



**COLLEGE OF AGRICULTURE AND NATURAL RESOURCES
DEPARTMENT OF ANIMAL PRODUCTION AND TECHNOLOGY
SENIOR RESEARCH PROJECT ON:
CONSTRAINTS AND OPPORTUNITIES OF IMPROVED FORAGE
PRODUCTION IN GEDEBANO GUTAZER WELENE WOREDA, GURAGE
ZONE, S/N/N/P/R/S, ETHIOPIA**

BY

NAME	ID
GASHAW ABERHAM.....	162/11
HASSEN NURATO.....	397/11
KETEMA FUFA.....	215/11
MOHAMMED ASSEFA.....	407/11
SADIK ASFA.....	410/11
WENDESEN HABTAMU.....	360/11

ADVISOR: KEDIR ADEM (MSc.)

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Submission date: August 2013 E.C.

Advisor: - **Kedir Adem (Msc)**

Sign_____

Student's declaration: We certify the following conditions of authorship.

We are responsible for the work submitted in this research project and the original work is our selves.

Students name

Signature

1. Gashaw Abereham

2. Hassen Nurato

3. Ketema Fufa

4. Mohmmmed Assefa

5. Sadik Asfa

6. Wendwesen Habtamu

TABLE OF CONTENTS

TABLE OF CONTENTS.....	III
LIST OF TABLES.....	V
LIST OF ABBREVIATIONS.....	VI
ACKNOWLEDGEMENT.....	VII
ABSTRACT.....	VIII
1. INTRODUCTION.....	1
1.1 Back Ground.....	1
1.2. Statement of the Problem.....	2
1.3. Objectives of the Study.....	3
1.4. Significance of the Study.....	3
2. LITERATURE REVIEW.....	4
2.1. The Major Feed Resources in Ethiopia.....	4
2.1.1. Natural pasture.....	4
2.1.2 Grass hay.....	4
2.1.3. Fodder tree.....	5
2.1.4. Crop residue.....	5
2.1.5. Agro-industrial by- products.....	5
2.1.6. Improved forage.....	5
2.2. Utilization of Improved Forages.....	6
2.3. Improved Forage Production Strategies.....	7
2.3.1. Backyard forage production.....	7
2.3.2. Under-sowing and inter-planting.....	8
2.3.3. Contour forage strips.....	8
2.4. Constraints and Opportunities of Improved Forage Production.....	8

2.4.1. Constraints of improved forage production.....	8
2.4.2. Opportunities for improved forages production.....	9
3. RESEARCH METHODOLOGY.....	11
3.1. Description of the Study Area.....	11
3.2. Method of Data Collection.....	12
3.3. Sampling Techniques and Sample Size.....	12
3.4. Method of Data Analysis.....	12
4. RESULTS AND DISCUSSION.....	13
4.1. Background of the Household.....	13
4.1.1. Sex of respondents.....	13
4.1.2. Educational status of respondents.....	14
4.2. Land Allocation Pattern per Household.....	15
4.3 Major Crops Grown in the Study Area.....	15
4.4. Types of Livestock.....	16
4.5. Feed Resources in Study Area.....	17
4.6. Types of improved forage production in study area.....	18
4.7. Purpose of Developing Improved Forages in District.....	19
4.8. Improved Forage Development Strategies used in the Study Area.....	20
4.9. Constraints of Improved Forages production in the Study district.....	21
4.10. Opportunities of Improved Forage Production.....	22
5. CONCLUSIONS AND RECOMMENDATIONS.....	23
6. REFERENCES.....	24
7. APPENDIX.....	29

LIST OF TABLES

Table 1. Age distribution of the respondents	13
Table2. Sex of the respondents.....	13
Table3. Educational status of respondents.....	14
Table4. Land allocation pattern per household in the study area.....	15
Table5. Major cereal crops per household.....	16
Table6. Livestock types holding in study district.....	16
Table7. The different feed resource used per household in the study area.....	17
Table8.Types of improved forage production in stud	18
Table9. Purpose of developing improved forage crops in the study area	19
Table10. Improved forage development strategies in study area	20
Table11. The constraints for improved forage development in study area.....	21

LIST OF ABBREVIATIONS

ANRS.....	Amhara National Regional state
CSA.....	Central Statistics Agency
ILRI.....	International Livestock Research Institutes
MPFT.....	Multipurpose forage tree
M.a.s.l.....	Meter Above Sea Level
NGO.....	Non-Governmental Organization
GGWWAO.....	Gedebano Gutazer Welene Woreda Agricultural office
GGWWLFO.....	Gedebano Gutazer Wolene Woreda livestock and fishery office

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ABSTRACT

The study was conducted with the objectives of identifying the major constraints and opportunities of improved forages production in Gedebano Gutazer Wolene Woreda, Gurage Zone, and SNNP Region of Ethiopia. A total of 80 households) of which 20 households in four kebeles were selected randomly. Descriptive statistics, which using frequency, percentage, table and least significance difference were carried out. To find the result, both primary information via questionnaire, interview, observation and focus group discussion, and secondary data from relevant offices, published and unpublished sources were gathered using 80 statistically selected households. The result of the study indicated that the main forage species widely distributed in the study area were elephant grass, Desho grass, Tree lucern-, Sesbania, Oats, and Rodes grass with their decreasing order of availability, respectively. As reported by the respondents only a small area of land was allocated for forage development. Apart from utilizing for feed, farmers also use improved forage species for soil and water conservation (Desho grass), fencing and as a wind break (sesbania and Tree lucern. Land shortage (11.5%), free grazing (17.5%), input shortage (15%), poor extension service (25%), attitude (18.75%) and skill gap (12.5%) of the farmers were limiting factors for the production and utilization of improved forages. Moreover, forage seed/seedling production at farmers' level/farmers cooperatives, community based implementation of free grazing policy and research and extension on the use of available marginal lands efficiently can be development interventions for the technology in the study area.

