Agric. Sci. Digest., 38(4) 2018: 280-284
Print ISSN:0253-150X / Online ISSN:0976-0547

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
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# Improved forage production practice and challenges in Libokemkem District, Ethiopia

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Received: 20-08-2018 Accepted: 25-12-2018 DOI: 10.18805/ag.D-133

## ABSTRACT

Cross sectional study was conducted with the objective of assessing improved forage production practice and challenges faced by farmers. Both random and purposive sampling techniques were used to select respondents in the district. The collected data were analyzed using statistical package for social science version 16. The major feed resource in the dry season was crop residue (Index value = 0.312) and natural pasture in wet season (Idex value=0.392). Majority of the households (55.6%) were not cultivating improved forage and the most frequently cultivated improved forages were elephant grass (Index value 0.211), rhodes grass (Index value 0.163), and dasho grass (index value 0.155). Shortage of land, lack of input, lack of awareness, and poor extension service were the challenges faced by farmers in their descending order of importance. From this result it can be concluded that improved forage production practice is poor and strong extension service delivery is recommended.

**Key words:** Challenge, Extension, Forage, Improved, Practice, Production.

## INTRODUCTION

Ethiopia has large livestock population in Africa, contributing considerable portion to economy of the country and still promising potential for the economic development of the country. The subsector contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP.

An estimate indicated the country is a home for about 56.70 million cattle, 29.33 million sheep, 23.11 million goat, 2.03 million of horse, 0.40 millions of mule, 7.42 million donkey, 1.16 million camel, 56.86 million chicken and 5.88 million beehives (CSA, 2015). The GDP of livestock related activities valued at birr 59 billion supporting and sustaining livelihoods for 80% of all rural population (Metaferia, *et al* 2011) . It also contributes 15% of export earnings and 30% of agricultural employment(Behnke 2010).

Despite the huge livestock population, the production and productivity of this sector is low mainly due to several factors such as genetic makeup, poor nutrition and poor veterinary care. Feed scarcity both in quantitative and qualitative dimensions is one of the major constraints for the promotion of the livestock sub-sector in Ethiopia (Tadesse 1990). In many areas 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 available grazing lands are decreasing in size and quality particularly in the highlands due to high population.

Poor livestock productivity in Libo Kemkem district is a common tragedy with the country and the reason is the same. Farmers grow diversified crops and usually produce a mixture of crop residues including the cereal straws like tef, wheat, barley, millet, maize, and sorghum. As a result crop residues are the major feed sources particularly in the long dry season. However, their nutritional value is poor which needs treatment and supplementation to improve their feeding value. One way of supplementation of crop residue is with improved forage and fodder trees. However, the improved forage production in the study area is not yet investigated. Therefore this study was initiated with the general objective of assessing the improved forage production practice and challenges faced by farmers in the area.

## MATERIALS AND METHODS

**Description of the study area:** The study was conducted in Libo Kemkem district, south Gondar zone of Amhara National Regional State, North western Ethiopia (Fig 1). It has an area of 1,560 km$^2$ and the total population of the district is 198, 951 of which 100,951 are males and 97,423 are females. It is located at 11°57' 46.6''-12° 25' 32.6'' N latitude and 37 º 34' 48.9''-38 º 3' 30.9'' E longitudes. The altitude of the district ranges from 1,800 to 3,000 meters above sea level and the temperature ranges from 18ºC to 25ºC. The area receives an average annual rain fall ranging from 900 to 1400 mm. From the total area of land, 51% is cultivable, 8.3% pasture, 5.9% forest or shrub land, 17.98%

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covered with water, and the remaining 17.03% is considered degraded or other. The livestock populations of the district are estimated to be 115,453 cattle, 36,448 goats, 17,939 sheep, 371 horses, 461 mules; 1,220 donkeys; 75,972 hens and 10,337 bee hives.

**Sample size and sampling technique:** Both purposive and random sampling techniques were used; purposive sampling technique was used to select, individual households owing livestock while random sampling technique was used to select representative peasant associations. Three peasant associations (PAs) namely, Asta mariam, Derita, and Angot which have higher livestock populations were selected. From each selected peasant associations (PAs); 45 respondents were selected by using simple random sampling technique, and made a total of 135 households; to identify improved forage production practice and challenges faced to do so in the district.

