021). The area receives a long-term average annual rainfall of approximately 100mm-400mm in a bimodal rainfall pattern. The main rainfall season is from June to September (locally called Kiremt) and there is a small rainfall season from February to March (locally called Belg).

Figure 2.Monthly Rainfall and Temperature of Four Stations (1992 to 2020) ((Hailu *et al*.,

2022).

3.1.6. Soil types of Study area

The district has three soil types' clay soil, sandy soil and loam soil types. From this loam soil was more dominant soil type. They're generally considered as fertile soils and stable soils with favorable physical properties. The deep porous and solid soil shape permits deep rooting and make the soil quite resistant to erosion. Thus, they are the most productive soils to produce the usually grown food and plantation vegetation.

3.7. Population of Study Area and economic activities

According to the 2007 Survey projected for 2014, the total population of the study District is estimated to be 115, 579 out of which 56,801 male and 58, 778 female (50.86 %). Zonal population growth rate is 3%. About 52% of the total population was economically active... The majority of the peoples are Christians in religion i.e., Protestant (89.88%), followed by Orthodox (5.28%), and Catholics (4.83%) the remaining are (CSA, 2007). The major economic activity of the study area is agriculture, particularly depend on mixed farming system including animal rearing. The dominant cereal crops include *maize (Zea mays L.), teff (Eragrostis teff L.),* sorghum (*Sorghum bicolor L.)*, barley *(Hordeum vulgares L.),* and with a rarely pulse crops like beans *(Phaseolus vulgaris L.),* peas *(Pisum sativum L.).* Majority of the people in the district are the primary ethnic organization is Kambata (1,080,837) female 536,676, male 544,161 rarely a few of Hadiya (1,403,048) male 702,017, female 701,029 and important the main spoken language was is Kambata and rarely. Majority of the people are Christian In relation to religion, protestants Protestants) in religion are most common CSA et al., 2007).

3.1.8. Methods

3.1.9. Research design

The study design was used in a systematic sampling technique were used for the study to collect the woody species data in the farmland. A total of 42 sampling plots of size 50m x 50m ($2500m^2$), 40m x 40m ($1600m^2$)& 20m x 20m ($400m^2$), were established for trees and shrubs, for Sampling sites have been arranged according to the topographic nature of the study area. Along 4 lines transects were laid down with 50 meters distance interval, 2 line transects from North to South direction and the remaining 2 line transects along east to west and in such a way that the various conditions encountered were represented by at least one sample.

3.1.10. Study site selection

Kachabira district has 21 Kebeles (smallest administration), from thoseLada, Walana&, Gamasha Keble were purposively selected for this study. That is due to the assumption that the peoples in rural Kebeles (smallest administration) know, cultivate and use composition and they're aware and depending on woody species. In addition, the entire study sites have been selected by purposive sampling approach by thinking about the availability of woody species in agriculturallandscape selectedwith the help of development agents and Agricultural office of the district. From the district, threeKebeles have been selected purposelyfrom covering the district and the study would have been

3.1.11. Data Collection

Every plant species in each quadrat had been identified, and their growth patterns had been documented. Also, sample quadrats situated along purposefully set transect lines have accumulated real field data, plant records, and environmental information. Beside the 50 meter-distance transect lines, quadrats had been placed every 50 meters. Plots measuring 50 m x 50 m, 40 m x 40 m, and 10 m x 10 m were laid out, and all woody plant species were recorded in them. Trees and bushes that were placed haphazardly in the main quadrat at the centre were also recorded.

3.1.12. Identification of plant specimens

The Jimma University Herbarium has the skills to identify specimens using botanical keys, Flora books (Flora of Ethiopia and Eritrea volume 1–8), and consulting experts. All woody species' sample specimens have been listed, pressed, dried, and brought to the herbarium for identifying and storing.

3. 1.13. Methods of Data Analysis

3.1.14. Data Analysis for species diversity

Dataanalysiswas entered and analyzed by using Microsoft excel. Compare thewoody species diversity in the site far from the clearing and in the site near to the settlement. The woody species richness (the number of species) was determined by summing up the number of species identified within each site. Shannon-Weiner diversity index was used to quantify woody species diversity and evenness index. Shannon-wiener diversity index accounts both for species richness and evenness and it is not affected by sample size (Kent and Coker1992). The diameter at breast height (DBH), basal area (BA), tree density, frequency and important value index (IVI) would be used for the description of vegetation structure.. The structural parameters have been analyzed by using the following formula:

Diameter at Breast Height (DBH): the diameter is calculated from circumference (C)

Where DBH is diameter at breast height. This technique is easy, quick, inexpensive and relatively accurate. There is direct relationship between DBH and basal area (Kent and Coker, 1992).

Tree height is a straight forward parameter used for direct measurement purposes. It can also say something about disturbance and re-colonization. For example, a stand comprised of a single species of tree, all of the same height could indicate woody speciesremoval and following invasion.

Basal area (BA): Basal area was the cross-sectional area of tree stems at breast height. It is measured throughDiameter, typically at breast height this is ≥ 5m level. It measures the relative dominance. The degree of coverage of a species as an expression of the space it occupies of a species on farmland. It’s abundant calculated

2)= $(DBH/2)^2 \times 3.14$, where d is diameter at breast height.

Density: is a count of the numbers of individuals of species within the quadrat (Kent and Coker, 1992). It is closely related to abundance but more useful in estimating the importance of the species.

Counting is usually done in quadrat placed several times in woody species diversity under study. Afterwards, the sum of individuals per species is calculated in terms of species density per convenient area units such as a hectare (Mueller-Dombois and Ellenberg, 1974).

$$\text{total number of above ground stems in the sample area} \times 100$$

Frequency: Frequency is defined as the probability or chance of finding a species in a given sample area or Quadrant (Kent and Coker, 1992). For that reason, it indicates the presence or absence of a given species inside each sample plot. The frequency of every woody species within area would have been calculated by means of figuring out the percentage of quadrant in which that species was found. Absolute frequency, that's the range of quadrant, would have been in the species recorded and relative frequency of a species, computed because the ratio of the absolute frequency of the species to the sum general of the frequency of all species.The result is called relative frequency and is given by the formula:

$$\text{total frequency of all speciesin all plots} \times 100$$

$$\text{some of BA of all tree species} \times 100$$

Importance Value Index (IVI\Importance value index was calculated for those woody species with a (DBH) of ≥ 5 cm in the farmland. It combines data for three parameters (relative frequency, relative density and relative abundance) or it often reflects the extent of dominance, occurrence and abundance of a given species in an area (Kent and Coker, 1992).

Importance Value Index (IVI) = RD +RF + RDO

Where, RD is Relative Density, RF is Relative Frequency, and RDO is Relative Dominance.

Shannon-Weiner Index (Species diversity index)

The Shannon-Weiner Index is the most commonly used diversity indicator in woody species, communities, and it takes a value of zero when there is only one species in a community, and a maximum value when species are present in equal abundance. (Shannon and Wiener 1949). The values of the Shannon diversity usually lie between 1.5 and 3.5, although in exceptional

cases, the value may exceed 4.5 (Kent and Coker, 2011). The Shannon diversity index of species would have been calculated by the following equation (Magurran, 2004).
The Shannon diversity index would have been calculated using the following equation:

$H' = -\sum PilnPisi{=}1$

Where, Pi is the relative abundance of the ith species, ln is the natural logarithm.

