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Survey on Constraints of Improved ForageAdoption in Anelemo Woreda, Hadiya Zone, Ethiopia

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Abstract

The survey was conducted on 100 respondents to assess constraints of improved forage adoption in Anelemo district using semi-structured questionnaire. The study area was selected purposively based on grazing area constraint. Respondent households were selected randomly. From each kebeles, 20 households were selected for the survey. Natural pasture (94%) was the main feed resource during the wet season whereas crop residue (59%), in the dry season. Only 37% of respondents replied that there was communal grazing land in their area. The major forage species widely planted in the study area were dasho grass, elephant grass, Guatemala grass, sesbania and tree Lucerne.

The major constraints for improved forage adoption in the study area was a shortage of land (28.8%), shortage of forage seed (13.5%), lack of awareness and poor extension services. Livestock feed shortage (88%) and water shortage (12%) was the major problem in the study area. Therefore, integration of improved forage with crops, and with soil and water conservation structure is best opportunity for increasing adoption of this technology. Increasing accessibility of forage seed for the farmer and creating awareness is also another way to achieve widespread adopting of forage technologies.

Keywords: Improved forage; Constraint; Feed resource

Introduction

Livestock are a crucial component of livelihoods and food security of nearly 1 billion people in the developing world, contributing about 40% of the global value of agricultural output. Livestock contribute 15% of total food energy, 25% of dietary protein, and some micronutrients that are not available from plants [1]. Additionally, more than 85% of the Ethiopian population lives in a rural area and their economy depends largely on livestock production system [2]. Livestock serve as a source of income; food security and also indicate prestige and social status in the rural community [3]. However, Feed shortage both in quantity and quality remains the leading constraint to good animal performance in Ethiopia [4]. Feeds are either unavailable in sufficient quantities due to fluctuating weather conditions or are available but of such poor quality that they do not provide adequate nutrition. As grazing land area declines and cropping expands to marginal areas, access to traditional feed resources is further constrained [5].

Previously natural pasture grazing land was the main forage feed source for livestock. At this time the size and quality like species composition, vigor and palatability of communal grazing lands have been substantially reduced over the past five years across all areas studied [6]. This is due to fast growth of the country's population with increasing land demand for crop cultivation. The remaining uncultivated pasture land also reduced in forage production because of over grazing and reduction in soil fertility [2].

Most improved forage, in particular legumes, is multi-purpose plants. Use of improved forages would reduce the pressure on natural pastures, improve soil fertility and reduce erosion on marginal lands [7], improve carbon sequestration to mitigate climate change [8,9], support system sustainability, and enhance natural assets and system resilience [5]. In addition to these, the promotion of integrated forage crops development has multiple functions in the feeding of livestock, conserving soil and soil water, improving the productive capacity of arable lands, and providing fuel and timber values [10].

Livestock are an important part of the farming system in the study area. One of constraint for livestock production in the study area is seasonality in quality and quantity of forage. Use of open grazing is limited as there is a shortage of communal grazing lands [11]. Therefore, these systems influence to see alternative way to fulfill feed requirements of animals to sustain their productivity. Introduction of improved forage technologies that can fit into the existing land use system coupled with improved feeding systems would be necessary to resolve the feed related problems [11]. On the other hand, cultivated forage crops is not

widely adapted due to shortage of land, lack of awareness of farmers on benefits of cultivating forage crops and shortage of availability of forage seed and planting material in other parts of country [12].

In the study area improved forage is not widely adapted by farmers. Therefore, identifying problems that hinder farmers' adoption of this technology is one of preliminary step to plan appropriate strategies. However, constraints that hamper adoption of this new technology has not identified in the study area. Therefore, the objective of this paper is to identify improved forage adoption constraints in the study area.

Material and Methods

Description of the study area

The study was conducted in Hadiya Zone of South Nation National Peoples Regional State. Hadiya zone is far 232 km away from Addis Ababa which is the capital city of Ethiopia. The mean annual temperature of study area is ranges between 15.1-20 °C and elevation ranges from 1501-2500masl. The annual rainfall ranges from 1001-1200mm/year. Generally, in the Hadiya zone rainy (winter) season fall from June to September and spring starts from September to November belong to the wet season. Summer that starts from December to February and autumn starts from March to May months belongs to the dry season. The plain topography combined with the availability of optimum climatic and fertile soil condition makes the woreda suitable for mixed crop-livestock production.

Sampling methods

Multi-stage sampling procedures (purposive and random) was employed to select the study sites and households (HHs) of the woreda. For data collection 5 sample kebeles was selected purposively based on livestock population and accessibility. To obtain the sample households, random sampling technique was employed. From each kebeles 20 house hold was chosen randomly from total households in the kebeles.