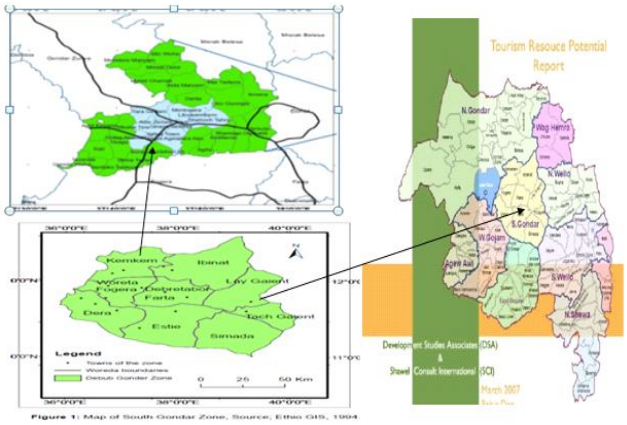



**Fig 1:** Map of the study area.

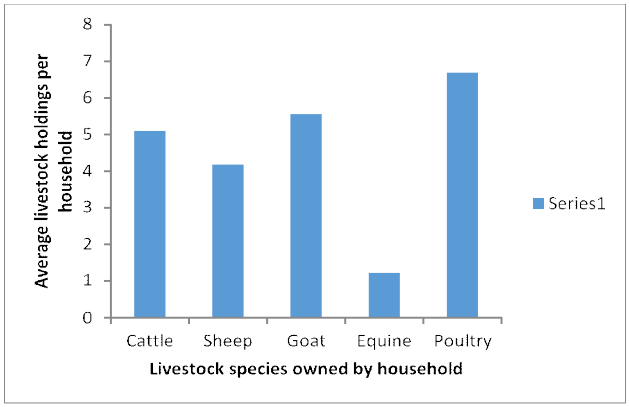



**Fig 2:** The average livestock holding of respondents.

**Method of data collection and analysis:** The data was collected through interview using semi structured questionnaires, group discussions and direct observations. Both qualitative and quantitative data was collected and analyzed by using statistical package for social science (SPSS version 16). And ranks also analyzed by index ranking system with Microsoft excel. The analyzed results was summarized by the use of mean, frequency, percentage and presented in the form of table.

## RESULTS AND DISCUSSION

**General socio-economic characteristics of households:** The study showed that more than 55% of the respondents were in the range of productive age 25-54 years old (Table 1) which also indicated as labor was not a limiting factor to produce forage. The illiteracy level of the respondents was found to be 55.6%. This might be a factor for the reported poor practice of improved forage production. This result was supported by Dandekar, and Kammar, S. K. (2016) that education and age of farmers were found significant and positive factors influencing adoption decisions of farmers in the adoption pattern of improved pigeonpea varieties. Land was the most important limiting production factor in the study area and the landholding per household was small (Table 2). The mean chicken holding was the dominant, followed by cattle, goat and sheep, in descending order (Fig 2). This variation might be attributed by availability of water and grazing lands, prevalence of diseases and parasites as well as the management of the livestock owner as it has been reported earlier (Desta and Coppock 2002). According to this study, all the livestock population were indigenous and there was not any cross breed or exotic breeds.

**Major feed resources in the study area:** The major feed resources for livestock in the study area were natural pasture, crop residue, improved forage, conserved hay and non-conventional feeds like byproducts of local drinks coffee, *areke*, *tella*, pulps of fruits and vegetables. Natural pasture

**Table 1:** Qualitative socioeconomic characteristics of the respondent.

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| Age | 15-24 | 12 | 8.9 |
| | 25-54 | 75 | 55.6 |
| | 55-64 | 33 | 24.4 |
| | >64 | 15 | 11.1 |
| Educational Background | Illiterate | 75 | 55.6 |
| | Attend Elementary School | 42 | 31.1 |
| | Attend Secondary School | 18 | 13.3 |
| Agriculture respondents Engaged In | Livestock Production only | 15 | 11.1 |
| | Crop Production only | 18 | 13.3 |
| | Mixed Production | 102 | 75.6 |

was the main feed resource during the wet season whereas crop residue and conserved hay, in the dry season. The same results have been reported before (Assefa *et al* 2015).