Past software would be used in this study to determine species richness, abundance, diversity, dominance and diversity profile (Hammer *et al.*, 2001).

Shannon evenness (E'*)*

Shannon evenness was maximum the species have same or almost identical number of species. Evenness (Shannon equitability) index could be calculated as described through (Kent and Coker 1992) to estimate the homogeneous distribution of E= Equitability (evenness) index which has values among zero.

$\boldsymbol{lns}$

Where:

E= Equitability (evenness) index which has values between 0 and 1

H' = Shannon Diversity

H'_{max} = Maximum level of diversity possible within a given population

Pi= Proportion of individuals found in the ^{i}th species

S = Total number of species (1, 2, 3…. s)

Sorensen's Similarity Index: Similarities between pairs of plots or community types would be calculated by using Sorenson's similarity index. Many measures exist for the assessment of similarity or dissimilarity between plant lives

The Sorensen coefficient of similarity (Ss') is given by the method:

$$2a + b + c$$

Where, a = number of common species

b = number of species unique to the first site

c = number of species unique to the second s

4. RESULTS AND DISCUSSION

4.1. Woody species composition diversity in farmland

Overall, 59 woody species, belonging to 56 genera and 36 families wererecorded in site far awayfrom the farmland, parklands and live fences in the study area. In the site were far from the clearing, the growth stage of plant species recorded include the woody species composition constituted 21(36%), shrubs 38(64%), & from recorded woody species39 (66%) indigenous and the remaining 20 (34%) were from theindividualspecies recorded in this study, area 59 were recorded in Lada, 47 in Gamasha &30 in Walana.

Figure .3. Individual woody species in study area

In the three study sites Lada Keblehashigh woody species composition than two sites, followed by Gamasha and Walana Kebeles respectively (Figure1). This currentstudyresultsare lower than study report of (Motuma*et al,* 2008) in South Ethiopia**.** Overall total of species which obtained from 42 plots. Themost average Number of individuals species per plot was (7.6) obtained on farmland parkland, livefinceand the smallest amount average number of individuals species per plot was (2.4) recorded in the study area. These results were in line with the previous findings (Dissanayake and Hettiarachchi, 2013).

Fabaceae was themostspecies rich family with 8(13.559%) thesecond orderspecies followed by familyPoaceae 4(6.77) andRutaceae, with 4(6.77%) species each, Moraceae 4(6.77). Whereas, Myrtaceae, &Solanaceae were the thirdspecies rich family with 3 (5.08%) species each. The other fourth families such as, Asteraceae, Boraginaceae, Araceae, Rosaceae, each of them contains 2 (2.38%) species. The last families were like Rhamnaceae and Rubiaceaea contain 1 (1.6%) species in study area.

Table 1: The list of family's species in descending recorded from Kachabira District;

Family name	Number of species	%
Fabaceae	8	13.559
Poaceae	4	6.77
Rutaceae	4	6.77
Moraceae	4	6.77
Myrtaceae	3	5.08
Solanaceae	3	5.08
Asteraceae	2	2.38
Boraginaceae	2	2.38
Araceae	2	2.38
Rosaceae	2	2.38
Rhamnaceae	1	1.6
Rubiaceaea	1	1.6
Total	36	54.74

4.1.2. Woody Species composition richness and Diversity

Woody species Shannon diversity and evenness index was also considered in the three study sites. The overall mean values of woodyspecies richness and Shannon diversity index (H') of woody species on farmland were 11 and 2.35respectivelythe mean values of the evenness index (E') of woody species on farmland were 0.478. The result supported by (Motuma*et al*, 2008). Who reported that, the value of the Shannon diversity index of crop field was 2.22. The result indicated that the (table 1) Shannon diversity was higher in Lada (H‘‘=2.423) followed by Gamasha (H‘‘=1.9914) andWalna(H‘‘= 1.1197) and species evenness was Lada recorded 0.5942, Gamasha0.5173, and Walana0.3293 respectively. Shannon diversity index of woody species was more or less comparable with study report of Motuma*et al*. (2008) in South Ethiopia (H‘‘=2.22, E= 0.64). The result of Shannon diversity index and evenness was higher than study result Ethiopia (H'' = 1.12, E=0.41) and much higher than study result of in northern Ethiopia (H''=0.58, E=0.21).

NO	Keble's	Species richennes	Shannon diversity	Shannon Evenness
1	Walana	6	1.1197	0.3293
2	Gamasha	11	1.9914	0.5173
3	Lada	16	2.423	0.5942
	Total	33	2.35	0.478

Table.2. Diversity indices of woody species composition on farmland in the study sites

4.1.3. Basal area ofwoody species

In the study area woody species diameter distribution was recorded in each plot was on farmland ≥5 cm DBH were identified and measured. Plant with height less than 2 m was considered as seedling and the height greater than 3 m was taken as tree (Feyera*et al*, 2002). In the field, the identities of all species were recorded (using by local name) with the help of the local community. The proportion of individuals of woody species in higher diameter classes was thelowest in number on farmlands which are presented as follows. On the other hand, the number of individual woody specie with lower diameter classes was higher than the other classes. These diameter distributions of woody species figured out a declining tendency from higher DBH class to lower DBH class. The results (table: 2) distribution of Woody Species showed that basal areaDBHminimum value of Lada 37, maximum value of 530, totalaverage in cm 155.8 & Gamasha minimum value of 20, maximum value of 600, totalaverage in cm 68.75, Walana minimum value 22, and maximum value of 300, totalaverage in cm103.4 highapplication of woody species for different purpose. This work is in arrangement with the finding of Dissanayake and Hettiarachchi, (2013) the distributions of DBH woody species of three sites were different.

NO	Basal area DBH measured Keble's	Minimum value	Maximum value	Total average
1	Lada	37	530	155.8
2	Gamasha	20	600	68.75
3	Walana	22	300	103.4

Table: 3. Distribution of Woody Species composition on farmland DBH measured at three sites minimum, maximum total average.

