



Characterization of the Farming and Livestock Production Systems and the Potential for Enhancing Livestock Productivity through Improved Feeding in Horro District, Ethiopia

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The Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.



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The Feed Assessment Tool (FEAST) is a systematic method to assess local feed resource availability and use. It helps in the design of intervention strategies aiming to optimize feed utilization and animal production. More information and the manual can be obtained at www.ilri.org/feast

FEAST is a tool in constant development and improvement. Feedback is welcome and should be directed feast@cgiar.org. The International Livestock Research Institute (ILRI) is not responsible for the quality and validity of results obtained using the FEAST methodology.

1. Introduction

Horro district is located in Horro Guduru Wollegga Zone of Oromia Regional State, Ethiopia. Livestock production is an important component of the mixed crop-livestock system in the district. Horro cattle and Horro sheep breeds are indigenous to this area. Horro cattle are a multipurpose breed (draft power, milk and meat) and Horro sheep are known for their prolificacy and large size, compared to other indigenous sheep breeds (Galal, 1983; Duguma, 2010). The population size of both the Horro cattle and Horro sheep breeds are estimated to be 3 million each (Rege and Thawah, 1999; Abegaz, 2002). Both species are owned and managed by resource poor smallholder farmers under traditional production systems. Productivity in terms of milk and meat is very low. Cropping is expanding into swampy areas that used to be communal grazing lands with concomitant decline in grazing lands. Inadequate feed is one of the major factors contributing to the low productivity of livestock in the district (Mekonen, 2007). One of the ways of improving livestock production and productivity is through improved feeding. To achieve this, it is imperative to understand the feed resource base of a given area.

FEAST is a feed assessment tool that has been developed by the International Livestock Research Institute (ILRI) and the International Center for Tropical Agriculture (CIAT) to assess feed resource availability in a specific area. The tool helps to design site specific strategies for feed supply and utilization through technical and organizational interventions. The current survey was, therefore, conducted with the following objectives:

- To assess feed resource availability and utilization using FEAST within the context of the overall farming and livestock production systems
- To determine the potential of site-specific feed interventions in selected areas

2. Materials and Methods

2.1 Study sites

Horro district is located in Horro Guduru Wollega zone of Oromia Regional State, West Ethiopia (Figure 1), about 315 km from Addis Ababa ($9^{\circ} 34'N$ latitude and $37^{\circ} 06'E$ longitude). Total land area of the district is 77,998 ha of which grazing land is 8.3% (District Agricultural Office). The proportion of highland, midland and lowland areas in the district is about 49.8, 48.96 and 1.24 respectively. The district has one long rainy season that extends from March to mid-October with mean annual precipitation of about 1800 mm (Olana, 2006). The mean maximum and minimum temperatures of the area are $22.7^{\circ}C$ and $11.8^{\circ}C$ respectively.

The *kebeles* (villages) selected for the study were Gitlo and Lakku (representing highlands) and Oda Buluq that represented the midland areas of the district. Gitlo and Lakku are about 11 km and 7 km respectively west of Shambu town. Shambu is the capital of the Horro Guduru Wollega zone. Elevation is about 2758 meters above sea level (m.a.s.l.) for Gitlo and 2710 m.a.s.l. for Lakku. Geographical coordinates for Gitlo are $09^{\circ} 33'N$ and $37^{\circ} 03'E$ and those of Lakku are $09^{\circ} 34'N$ and $37^{\circ} 03'E$. Oda Buluq is about 15 km North West of Shambu town. The elevation of the area is about 2490 m.a.s.l. and its geographical coordinates are $09^{\circ} 38'N$ and $37^{\circ} 04'E$.

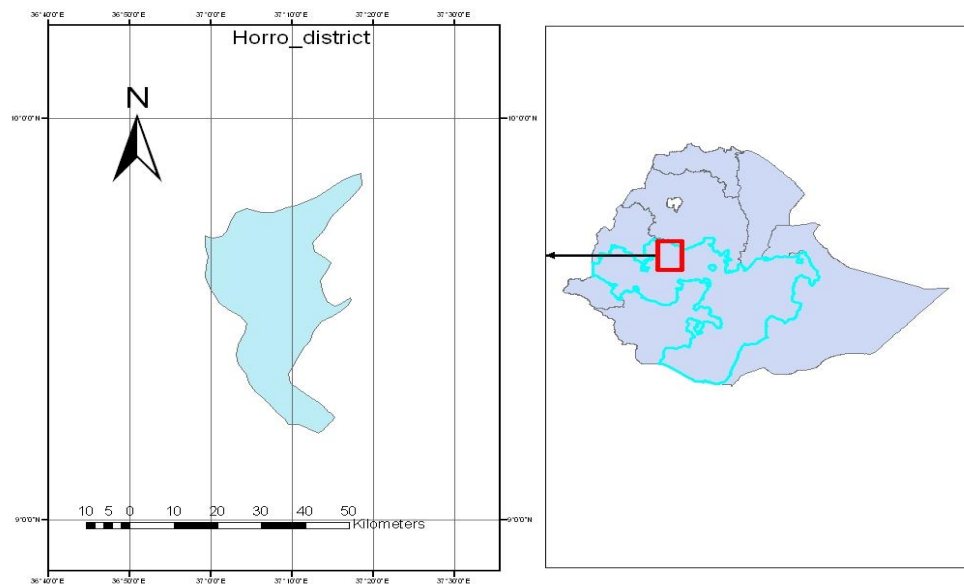


Figure 1: Map showing location of Horro district, the study area

2.2 Site selection

The study *kebeles* were identified based on secondary information obtained from the District Bureau of Agriculture and Rural Development. The *kebeles* were identified by the research team of Bako Agricultural Research Center (BARC) of the Oromia Agricultural Research Institute and the staff of Horro district Bureau of Agriculture and Rural Development. The criteria used to select the *kebeles* were: livestock population (particularly sheep) and their importance to the livelihood of the communities and accessibility to the *kebeles*.

2.3 Participant selection

Participants were selected by the research team of BARC, the staff of Horro district Bureau of Agriculture and Rural Development, Development Agents and Local Administrators. A total of 15 individuals were selected from each *kebele*. Land holding, age, education status and gender were considered in selecting the interviewees.

