

Research Article

# Improved Forage as Supplemental Feed Source and Its Utilization System in Yem Special Woreda of Central Ethiopia

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## Abstract

This study was conducted to assess the improved forage production and Utilization. For this study, three kebeles were selected purposively based on their livestock potential and 160 households were selected from selected kebeles randomly. The major feed resource in the study area was crop residue and pasture land grazing. The dominant forage species adopted in the area were Desho and elephant grass. Primary problem for livestock production was the shortage of feed resources. Majority (66%) of the households were in the active productive age (31-45) about 60% of household heads were literate (primary school and above). The average land cultivated per household in the study area was 0.25 hectares. Crop production was the principal source of cash income in the region, followed by cattle production in second place and sheep production in third. Almost all households in the study area had experience in cultivating improved forage, particularly elephant and desho grasses. The main challenges related to livestock production identified in the area were primarily diseases, ranked first, followed by feed shortages in second place, and water shortages in third, along with issues related to poor breed performance to some extent. Among the main feed sources identified, grazing, crop residues, and desho grass were ranked first, second, and third, respectively, in the study area.

## Keywords

Crop Residue, Desho Grass, Forage Crop, Yam Special Woreda

## 1. Introduction

Livestock population of south nation national people region state (SNNPR) estimated to 12,404,963 cattle, 4,735,604 sheep, 4,819,573 goats, 292,496 horses 305,089 dockey, 7,0365 mules, and 7,347,205 poetry [1]. Despite the large livestock population in the country with high potential for meat and milk production, the contribution of the sector is well below its biological potential due to various reasons. Feed Shortage and disease, fewer effects in introducing the appropriate improved livestock technologies, cross breeds,

improved feeds management practices is indicated as a factor resulting for lower production, productivity growth performance and reproductive of animal especially during the dry period [2].

During dry season, in adequacy of grazing resources result for animals not to meet even their maintenance requirements and body weight losses. Livestock feed resources are classified as natural pasture, crop residue, improved pasture, forage, agro industrial by product and other by products like food and

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vegetable refusal, with the first two contribute the largest feed type [3] Animal depends mainly on natural pasture for their feed requirements. However, natural pastures which provide more than 90% are very poorly managed.

The important of natural pasture is gradually declining and expansion of crop production in to grazing lands also redistribution of common lands to the landless and land degradation [4]. Though increased utilization of agro-industrial products has been reported, they are not available, affordable or feasible for most of the small holder farmers in Ethiopia. Hence, animals are allowed to graze natural pasture or crop stubbles around homestead supplemented with weed was the major feeding practice and it is now shifting to zero grazing because of continuing shrinkage of grazing.

Thus, there is no doubt that evaluating the current potential and identification of challenges that threatening this potential is mandatory in order to keep and exploit the current potential and tackle the threatening problems. Identification of feed resources and opportunities and constraints associated to livestock feeding are therefore, preconditions.

This study was, therefore, designed to assess the feed resources utilization system and improved forage production status in the study area.

## 2. Material and Methods

### 2.1. Description of the Study Area

The study was conducted in Yem special woreda, located in the north-western apex of the Southern Nations, Nationalities and Peoples Regional State of Ethiopia. The administrative center of Yem special woreda (saja city) is located at 247 km from Addis Ababa Southwest Ethiopia. Yem is bordered on the west and north by the Oromia Region, and separated from Gurage on the northeast and Hadiya on the east by the gibe River. Yem occupies a surface area of 724.5 km<sup>2</sup>. The woreda lies within elevations of 920–2939 meters above sea level (MASL) and has three agro climatic zones; namely, Dega (cool highlands) (18.4%), Weyna Dega (tropical highlands) (57.6%) and Kolla (lowlands) (24.0%). It receives a mean annual rainfall of 900 – 2200 mm in a bimodal pattern, from mid-February to April, and June to September. The mean annual temperature is in the range of 12– 30 °C. The topography of Yem district is characterized by rolling mountains, long gorges, steep slopes and flat to undulating plateaus. The physiographic features of the woreda are characterized by high peaks and mountains and partly by deep gorges of Gibe River to the east. The total human population of the woreda as per 2007 population census is estimated to be 80,647 of which 50.3% are male and 49.7% female [5] and the population density is 111.3 persons/km<sup>2</sup>. The major livestock production system in the woreda is cattle in Mixed crop-livestock farming comprising more than 43.7% (n= 107,201) of regional livestock population.