(Table: 4) Basal area for stem most important woody species in farmland of Kachabira District;

NO	**Name of Species**	**Local name**	**Family Name**	**BA**	**BA/ha**
1	*Coffee arabica*	Buna	Fabaceae	118.7	6.84
2	*Manngifera indica*	Manguta	Anacardiaceae	25.8	3. 01
3	*Perseaamericana*	Abukatuta	Lauraceae	23.6	1.19
4	*Cordia africana*	Wanja	Boraginaceous	22.67	1.4
5	*Croton macrostachyus*	Mesena	Euphorbiaceae	19.36	1.35
6	*Grevillea robusta*	Gravila	Proteaceae	18.29	1.33
7	*Albizia gummifera*	Matichu	Fabaceae	17.16	1.12
8	*Maesalanceolata*	Gewada	Myrsinaceae	7.06	1.10
9	*Carica papaya*	Papaya	Caricaceae	2.2	0.95
10	*Erythrina abyssinica*	Welchu	Fabaceae	1.3	0.84

Relatively, the maximum basal area was calculated *Coffee arabica* for followed by *Manngifera indica*in the farmland

Table 5: Basal area mostimportant woody species compositionparkland of Kachabira District**.**

Name of species	Locale name	Family name	BA	BA/ha
Prunus africana	Gerbichu	*Rosaceae*	15.5	9.2
Cordia africana	Wanja	*Boraginaceae*	13.5	8.3
Eucalyptus camaldulensis	BishaBerzafa E	*Myrtaceae*	11.8	6.8
Casuarina equisetifolia	Shiwashiwe	*Casuarinaceae*	9.3	6.2
Croton macrostachyus	Mesena	*Euphorbiacea*	8.1	5.7
Olea europaea.	Wera	*Oleaceae*	8.6	4.33
Celtis africana	Sutichu	*Ulmaceae*	7.5	2.1
Acacia abyssinica	odora	*Fabaceae*	5.3	2.01
Cupressuslusitanica	Ferenjihoma	*Cupressaceae*	3.3	1.07
Juniperusprocera	Abeshihoma	*Cupressaceae*	2.7	1.02

Table 6: Basal area for most important woody speciesin live fence of KachabiraDistrict;

Species name	**Locale name**	***Family name***	**BA**	**BA/ha**
Dovyalisabyssinica	Koshima	*Flacourtiaceae*	15.9	3.28
Calpurneaaurea	Chea	*Fabaceae*	13.5	2.39
Erythrina abyssinica	Wellechu	*Fabaceae*	10	1.82
Euphorbia tirucalli	Matuta	*Euphorbiaceae*	2.95	2.87
Justiciaschimperiana.	Gulibana	*Acanthaceae*	2.87	1.77
Maesalanceolata	Gewada	*Myrsinaceae*	2.7	1.76
Prunus africana.	Gerbichu	*Rosaceae*	2.67	1.7
Solanumincanum	Maheta	*Solanaceae*	2.59	1.47
Syzygiumguineense.	Goteta	*Myrtaceae*	1.60	0.22
Millettiaferruginea.	Hengezena	*Fabaceae*	1.36	0.21

Basal areas of woody species in the three agroforestry practices are presented in (Table 7) generally, mean basal area under agroforestry practices at the study sites were 10.8 m^2 per ha.

The highest basal area was recorded in the woodland (19.7m^2/ha), followed by farmland (11.74) and live fence (8.6). While parkland had the least basal area (3.2m^2/ha).. There was significant difference in basal area between poor and rich wealth categories (p<0.05).

Table 7. Mean (±SD) across agroforestry practices and wealth categories

Sites	Wealth categories			
	Poor	Medium	Rich	Overall mean
Farmland	7.02±5.8	10.68±8.5	17.52±4.9	11.74±3.2
Parkland	3.03±4.5	4.36±6.8	2.4±7.2	3.2±6.2
Live fence	11.3±12.64	8.62±10.5	6.07±5.8	8.6±9.6
Woodland	13.4±10.1	19.3±16.2	26.5±13.6	19.7±13.3
Mean	8.6±8.3	10.7±10.5	13.1±7.8	10.8±8.07

4.1.4. Frequency of woody species composition on farmland Parkland Live fence

The most frequently sampled woody species composition diversity in agricultural landscape from the three land use types was Coffee arabica. Whereas, *Coffee Arabica* was the greatest frequently observed species in farmland and parkland.Similarly woody species such as *Manngifera Indica*, *Coffeearabica, Perseaamericana*, *Cordiaafricana*, *Croton macrostachyus*, *Caricapapaya*, were among the most frequent tree species onstudywerefrequentlyrecorded farmland.*Eucalyptus&camaldulensis,Albiziagummifera,Grevillaerobust,Acaciaabyssinic,Milletti aferrugiera,Erythrinburecischweinf, Maesalanceolata , Croton macrostachyus , Psidiumguajava ,Euphorbia tirucalliin*parkland. On the other hand,*ErythrinabureciSchweinf Maesalanceolata*, *Croton macrostachyus, Euphorbiatirucalli*, *was* the smallest frequent woody species compositionin live fence. The present finding is supported by Toleraetal. (2008) who reported that, *GrevillaerobustandAbinzagummiferathe* most preferred tree species for different purpose in agricultural landscapes reported that farmers in South Ethiopia, The result also indicated that different percentage of woody species composition & diversity in agricultural landscape the species frequency recorded from different site of study area farmland, Parkland land, live fence: Frequency (F), Density (D) and Relative density (RD) of species recorded, from farmland, parkland and live fence of KachabiraDistrict

Table 8: Frequency (F), Density (D) and Relative density (RD) of species recorded from farmland, parkland and Live fence of Kachabira District

Species name in farmland	**F**	**D**	**RD**
Coffee arabica	11	53	19.5
Manngifera indica	10	18	6.5
Perseaamercana	8	17	6.86
,Cordia africana	7	15	5.5
Carica papaya	7	14	5.7
Species name (in parkland)	**F**	**D**	**RD**
Grevillaerobust	8	47	19.5
Eucalyptus camaldulensis	11	42	18.2
Albizia gummifera	6	18	7.1
Carica papaya	5	9	3.3
Acaciaabyssinica	2	3	2.3
Species name in Live fence	**F**	**D**	**RD**
Millettiaferruginera,	6	22	14.9
Erythrinabureci schweinf	6	22	14.9
Maesalanceolata	5	11	7.6
Croton macrostachyus	5	10	5.5
Psidiumguajava.	3	8	3.63
Euphorbia tirucalli	2	8	2.6

4.1.5. Density of woody species

Overall, 136 individual woody species were collected from 18 farmland of the three study site of Kachabira district. 59 woody species with > 5 DBH were recorded from three study area agricultural landscape in farmland, parkland and live fence. Individual woody species were collected fromthreeKebeles in Walana 30(22%), Gamasha 47 (34.55%), and Lada 59 (43.4%)

The mean value of the sites Walana, (0.9) Gamasha (6.13), and Lada 9.79 were respectively. Walana was significantly lower than Gamasha and Lada sites at Specie richness statistically significant variance< 0.05, (table.8).

Table: 9; Specie richness statistically significant variance P < 0.05 between Three study sites.

Kebeles	Mean	St. deviation	P-value
Lada	0.900	1.583	0.004
Walana	6.1277	3.854	0.000
Gamasha	9.7966	4.564	0.000

In general, the three study sites have lower, higher, medium density per in hectares; that was Walana 3.3, Gamasha 5.2 and Lada 6.5.