Data collection

In order to address the objectives of this study, discussion with key informants for baseline information and formal survey using semi-structured questionnaire was used. In the primary phase of the study, group discussion was held with key informants to investigate and have an overview about the major feed resource, improved forage species, improved forage utilization and challenges of improved forage production in the study area. The information generated in the group discussion phase was used for the preparation and development of the questionnaire for the formal survey. The questionnaire was pretested on sample households out of the study area. Secondary data regarding land holding, land coverage by crop type, livestock population by species and number of kebeles was collected from Anelemo woreda office of Agriculture.

Statistical analysis

Surveyed data was analyzed using Statistical Package for Social Sciences (SPSS) version 20 [13]. Descriptive statistics such as mean, frequency and percentage was calculated.

Result and Discussion

Farming activity

Livestock rearing and crop productions were the main farming activities in the study area. About 100% of the respondents depend on livestock and crop production for livelihood. Therefore, the main economic source of livelihood is based on both crop and livestock production.

Socio-economic profile

Household characteristics: Respondent household characteristics are presented in (Table 1). In this study about 85% of respondent household were male headed and 15% were female headed. Education plays great role in transferring technology to farmers and to initiate their willingness to adopt technologies. In this study out of the total respondent 52% can read and write. About 30%, 6% and 4% of respondents were attending elementary, secondary and junior secondary school, respectively. This shows that people who were much involved in agricultural activities either did not attend any formal education or stopped at lower levels (primary and secondary levels).

Table 1: Socio-economic characteristics of households in the studied sites.

Variable	Frequency	Percentage (%)
Sex		
Male	85	85
Female	15	15
Educational level of household heads		
Read and write only	52	52
Elementary	30	30
Illiterate	6	6
Junior secondary	4	4
Secondary	6	6
Above secondary	2	2

Livestock and land holdings: The result on family size, age of respondent, land holding and livestock holding is presented in (Table 2). Land is the most important limiting production factor and the quality and quantity of land available greatly determines the amount of production. However, as opposed to family size, the land holding per household is decreasing from time to time posing the integration of crop and livestock systems with no fallacy [14]. On average land holding per household in the area was 0.66ha. This indicates that farmers in the study area suffered due to shortage of cultivation land. Furthermore, this cultivation land is decreasing from time to time due to high human population.

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Table 2 : Mean land and livestock holdings/household in the studied sites.

Study Kebeles						
Descriptors	**Lafto Lenka**	**Debub Fonko**	**Lay Fonko**	**Demela Balbula**	**Bendelicho Kombota**	**Overall**
Family size	7.8	6.1	6.7	6.65	5.1	6.47
AR (yr)	42	40.1	49.1	39	52.75	44.59
LH(ha)	0.59	0.75	1	0.51	0.43	0.66

However, Enset production enables farmers to compensate this land shortage because it can produce high dry matter per plant. The results are consistent with the land holdings of smallholder farmers in Lemo district of Hadiya zone of SNNPR [11].This result is also in line with the value of 0.5 ha per household reported by Mekonnen et al. [15] in Doyogena district. However, this result is lower than the value of 1.3ha reported by Yenesew et al. [16] for Burie District. It is also lower than the value of 2.55haper household reported by Yeshitila [14] from Alaba Woreda. The mean age of respondents in the study area was 44.59 year. Family size has positive and negative effects on economic development. Large family size with limited economic activities and income sources lead to an increase in the number of dependent groups which lead to adverse living conditions [17]. The average family size in the study area was 6.47 (Table 3). This is mainly due to labor demanding agricultural activities in the area contributed for such higher family sizes [18]. This was higher than the family size of 5.6 reported by Misginaw & Ayalneh [19] from Soro and Gombora district of Hadiya zone. The large number of persons per family is an indication of high population pressure and land fragmentation in the area [20].

Table 3 : Mean livestock holdings/household in the studied sites.