### 2.2. Data Collection Techniques

All relevant primary and secondary data source was employed for this study. Both qualitative and quantitative data from primary and secondary sources was used. The primary data was collected from sampled households, Woreda agricultural offices, from site development agents (DA) and others who have adequate information about the existing situation of the research area. Structured questionnaire which was filled by respondents, focus group discussion with farmer groups and an in depth interview was conducted to collect the primary data. Qualitative type data on the other hand was collected using focus group discussion and informal discussions with administrators and personal observations. Secondary data was collected from records of the woreda agricultural offices, and related literature prepared by government and nongovernmental organization. Such data sources include journal, research works, articles, statistical report, and official world-wide web sites for literature review and information about the study area.

Key informant interview was carried out to collect required primary data that lead to discussion with concerned bodies to obtain information about the issue related to the study objectives and description of study area. The key informant of this particular study was livestock directorate experts and kebele level extension agents. The interview was recorded by using checklist.

### 2.3. Sample Size

According to the data obtained from the Yem special woreda agriculture and natural resource development office, there are 32 rural *kebeles* and 5 urban centers in the *woreda*. Two-stage sampling procedure was employed in this specific study. In the first stage, the 3 representative *kebles* was selected purposively based on the livestock production potential. These selected *kebeles* were dari *tegu*, *Ediya* and Oya kepo. Secondly, within the 3 *kebeles*, 135 households were selected using random sampling methods.

### 2.4. Research Design

The study applied cross sectional survey method that both qualitative and quantitative design was employed to address the proposed study objectives. Quantitative methods aim to classify features, count them, and create statistical methods and explain observations, interview and use of questionnaires. Qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances. In order to achieve the objective of the research, considering the nature of the problem and the type of the assessment, this study was using both qualitative and quantitative research approaches.

## 2.5. Methods of Data Analysis

Data was analyzed with reference to the purpose or to the objective of the study, and was in referring to the research problem at hand or the hypothesis. The process of data analysis includes steps like categorization, coding, statistically adjusting the data and tabulation. Finally SPSS (Version 20.0) was used to analyze data and the results were presented in the form of tables and figures. Descriptive statistics was applied to describe the collected data using mean, standard deviation, percentages, and graphs.

## 3. Results and Discussion

### 3.1. Household Characteristics

The information regarding sex, age, educational level, and family size of households indicates that 80% were male-headed households while 20% were female-headed. Most households (66%) consisted of individuals in the productive age range of 31-45 years, and 60% of heads of households had received an education (at least primary school level). The average number of members in a household was 6.56.

**Table 1.** Age, sex, educational level and family size of a household.

Description	Frequency	Percent
Household sex		
Male	108	80
Female	27	20
Household age		
18-30	18	13.3
31-45	90	66.7
46-65	18	13.3
>65	9	6.7
Education level		
Illiterate	0	0
Primary (1-4)	45	33
Primary (5-8)	81	60
Secondary (9-10)	9	7
Preparatory (11-12)	0	
Family size		
≥3	12	8
4-6	62	45
7-10	50	35
11-12	12	8

The average family size for households in this study (which is classified as a medium family size of 4-6) aligns with findings from a previous assessment report (7.3) [6] conducted in the same region from different agro-ecological backgrounds and in the Anelemo district [7]. In many rural areas of Ethiopia, family members serve as the primary labor force for households. Thus, having a larger family size can be seen as beneficial when it comes to managing labor-intensive agricultural tasks. Nevertheless, a large family size may negatively affect the family's livelihood if economic opportunities and income sources are scarce [8]. The existence of larger families may be linked to the labor-intensive agricultural work in the region [9] and/or a lack of knowledge regarding effective family planning methods.

Education, conversely, significantly contributes to the transfer of technology and encourages farmers to embrace various innovations. In this study, around 60% of household heads possessed literacy skills (at least at the primary school level), which presents a valuable chance to effectively spread different technologies via enhanced training programs. Additionally, the fact that most household heads fall within the active working age group represents a substantial opportunity for engagement in multiple activities.