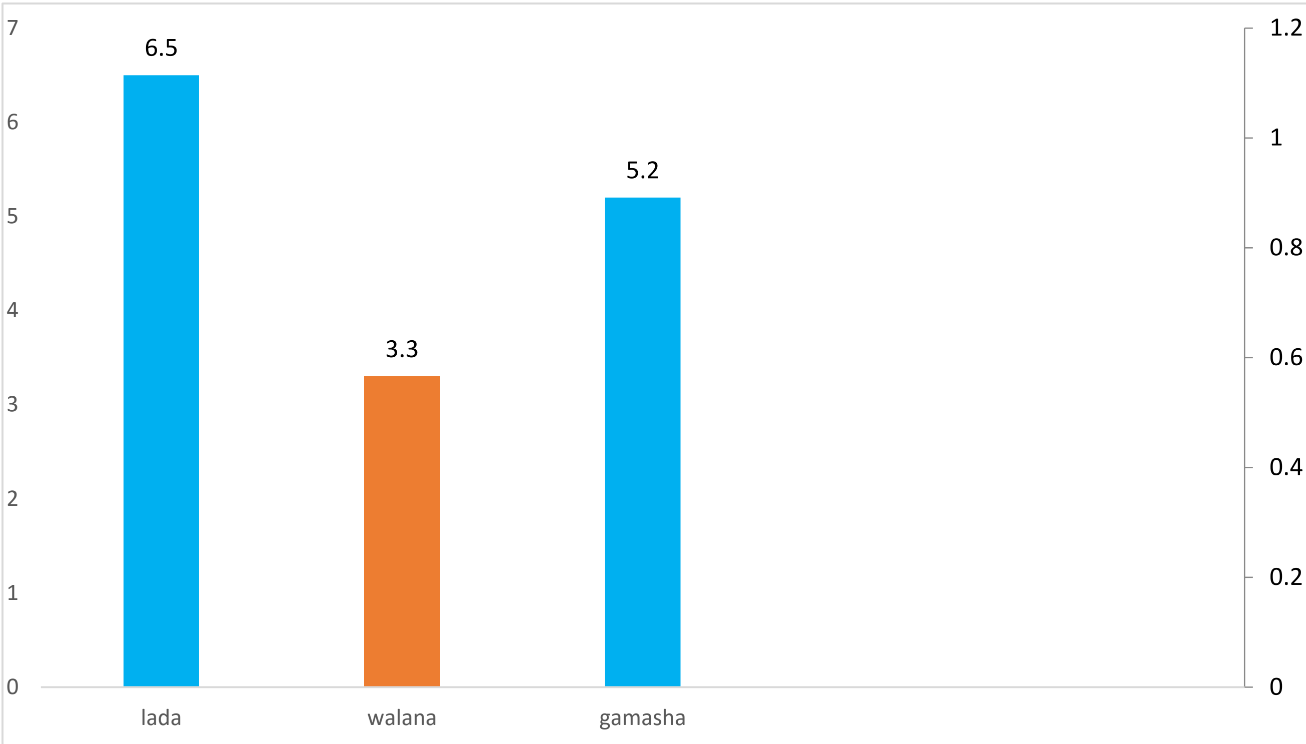


Figure 4: woody species density per in hectare lower, higher, medium

The current finding is in arrangement with the research in the parkland Agro forestry of due to the continuous cultivation of farmland and no unplanted practices that could enable species to regenerate and grow to big size contributes to the low density of species in farmland. The result also indicated that, parkland was found to be with the highest woody species density when compared to live fence and farmland. The species richness was significantly different between the three study sites

4.1.6. Important value index (IVI)

The result of the analysis of importance value index indicated that Coffee arabica, *Manngifera indica, Cordia africana*, *Cronmacrostachyus, Albizagummifera*, *Grevillaerobust*, *Carica papaya*, *Maesalanceolata. Coffee arabica* was the most essential woody species composition in farmland, followed by*Persea americana.* While *Cordiaafricana*was the greatest important woody species in the parkland as farmers deliberately left the species scattered on the farms were the top 16 highest IVI tree species on farmland in the study area (Table 6). The important value index shows that the importance of woody species on farmland helps to evaluate the important woody species.

In this study the result of importance value index (IVI) indicated that the woody species that have uses as well as higher frequency or higher BA in the study sites. *mannigiferacana, Coffee arabica, Perseaamericana, Cordiaafricana,Cronmacrostachyus* , needed the highest Frequency and important value index (IVI).those woody species, was the most important trees in study sites for farmers by providing different uses like fuel wood, shade, charcoal, timber, soil erosion, soil fertility, for income and fencing purposes. The current finding is in arrangement with. Those species, which had highest IVI, (Asfaw, 2002).In the same way, the trees in the crop fields are seen as a source of income to the household.

And also, the practice of composition this woody species in farmlands would have been a positive contribution to the crops similarly. The highest basal area species, *Manngifera indica*,*Cordiaafricana, ErythrinabureciSchweinf,Cordiaafricana,* were the species to have larger value of relative dominance*Manngifera indica*(80.079%,*Cordiaafricana,* (11.195%), *Crotonmacrostachyus* (6.68%) andAlbizagummifera(10.468 %)respectively in(table 9)therefore got the highest IVI in overall studysiteshavehigherrelativedensityspecieswhichhigherrelative frequency. *Coffee Arabica*, (93.659%), *Albizagummifera*39.349 %, *Cordiaafricana* 27.059% Persea Americana, 14.95%) Croton macrostachyus23.764%, Grevillaerobust 4.048 % have larger relative frequency values contributed to getting the highest IVI. The smallest relative frequency woody species was*ErythrinabureciSchweinf* 0.692 %. Thecurrent result agrees with Akliluetal, (2013). Also revealed that species with the greatest importance values are the most dominant of particular vegetation.

Importance value index of the highest 14woody species through agro forestry practices on are shown in (Table 8). There were variations in terms of woody species being dominated among the agro forestry practices in the studied area. Coffee Arabica was the most important woody species in farmland, followed by*Cordiaafricana&Manngiferaindica*.

Table 10: Importance value index of woody species in the study area

	Scientific Name	Local Name	RD	RA	RF	IVI
1	*Coffeearabica*	Buna	16.9	30.619	93.659	141.178
2	*Manngifera indica*	Manguta	80.079	9.73	4.954	94.463
3	*Perseaamericana*	Abukatuta	27.34	18.82	14.95	61.11
4	*Cordia africana*	Wanja	11.195	20.703	27.059	58.957
5	*Croton macrostachyus*	Mesena	6.68	27.91	23.764	58.354
6	Albizagummifera	Matichu	10.468	13.98	33.349	57.1439
7	*Grevillaerobust.*	Gravila	5.745	11.805	4.048	21.598
8	*Carica papaya.*	Papaya	2.8149	3.268	0.694	6.7769
9	*Psidiumguajava.*	Zayituna	0.405	3.268	2.389	6..062
10	*Maesalanceolata*	Gewada	0.822	2.268	2.389	5.479
11	*Millettiaferruginera*	Hengezena	0.813	1.268	1.694	3.775
12	*Acacia abyssinica*	Odora	0.803	1.268	0.692	2.763
13	*FicussurForssk*	Odechuta	0.801	1.268	0.55	2.619
14	*ErythrinabureciSchweinf*	Welechu	0.439	2.268	0.267	1.974