2.4 Data collection

Participatory Rural Appraisal (PRA) group discussions and key informant interviews were used to collect data. All selected individuals were used for the PRA group discussions. After completion of the PRA group discussion, nine individuals underwent individual interviews. The PRA group discussions focused on description of the general farming and livestock production systems and feed resource availability and utilization while the individual interviews focused on overall feed availability, quality and seasonality.

2.5 Data analysis

The quantitative data collected during individual interviews was analyzed using the FEAST excel template (www.ilri.org/feast) while the qualitative data collected using the PRA group discussions was synthesized and summarized.

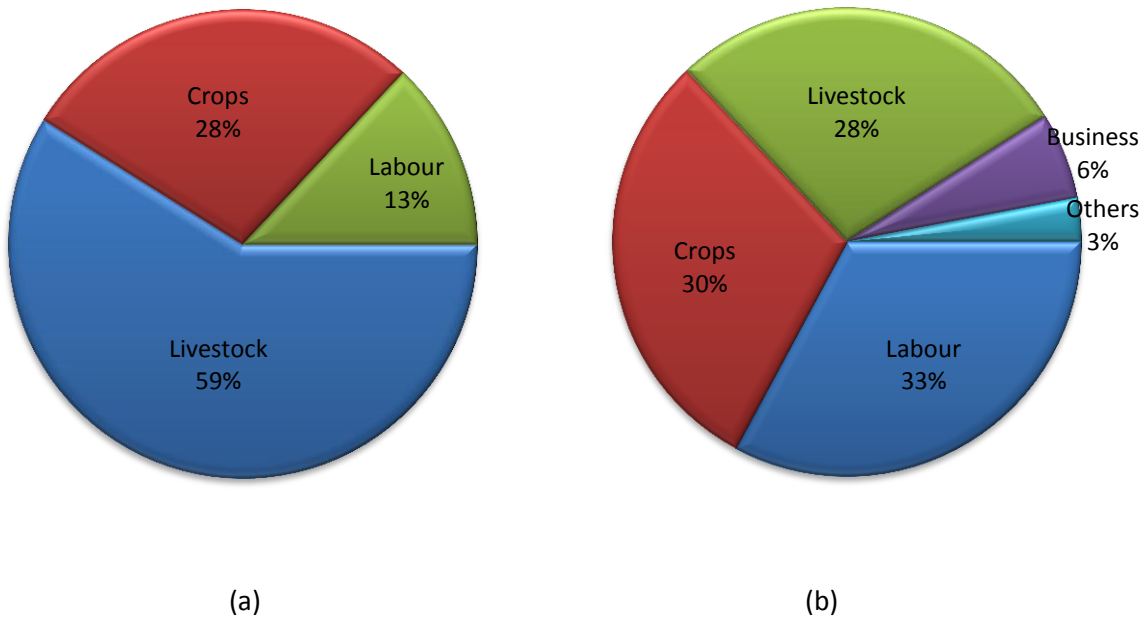
3 Results and Discussion

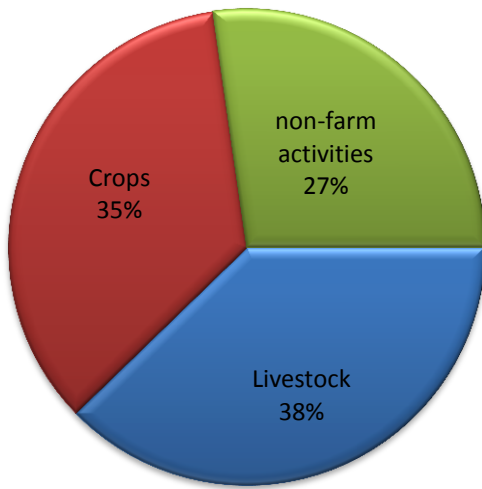
3.1 Description of the farming system

The average farm size per household (land holding) was reported to be 2 hectares (ha) for Gitlo and Lakku and about 1.6 ha for Oda Buluq. The smallest farm holdings reported in Oda Buluq is attributed to large areas of swampy lands that serve as communal grazing lands. There are about 6, 7 and 7 people in each household in Gitlo, Lakku and Oda Buluq respectively.

Farmers in all *kebeles* described one rainfall season that extends from May to September with the heaviest rainfall in July and August. There are no rains in February, March, November and December. There is only one cropping season that coincides (June - October) with the rainfall season. About 66% of households in Gitlo and 10% in Lakku have access irrigation. No irrigation was reported in Oda Buluq due to the absence of perennial rivers suitable for irrigation.

Household incomes were reported to be derived mainly from livestock and crop production. Livestock production in Gitlo and Oda Buluq contributes more to household income as compared to income derived from crop production, whereas there is comparable contribution with crops in Lakku (Figure 2). Household income from livestock is mainly from the sell of sheep, horses and butter; while potato and wheat are the major contributors from crops. The contribution from livestock reported in the current survey is lower than the 61 – 70 % reported for the Ethiopian highland systems in literature (Otte and Chilonda, 2002). The likely reasons for the disparity may be attributed to the fact that the current survey covered only specific *kebeles*, while the latter study was based on review results covering wider areas covering the vast Ethiopian highlands. In the current survey, about 13 and 33% of household income in Gitlo and Lakku respectively was from on-farm labor. There are some households that undertake off-farm activities in Gitlo and Lakku, probably due to their proximity to Shambu town.





(c)

Figure 2: Contribution (%) of livelihood activities to household incomes in Gitlo (a), Lakku (b) and Oda Buluq (c)

The major crops grown in the areas are wheat, barley, tef, field peas and faba beans (Figure 3a-c). Wheat is the dominant crop in area coverage both in Gitlo and Lakku, while tef is the dominant crop in Oda Buluq. Barley is also an important crop grown in Gitlo and Lakku. Noug was reported as one of the most important crops in Oda Buluq.