Keywords: *constraints, feed resources, household, improved forage crops, opportunities.*

1. INTRODUCTION

1.1 Back Ground

Ethiopia is believed to have the largest livestock population in Africa and this livestock sector has been contributing considerable portion to the economy of the country. It possesses one of the world largest livestock populations of which **70** million cattle population that make the country stand or rank first in Africa that make Ethiopia to stand 1st in Africa and 9th in the World (CSA, 2021). The national income of country is mainly dependent up on Agriculture by which the livestock sub-sector plays a significant role on it (Alemayehu, 2012) and at a household levels as well (Gebreegziabher and Tsegay, 2016). Although livestock has a vital role in the household and national economy of the country, current contribution of this subsector is below its potential due to various factors. Reports by ILRI and MOA (2013); Behnke and Menagerie (2011) indicated that the overall livestock sector, such as cattle, sheep, goats, equine and poultry contributes about 15 to 17% of national gross domestic product (GDP), 35_49% of the agricultural gross domestic product and 37 to 87% of the household incomes, 16% of export earnings (yaynshet, 2010), and 30% of agricultural employment (Behnke, 2010). Such very low productivity is attributable to different constraints like poor nutrition, diseases, genetic makeup and environment of which poor nutrition takes its large effect. In many parts of the country, animals are kept on poor quality natural pasture that commonly occur on permanent grasslands, roadsides, pathways and spaces between cropped plots. Moreover, the main livestock feed resources accessible in Ethiopia were natural pastures/grazing or green fodder (54.54%), crop residues (31.13%), hay (7.35%), agro industrial by product (2.03%), improved forage (0.57%) and others 4.37% (CSA, 2021).

However, these feed resources were very low in quality having high fiber, with to moderate digestibility and low levels of nitrogen (Tsige-Yohanes, 2000), which might be linked with a low voluntary intake, thus resulting in inadequate nutrient supply, low productivity and even weight loss. As a result Livestock feed was greatly in short supply particularly latter in the dry season and of poor in quality. This condition calls for integration of improved forages that could have several advantages over conventional feed resources available. It contributes overcoming much to supplement low quality feed resources such as crop residues and pasture roughages there by the dry season constraints affecting livestock production (Gary A. Sullivan, 2001).

In Ethiopia there are several opportunities for improved forage production. Improved forages have longer length of production season, which provides an opportunity for dairy and fattening

production, integration of pasture and forage crops in the existing farming system is a good opportunity for the production of improved forages, they give high yield and nutritional values gained (Alemayehu, 2006).

According to Mokoyaet *al.* (2008), over many decades, Ethiopia has cultivated various improved forage species such as Sesbania, Leucaena, Calliandra and Tree Lucern, for supplementary feeding of livestock and soil improvement. In spite of the significant development efforts undertaken and the apparent benefits obtained, the numbers of farmers planting these trees were very low due to various factors such as awareness problem, capital scarcity and risk considerations (Zakarias, 2015). Shortage of farm land, natural hazards and diversification in production are serious problems in the Gedebano Gutazer Wolene distric. Since the livelihood of people depends on agriculture ,integrating and diversifying with livestock and crop production are very important to minimize the risk; which makes the agriculture system more sustainable Even though the production and utilization of improved forage crops in the district are too low, the existence of enclosure areas and marginal lands in the district may increase and feasible for the production and utilization of improved forages; especially the multipurpose improved forages. In addition, the decreasing rate of natural pasture, poor quality of the available crop residues, and absence of other alternative feed resources like agro-industrial byproducts showed that the different concerned bodies should focus on improved forages for decreasing the feed shortage in terms of quality and quantity (GGWWAO 2019).

1.2. Statement of the Problem

Even though there were diversified types of vegetation and cultivation crops as potential forage production in Gedebano Gutazer Wolene Woreda so far, perhaps, the problem could be lack of scientific information on status of improved forages production. Because of this assumption the researcher was inspired to conduct a research on this topic. Thus, the main purpose of this study was to assess the constraints and opportunities of improved forage production in Gedebano Gutazer Wolene Woreda. As far as the knowledge of the researcher is concerned, there is no study conducted in the focused area.

Research Question

The study has the following research questions

1. What are the factors affecting improved forage production in the study area?
2. What types of improved forage available in the study area?
3. When improved forages are surplus?
4. What type of improved forage production system being practiced?

1.3. Objectives of the Study

General objective

The general objective of the study was to assess the constraints and opportunities of improved forage production in Gedebano Gutazer Wolene Woreda.

Specific objectives

- To identify factors affecting improved forage production in the study area.
- To identify types of improved forage available in the study area.
- To identify improved forage production strategies practiced in the area.
- To identify available feed resources in the area.

1.4. Significance of the Study

The significance of the study is to serve as starting point for interested group or individuals to conduct further research in the study area. It gives direction for the researcher to identify forage opportunities and constraints in the area. Moreover, the data can be used as secondary data for researchers and any interested parties working in the study area.