Table 11: Importance value index of woody species in the study area in presence,

Absence in Farmland, Parkland & Live fence

Species Name	**Farmland**	**Parkland**	**Live fence**
Acacia abyssinia	-	2.1	1.1
Albizagummifera	-	3.1	0.9
Catha edulis	-	-	2.1
Coffee arabica	39..9	1.01	-
Cordia africana	26.5	54.9	6.5
Croton macrostachyus	1.5	7.5	10.3
Juniperusprocera	-	2.1	1.4
Manngiferaindica	27.9	2.3	-
Persea americana	19.8	6.8	0.1
Podocarps fulcatus	0.5	4.5	2.2
Prunus africana	-	0.6	0.5
Ricinuscommunis	2.7	-	-
Trichiliadregeana	-	-	2
Vernoniaamygdalina	1	-	2

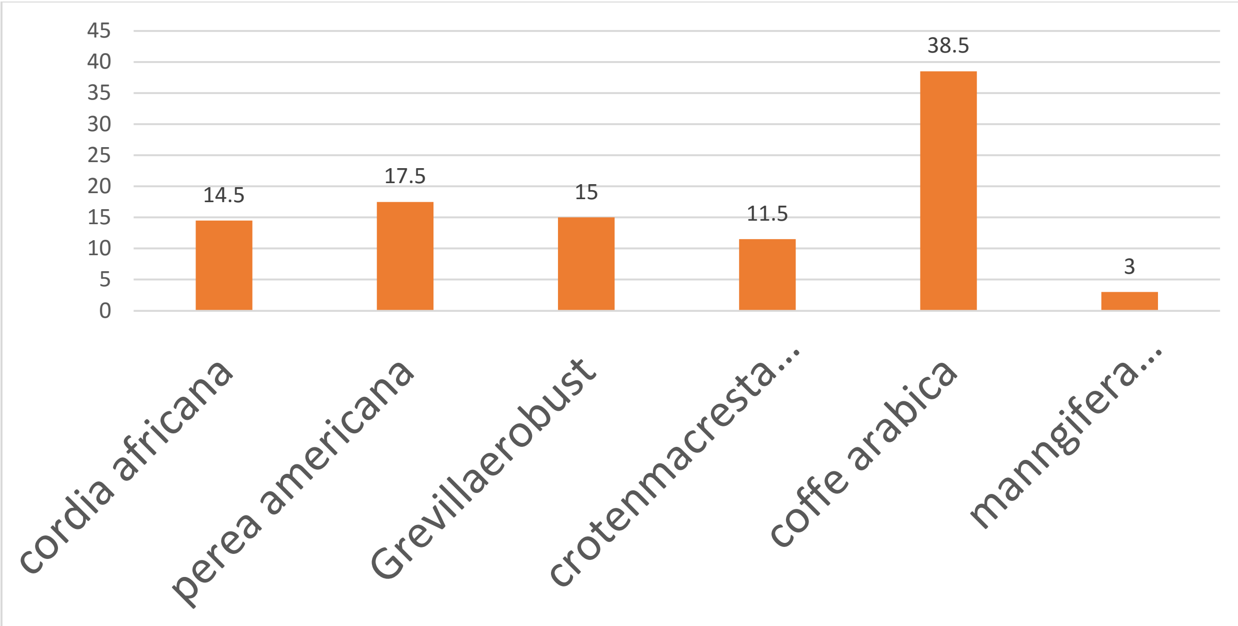
4.1.7. Similarities Index between Sites

Sorenson's index of similarity of Lada and Gamasha sites presented the highest similarity (61.54 %) followed by Gamasha and Walana sites (69.33%). Walana and sites had lowest similarity index (68.3%) as compared with other sites show indicate that Sorenson's index of similaritythe distributions of DBH woody species (Figure 2). The similarity indexes of species showed the highest similarity (61.54%) between Lada andGamasha sites.

4.1.8. Woody species Preference

In the three study areas, woody species that were additionally planted or retained on farmland provided different types of services, like a source of income, soil fertility, timber, fuel wood, fodder, housing materials, etc. The most preferred woody species by uses were *Cordia africana*, 14.5% *Persea americana*, 17.5% *Grevillea robusta*, and 11.5% *Crotonmacrostachyus*. The other woody species by uses were: (*Coffea arabica) 38.5%; and Mangifera indica5%*. It is easily grown or redeveloped itself in the study sites. This finding is in agreement with Motuma (2006) and Tesfaye (2017). It was also reported that farmers retained different woody species for different purposes on agricultural farmland. However, according to Hasan Zamanet *al*. (2014). Appropriate selection of tree species depends on the success of local market demand and the realization of environmental sustainability.

In thethree-study area, was woody species which were additionally planted or retained on farmland provide different types of usesfor services like source of income, soil fertility, timber, fuel-wood, fodder and housing materials, etc. The most preferred type's woody species by useswere;*Cordiaafricana,14.5%Perseaamericana, 17.5% Grevillearobust 15% andCroton macrostachyus 11.5%*were the preferred woody species by 'respectively. The other woody species by useswerecoffee arabica *38.5 %*, and*Manngifera indica5%*. It is easily grown or redeveloped itself in the study sites. This finding is in arrangement with Motuma (2006) and Tesfaye (2017). Also reported that farmers retained different woody species for different purposes in the agricultural farmland. However, according to Hasan zaman*et al*. (2014). Appropriate selection of tree species depends on the success of local market demand and realization of environmental sustainability.



Figure; 5: List of preferred species by respondent

4.1.9. Uses of farmland woody species

Based on respondents, different types of woody species use were recognized on farmland in study sites (Figure 7). Some of the major uses found from farmland woody species includes, fire wood (13%), Income generation (44.5%) construction material (3%), charcoal (2.5%) fruit (22%), Soil fertility improvement (7%), shade (8%) and others.

Figure 6: List of benefit of farm land woody species

Practically all the identified farmland woody species provide more than one use. *Cordia africana, Grevillaerobust.*

*Manngiferaindica*and, *Croton macrostachyus, Perseaamericana, Cordiaafricana*were the most important woody species which generate different purposes for farmers living in that study site. Since, these trees were identified, depending on their multipurpose uses as compared to other woody species across the study sites. These woody species in farm land mostly for fuel-wood and for construction, source of income &soil fertility& fruit others purposes. These five services were covering more than half of the other services provided. This is in rural areas no other income and no other options exist for constructions except woody species Leonidas (2015) reported that the farmers in rural areas use woody species mostly for firewood and building opposites as main products. The present finding is supported by (Kindeya, 2004) who reported that woody species can protect wind erosion and provides fuel wood, charcoal, shade, construction materials; farming implements and fodder for livestock. (Biruk 2006) also reported that farmers in South East Langano, Ethiopia preserved trees/shrubs on their farms for different economic purposes including medicinal products, provision of shade and shelter, fodder, fuel wood and the like.

4.1.10. Factors affecting farmland woody species diversity and abundance

According to respondents, indigenous farmland woody species within the study area were exposed by, increased fuel wood demand especially on study sites the majority of community life depend on farmland woody species like jobof fire wood, source of income, and the other, Construction, lack of natural regeneration, lack of tree planting be likely to, lack of managing, low availability of saplings for, planting of introduced species specifically *Cordia. africana*and rapid population growth because no other option exist which used for this purposes due to Clearance of forest in the area and no income other in the rural area of the study area. Each of these factors contributes differently to the decline in abundance and diversity of woody species in farm land.