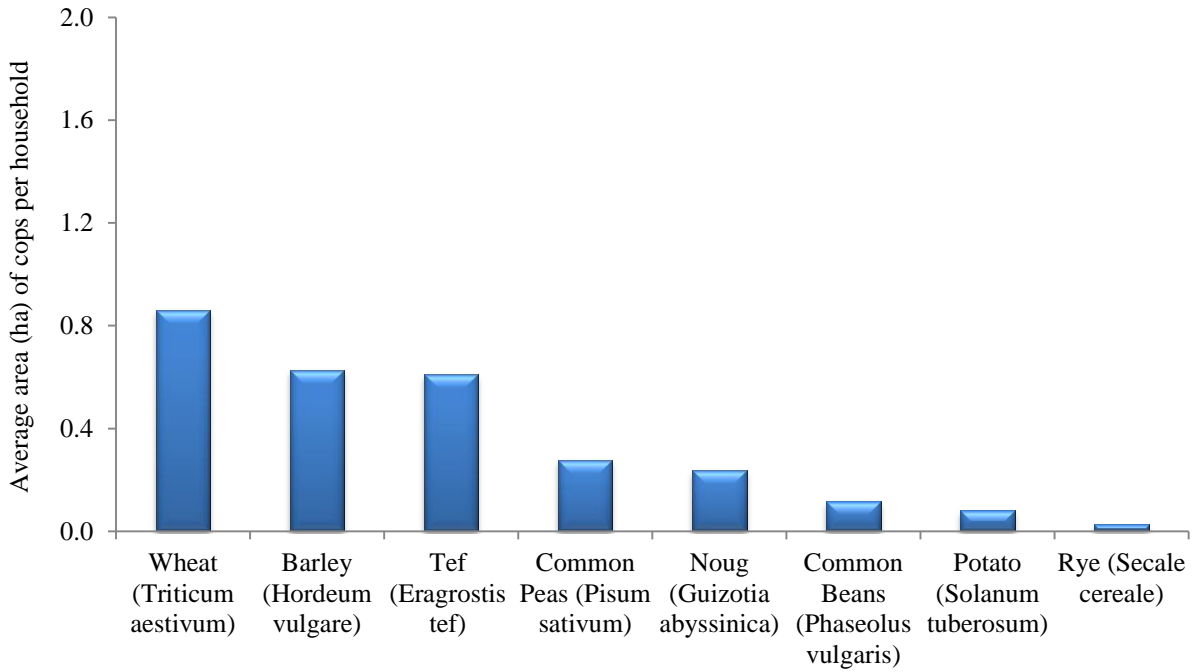


Figure 3a: Major crops grown in Gitlo

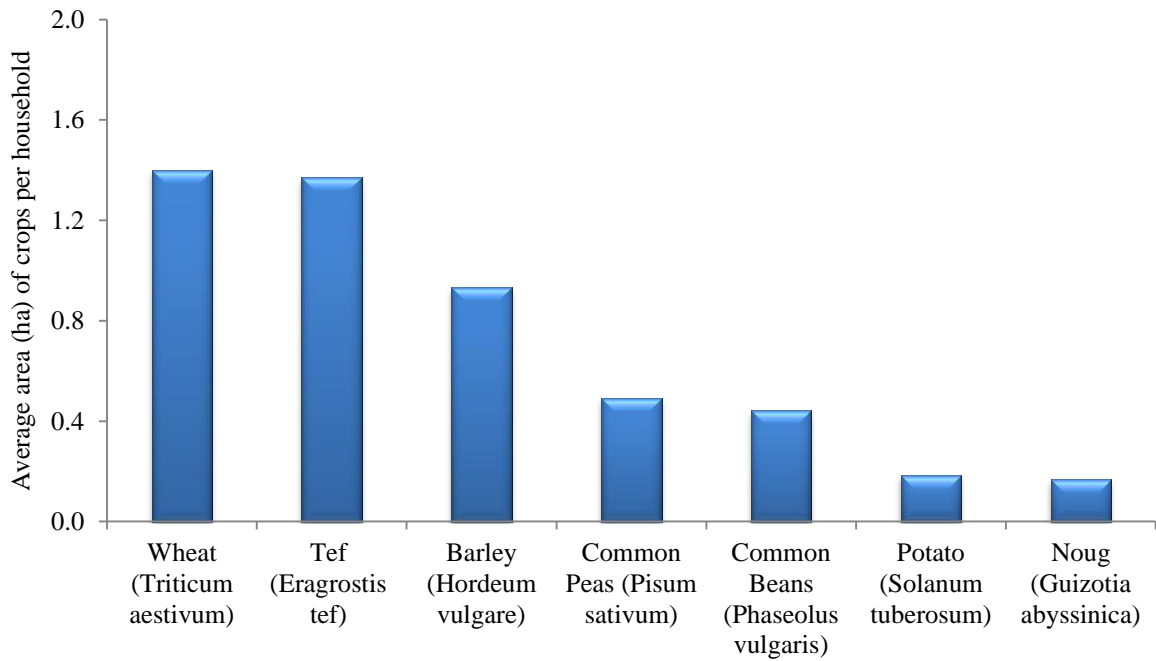


Figure 3b: Major crops grown in Lakku

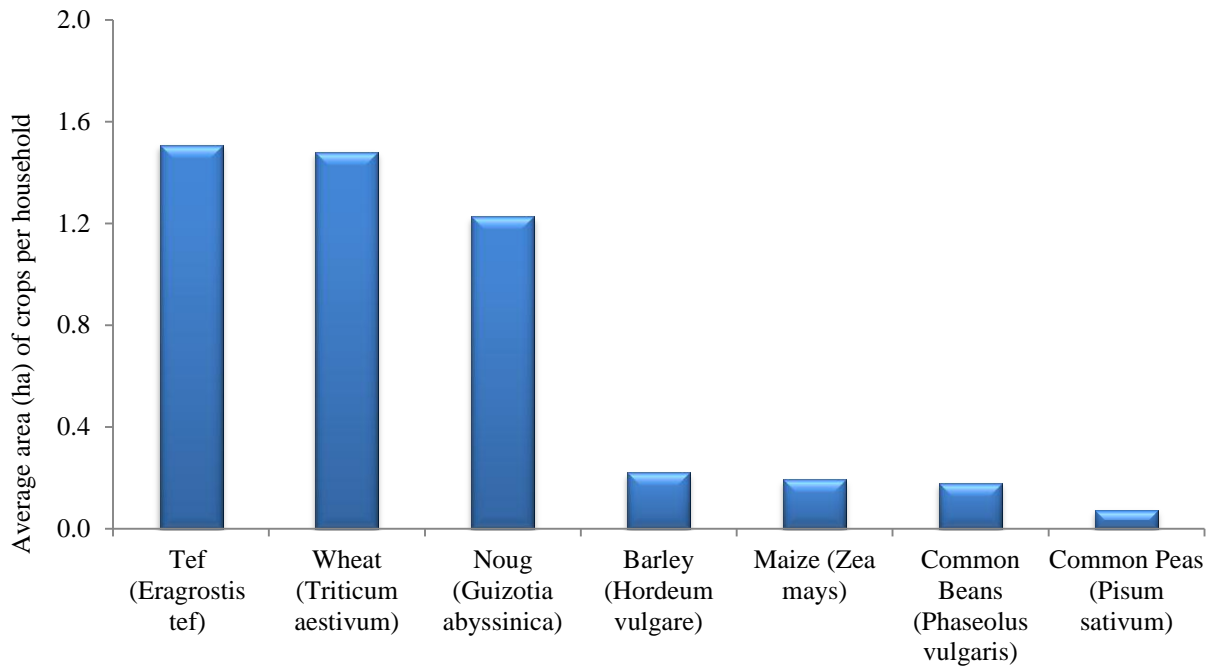


Figure 3c: Major crops grown in Oda Buluq

The main factors that influence agricultural activities in the *kebeles* are land, labor, credit/finance and agricultural inputs.

Land is one of the most limiting factors of agricultural activities in the areas. Approximately 15%, 30% and 31% of the households in Gitlo, Lakku and Oda Buluq respectively do not have any land other than where they have constructed their homes. Landless households comprise particularly younger people. Most of the land is occupied by rich and older farmers. Fallowing is not commonly practiced in the areas due to shortage of land. Leguminous crops like faba bean, field peas and noug are planted on exhausted land in order to replenish the land.

Labor is one of the major influencing factors to agricultural activities. Both family labor and hired labor are used to undertake the different agricultural activities. Hired labor is mostly required during December and January for harvesting and threshing of wheat, barley, tef and noug. Crops like faba bean and field peas are harvested using family labor. The cost of labor depends on the crop. It is highest for wheat and tef (Ethiopian Birr (ETB) 27.50; USD 1.5) followed by barley (ETB 25.50; USD 1.4) and lowest

for noug (ETB 17.50; USD 0.97)). This may be attributed to the additional activities needed (e.g. tying and piling) for tef, wheat, and barley. Based on information from respondents, labor cost has been increasing over time due to the scarcity as potential workers seek other jobs like sand and stone mining as well as house construction in the nearby towns. About 30% of the households in Gitlo engage in off-farm activities irrespective of sex.

Although there are two credit organizations in all of the areas surveyed, credit is not readily available. Group collateral is needed to access credit (i.e. a group of four or more individuals are needed). However, finding peers was reported to be difficult due to mistrust. Misuse or use of the credit money for purposes other than the purpose the money was meant for by some group members was also raised by the respondents as one of the major constraints. Farmers complained that the available credit system better suits crop production as compared to livestock production. The terms of credit terms require periodic repayment that does not match the reproduction cycle of cows or ewes (e.g. more than one year is needed for the ewe to raise marketable lambs). It is, therefore, more convenient to use the credit for the purchase of farm inputs like fertilizer and improved seeds.

Agricultural inputs such as fertilizers, improved seeds, urea for crop residues treatment and plastic sheeting are not used by farmers because of several reasons. Plastic sheeting is not available in local markets, fertilizer prices are reported to be too high while inputs like improved seeds are in short supply. According to farmers, seeds distributed to farmers through the District Bureau of Agriculture and Rural Development are not certified and they have low germination rates. The Bureau of Agriculture and Rural Development distributes seeds multiplied by farmers on their fields.