Study Kebeles							
LIH (Mean)		**Lafto Lenka**	**Debub Fonko**	**Lay Fonko**	**Demela Balbula**	**Bendelicho Kombota**	**Overall**
Cattle	Local	2.56	2.56	2.6	2.2	2.3	2.45
	Cross	-	1.5	3	1.3	-	1.86
Sheep		1.9	2.4	1	2.3	1.2	1.98
Goat		2.5	1.5	2	2.67	1	1.85
Horse		-	-	1.5	1.67	1	1.32
Donkey		1.07	1	1	1.29	1	1.05
Mules		1	-	-	1		1
Chicken							
	Local	2.25	3.5	3.5	4.25	-	3.23
	Exotic	4	2	4.5	3	8	3.8
Beehive		1	3.3	1.3	2.5	1	2.1

NB: LIH=livestock holding; LH=land holding; AR=age of respondents

according to survey result the average cattle, sheep, goat, horse, donkey and chicken was 4.31, 1.98, 1.85, 1.32, 1.05 and 7.03, respectively. Cattle, sheep, and equines (donkeys, horses and mules) are reared in the study area, but the types of livestock owned vary considerably from one wealth group to the other. Due to a lack of grazing land, households tend to keep small numbers of animals and use a zero grazing system for feeding their livestock. In agreement to this result, study conducted by Nina Österle et al. [21] indicated that stock sizes were particularly high in area where most people had access to large communal grazing areas.

Purpose of livestock production

Cattle are one of livestock kept in Ethiopia. There is a wide range of reasons for which households keep cattle [19]. The reasons vary across ethnic groups, agro-ecological and socio-economic conditions [22]. Most farmers in the study area keep cattle for draught and income (37%). About 30% of respondents keep cattle for income and home consumption. As expressed by respondents during discussion, they use oxen for ploughing land during cropping season and then use these oxen for fattening purpose after cropping season accomplished.

According to respondents small ruminant are kept for home consumption (66.1%). As expressed by respondents they keep small ruminants for slaughtering to religious sacrifice. Chicken in the study area is kept primarily for income and home consumption (40.6%). All equines are used for transportation (100%) of human and farm products from and to market. Likewise, [23] reported that livestock are used for draft power,

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milk, meat, skin and hides, and they are also the main sources of income.

Available feed resources

Natural pasture, crop residue, improved forage, fodder tree and non-conventional feeds (Table 4) are the major feed resources for livestock in the study area and shows varied availability in different seasons [24]. Natural pasture (94%) was the main feed resource during the wet season whereas crop residue (59%), in the dry season. This indicates that animals are undernourished because of fluctuating supply of nutrients, insufficient intake of available feeds or from inherent deficiencies in the available feeds [14]. This result is agree with [15] who reported crop residues and natural pastures are the main sources of livestock feeds in Lemo district.

Table 4 : Reasons of keeping livestock in the study area.

Parameter (%)	Cattle	Small Ruminant	Equines	Chicken
Draught power	1	-	-	-
Home consumption	5	66.1	-	31.3
Draught and income	37	-	-	-
Income and home consumption	30	22.6	-	40.6
Consumption, draft and income	25	-	-	-
Income	-	-	-	28.1
Others	-	11.3	-	-
Transportation	-	-	100	-

NB. NP=natural pasture, CR=crop residue, FT=fodder tree, H=hay, IF=improved forage

More utilization of improved forage was noticed in dry season than in wet season. The similar results was reported by Feleke et al. [24] that the main feed resource is natural pasture during the wet season whereas crop residue and conserved hay in the dry season in shashogo woreda. All ruminants as well as the equines depend on two major feed resources, namely natural pasture and crop residues [25]. Agro-industrial by products like wheat bran is used for lactating animal by some farmers especially for cross breeds. As expressed by farmers they have interest to follow market-oriented dairy cattle production using supplementary feed. But, they cannot implement their idea in practice due to feed shortage less accessibility and high price of agro-industrial by products.

During dry season farmer allot their cattle to graze at aftermath, road side and rive side. As explained by respondents they suffer feed shortage during the beginning of rainy season because cultivation land is ploughed for cultivation and covered by crop and animals are restricted from access to grazing land. Therefore, farmers tether their animal around their house and bring pasture grown between Enset. They also feed weed for animals obtained from different crops. In agreement with this result, [26] reported that there is severe feed shortage during the dry season and at the start of the rains. In addition to this, only 4% of respondents have private grating lands. Private grazing land owners were those peoples who hold large land size.

In the study area farmers' storage of crop residue different from one are to another. In most parts of the study area, farmers use shade (79%) to store crop residue. As explain by farmers storage under shade is one of mechanism to minimize wastage of crop residue due to stray animals. In another part of the study area farmers simply stack crop residue in front of their house. Most farmers (79%) do not prepare hay for dry period of the year because of less availability of land for harvesting grass which can be preserved as hay. However, some farmers have experiencing of preserving grass as hay. Those farmers who were preparing hay were purchase grass from compounds of religious place and government institution like schools. For harvesting hay grass they use eye opinion.