4.1.11. Woody species composition in Agricultural landscapes

Traditionally farmers have integrated woody species in the cropland or in the farmland in rural area of Ethiopia, and same is true in the study area. As indicated earlier, farmers organize this for many purposes. Woody species are also planted or retained, and they require different types of composition to reduce the competition with crops, to obtain good products and other purposes.

All of the respondents organized practice different types of composition activities for the woody species diversity they had in their field. Out of them the most common composition practice that used in the study area was protection 15, branch pruning 45, pollarding 37.5, coppicing 27, and lopping 18. About 40.5.8% of the respondents were branch pruning woody species retained in Crop fields for reducing the effect on crops, getting fodder for animals, and collecting wood to be used for fencing, constructing houses, firewood and also for transactions.

About 30.1% respondents were use pollarding to promote normal growth of the trees, control its interaction with crops, and encourage regeneration and construction purpose. About 12.3% respondents practices coppicing woody species for different uses like timber and others. About 12.7% of the respondents were practiced lopping. Through the removal of large side branches and topping which is the removal of large portions of the trees for different purpose like forage, for reducing the effect of shade from the crops and etc. About 9.2% of the respondents protected sapling through fencing to protect from damage by animals.

Similar result reported by Worku (2011) in central rift valley of Ethiopia, in Agro forestry, indicated that farmers carried out pruning, pollarding, protection, watering and tying.

4.1.12. Factors influencing composition of woody Species on Farmland

The present results from the study of economically factor showed that, wealth status farmland shortage, lack of education, wealth status, seedling shortage and free grazing or animal damage were the most frequently replied factors by respondents. Among influences, the most important factors that affect woody species composition diversity was farmland shortage (41.05%), lack of Education (24.2%), wealth status (14%), free grazing (9.04%) and seedling shortage (11.71%). The households' farm land size was one of the important factors that affect woody species composition. In the study area the most variation among different wealth groups is dependent on farmland size.With larger land sizes plant more species on their farmland as compared to farmers with small size of land.

Figure 7: Types of woody species composition diversity practice used by respond

The majority of small size farmland owner farmers were educated and awareness about Multipurpose of farmland woody species that they want to plant or retain trees but much of their land was already allocated for crop production to feed their families and they do not have extra land to retain trees. There was statistically; different significance among three study sites. These findings showed that land shortage was a serious factor to manage woody species in the study sites. The majority of uneducated farmers have large size farmland and considered this practice as harmful for their agricultural crops due to not have awareness. They recognize composition practices as it competes with their crop and take long time to be productive than agricultural crops. The present finding is in line with Amir. (2003) who reported that, education was the main and vital racket for bringing a positive change in the behavior of individual, farmer who develops knowledge and other desirable qualities of mind and general competence. The households were categories into three groups as poor, medium and rich on the basis of the resources they own. Wealth status also affects positively or negatively the composition of woody species in the farmland. A sample household who had well enough of basic necessity (rich) had composition the species diversity on farmland in proper manner. Farmers who have more resources composition their woody species better than those who have less resource in their farmland. Because farmers who have small resources focuses on the composition or production of immediate consumption rather than considering sustainable composition or production as they have apprehension for their subsistence.

The majority of lower income households 'lifewasdepended on woody species to survive their life by selling fire wood, charcoal, timber, and different traditional medicine. The wealth status of farmers was highly correlated with farm size and the variation among the different wealth categories was determined by the size of the farmland. The least factor of woody species composition diversity is free grazing or animal damage.

Table 12: List of factors affecting woody species composition

No	Factors affecting composition	No. of respondent	Percent of Respondents
1	farm land shortage	52.5	41.05%
2	lack of education	31	24.2%
3	wealth status	18	14%
4	seedling shortage	15	11.71%
5	Free grazing	12	9.04%

4.1.13. Discussions

Overall, 59 woody species belonging to 56 genera and 36 families were recorded in sites far away from the in-study area, including highly dominant species Coffee arabica, *Manngiferaindica, Cordiaafricana, and Persea americana.* The current study's findings are lower than those reported by Motuma et al. (2008) in south Ethiopia. In this study, the reason for the high number of indigenous tree/shrub species is related to maintaining the already existing species. The low evenness in parklands could be attributed to the dominance of some species in terms of total population, such as *Cordia africana*, *Croton macrostachyus,* and *Acacia abyssinica,* which farmers often plant, maintain, and tend purposefully in high density. Similarity in woody species composition among, farmland, parkland, and live fence is due to the same agroecology.

Fabaceae was the most species rich family (8 species), followed by *Poaceae* (4 species) and *Rutaceae* (4 species). *Moraceae* and *Myrtaceae* each contain three species. The other four families, such as *Asteraceae*, *Boraginaceae*, and *Araceae (Rosaceae*), each contain two species. The last families were like *Rhamnaceae* and *Rubiaceae* and contain 1 species in the study area. But the majority of the families (36 families) were represented by a single species. Similar results have been reported from Gunono district and Wolayita zone by Aklilu Bajigo and Mesfin Tadesse (2015). Accordingly, this was a commonly observed family among woody species. The result of the study indicated that the highest number of woody species were recorded from farmland and parkland as compared to the live fence.

The possible explanation for this difference in species richness among the land use types is that, farmers may conserve plants purposefully depending on the economic importance of those plants. They might prefer to conserve large trees with a high canopy in order to form a favorable environment for coffee shade, to get timber, and to conserve soil. For example, the most frequent woody species recorded from farmland were trees with a high basal area and a large canopy. These are *Cordia africana*, *Eucalyptus camaldulensis*, *Croton macrostachyus*, *Albizia gummifera*, *Coffee arabica*, and *Ficus sura*. This result is supported by KitessaHunderra et al. (2013), who found that the regeneration of six late-successional tree species (*S. guineense, Afrocarpus flavus, O. welwitschii, and P. africana*) was consistently greater in the farmland coffee system than in the farmland agroforestry system. Also similar is the study reported by Dereje Denu et al. (2016), in which farmers preferred trees with flat and wider cover, under which they expect a better coffee yield. *Cordia africana* was also reported as an important shade tree and was preferred by some farmers due to its valuable timber. The farmers' preference for coffee shade trees was in line with the richness of tree species in the coffee plots: *Albizia gummifera*stems. The explanation for this study about farmland is similar to the study conducted by AkliluBajigo and Mesfin Tadesse (2015), which found that the dominancy of fruit and timber trees is related to farmers' tree species preferences (37). Consequently, the woody species, plantation crops, and agricultural crops are chosen due to their shade, soil fertility improvement, less competitive effect on middle and lower stories, and income generation such as timber production. Fruit trees such as *Persea americana* and *Cordia africana* were also reported.