2. LITERATURE REVIEW

2.1. The Major Feed Resources in Ethiopia

The major feed resources available in the country include natural pasture (54.54%) and browsers, crop residue (31.13%) and other feed arising from cropping system, agro industrial by products (2.03%), cultivated forage and pasture conserved forage (0.57%) and other feeds, pods and leaves of trees (4.37%) CSA (2021), Tree leaves and pods such as maize and sorghum as well as inset leaves and sweet potato vines could play a significant roles in livestock feed supply depending up on the localities. The relative importance of different feed resources varies from place to place and from time to time depending up on agro ecology, livestock production system and season of the year (ILRI, 2009)

2.1.1. Natural pasture

A natural pasture, which encompasses communal grazing lands, shrub lands and private grazing lands, is also practiced in the feeding calendar and its availability is relatively good from July to December. Communal grazing lands and a shrub lands are utilized year round without restriction in all altitude zones and become a major source of feed for livestock until crop harvest. However, its availability and productivity is decreasing from time to time because of the crop land expansion and poor management resulting from uncontrolled free grazing and weed encroachment (Alemayhu, 2004).

2.1.2 Grass hay

Hay is also provided from March to June especially to oxen during the period when high draught power is needed. However, there is a difference depending on the quantity of hay harvested, the number of animals kept and the agro-ecology. Even though the contribution is too small, improved forage crops are also available and supplemented to animals. March and April (after little shower rain) and October, November and December (after the main rain) are months of the year in which improved forage crops are more available and utilized by the farmers (Alemu, 1990).

Similarly, Alemayhu (2003) indicated that livestock feeding calendar varied depending on the availability of feed resources over season. According to this study; feeding calendar is an essential livestock management practice to use the available feed resources efficiently and to supply livestock with the required quantity and quality of feed and to overcome the feed shortage.

2.1.3. Fodder tree

Fodder tree and shrubs are important animals feed in Ethiopia especially arid, semi-Arid and mountainous zone, where large number of the country livestock is found around pastoralist's area. Tree fodders are generally rich in proteins, vitamins and minerals element and can be as the dry season feed resource and supplements for poor quality grasses and crop residues. However, their utilization is reduced by presence of tannins and other phenolic compounds in their leaves (Alemayehu, 2004).

2.1.4. Crop residue

The crop residues are utilized all over the year with different contributions; there is high availability from November to May. The same practice was reported in the central highlands of Ethiopia that livestock graze on seasonal fallow lands and permanent pasture during cropping season and on croplands after harvest is common. When these feed resources are finished, the animals are offered from collected and stored crop residues twice or three times per day. The crop residues are the major feed resources and feeding of new crop residues and crop stubbles start in October when pulse crops (faba bean, field pea) start to be harvested. Even though feeding of crop residues is practiced throughout the year; its contribution is decreasing from June to October because of decreasing availability. Crop stubbles are also used with varied quantity and quality depending on the crop type and crop calendar of the farmers *i.e.* more accessible from October to May and reaches to maximum in December and January since most crops are harvested (Sisayet *al.*, 2009).

2.1.5. Agro-industrial by- products

The suitable by-products have high digestibility, high energy (carbohydrate) and protein level and low fiber content. Most high protein (soya bean) and high energy (maize and barely) are expensive, especially where dairy producers complete for them with poultry producers. Low protein (nougé and cotton seed cake) and low energy (oats and barn) concentrates are desirable for dairy cattle and are more cost effect than the expensive concentrates (Alemayhu, 2008).

2.1.6. Improved forage

Around 736 species of grasses, 358 species of legumes, and 179 species of browse trees fit for animal feeding have been identified (Ethiopia's CBD 4th Country Report, 2014). The most common improved species of forage crops are oats (*Avena sativa*), vetch (*Vicia spp.*), Desho grass (*Pennisetum pedicellatum*), Napier/elephant grass (*Pennisetum purpureum*), fodder beet (*Beta*

vulgaris), siratro (*Macroptilium atropurpureum*), *Desmodium* spp., cowpea (*Vigna unguiculata*), lab lab (*Lablab purpureus*), *Panicum* spp, Rhodes grass (*Chloris gayana*), lucerne (*Medicago sativa*), *Phalaris* spp, *Trifolium* spp, *Sesbania* spp., *Leucaena* spp, Sweet lupine (*Lupinus angustifolius*), and tree lucerne/tagasastes (*Cytisus proliferus*). Improved forages represent < 0.15% of the total livestock feed balance, according to FAO 2018, and < 0.1% of the total energy required by Ethiopia livestock. However, the adoption rate for forage and pasture crop Production and utilization has been extremely low due to various reasons, which may include small holding and use of communal grazing resources, seasonal rain fall distribution and scarcity of water, lack proper know how and awareness in forage production, management and utilization, free grazing, low economic incentives under subsistence production, limitation in services delivery and in adequate policy and institutional supports. The potential for production of improved forage crops to be high when and where market oriented livestock production is possible and where farmers keep improved cross breed animals that respond to improved feeding management. For small holder farmers with problems of land shortage options like integration food and forage crops are highly suitable.

2.2. Utilization of Improved Forages

Making use of improved forage varieties has several advantages. The most important contribution of improved forages is their direct effect on livestock production. It had good feeding value related to nutrient contents and digestibility. Better animal performance can be obtained from high protein and energy because milk and other products increase their nutrients flourish for the neonate and human nutrition (Mengistu, 2012) and (Endalewet *et al*, 2016). Not only improving animal nutrition resulting in higher producing livestock; it also compliments crop production by maintaining soil fertility through nitrogen fixation. While grazing depletes the fertility of the land, forage growing improves soil health. For instance, intercropping species like maize and Lablab or coffee and *Desmodium* is more advantageous than growing one crop alone (Etsubdink, 2012). According to Gebreegziabher and Tsegay (2016) and Workyeet *et al*, (2018), improved forage cultivation practiced for various purposes such as source of animal feed, soil conservation, crop rotation, wind break, fence and for fuel. In Ethiopia, amongst the purpose of forage production, animal feeding and soil and water conservation are accounted the largest share. Bezabihet *et al*. (2016) noted that soil conservation can improve and maintain soil fertility. It also minimizes diminishing grazing pastures for crop cultivation. Using improved forage production for soil conservation might be due to the recent campaign to soil and water conservation in the country (Mekoyaet *et al*, 2008).