3.2 Livestock production and management

Different livestock species which serve various purposes are raised in the areas surveyed. Major livestock species raised, their uses, proportion of households that own the species and mean herd/flock sizes of each *kebele* are shown in Table 1 and Figure 4 (a-c). Cattle (indigenous Horro), sheep, horse and poultry are the most important livestock species raised in Gitlo, Lakku and Oda Buluq. Goats, donkeys and mules are only kept by few households and their numbers are also low. The absence of browse tree species is reported as a major limiting factor for goat production in Gitlo and Lakku. Natural mating is the common method of animal reproduction in the areas. Very few farmers (about 4.1%) use artificial insemination (AI) for their cows mainly to produce crossbred heifers. There is no charge for the use of local bulls, but crossbred bulls cost ETB 10.00 (USD 0.6) in Gitlo. Improved dairy cows (crossbred of Holstein and local Horro) are very few. About 3.0% of the households in Lakku have one or more crossbred animals whereas less than 1% of the households in Gitlo and Oda Buluq own such animals (Table 1). The larger number of crossbred animals observed in Lakku may be due to its proximity to Shambu town, where AI services are available.

Mean cattle herd sizes of Gitlo and Lakku are nearly similar but mean herd size of Oda Buluq is the lowest (Table 1). About 33.3% of the households in Oda Buluq do not have cattle, while in Gitlo and Lakku only about 10% and 5.9% of the households did not own cattle respectively. Proportions of

households that own draught oxen and those that practice cattle fattening are highest in Lakku and lowest in Gitlo. Almost all households in Lakku and about 97% of households in Gitlo rear sheep, but about 11.1% of the households in Oda Buluq do not have sheep. Mean flock size of sheep in Oda Buluq is lower than the other two kebeles. The proportions of households that own horses and local chicken is also highest in Lakku and lowest in Oda Buluq.

Table 1: Major livestock species owned per household; their uses, proportion of households own each species and average number of animals

Livestock species	Uses	% of households own the species	Average No of animals /household	% of households own the species	Average No of animals /household	% of households own the species	Average No of animals /household
		Gitlo		Lakku		Oda Buluq	
Local dairy cows	Traction, milk, income and manure	90	5	94.1	3	66.7	4
Improved dairy cows	Milk, traction, income from sell of male calves	0.20	3	3.8	3	0.22	1
Draught cattle	Traction, threshing and income	70	2	91.1	2	77.8	2
Fattening cattle	Income (fattened cattle fetch higher price)	3	1	14.8	1	5.5	1
Sheep	Income (twin bearers, fast reproduction and growth) and manure	97	15	100	15	88.9	8
Goats	Income (twin and triplet bearers, fast reproduction and growth) and manure	10	5	50	3	7.5	4
Poultry-village	Income (from eggs and live chicken) and consumption	90	15	97.6	5	77.8	10
Poultry-improved	Income (from eggs-lay eggs continuously) and some farmers use the eggs for chicken production (incubation is by local hens)	15	2	14.8	3	6.7	2
Horse	Transport, draft power, threshing, level/trampling of tef fields, income from selling of live animals	75	4	95.6	4	50.1	2