The result of the study revealed that farmland and parkland showed more similarity in woody species composition, while the least similarity was observed between farmland and parkland. This might be due to human preference to conserve woody species in parkland and on fences for different purposes. For example: to get timber, fruit, and fertile soil. This is similar to the study conducted by Makundi and Sathaye (2004); the planting of trees along with crops on cropland improves soil fertility, controls and prevents soil erosion, and controls waterlogging.*Coffee arabica* is the most dominant species that approximately belongs to the *Coffee* genus (Hailu *et al*., 2017). In spite of the fact that, *Coffee arabica* originated from Ethiopia (Davis *et al*., 2012) and the country's economy is exceedingly dependent on coffee (Hailu *et al*., 2017), less consideration has been given to the spatial distribution of coffee in Ethiopia.

In this study, the spatial distribution of *Coffee arabica* under current and future climate change in the study area has been indicated. The impact of climate change on this highly important cash crop should be of serious concern. The current study shows the reduction of woody species richness in farmland. This could be due to the farmers' management of farmland to reduce the effect of shade and competition with their crop. This result is also similar to the findings reported by Bobo (2006) from Cameroon. In the study area, only *Cordia africana* has a high abundance in crop land, mainly due to its valuable timber. Farmland was characterized by a high diversity index because of the local culture of maintaining several tree species in the farmlands. The number of shrub species in the study area was very high compared to tree species because people maintain them in croplands and semi-forested coffee plots.

5: CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The current finding revealed that throughout farmland, parkland, and live fences, 59 plant species from 56 genera and 36 families were discovered in the three-studyarea. Woody plant species made up 21 (36%), shrubs 38 (64%), and from the documented plant species, 39 (66%) were native and the remaining 20 (34%), introduced species. In the three study areas, these species were noted on farmland, parkland, and live fences. The findings of this study demonstrated that the diversity of woody species composition in farmland inventories provided baseline data on the current situation of woody species data, including tree species abundance, diversity, richness, basal area, frequency, and dominance; an importance value index and Sorenson's similarity (Ss') were calculated per kebele.

Farmland had the highest average number of individual species per plot (7.6) whereas the research area had the lowest average number of species per plot (2.4).The mean, range, frequencies, percentages, minimum and maximum values of the woody species composition diversity variables, as well as other descriptive statistics, were determined. These diversity indexes gave valuable insight into the rarity and abundance of various species within a group. However, because there were no other options available owing to the clearance of forest in the area and the absence of electricity in the study area's rural areas, farmers in the three research areas employed the woody species in their farmland primarily for fuelwood and for construction.According to respondents, farm land size, educational background, and household wealth status, family size, a lack of seedlings, and free grazing were the most significant economic factors influencing the practices of woody species composition on farmland in the study sites. Ultimately, based on the results of this study, it can be said that although farmers have local traditional practices for the composition and diversity of woody species in their agricultural landscapes on their property, these practices have not been properly supported by extension to address the issue.

6. Recommendation

Based on the results, the following future line of work is recommended.

- It is necessary to raise open awareness about the diversifying, composition, and sustainability of the agricultural landscape's woody species composition. This could be accomplished by introducing and expanding multipurpose woody species composition on farm lands, which would aid in increasing the product and service value of the woody species. Therefore, diversification of farmlands with multipurpose woody species composition with the aim of enhancing productivity needs to be an important priority**.**
- The contributions of farmland in the study area were multiple. it needs rural agricultural land policies and extension service to enhance natural resource conservation and local community involvement on reduction of farmland woody species composition and make sustainable training and long-term land improvement awareness creation should be conducted to the local community regarding the importance, integration and sustainable composition of Agro forestry system to conserve and more diversify than the current existing status of species.
- The present research focused on traditional composition practices and the user factors of woody species. Composition and diversity in the agricultural landscape but lacks detailed examination, another issue. Therefore, a detailed income analysis and the contributions of the woody species composition and diversity in agricultural landscape farmlands at the study area should be necessary for any researchers who are interested in the issue.

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APPENDEX 1;

Scientific name Local name Family Life form Origin

Scientific name	Local name	Family	Growth form	origin
Acacia abyssinica.	Odora	Fabaceae	Tree	Indigenous
Albizia gummifera	Matichu	Fabaceae	Tree	Indigenous
Bruceaantidysenterica	Duketa	Simaroubaceae	Shrub	Indigenous
Cajanuscajan	Atara	Fabaceae	Herb	Introduced
Calpurinaaurea	Chea	Fabaceae	Tree	Indigenous
Carica papaya	Papaya	Caricaceae	Tree	Introduced
Casimiroaedulis	Kasimira	Rutaceae	Tree	Introduced
Casuarina equisetifolia.	Shiwashiwe	Casuarinaceae	Tree	Introduced
Catha edulis	Chata	Celastraceae	Shrub	Indigenous
Celtis africanaBurm.	Sutichu	Ulmaceae	Tree	Indigenous
Coffea arabica	Buna	Rubiaceaea	Shrub	Indigenous
Colocasiaesculenta	Gebiza	Araceae	Herb	Introduced
Cordia africana Lam.	Wanja	Boraginaceae	Tree	Indigenous
Coriandrum sativum	Wodimamu	Apiaceae	Herb	Introduced
Croton macrostachyus	Mesena	Euphorbiacea	Tree	Indigenous
Cucurbita pepo	Debakula	Cucurbitaceae	Herb	Introduced
Cupressuslusitanica	Ferenjihoma	Cupressaceae	Tree	Introduced
Dovyalisabyssinica	Koshima	Flacourtiaceae	Shrub	Indigenous
Ehretiacymosa	Ulagichu	Boraginaceae	Shrub	Indigenous
Enseteventricosum	Wesita	Musaceae	Herb	Indigenous
Eucalyptus camaldulensis.	*BishaBerzafa*	Myrtaceae	Tree	Indigenous

Eragrostis teff	Taffa	Poaceae	Herb	Indigenous
Erythrina abyssinica	Welechu	Fabaceae	Tree	Indigenous
Euphorbia tirucalli.	Matuta	Euphorbiaceae	Shrub	Indigenous
Ficus vastaForssk.	Odechuta	Moraceae	Tree	Indigenous
Grevillea robusta	Gravila	Proteaceae	Tree	Introduced
Hypoestesforskaolii	Omoruta	Acanthaceae	Herb	Indigenous
Ipomoea batatas.	Shukarita	Convolvulaceae	Herb	Introduced
Juniperusprocera	Abeshihoma	Cupressaceae	Tree	Indigenous
Justiciaschimperiana	Gulibana	Acanthaceae	Shrub	Indigenous
Lippiaadoensis	Kosoretita	Verbenaceae	Shrub	Endemic
Lycopersiconesculentum	Timatima	Solanaceae	Herb	Introduced
MaesalanceolataForssk.	Gewada	Myrsinaceae	Tree	Indigenous
Manngifera indica	Manguta	Anacardiaceae	Tree	Introduced
Millettiaferruginea	Hengezena	Fabaceae	Tree	Endemic
Musa x-paradisiaca	Muza	Musaceae	Herb	Indigenous
Ocimumamericanum.	Besobila	Lamiaceae	Herb	Introduced
Olea europaea	Wera	Oleaceae	Tree	Indigenous
Persea americana	Abukatuta	Lauraceae	Tree	Introduced
Phaseolus vulgaris	Wokita	Fabaceae	Climber	Introduced
Pinuspatula.	Pachula	Pinaceae	Tree	Indigenous
Podocarpus falcatus	Zagishu	Podocarpaceae	Tree	Indigenous
Prunus africana (	Gerbichu	Rosaceae	Tree	Indigenous
Psidiumguajava	Zayituna	Myrtaceae	Tree	Introduced
Rhamnusprinoides	Gesha	Rhamnaceae	Shrub	Indigenous
Ricinuscommunis	Chena	Euphorbiacea	Shrub	Indigenous