2.3. Improved Forage Production Strategies

Natural grazing and browse, crop residues, improved pasture, forage crops and agro-industrial products are the main livestock feed resources in Ethiopia. Grazing lands have been degrading due to the demand for high pressure on land resources from increasing populations and greater cropping intensity. Although crop residues serve as a feed resource for livestock, it is poor in quality which could not provide the nutritional requirements of the animal. Removing them from the fields also reduce organic matter content in the soil which degrades soil structure and increases the erodibility of cropped land. Furthermore, industrial by-products are too expensive for smallholder farmers to afford. The prevailing feed shortages in different agro ecological zones can be overcome by producing improved forages. In due regard, Alemayehu (2006) indicated that improved feed supply is possible if backyard forage production, under-sowing, over sowing and growing improved pasture and forages are widely adopted. Forage and pasture development strategies have been promoted widely into the crop–livestock system, traditional grazing areas, and around homesteads, within soil and water conservation structures and under plantation crops and forestry (Alemayehu 2006).

2.3.1. Backyard forage production

This is a strategy by which small plots and hedges of productive forage and browse planted within house compounds and around their boundaries. It is the most important initial strategy since it is developed in the farmer's household, and is very suitable for intensive feeding. Since house compounds are highly fertile, it supports a successful establishment of backyard forage. This strategy has a major impact in exposing farmers to the management and productivity of new species and also provides a seed bank to help establish new plantings for other forage strategies. Woody leguminous browse species are particularly convenient to this strategy because of their multipurpose benefits (i.e. provides forage and fuel wood, used as shelter, increased privacy, constructions, and hive) and fast growth rates. According to Alemayehu (2002) tall growing tropical grasses are also convenient to backyard forage development. Backyard forages can be cut and carried to intensify (tethered or housed) animals, or for dry season use, it can be cut and conserved in mixes with crop residues and natural pasture hay or roughages. *Leucaena*, *sesbania*, pigeon pea and Tree Lucerne, whereas Greenleaf, silver leaf, alfalafa, vetch and vernanostylo herbaceous forage legumes are the most commonly used backyard tree legumes in Ethiopia. Similarly, grasses including Rhodes grass, elephant grass, panicum, phalaris and oats can be used as backyard forage. This strategy provides an opportunity to reach large numbers of farmers very quickly. Forage seedlings or sets can be planted

in any pattern to suit the needs of the household but simple boundary hedges/shelter belts or forage blocks are the most widely accepted designs for backyard forage plantations.

2.3.2. Under-sowing and inter-planting

Training by the Netherlands organization for extension workers in Ethiopia indicated that this strategy involves the establishment of forage species in an annual crop or perennial plantation. It provides the most suitable approach to rapidly increasing on-farm forage supplies over a large number of farmers. The use of legumes in this system will contribute to the improved fertility and structure of cropping soils. The strategy is more acknowledged in its convenience for the production of tall growing cereals such as maize, sorghum or millet but also works with other cropping systems. Large quantities of high quality forage for utilization by either post-harvest grazing or cut and carry systems can be produced by under sowing with legumes. The under sown forage is important in protecting the soil from erosive rains, can contribute nitrogen for the food crop, and balances the forage value of crop residues to increase its feeding value. Sprawling and climbing legumes are convenient to this strategy. In addition, tree crops and some vegetables can also be under sown or inter planted with leguminous forages. The establishment of annual or perennial legumes under tree crops is a reliable strategy, which is highly valued by farmers (Robertson 1990).

2.3.3. Contour forage strips

These are broad based mixtures of herbaceous and tree legumes, and grasses planted on contour bunds or in narrow strips along the contour without any physical structures. It is a multipurpose strategy providing forage, shelter, soil stabilization and fuel wood. Moreover, its contribution goes towards soil conservation by directing ploughing along the contour and by reducing run-off down the slope. As a result, these increases infiltration and reduces soil erosion, particularly where a thick sward of grass or herbaceous legumes is included in the forage strip. This strategy is particularly successful when perennial, thick rooted grasses are mixed with woody leguminous species.

2.4. Constraints and Opportunities of Improved Forage Production

2.4.1. Constraints of improved forage production

In Ethiopia, forage development strategy have been practiced long ago, but its adoption by the farming community has been very low because of various factors such as lack and unadoptable forage technologies, poor extension services, lack and high cost of planting materials, reluctance of most smallholder farmers and size of livestock ownership and farm size (Alemayehu and Getnet

2012), (Beshir 2014) and (Othill 2015). However, different highlands and lowlands hold similar constraints to adoption of forage technologies. Land shortage is one of the major factors to adoption in the Ethiopian farming system. This is a constraint because of unwilling farmers to take land away from cultivating food crops for improved forage production (Teshome 2014). Land tenure is a challenge to farmers wanting to adopt long-term technologies for soil improvement and tree development since there might be uncertainty of tenure. Shortages of labor also play a vital role in whether farmers adopt forages or not. Labors are getting busy during the times when labor is required for forages by being already occupied by other fieldworks. Thus, labor constraints may continue to be a factor influencing the adoption of improved forages (Gebremedhin .B *et al.* 2006). Moreover, lack of adequate seed availability is also a constraint for the adoption of improved forages, which must be addressed and should not be overlooked. The other major factor affecting adoption by many farmers in Ethiopia is lack of capital to cover the up-front costs of developing certain forage technologies. The last constraint is that the generic technologies provided to farmers may be inappropriate for the individual farmers (Gary 2001).