### 3.2. Farming Characteristics and Land Holding

Farming activities and land holding was shown in Table 2. Major farming activities in the study area were cultivation/cropping and rearing livestock (86%) followed by both Farming and labor (24%). The mean land holding of the area was 0.25 ha.

**Table 2.** Major occupation and land holdings.

Description	Frequency	Percent
Major occupation		
Farming	117	86
Both farming and trading	0	0
Farming and labor	18	24
Farming, trading and labor	0	0
Land holding	Mean	
Cultivated land	0.52	52
Grazing land	0.16	16
Wood land and settlement	0.2	20
Fodder land (cultivated)	0.12	12

The total average land holding per household in the study areas in the current study were similar with reports for average land holding (0.52 ha) in Anelemo district [7]) and for Doy-

ogena district (0.5-1 ha) [10]. However, the value in the current study was lower than a report for Burie district [11], and 2.98 reported for enset based farming system in Enor woreda of Gurage zone [12]. The size of a family may influence the income of farmers. The issue is likely to worsen if development solutions for landless populations are not put in place, along with the adoption of intensive and sustainable land management practices. There was not a significant difference in the size of land holdings among the farmers. The primary occupation in the district is farming, with combined farming and small-scale trading also present, which highlights that agriculture (both crops and livestock) is the principal source

of livelihood in the area under study.

### 3.3. The Contribution of Agricultural Activities to the Household Income

The various income contributions from different agricultural activities are presented in Table 3. The farmers in the region had multiple income sources, with crop production serving as the primary cash income source (1<sup>st</sup> rank), followed by cattle (2<sup>nd</sup> rank) and sheep (3<sup>rd</sup> rank) production. Forages feed was also to lesser extents (5<sup>th</sup> rank) serve as income source.

**Table 3.** The contribution of different agricultural activities to the household income.

Income source	Primary choice					T-sum	PI	Rank
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>				
Crop	63	19	6	0	88	35		1
Cattle	0	0	23	26	49	19		2
Sheep	0	0	23	26	49	19		3
Poultry	0	3	23	14	40	16		4
Forage	2	23	4	1	30	12		5

This result is in consistent with report for Lemu district of Hadiya zone. The lower contribution of small ruminant compared to cattle was related with small number small ruminant holding of the area.

### 3.4. Livestock Production Challenges

The difficulties faced in livestock production within the study area are presented in Table 4. The primary issues con-

cerning livestock production in the region include disease, ranked first; followed by inadequate feed, which is in second place; and a lack of water, in third place, along with poor breeding performance and other factors.

The issues observed correspond with findings from the Horro and Guduru districts [13]. Additionally, local breeds show a higher resistance to diseases and tend to thrive even with restricted feeding options and simpler management conditions [14].

**Table 4.** Major livestock production challenges.

Income source	Primary choice				T-sum	PI	Rank
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>			
Disease	85	23	10	17	135	25	1
Feed shortage	35	58	20	13	103	19	2
water shortage	23	15	38	55	131	24	3
Poor breed performance	50	43	5	6	104	20	4
Market problem	0	0	43	17	60	11	5

### 3.5. Livestock Feed Shortage and Coping Mechanisms

The specific feed shortage, the duration of the shortage, and the coping strategies employed are illustrated in Figure 1. Approximately 96% of the households surveyed reported experiencing feed shortages. The majority of farmers (80%) encountered this issue during the dry season, which lasts from December to May, and they indicated that they utilize various coping strategies to mitigate the feed shortage problem. The most common strategies adopted in the study area include purchasing grass and concentrates, as well as feeding non-traditional feed resources such as kitchen waste and ensen leaves, which aligns with findings from several highland regions in Ethiopia [15].

The issue of feed shortages encountered during dry seasons in the study area was associated with moisture stress, which led to reduced herbage growth on the current grazing lands. This finding is consistent with reports from various regions in Ethiopia that share a similar agro-ecological context. During the dry season, grasses are purchased as the primary source of roughage [7], although these grasses have a low nutrient content [16].