		e		
Rosa x richardii	Tsigereda	Rosaceae	Shrub	Indigenous
Rutachalepensis L.	Telechuta	Rutaceae	Herb	Indigenous
Saccharumofficinarum.	Shenkora	Poaceae	Herb	Introduced
Solanumincanum	Maheta	Solanaceae	Shrub	Indigenous
Solanum macrocarpon.	Bulita	Solanaceae	Shrub	Endemic
Solanumtuberosum	Dinicha	Solanaceae	Herb	Introduced
Sorghum bicolor	Beshinka	Poaceae	Herb	Indigenous
Syzygiumguineense	Goteta	Myrtaceae	Tree	Indigenous
Trichiliadregeana	Bonga	Meliaceae	Tree	Indigenous
Vernoniaamygdalina	Heba	Asteraceae	Shrub	Indigenous
Vernoniaauriculifera	Reja	Asteraceae	Shrub	Indigenous
Viciafaba	Bakela	Fabaceae	Herb	Introduced
Zea mays	Bokola	Poaceae	Herb	Introduced

Appendix 2: Family and Genera of the study area

NO	Family	No of Genera	No of Species
1	Acanthaceae	1	1
2	Apiaceae	1	1
3	Anacardiaceae	1	1
4	Convolvulaceae	1	1
5	Verbenaceae	1	1
6	Araceae	1	1
7	Asteraceae	1	2
8	Bignoniaceae	3	2

9	Caricaceae	2	1
10	Casuarinaceae	1	1
11	Celastraceae	1	1
12	Musaceae	1	1
13	Cupressaceae	1	1
14	Euphorbiaceae	5	1
15	Fabaceae	4	2
16	Flacourtiaceae	1	1
17	Lauraceae	1	1
18	Oleaceae	1	1
19	Pinaceae	2	1
20	Melianthaceae	1	1
21	Podocarpaceae	1	1
22	Moraceae	2	1
23	Moringaceae	1	1
24	Myrsinaceae	1	1
25	Myrtaceae	3	1
26	Solanaceae	2	1
27	Poaceae	1	1
28	Simaroubaceae	1	1
29	Rhamnaceae	2	1
30	Rosaceae	2	1

31	Rubiaceae	2	1
32	Rutaceae	1	1
33	Flacourtiaceae	1	1
34	Cucurbitaceae	1	1
35	Ulmaceae	1	1
36	Proteaceae	1	1

Appendix 3: Density of woody species in farmland

Pilots	Altitude	(kg/ha)	Density
P1	1587	470.7407108	17
P2	1586	839.9912348	20
P3	1518	243.4249708	12
P4	1589	122.8347891	11
P5	1559	293.0131156	12
P6	1556	97.0651749	14
P7	1629	69.3151828	1 3
P8	1645	481.1308156	21
P9	1701	180.090618	11
P10	1693	348.57251	10
P11	1679	588.5155736	18
P12	1672	1116.983206	23
P13	1686	413.033813	13
P14	1704	153.2092391	12

Total		5399.920954	229

Appendix 4: Density of woody species in parkland

Pilots	Altitude	(kg /ha)	Density
P1	1590	563.2435282	12
P2	1572	988.0579641	17
P3	1530	571.3155669	10
P4	1497	427.8105591	19
P5	1601	255.8416511	10
P6	1534	1367.661379	14
P7	1598	261.7386618	15
P8	1640	2122.068118	20
P9	1672	833.8013698	21
P10	1682	624.664565	9
P11	1651	302.984981	5
P12	1672	185.6848794	11
P13	1731	244.6856387	4
P14	1712	155.9730152	5
Total		8885.531878	162

Appendix 5: Density of woody species in live fence

Pilots	Altitude	(kg/ha)	Density
P1	1584	737.9101928	7

P2	1578	14.15448154	4
P3	1479	145.9983287	6
P4	1501	180.9339785	8
P5	1574	87.29002146	5
P6	1550	31.27071766	6
P7	1596	163.8573164	9
P8	1655	751.8719298	11
P9	1725	184.7788975	9
P10	1679	116.2312075	6
P11	1661	104.1444968	10
P12	1670	83.5121423	13
P13	1717	106.5756527	18
P14	1734	616.6045133	25
Total		3325.133877	137

Table 2; Basal area of species

	Lada	Gamasha	Walana	Average
Max	1.7662	4.9	5.512	4.059
Min	0.00785	0.0094	0.0268	0.0262
Average	0.115	0.433	0.7923	0.4468
Sum	7.84	20.34	22.34	16.84
Mean	0.133	0.433	0.745	0.437

APPENDEX 6: Importance value index of woody species in the study area

	Scientific Name	Local Name	RD	RA	RF	IVI
1	*Coffea Arabica*	Buna	16.9	30.619	93.659	141.178
2	*Manngifera indica*	Manguta	80.079	9.73	4.954	94.463
3	*Perseaamercana*	Abukatuta	27.34	18.82	14.95	61.11
4	*Cordiaafricana Lam*	Wanja	11.195	20.703	27.059	58.957
5	*Croton macrostachyus*	Mesena	6.68	27.91	23.764	58.354
6	*Albizagummifera*	Matichu	10.468	13.98	33.349	57.1439
7	*Grevillaerobust. Cunn.*	Giravila	5.745	11.805	4.048	21.598
8	*Carica papaya.*	Papaya	2.8149	3.268	0.694	6.7769
9	*Psidiumguajava.*	Zayituna	0.405	3.268	2.389	6..062
10	*Maesalnceolataforssk*	Gewada	0.822	2.268	2.389	5.479
11	*Millettiaferruginera*	Hengezena	0.813	1.268	1.694	3.775
12	*Acacia abyssinica*	Odora	0.803	1.268	0.692	2.763
13	*Ficussur forssk*	Odechuta	0.801	1.268	0.55	2.619
14	*ErythrinabureciSchweinf*	Welchu	0.439	2.268	0.267	1.974

Table 1; Paired sample test difference.

Study SITE	Mean	Std. Deviation	Std. deviation	Lower	Upper	T	difference	Sig.2(tailed)
Lada – Walna	5.73333	2.91173	0.53161	4.64608	6.82059	10.785	29	0.002
Lada-Gamasha	2.06383	1.66033	0.24218	1.57634	2.55132	8.522	46	0.000
Walna – Gamasha	-3.33333	2.88077	0.52595	-4.40903	-2.25764	-6.338	29	0.000