Donkeys	Transport (goods), some males used to sire female horses to produce mules	30	2	1.5	1	22.2	1
Mule	Transport (travel longer distances especially in lowlands and more powerful than horse), income (price is higher than horse), long life span (up to 30 years)	8	1	3	1	1.1	1

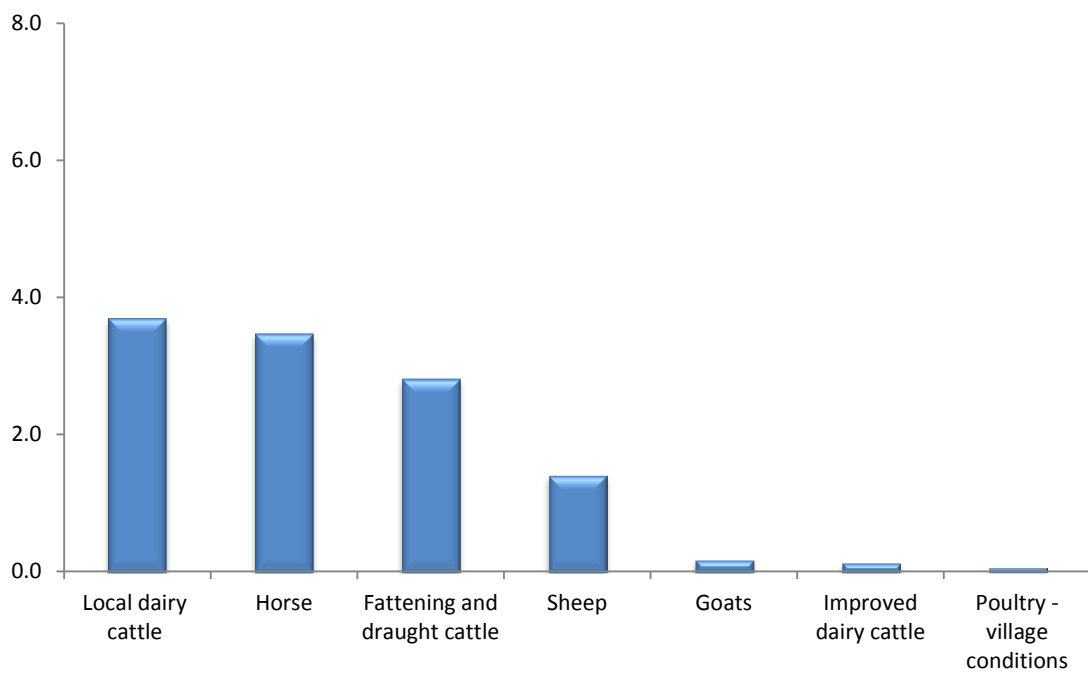


Figure 4a: Average livestock species holdings per household in Tropical Livestock Units in Gitlo

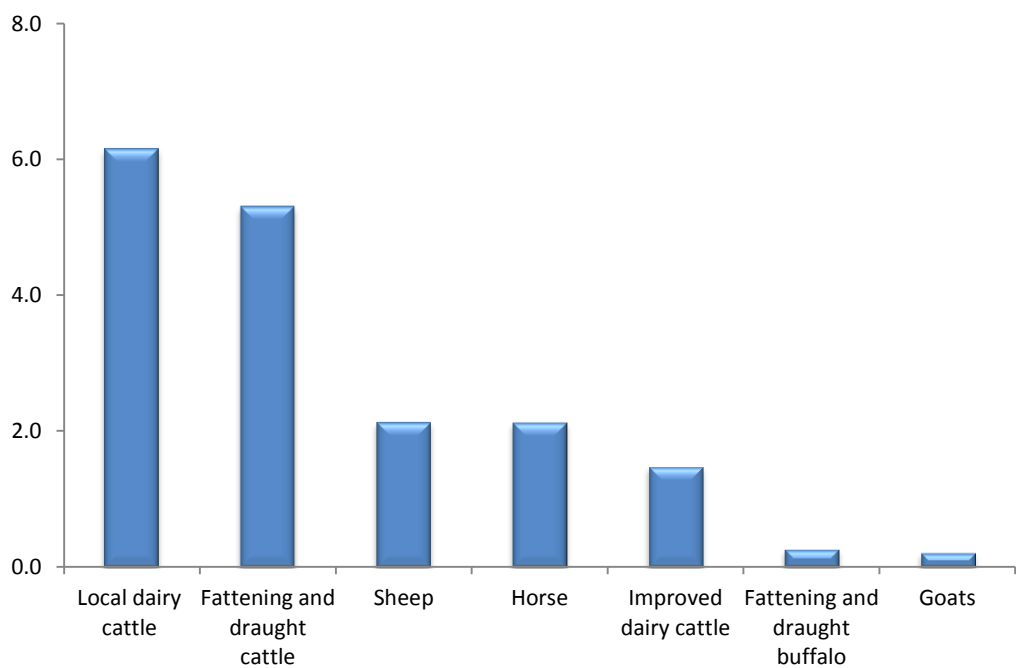


Figure 4b: Average livestock species holdings per household in Tropical Livestock Units in Lakku

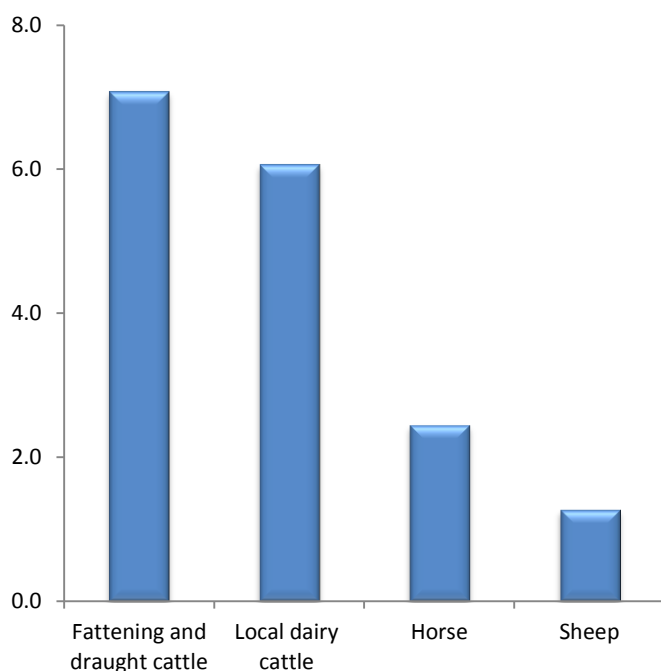


Figure 4c: Average livestock species holdings per household in Tropical Livestock Units in Oda Buluq