This study indicated that crop residues and natural pasture were most common. This might be due to the limited or almost nonexistence of grazing land as a result of intensified utilization of land for crop cultivation. This result was supported by findings reported for the Eastern Hararghe highlands (Abate and Yami 2000). It was reported by the respondents that animals are taken from high lands to lowland for grazing during the wet season when crop residues are scarce. The same result of moving animals from place to place to alleviate feed fluctuations across seasons were also reported (Elias *et al* 2015).

Many researchers and development workers agreed that natural pasture comprises the largest feed resource, but estimates of the contribution of this feed resource vary greatly. Some research out puts indicated natural pasture provides 80–85% of the total feed (Alemayehu 2004). Though there was not quantification of contribution, this study revealed that natural pasture got the first rank in wet season (index value=0.392). But in dry season, it ranks second following crop residue (Table 3). However the rapid increase of human population and increasing demand for food are steadily shrinking grazing lands by being converted to arable lands. Because of this; currently grazing is restricted to areas that have little farming potential such as hilltops, swampy areas, roadsides and other marginal land. Improved forage production and utilization got the 4$^{th}$ rank both in dry and wet season. In fact this practice should have to be high in the dry season to supplement crop residues.

Crop residues contributed the largest share of feed resource which was available throughout the year. Communal grazing land was available in wet season than dry season. October to December are months when most common feeds are surplus (Table 4).

**Improved forage production practice:** The main forage species widely produced in the study area were elephant grass, vetch, oat, rhodes grass, sesbania, dasho grass and leucaena with their decreasing order of availability. Majority of the households (55.6%) were not cultivating improved forage, whereas the rest (44.4%) of respondents were cultivating one or more of the improved forages (Table 5).

As reported by the respondents, only a small area of land was allocated for forage development. This poor practice of forage development might be challenged by resource and technology limitations. A study conducted in north east highlands of Ethiopia showed that the resource endowment of households like farm size, livestock ownership and labor available had a positive and significant effect on the adoption of forage technologies(Beshir 2014). Apart from utilizing for feed, all farmers practicing forage production also use improved forage species for soil and water conservation (desho grass), fencing and as a wind break (Sesbania and Leucaena).

**Table 2:** Land holding and family size of the respondents.

| Variables | | Mean ± SD |
|---|---|---|
| Land Holding (hectare) | Cultivated land | 2.81±1.00 |
| | Grazing land | 0.44±0.35 |
| Family Size (Number) | | 4.76±2.09 |

**Table 3:** Livestock feed resources in their order of availability in dry and wet seasons.

| Feed Resources | Season | | | |
|---|---|---|---|---|
| | Dry Season | | Wet Season | |
| | Index value | Rank | Index value | Rank |
| **Natural pasture** | 0.151 | 2 | 0.392 | 1 |
| **Hay** | 0.200 | 3 | 0.152 | 3 |
| **Crop residue and aftermath** | 0.312 | 1 | 0.242 | 2 |
| **Improved forage** | 0.140 | 4 | 0.101 | 4 |
| **Industrial byproducts** | 0.104 | 5 | 0.052 | 6 |
| **Non- conventional feed resource** | 0.093 | 6 | 0.061 | 5 |

**Table 4:** Availability of livestock feeds across the year in the study area.

| Feed type | MONTHS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG |
| **Crop reside** | - | + | + | + | + | + | + | * | * | * | - | - |
| **Aftermath** | - | + | + | + | * | * | * | - | - | - | - | - |
| **Hay** | - | + | + | + | + | + | * | * | * | - | - | - |
| **G. Forage** | + | * | - | - | - | - | - | - | - | * | + | + |
| **NCFR** | * | + | + | + | + | + | + | - | - | * | - | - |
| **CONC feed** | + | + | + | + | + | * | * | * | - | - | - | - |

$^{+}$Months with high feed available; $^{*}$months with good available; $^{-}$months with low feed available.