Non-conventional feeds resource refer to all those feeds that have not been traditionally used in animal feeding and/or are not normally used in commercially produced rations for animals [27]. Non-conventional feeds like banana leaves, Enset leave, sugar cane,chat and avocado leaves were also used as feed in the study area (Table 5). About 20% of respondents were used non-conventional feed for their animals. In the past farmers use Enset part for animals especially for stressed cattle due to feed shortage, milking cow and oxen. Fodder trees (heba-local name) are used as source of feed in dry season. At this time farmers lost Enset plant due to disease and need attention in which farmers are depend on this plant to sustain their life. This loss of Enset plant exacerbates food security in the study area combined with cultivation land shortage.

Communal grazing land availability

A result on grazing land is present in (Table 6). In the study area only 37% of respondents replied that there was communal grazing land in the study area. In general, all respondents (100) indicated that communal grazing land was decreasing in size. As expressed by respondents now day communal grazing lands is used for construction of religious place and government institutions like farmers' demonstration site and school. Similar to this result, Berhanu et al. [28] reported that the importance of natural pasture is gradually declining because of the expansion of crop production into grazing lands, redistribution of common lands to the landless and land degradation. Similarly, Ahmed et al. [12] reported that the size of the grazing land is decreasing over time with the expansion in farmland size, which is a result of the increase in human population. Thus, because of less availability of communal grazing land farmers keep small number of animals. The livestock holding per household is decreasing from year to year due a gradual decrease in the area of grazing land [29].

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Table 6: Use of non-conventional feed and conservation of hay in the study area.

Variables	Frequency	Percentage (%)
Use of non-conventional feed		
Yes	20	17
NO	80	80
Non-conventional feed type		
Sugar cane	1	5
Banana leaves	2	10
Enset leave	8	40
Heba (local name)	2	10
Sugar cane and Enset leaves	2	10
Chat and avocado leaves	2	10
Enset and heba (local name)	3	15
Conserve feed		
Yes	21	
NO	79	
Types of conserved feed		
Crop residues	79	79
Hay and crop residue	21	21
Hay and crop residue storage methods		
Stacked outside	21	21
Stacked under shade	79	79

Improved forage species

Survey result on improved forage species is presented in (Table 7). There are many different ways of forage development techniques to be adopted to cope up feed scarcity periods by small holder farmers even though the extent of these techniques usage by farmers of our country is quite minimal [14]. From total respondents, about 48% were planted improved forage. Therefore, the trend of improved forage utilization in the study area calls for effective extension service to encourage farmers to grow improved forage species [24]. Similarly, Ahmed et al. [12] reported that only 35% of households use improved forage to alleviate feed shortage during the dry season sin the Central Highlands of Ethiopia. Most farmers around demonstration sites of forage development and main road side have a chance to plant improved forage. This indicates that farmers around this area have access to forage species and extension service by development agents. Therefore, development agents use this area as escape mechanism from their boss critic. As expressed by respondents during discussion extension workers give much attention for model farmers and adoption of this technology depends on distance from farmers' demonstration site [30].

Table 7: Communal grazing land availability and its status in the study area.

Is there Communal Grazing Land in Your Area	Frequency	Percentage
Yes	37	37
No	63	63
Status of communal grazing land		
Decreasing	37	100
Do you have private grazing land		
Yes	4	4
No	96	96

The major forage species widely planted in the study area were dasho grass, elephant grass, guatemala grass, and sesbania and tree lucerne. From sampled households, 31.0% of respondents have planted mainly dasho grass indicating that the use of dasho grass is common in the study area. This indicates that this species of improved forage is suitable for this agro-ecology. This result is similar with the result of Feleke et al. [24]) from Shashogo Woreda. Likewise, Ashenafi et al. [15] also reported that desho grass is the dominant improved forage produced under different forage development options including soil and water conservation structures in Lemo districts of Hadiya zone. Respondents explained that they mostly plant forages under their fence because of shortage of lands. There are also few farmers who allocate land for improved forage plantation [31].

Most farmers plant forage for utilizing as animal feed. In addition, farmers also use improved forage species for soil and water conservation, fencing and as a wind break and as ornamental plant (tree lucerne). Tree lucerne is common forage around debubfonko as ornamental plant. Similar result has been reported by Feleke et al. [24] that farmers in Shashogo Woreda use forage as animal feed, soil and water conservation, and fencing and as a wind break. According to respondents cut and carry system (100%) was the main ways of utilizing improved forages. Farmers also give high priority for lactating cows (95.8%) followed by pregnant and fattening cattle (4.2%) during feeding this forage. This indicated that farmers prioritize forage utilization in feeding sensitivity [24]. According to Ahmed et al. [12] some households feed improved forages to crossbred cows in the form of cut and carry and hay in the Central Highlands of Ethiopia [32].