Different management practices (housing and feeding managements) are used for different livestock species and the different classes of animals. Small ruminants and calves are kept either in a separate houses or family houses. Large ruminants and equines are kept in kraals. Some farmers construct separate houses for oxen. Small ruminants and calves are more protectively housed because of fear of wild beasts as the farmers consider them defenseless compared to mature large ruminants and equines. In addition, some farmers believe that housed oxen would get enough rest and provide better draft performance as compared to those kept in kraals. The primary style of feeding in the area is open grazing. Herding is common during the cropping season (from August to January). During this time, neighboring households share responsibility of looking after the mixed species of animals by taking turns. Animals are left free to roam during the remaining part of the year after the harvesting season, although small ruminants are looked after by family members continuously for fear of theft. During this time, the major feeds are crop aftermath and crop residues. Feed processing is not widely practiced in the area other than collection and conservation of residues of some crops by some households.

Gitlo and Oda Buluq have a veterinary clinic each. However, neither of them is equipped with necessary equipment and drugs. Disease diagnosis was reported as one of the major problems in the areas due to the absence of laboratory facilities and skilled technicians. Treatment of animals is mainly based on observed symptoms reported by owners of the sick animals. The main veterinary services provided are drenching for internal parasites like liver fluke and lungworms and treating animals for minor health problems. About ETB 15.00 to 40.00 (USD 0.8-2.2) is needed to treat a sick animal. The cost is higher by at least ETB 10 (USD 0.6) when animals are taken to private veterinary clinics. The cost of drugs used for internal parasites ranges from ETB 1 to 3.00 (USD 0.06-0.17) both from the government and private veterinary clinics.

There is seasonality in livestock market prices in the study areas. Market prices for cattle, sheep and goats are higher in March, April and May (Figures 5-7). The peak market prices are in April which is mainly related to the Ethiopian Easter. Livestock market prices are lower in September, January, February and August for cattle; June, July and August for sheep and goats. In June and July, the supply of small ruminants increases in the markets mainly due to the pressing need for cash to purchase agricultural inputs.