2.4.2. Opportunities for improved forages production

According to (Muhamad *et al.*, 2012), in the past few decades, various forages have been tested in different agro ecological zones. Considerable efforts have been made to test the adaptability of these crops under varying agro ecological conditions in different parts of Ethiopia. Consequently, selection of quite a number of useful forages for different agro ecological zones has been made to be possible. Improved forage crops are commonly useful for feeding dairy cattle (Alemayehu, 2006). However, there has been limited spontaneous adoption of improved pasture and forages due to land scarcity and crop-dominated farming systems as a result of increased human population. Alemayehu (2002, 2006) on the other hand noted that, there are several prospects for improved forage production. Integration of pasture and forage crops in the existing farming system is a good opportunity for the production of improved forages. Because of high demand for land resources and greater cropping intensity from populations growing at alarming rate, forage crops cannot be produced in sufficient quantities unless there is an integrated crop-livestock production system (Alemayehu 2002). As indicated in several literatures, livestock and cropping systems can be integrated in a number of ways, including agro forestry, intercropping and ley farming. Alemayehu (2006) stated that one of the best opportunities for highland farmers to use land efficiently will be through the introduction of pasture and forages in the farming system. In addition to a higher yield and nutritional value gained from cultivated pastures, they have longer length of productive season,

which provides an opportunity for dairy and fattening production to develop and use pasture and forage on a large scale (Alemayehu 2006). Besides, fodder trees and shrubs assists in increasing soil fertility, controlling soil erosion and providing firewood and timber. These legumes are well adapted to the current edaphic and grazing condition, they can be readily integrated into farming systems, and they retain their greenness and feeding value into the dry season (Alemayehu, 2006). Irrigation access offers the chance for forage production to the farmers. Farmers having good access to irrigation, they can practice forage growth three times a year (Shiferawet *al*, 2018). Apart from this, the availability of several NGOs for the community can be taken as great opportunity for future expansion of the technology (Addisuet *al*, 2016).

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

The study was conducted in Gedebano Gutazer Wolene woreda which is located at 120km from Addis Abeba, 395km from Hawassa and 65km from Wolkite. Mehal Amba is the capital city of Gedebano Gutazer Wolene Woreda. Gedebano Gutazer Wolene Woreda is found between 1800 and 3600masl. The woreda comprises of 32 kebeles with a total area of 54,500 hectares of land; out of which 26,663 ha for crop production (16,697 ha annual and 9,966 ha perennial crop land), 7365.22 ha grazing land, 9844 ha forest land, 5078.3 ha degraded land, 722 ha land is occupied by rivers and water bodies, 2362 ha land is prepared for cultivation and there mining 2465.08 ha for other social services giving institutions. The woreda has an estimated total population 131,332 of which 62,412 is male (47.52%) and 68,920 is female (52.48%). The woreda has a bi modal annual rainfall covering from mid-March to the first 10 days of May and June to mid of September. The annual rainfall is ranges between 780 to 1200 mm. The annual temperature is 19.5⁰C and with the range of 15⁰C to 24⁰C. A livestock population of the district 101885 cattle, 119385 sheep, 101868 goats, 226597 chickens, 16885 horses, 1642 mule and 22755 Classified as Wurch (5%) that have an altitude of greater than or equal to 3500m, Dega (65%) which ranges 2500m-3500masl and Weynadega (30%) which have an altitude of 1800m to 2500masl. The farming system of Gedebano Gutazer Wolene district known by crop-livestock mixed donkeys (GGWWPCO, 2020).

Regarding to agro-ecology, the district agro-ecology farming systems where crop and livestock sub system are largely inter dependent to each other. The districts mostly hilly (mountainous) and undulating area is covered with vegetation consisting of trees, bushes, shrubs and herbs (in dry and the rainy seasons). The major crops grown in the areas are enset, avocado, citrus, mango, barley, wheat, teff, chat, field bean, pea, potatoes and coffee. There are also different spice plants, horticultural crops, field crops along with wet and dry season rivers and other water bodies as well as non-agricultural and used for improved forage (GGWWPCO 2020).

3.2. Method of Data Collection

Both primary and secondary data sources were collected and used in the study. Primary data was collected by using questionnaire, personnel observation and group discussion. Secondary data was collected from the woreda livestock and fishery resources office.

3.3. Sampling Techniques and Sample Size

Gdebano Gutazer wolene Woreda has 32 kebeles among those 4 kebeles was selected by using purposive techniques based on their livestock potential. The total of 80 households which means 20 household were selected from each kebeles by using random sampling techniques for interview

3.4. Method of Data Analysis

The collected data was summarized and analyzed using Microsoft office excels 2007 and descriptive statistics such as mean, percentages and standard deviation were used to present the results.

4. RESULTS AND DISCUSSION

4.1. Background of the Household

Majority of respondents in study area were under the age 25-60. They have good labor force to do. These age structures found in the study district, however, could be categorized under the active labor forces to the farming families.

From the total householders included in survey, 89.75% of the family members was under the age group less than 60 and only 10% of the family members were dependent (above 60 and below 25 years age) (Table 1). This is an indicator of higher productive human resources of the study area which by turn considered as opportunities for improvement of agricultural sector in general and livestock sector in specific of the study area lessening down other factors to its minimum levels.