Constraints of improved forage adoption

A survey result on constraints of forage adoption in the study area is presented in (Table 8). According to respondents shortage of land (28.8%) was identified to be the major constraints of improved forage adoption in the study area followed by shortage of forage seed (13.5%). Lack of awareness is also another

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constraint expressed by the farmers. Poor extension services was also another constraint which need to be alleviated [18]. The result is in agreement with the finding of Yeshitila [14] from Alaba woreda in which farmers do not adopt improved forage technology due to shortages of land, seeds, lack of awareness and no effort made to introduce these technologies. Similar to this result, Endale [18] also reported that the major reasons for not planting improved forage in Robi District was shortage of land (42.4%), shortage of forage seeds (24.3%), lack of awareness (26.4%), unevenness of rain fall (5.6%) and lack of interest of farmers (1.1%). Likewise, Shortage of land, lack of awareness and the increased price of forage seed were the main constraints that hinder the adoption of improved forage in Shashogo Woreda of Hadiya zone [24]. According to ESAP [25] lack of planting material, poor experience and land shortage were identified as the major reasons for not growing improved forages in Adaa Liben district. Extension service is important way to expand adoption of this technology but study result indicates that only 51% of respondents have access to extension service. This can contributes to low delivery of information to farmers. Therefore, farmers in the study area lack awareness on the importance of this improved forage production.

Table 8: Common improved forage species in the study area.

Parameter (%)	Frequency	Percent
Plant improved forage		
Yes	48	48
No	52	52
Forage Species		
Elephant grass	3	3
Dasho grass	31	31
Elephant, Dasho and sesbania	4	4
Elephant &densho	4	4
Elephant, Dasho, Guatemala,Tree Lucerne	4	4
Dasho & Sesbania	2	2
Utilization system		
Cut and carry system	48	100
Livestock class		
Lactating cows	46	95.8
Lactating cows, pregnant & fattening cattle	2	4.2

Major livestock production constraints

Major livestock production constraints in the study are presented in (Table 9). In the study area, livestock feed shortage (88%) was the major problem followed by water shortage (12%). In addition to this, disease and low productivity was also identified as constraint in the study area. This is in agreement with the result of Endale [18] in which feed shortage, animal diseases, water shortage, shortage of artificial insemination, veterinary services, extension services, market and poor genetic potential of the animals was major problem for livestock production in Meta Robi District of West Shewa Zone [33] (Table 10).

Table 9 : Constraint of improved forage adoption in the study area.

Parameters (%)	Frequency	Percentage
Extension service		
Yes	59	59
No	41	41
Constraints		
Shortage of land	15	28.8
Shortage of forage seed	7	13.5
other	2	3.8
Seed shortage & not aware	7	13.5
seed shortage, land shortage & not aware	2	3.8

Feed problem is one of the major factors that hinders the development and expansion of livestock production [12]. As observed in transect walk, pond was prepared in some parts of study area to collect water at rainy season to overcome water shortage at dry season. Most rivers are seasonal and peoples use spring and ground for home consumption. Some farmers have good habit of digging ground water around their compound. Sometimes they use ground water for animal especially for birth giving ewe, stressed cattle due to feed shortage, very young caves and early lactation cows which are mostly tethered around their compound.

Table 10: Major livestock production constraints in the study.

Parameter (%)	Frequency	Percentage
Constraints		
Feed shortage	88	88
Feed and water shortage	12	12
Cattle production system		
Extensive	56	56
Semi-intensive production	44	44

Conclusion

In the study area livestock production is one of main agricultural activity and play great role in livelihood of farmers. However, animal feed shortage is one of leading constraint that hamper productivity of this sector. Farmers in the study area have less access to communal grazing land for their animal. Available feed is also not meet requirement of animals both in quality and quantity. Because of less accessibility of grazing land farmers keep small number of animals and their number decreases from time to time. Efficient utilization of available feed resource and adoption of new technology support farmers to maximize and sustain productivity of livestock. Integration of improved forage technology in farming system can support farmers in different way. However, farmers in the study area not widely adopt

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improved forage technology due to shortage of land, shortage of forage seed, lack of awareness and poor extension services. Therefore, it can be recommended that increasing accessibility of forage seed and creating awareness on importance and possible ways of integration in farming system is important for extensive adoption of this technology in the study area.

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