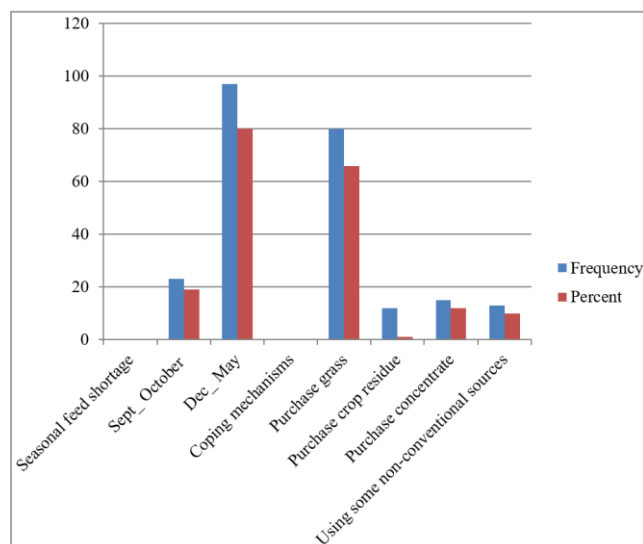


Figure 1. Feed shortage problems and coping strategy% of respondent (N=135).

### 3.6. Livestock Feed Sources

The major feed resources used for cattle in the area are indicated in Table 5. Among major feed sources identified, grazing, crop residue and desho grass were given 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> rank in the study area respectively.

Table 5. Major cattle feed sources in the district (N=135).

Feed type	Primary choice				T-sum	PI	Rank
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>			
Local grass (harvested)	25	34	39	33	131	26	1
Desho grass	20	21	54	32	127	25	2
Grazing	55	10	25	15	105	20	3
Crop residue	30	18	12	23	83	16	4
Elephant grass	5	12	23	0	28	5	5
Concentrate	10	0	0	10	20	3	6
Enset leaf	5	2	21	2	9	1	7

The findings concerning feed resources indicate that grazing, crop residues, and local grasses are the primary sources in the region, which aligns with observations from the Anelemo district of the Hadiya zone [7]. The use of concentrated feed in the area was notably high during the dry season, aimed at complementing the low-quality roughages that are available during this time. Due to the limited grazing land that has led to a reduced stocking rate of animals, most farming families engage in daytime controlled or tethered grazing and provide

individual feeding at night.

### 3.7. Seasonal Livestock Feed Availability and Utilization

The availability of feed resources and their seasonal use are detailed in Table 6. In the study areas, the primary feed resources included Crop residues, Grazing, Elephant grass, and Desho grass. Specifically, during the dry seasons, the main

feeds commonly used were Crop residues, Grazing aftermath, Elephant grass, Local grass, and Desho grass. Conversely, in wet seasons, the feed resources that were mostly utilized included Grazing on pasture, Elephant grass, Local grass

(through a cut and carry system), and Desho grass. Improved forages were generally used as a supplement throughout both the dry and wet seasons.

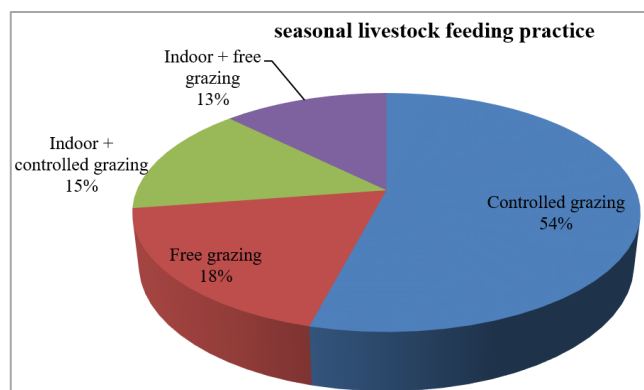
**Table 6.** Seasonal availability and utilization of feed resources (N=135).

Dry season							Wet season						
Feed resources	Primary choice				Rank 2 <sup>nd</sup>		Feed resources	Primary choice 4 <sup>th</sup>				Ran	
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>				1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>		
Crop residue	68	3	3	0	133	1	Grazing on pasture	111	12	9	0	132	1
Desho grass	30	13	32	32	107	4	Desho grass	78	4	5	8	95	4
Elephant grass	25	20	49	30	124	3	Elephant gras	12	40	46	9	107	3
Grazing	47	40	43	2	132	2	Crop residue	23	45	55	0	123	2

Source: Field Survey, (2021)

### 3.8. Livestock Feeding Practice

Seasonal animal feeding practices observed are presented in Figure 2. The majority of farmers engaged in individual feeding at night and managed grazing during the day. Free grazing was the most prevalent feeding practice in the research area.