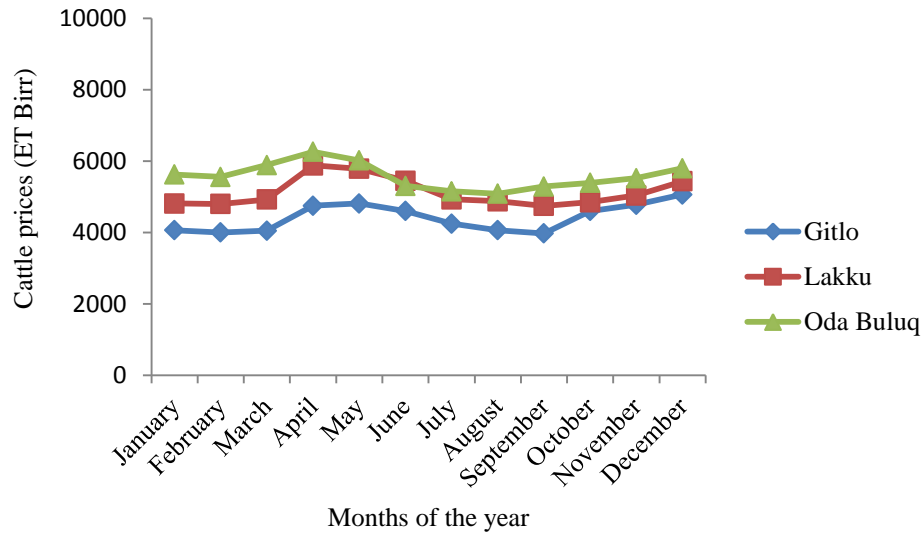


Figure 5: Seasonality of cattle prices in Gitlo, Lakku and Oda Buluq

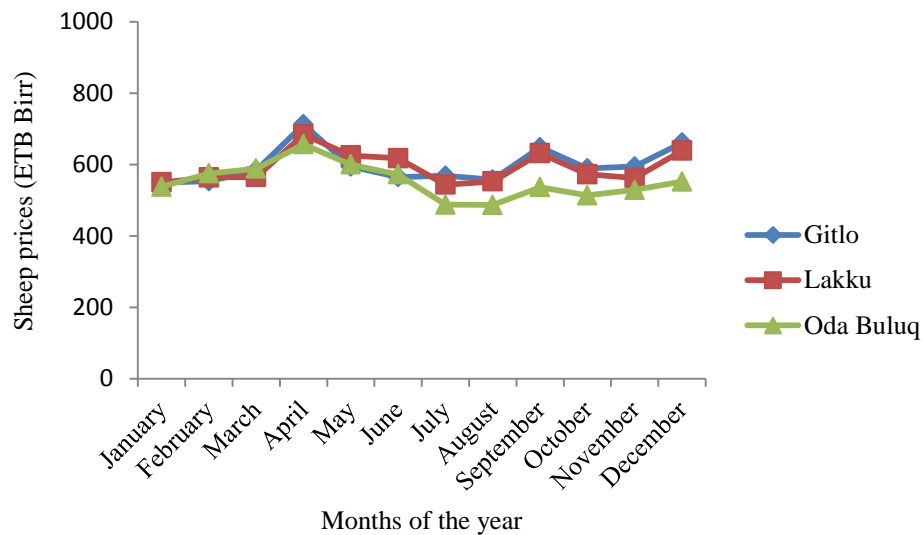


Figure 6: Seasonality of sheep prices in Gitlo, Lakku and Oda Buluq

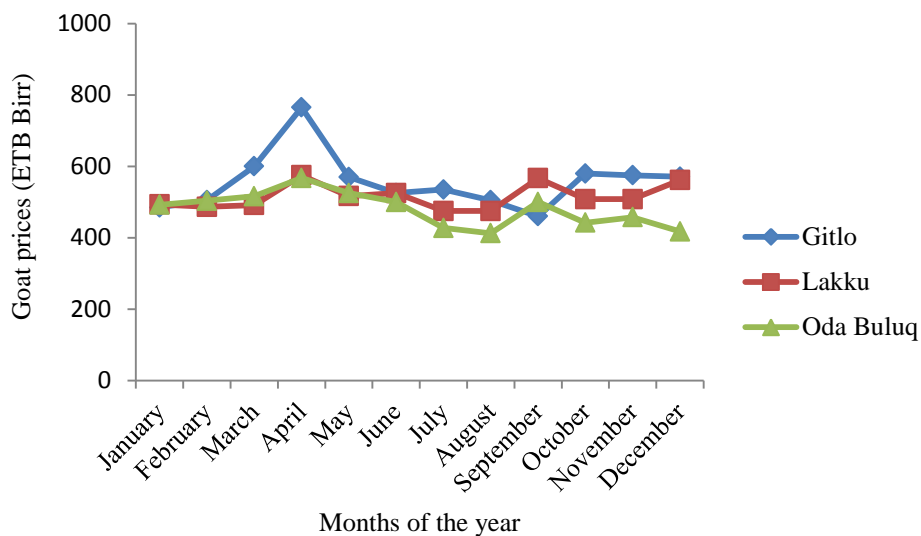


Figure 7: Seasonality of goat prices in Gitlo, Lakku and Oda Buluq

3.3 Feed resources

Major feed resources

The major feed resources are natural pasture, crop residues, crop aftermath, green fodder or hay prepared from natural pasture, in that order of importance. Naturally occurring green fodder material like weeds from cropping areas, roadsides and naturally occurring grasses also serve as sources of feeds. Grazing (natural pasture) is the most important feed sources in all the areas. Though plenty of crop residues are produced in the *kebeles* (about 6.3 to 11.7 tons of crop residues/household is estimated to be produced) due to the fact that different crops are grown in the *kebeles*, it was reported that only few farmers conserve and use residues of some crops like tef, barley and wheat. Cultivation of improved forage crops and purchase of supplementary feeds are also not commonly practiced in the areas. Common beans (3%), maize grain (32%) and noug cake (65%) were some of the purchased supplementary feeds reported in Gitlo. Maize and tef grain, green fodder and natural pasture hay (the sum of all constitute less than 10% of the purchased supplementary feeds) were also reported as purchased supplementary feeds in Oda Buluq. However, no purchased feed was reported in Lakku other than mineral salt. Castrated sheep are fed with boiled common beans (faba beans) mixed with salt.

Seasonality of feeds

Seasonality of feeds is shown in Figure 8 (a-c) for Gitlo, Lakku and Oda Buluq. Natural pasture, the major feed resources in the area, serves almost year round. However, its availability is mainly lower in April, May and June in Gitlo and Lakku; and in March, April and May in Oda Buluq. Crop residues assume the highest importance from November to July in all areas surveyed and particularly highest importance in Oda Buluq in February. Residues of tef, barley, pulses, noug and wheat are important feed sources during the dry season. In addition, maize stover is also reported as an important animal feed in Oda Buluq. Based on the harvesting index procedure, about 6.3, 8.7 and 11.68 tons of crop residues/household can be produced in Gitlo, Lakku and Oda Buluq respectively. However, it was reported that most these feed resources are not collected, conserved and properly utilized. Draught

oxen and lactating cows are fed preferentially for better draught performance and better milk production. Weeds from cropping areas and roadsides are mainly provided to young calves during the dry season. It was also reported that some farmers offer crop residues (in rainy season) before they let their animals for grazing to avoid risk of bloating. According to respondents, no incidence of bloating happens if animals are offered some dry feeds like tef straw before they are let out for grazing.