Table1. Age distribution of the respondents

Age	Sefato		Tilamo		Welegadise		Gereno		Overall %
	Freque ncy	%	Frequenc y	%	Freque ncy	%	Frequ ency	%	
25-35	4	20	4	20	6	30	3	15	21.25
36-45	9	45	7	35	9	45	11	55	45
46-60	5	25	6	30	3	15	5	25	23.75
>60	2	10	3	15	2	10	1	5	10

4.1.1. Sex of respondents

Among the total of the households, 47.5 % were male and 52.5% were female which indicated the major respondents in study area were female. This has shown economy of the households is strongly affected by the sex ratio and age structure, both of which have major influences on the labor supply and productivity of the society.

Table2. Sex of the respondents

Sex of household	Sefato		Tilamo		Welegadise		Gereno		Overall %
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Male	10	50	9	45	9	45	10	50	47.5
Female	10	50	11	55	11	55	10	50	52.5
Total	20	100	20	100	20	100	20	100	100

4.1.2. Educational status of respondents

The results of this study reveal that of the total householders in the surveyed area, (27.5%) of the family members was illiterate and the remaining was literate. Furthermore, from this literate members of the family, higher percentage (28.75%) as shown in table 3 below, with basic educational level. On the other hand, there is several (21.25%) family members were at grade 1-4 educational level and to some extent (12.5%) of the householders family members have seen to have of educational level of grade 5-8 and only 10% were at grade 9-12 educational level. This relatively low level of educational status may exert adverse impact on technology transfer and hamper the productivity of the interventions being made in the district. The finding implicated that it is important to introduce education in the area.

Table3. Educational status of respondents

Educational status	Sefato		Tilamo		Welegadise		Gereno		Overall %
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Illiterate	5	25	6	30	6	30	5	25	27.5
Basic education	5	25	6	30	5	25	7	35	28.75
Grade1-4	5	25	4	20	4	20	4	20	21.25
Grade5-8	3	15	2	10	2	10	3	15	12.5
Grade9-12	2	10	2	10	3	15	1	5	10

4.2. Land Allocation Pattern per Household

The average land allocation household in Gedebano Gutazer Wolene Woreda is crop land (77.5%), grazing land (10%) but stocking rate is above the caring capacity of the land, forest/plantation land (7.5%) and land allocated to improved forage production (5%) (Table 4). The report of CSA (2007) shows that land holding of smallholder farmers were small and fragmented and at national level about 60% of the households have less than 2 ha/household; which is better from the current study. This might be due to majority of the land in the districts not suitable for cultivation due to undulated topography which results very high human population has been concentrated in cultivated land of the district.

Table4. Land allocation pattern per household in the study area

Land allocated for	Setato		Tilamo		Welegadise		Gereno		Over all%
	Freq uenc	%	Frequ ency	%	Fre que	%	Freq uenc	%	
Crop land	15	75	15	75	16	80	16	80	77.5
Forest/plantation	2	10	1	5	2	10	1	5	7.5
Grazing	2	10	2	10	2	10	2	10	10
Improved forage	1	5	2	10			1	5	5

4.3 Major Crops Grown in the Study Area

According to the households the major cereal and root crops grown in the area were Bean (10%), pea (11.25%), barley (30%), wheat (22.5%), maize (5%), enset (11.25%), potato (10%). This shows that the production system in the study area is mixed crop livestock system which shows the main feed resources in the area is crop residue that is low in quality and quantity. So integration of improved forage (especially legumes forages) in the study area is required to increase the productivity of livestock and to improve soil fertility.

Table5. Major cereal and root crops per household

Main crops	Sefato		Tilamo		Welegadise		Gereno		Overall %
	Frequenc	%	Frequenc	%	Frequenc	%	Frequenc	%	
Bean	y		y	10	y	10	y	20	10
Pea	-				5	25	4	20	11.25
Barle	7	35	8	40	4	20	5	25	30
Maize	2	10	2	10					5
Whea	5	25	6	30	6	30	3	15	22.5
Enset	3	15	3	15	2	10	1	5	11.25
Potat	1	5	2	10	3	15	3	15	10

4.4. Types of Livestock

According to the households cattle were the dominant livestock species which accounted for 42.5% followed by 31.25% Sheep, 13.75% equine and 12.5% goat. The current study is in line with the report of Getachew and Abate (1993) that in the mixed farming systems of the high altitude and mid altitudes of Ethiopia cattle were the most important livestock species for cultivation, threshing and manure purpose.

Table6. Livestock types holding in study district

Types of livestock	Sefato		Tilamo		Welegadise		Gereno		Overall (%)
	Freq	%	Freque	%	Freque	%	Frequenc	%	
Cattle	8	40	9	45	8	40	9	45	42.5
Sheep	6	30	4	20	7	35	8	40	31.25
Goat	4	20	5	25	1	5			12.5
Equine	2	10	2	10	4	20	3	15	13.75

4.5. Feed Resources in Study Area

The main feed resources to livestock in the district are crop residues, natural pasture (communal grazing land, shrub lands and private grazing), and other local feeds like aftermath from crop lands, concentrate feeds, industrial-by product, enset leaves, local drink by products, potato, improved forage and hay with their decreasing order of feed contribution. Alemayehu (2004) indicated that the major basal feed resources in high altitude parts of Ethiopia were natural pasture, crop residues and stubble grazing, but their contribution to the total feed resource base varied from area to area based on cropping intensity. The contribution and quantity of feeds obtained from different sources were different. For example 38.75% use crop residues, 32.5% natural pasture, 12.5% local feeds, 11.25% hay, 2.5% agro industrial by products, 1.25% improved forage and 1.25% of farmers use concentrates feed. Ahmedetal, (2010) in the central highlands of Ethiopia also showed that over 50% of the feed to animals came from natural pasture. Similarly, study conducted by Fire wand Getnet (2010) in ANRS showed that the major feed resources in the region includes natural pasture, crop residues, industrial byproducts, hay, improved forage (too small), and “unconventional” feed resources like Atela and Brint which are by products of home brewed beverages. But this study shows the main feed resource is crop residue because the majority of the land in the study area is cultivated crop land.