**Figure 2.** Seasonal livestock feeding practice.

Majority of the householders of the study area have experience using various supplementary feeds such as Atela (by-products from local brewing), wheat bran, and additional items (food grains, enset corm, food scraps, root crop tubers, and sweet potato vine).

### 3.9. Improved Forage Production

The primary improved forage cultivated in the region is

shown in Table 7. Nearly all householders in the study area (100%) have knowledge in producing improved forage, particularly elephant grass and desho, which are the most prevalent in the region. Satariya and Guatemala grass are new forage varieties that have been recently introduced.

**Table 7.** Improved forage producers and forage type produced in three kebele (N=135).

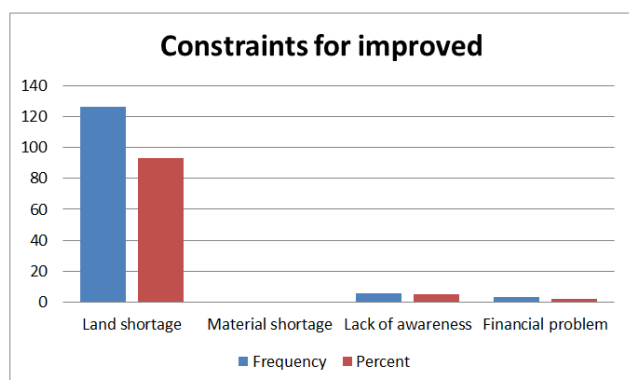
Description	Frequency	Percent
<b>Use of improved forage</b>		
<b>Forage type /ha/</b>	<b>Hectare</b>	<b>% of respondents</b>
Desho grass/ha/	380	79
Elephant grass/ha/	76.85	16
Satariya	14.25	2.9
Guatemala grass/ha/	7,125	1.4

Improved forage production is thought to be a solution for addressing feed shortages, yet it faces several hurdles such as small land holdings, competition from food crop cultivation, insufficient availability of forage seeds, and a lack of knowledge regarding forage species and their production methods. This issue has been worsened by the lack of a system for supplying and distributing improved forage seeds in the region. In contrast to this finding, land was identified as the main constraint in the Anelemo and Robi districts [7, 9].



### 3.10. Constraints for Improved Forage Production

Major constraints that hampered improved forage productions are presented on Figure 3. Majority of the householders responded that they have shortage of Land and Financial problem as primary constraints followed by lack of awareness; with shortage of land were highly prominent (93%) in the study areas.



**Figure 3.** Major constraints for improved forage production in the area (N=135).

Lack of awareness about various improved forages and their production method, along with limited land availability and access to improved forage seeds, has obstructed the advancement of improved forage technologies. Therefore, this scenario highlights the need for implementing diverse forage development tactics and the incorporation of legume forages that can be combined with other cropping systems.

## 4. Conclusion

The major feed resources in the area were natural pasture which is shrinking from time to time as a result of converting lands to food crop production. Besides, the quality of available feed from pasture land is not substantial to livestock need, because its quality and quantity was highly fluctuated to the season of the year. Hence feed shortage was recorded as primary constraints in the study area following seasonal fluctuation. Accordingly, feed shortage season started from end of December to May. The observed feed shortage was exacerbated by lack of supplementary feed like improved forage production in the area. As a result, purchased feeds and several locally available by products like ensen leaf were used as a coping mechanism against feed shortage. Though it was not at adequate level, these were starting points for improved forage adoption in the area. So introducing of improved forage like desho grass, vetch, elephant grass, sesbania, and leuceana were becoming as common practice in the study area. Farmers gave particular emphasis to lactating cows,

pregnant cows, fattening cattle and calves in utilizing this improved forage. Shortage of land, lack of awareness and the increased piece of forage seed were the main constraints that hinder the adoption of improved forage.

## Abbreviations

DA	Development Agents
SNNPR	South Nation National People Region State
SPSS	Statistical Package for Social Science

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## Author Contributions

Kedir Adem is the sole author. The author read and approved the final manuscript.

## Conflicts of Interest

The author declares no conflicts of Interest.

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