**Purpose of improved forage production:** Improved forage cultivation was practiced for the purpose of source of animal feed, soil conservation, crop rotation, wind break, fence and for fuel in descending order of their importance (Table 6). The leading purposes of forage production was for animal feeding and soil and water conservation. Soil conservation being the second purpose of forage production can improve and maintain soil fertility which again minimizes diminishing grazing pastures for crop cultivation. This is because poor soil fertility is key reason for increasing demand for arable land expansion (Bezabih *et al* 2016). Using improved forage Production for soil conservation might be due to the recent campaign to soil and water conservation in the country. The same result has been reported in Lay-Armachuho district of Amhara region, in the north-western highlands of Ethiopia, and Sidama district of Southern region, in the southern highlands of Ethiopia that farmers' preference criteria encompass multiple objectives beyond feed value and soil rehabilitation (Mekoya *et al* 2008).

**Challenges to improved forage production:** According to this study, adoption of improved forage bear different constraints as indicated in Table 7. Land shortage is one of the major constraints of improved forage production in the study area. This is a problem because farmers do not want to take land away from food production for other uses. The shortage of land is likely to become escalating as the population continues to grow (Teshome 2014). There is therefore a need to intensify agricultural production and increase productivity per unit of land to overcome the problems of land shortage. Input problem which includes lack of capital to purchase improved forage seed was the second constraint (index value= 0.196) reported by the respondents (Table 7). Lack of knowledge or awareness is another constraint identified by the farmers as a problem with improved forage production. This again was shown by poor extension services as another fourth ranked constraint (index value = 0.160) which needs to be alleviated. It is obvious that extension service is an important pillar in the transformation of subsistence agriculture to market oriented agriculture. (Gebremedhin *et al.* 2006).

Despite the apparent potential of forage technologies, adoption by farmers has often been poor. Often the problem is not only lack of supply of new technologies but also the poor adoption of existing technologies. Moreover, poor productivities of forage species used after expensed many resources by farmer was another problem. This might be due to the use of forage species inappropriately with respect to the ranges of altitude or poor soil fertility. In contrast to the result of this study, land and labor, and market integration and crop intensification were important factors encouraging adoption of forage technologies (Gebremedhin *et al.* 2003). Actually labor was the least ranked challenge of improved forage production and was most raised by older farmers.

**Table 5:** Improved forage species produced in their order of availability in the study area.

| Cultivated forage | Index value | Rank |
|---|---|---|
| Elephant grass | 0.211 | 1 |
| Rhodes grass | 0.163 | 2 |
| Dasho grass | 0.155 | 3 |
| Susbania | 0.146 | 4 |
| Vetch | 0.129 | 5 |
| Oat | 0.119 | 6 |
| Luecern | 0.077 | 7 |

**Table 6:** Purposes of improved forage production by farmers in the study area.

| Variables | Index value | Rank |
|---|---|---|
| Soil conservation | 0.305 | 2 |
| Forage | 0.374 | 1 |
| Wind break | 0.115 | 4 |
| Fuel | 0.031 | 6 |
| Crop rotation | 0.121 | 3 |
| Fence | 0.054 | 5 |

**Table 7:** Challenges faced by farmers to produce improved forage in the study area.

| Variables/factors | Index values | Rank |
|---|---|---|
| Shortage of land | 0.221 | 1 |
| Poor extension service | 0.160 | 4 |
| Lack of awareness | 0.192 | 3 |
| Poor productivity | 0.133 | 5 |
| Input problem | 0.196 | 2 |
| Lack of labor | 0.098 | 6 |

**Conclusion and Recommendation:** From the results of the study it can be concluded that improved forage production practice of the area was poor. The main determinant factors was shortage of land, lack of inputs, and poor extension service so that lack of awareness. The main purpose of forage production was as animal feed and soil and water conservation purposes. From this conclusion, it can be recommended that immense extension service delivery may be important to improve the production of improved forage for sustainable animal production.

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