Table7.The different feed resource used per household in the study area

Feed resources	Sefato		Tilamo		Welegadise		Gereno		Overall %
	Frequ ency	%	Frequ ency	%	Frequenc y	%	Frequency	%	
Crop residue	6	30	8	40	9	45	8	40	38.75
Natural pasture	6	30	5	25	5	25	10	50	32.5
Other local feeds	4	20	3	15	2	10	1	5	12.5
Hay	3	15	3	15	2	10	1	5	11.25
Improved forage	1	5							1.25
Industrial by product			1	5	1	5			2.5
Concentrate feeds					1	5			1.25

4.6. Types of improved forage production in study area.

Although the level of production and contribution of improved forage crops are very limited in the study district, the production of some types of improved forage crops such as Desho grass, Tree lucern, Elephant grass, oats, sespania, Rhodes grass from the leguminous and grass species are some of improved forages disseminated and practiced in the district (Table 8) but the production of improved forage is very low. According to the households in the study district the households owns below 0.01 hectare on average.

Table8.Types of improved forage production in study area

Species	Sefato		Tilamo		Welegadise		Gereno		Overall (%)
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Elephant grass	5	25	5	25	-	-	-	-	12.5
Sesbania	1	5	1	5	-	-	-	-	2.5
Desho grass	10	50	9	45	10	50	2	10	38.75
Tree lucern	2	10	2	10	5	25	8	40	21.25
Oats	2	10	3	15	5	25	10	50	25

4.7. Purpose of Developing Improved Forages in District

It was noted that, most of the above improved forage crops are developed with the primary aim of feed (67.5%) followed by fence (18.76%), 6.25% for soil conservation, and 7.5% for wind break (Table 9). In feed development strategies, to close the feed gap, improving soil fertility in smallholder farming systems should also be considered. In addition to the above purposes, they were also used the developed improved forages as a wind break, crop rotation and fence. Similarly, the works of Abebe (2008) on multipurpose forage trees (MPFT) in Ethiopia also showed that the farmers' criteria of evaluating MPFT broadly combine the intended purposes to meet different farming objectives and agronomic characteristics they wish from trees *i.e.* farmers' appreciation of fodder trees due to; soil fertility improvement, bio mass production, multi-functionality, life span of the tree, and compatibility to the cropping system.

Table 9. Purpose of developing improved forage crops in the study area

Purposes	Sefato		Tilamo		Welegadise		Geteno		Over all
	Freq uenc y	%	Frequ ency	%	Frequ ency	%	Frequ ency	%	
Soil conservation	1	5	1	5	3	15	-	-	6.25
Forage(feed)	15	75	14	70	10	50	15	75	67.5
Wind break	1	5	2	10	2	10	1	5	7.5
Fences	3	15	3	15	5	25	4	20	18.75

4.8. Improved Forage Development Strategies used in the Study Area

Improved forage development strategies practiced in the district are more related with the aim of developing improved forage crops for livestock feed, soil and water conservation (Table10). According to the respondents 17.5% of the respondents developing multipurpose improved forage crops on strips integrating with soil and water conservation whereas 77.5% of the respondents develop improved forage on backyard. The reason explained is that forage strips would have multiple roles, including the provision of forage for cut and carry feeding system, fuel wood supply and soil erosion control.

On the other hand, backyard forage development involves the establishment of forage in the immediate vicinity of the house which provides a very convenient point of entry for new species prior to their subsequent use on a wider scale.

Table10. Improved forage development strategies and respondents' in study area.

Development strategies	Sefato		Tilamo		Welegadise		Gereno		Overall I (%)
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
On strips	2	1	3	15	5	25	4	20	17.5
Backyard	17	85	15	75	14	70	16	80	77.5
Under-sowing	1	5	2	10	1	5	-	-	5

4.9. Constraints of Improved Forages production in the Study district

Although previous efforts have been made to promote improved forage production in the study district with Woreda agriculture office, the contribution is below expectation. However, different factors did not contribute equally for the production and utilization of improved forage crops, lack of integration with high producing animals (dairy and fattening), cost of seed, land shortage, free grazing, input shortage (seeds/seedling), scarcity of water for irrigation (seasonal nature of rain fall distribution), poor extension service, attitude and skill gap are limiting factors for the production and utilization of improved forage crops as per the result of interviewed household (Table11). The shortage of land in the districts also aggravated by poor soil and undulated topography which easily exposes the soil to erosion. This result agrees with a study conducted by Tilahun*etal.*(2005) in Ethiopian highlands ; in which land shortages sever in the mixed crop-livestock production system. According to the respondents and the woreda livestock and fishery office, lack of extension service, lack of awareness, input shortage, cost of seed and lack of integration with high producing livestock (dairy and fattening) are the major constraints of improved forage production, adoption, and utilization.

Table11. The constraints for improved forage development in study area

Problems	Sefato		Tilamo		Welegadise		Gereno		Overall (%)
	Frequency	(%)	Frequency	(%)	Frequency	(%)	Frequency	(%)	
Land shortage	3	15	2	10	3	15	1	5%	11.25
Free grazing	4	20	3	15	1	5	6	30	17.5
Input shortage(seed/seeding)	1	5	1	5	5	25	5	25	15
Poor extension service	5	25	5	25	7	35	3	15	25
Awareness	4	20	6	30	2	10	3	15	18.75
Skill gap	3	15	3	15	2	10	2	10	12.5

4.10. Opportunities of Improved Forage Production

Now there are many opportunities for production, adoption, and utilization of improved forage. Among them, increased demand of livestock products, government attention on the livestock and fishery sector, improved forages are direct income source which initiate farmers to produce forage, integrated soil and water conservation with improved forages, urbanization were opportunities for the production, adoption and utilization of improved forage. According to the key respondents, even though free grazing is one of critical limiting factors for improved forage production and utilization, the trend is decreasing from time to time which might be promising in the future. Moreover, the attention recently given to livestock at federal and regional levels (e.g. establishment of livestock development agency at regional level) can also reduce the different livestock production constraints including feed shortage. This helps for intensification of agriculture through use of technologies including g livestock which can be an opportunity for production of forage crops in integration or in rotation.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

One of the major constraints to increase livestock production in study area is the shortage of feed for livestock. These feed resources are low in quality characterized by high fiber, with low digestibility and low levels of nitrogen, low voluntary intake and low productivity.

In order to improve the shortage of livestock feed in the study area, there are many opportunity from these increase demand of animal products, government attention on the sector, increase cost of forage are some of the opportunities for the production of improved forage. The use of improved forages could have a much potential to alleviate such problem associated with conventional feeds. In general the use of improved forages has been practiced long year ago, its production has faced many challenges such that shortages of land, seasonal distribution rain fall, cost of seed ,lack of integration with high producing animals, lack of awareness, free grazing, poor extension services and numbers of livestock's owner ship are common.

5.2. Recommendations

There are future prospects for improved forages productions are:-

- On farm evaluation of the different improved forage crops with full participation of the farmers.
- Efficient utilization the available marginal ands (enclosure areas, degraded unproductive communal grazing lands and soil and water conservation structures) with desirable forage crops should been encouraged.
- Full extension services delivery may be imperative to improve the production and adoption of improved forages for suitable development in livestock production.
- Shifting free grazing to control grazing/zero grazing system should be encouraged.
- Stimulate and facilitate the private sector in the production and commercialization of certified forage species/cultivars/varieties seed and plant material.
- Improve management practices of commonly used varieties such as Desho grass, Napier, and Rhodes grass.
- Improve soil and water management and use, focused on future generations and integrate with improved forage

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7. APPENDIX

Questionnaires' for Assessment of challenges and opportunities of Improved Forage production I,
Data to be collected from household of the woreda

1. Name of the respondents ----- Date of interview ----- 2, Kebeles -----

3. Age and sex of the respondents

3.1, Age -----

3.2, sex b-----

4. Maternal status A. single B Married C. divorce D. Widowed

4.1 Major occupation -----

5. Educational level of respondents -----

5.1. Illiterate -----,

5.2. Read and write-----

5.3 .Grade1-4 -----, Grade5-8----- Grade 9-12-----

6. Religion-----

7. Economic status of the family number of cattle-----

8. Land size (he) -----

9. Family size male _____ female _____ total _____

9.1, Age b/n 18 to 35yr -----

9.2, Age b/n36 to 49yr -----

9.3, Age b/n 50 to 60yr -----

9.4, Age above 60y -----

9.5, Total number -----

10. Number of livestock -----

10.1. Oxen -----

10.2. Cow-----

10.3. Sheep-----

10.4. Goats-----

10.5. Poultry-----

10.6. Horse-----

10.7. Donkey-----

10.8. Mules-----

11. Types of feed you offer for your animal---? A. natural pasture B. crop residue C. hay D. agro-industrial by product E. improved forage F. others_____

12. What are the major constraints of natural pasture in study area?

A, over grazing

B, Population growth

C, Invasive vegetation (weeds)

D, Shortage of grazing land

E, Pasture land degradation

F, Drought

13. What is the possible solution of the constraints of natural pasture in study area?

14. The major constraints of improved forage are?

A, Lack of awareness

B, Lack of suitable forage

C, Seed planting material

D, Lack of adequate extension service

E, Expensive price of seed

F, Shortage of knowledge

G, Lack of competition of forage

H, Lack of man

I, others _____

15. The major feed resources for the house hold live stock; say yes/no?

No. Types of feed resource Dry Wet

1, Natural pasture-----

2crop-residues-----

3. Conserved forage-----

4, improved forage-----

5, aftermath-----

6, sugarcane leaf and top stem-----

7. Sweet potato-----

8, others _____

16. How do you store crop residues.....?

17. What is the major crop residue produced in the area-----

18. Do you plant improved forage if your answer is yes where you obtain the

Seed _____

19. Do you plant improved forage pasture, legumes or trees? A, Yes B, No, If

Yes, which production system you use

A, over sowing of natural pasture

B, under sowing legumes

C, planting tree legumes

D, backyard

20. What are the types of improved forage found in study area?

A, Elephant

B, grasses

C, Rhodes grass

B, Densho grass

D, Sesbania

E, oats

F, tree Lucerne others _____

21. Based on number 20 what is the role of forage?

A, Elephant grass _____

B, densho grass -----

c. Rhodes grass-----

D sesbania-----

E, oats _____

F, others _____

22. For what purpose you feed improved forage?

A, for fattening

B, for dairy

C, for both

D, others_____

23. From the following which method use feeding improved forages?

A. In hay form

B. cut and carry system

C. grazing

24. What are the critical feed shortage periods in the study area?

A, December—April

B, September--November

c, May--August

25. Based on question number 23, If December—April what is the cause?

_____, _____, _____, _____

26. Which method of feed conservation practice use in the study area?

A. in the form of hay

B. neither of hay or silage

C. Normal prepared hay dry in after cutting

D. silage

E other