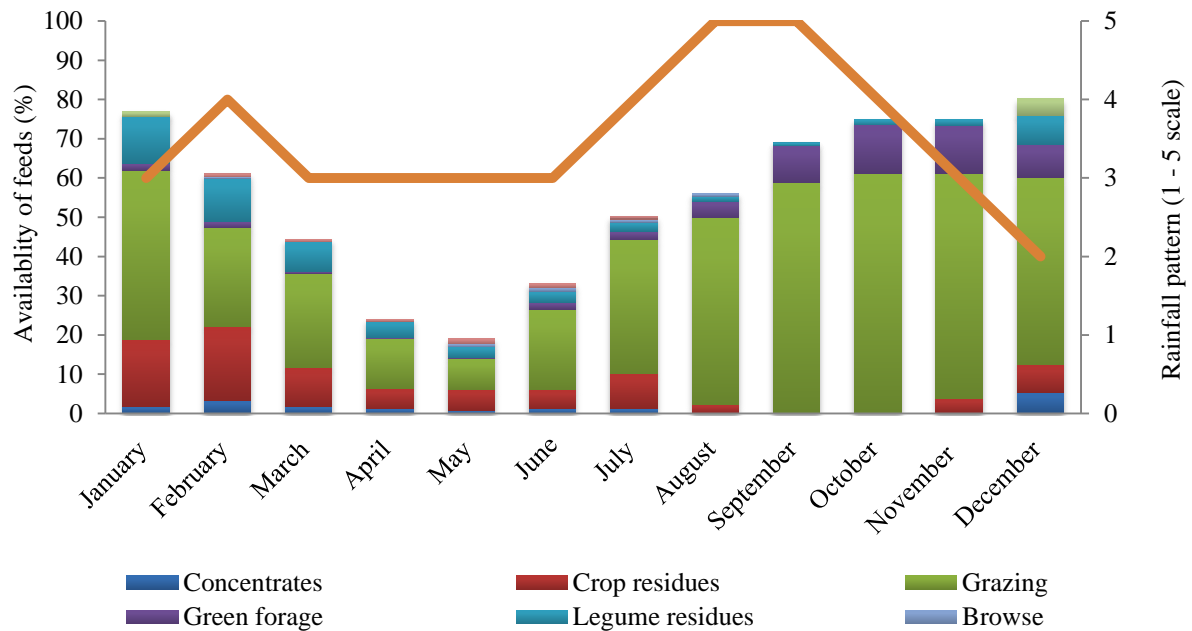


Figure 8a: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Gitlo

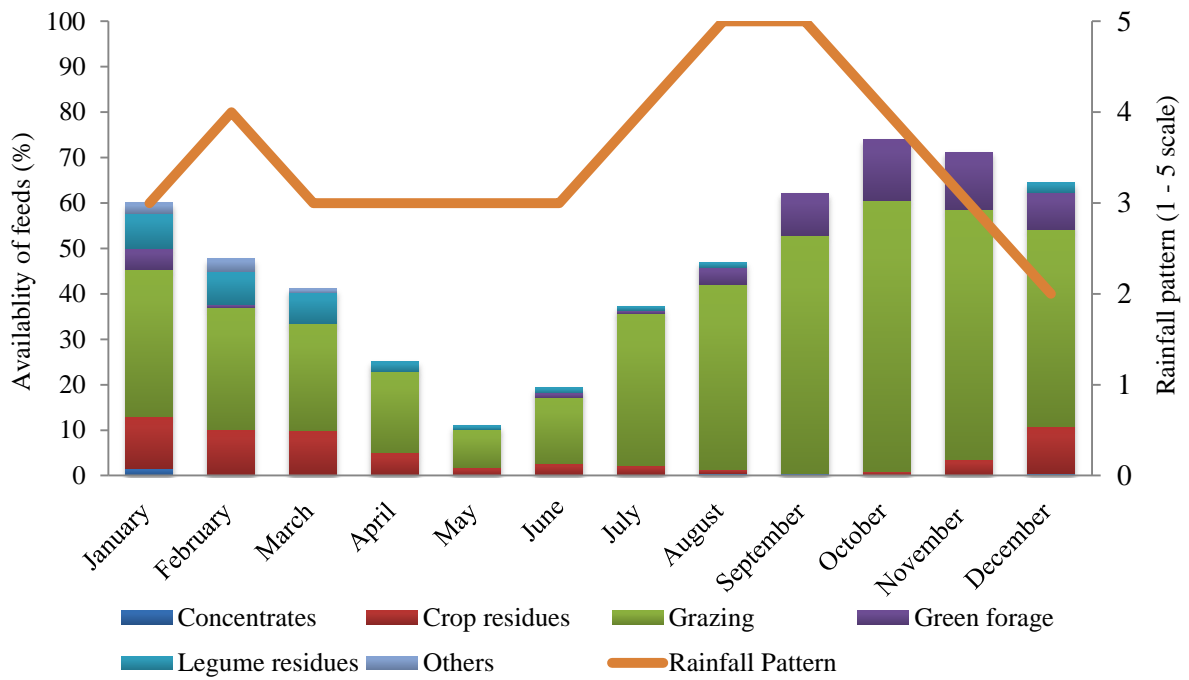


Figure 8b: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Lakkur

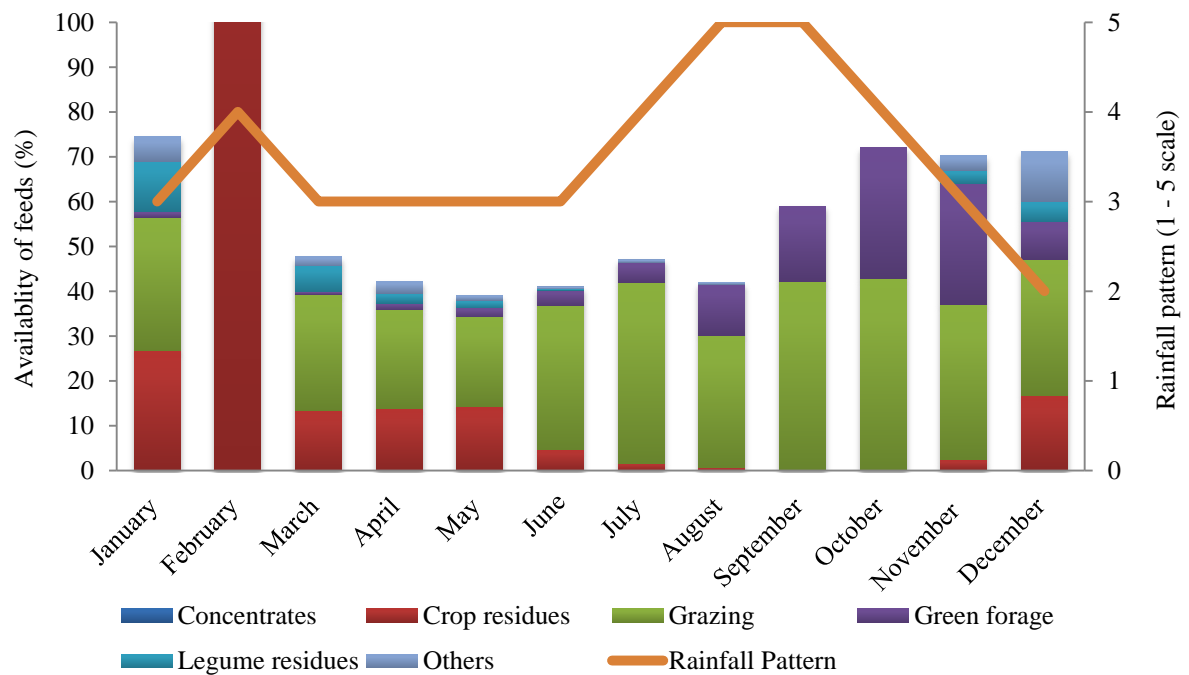


Figure 8c: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Oda Buluq

Dietary composition

Grazing contributes the largest proportion to the livestock diets in terms of dry matter (DM), metabolizable energy (ME) and crude protein (CP) in all study sites followed by the naturally occurring green fodders like weeds from cropping areas, roadside weeds, naturally occurring grasses, or any other green materials that are naturally occurring and collected for livestock feeding (Figures 9, 10 and 11). Despite the presence of abundant crop residues in the area, the percentages contribution of crop residues to the diets on the basis of DM, ME and CP is minimal. The proportion of crop residue contribution to DM, ME and CP is 9, 7 and 6 in Gitlo (Figure 9), and 10, 8 and 7 in Lakku (Figure 10) and Oda Buluq (Figure 11).

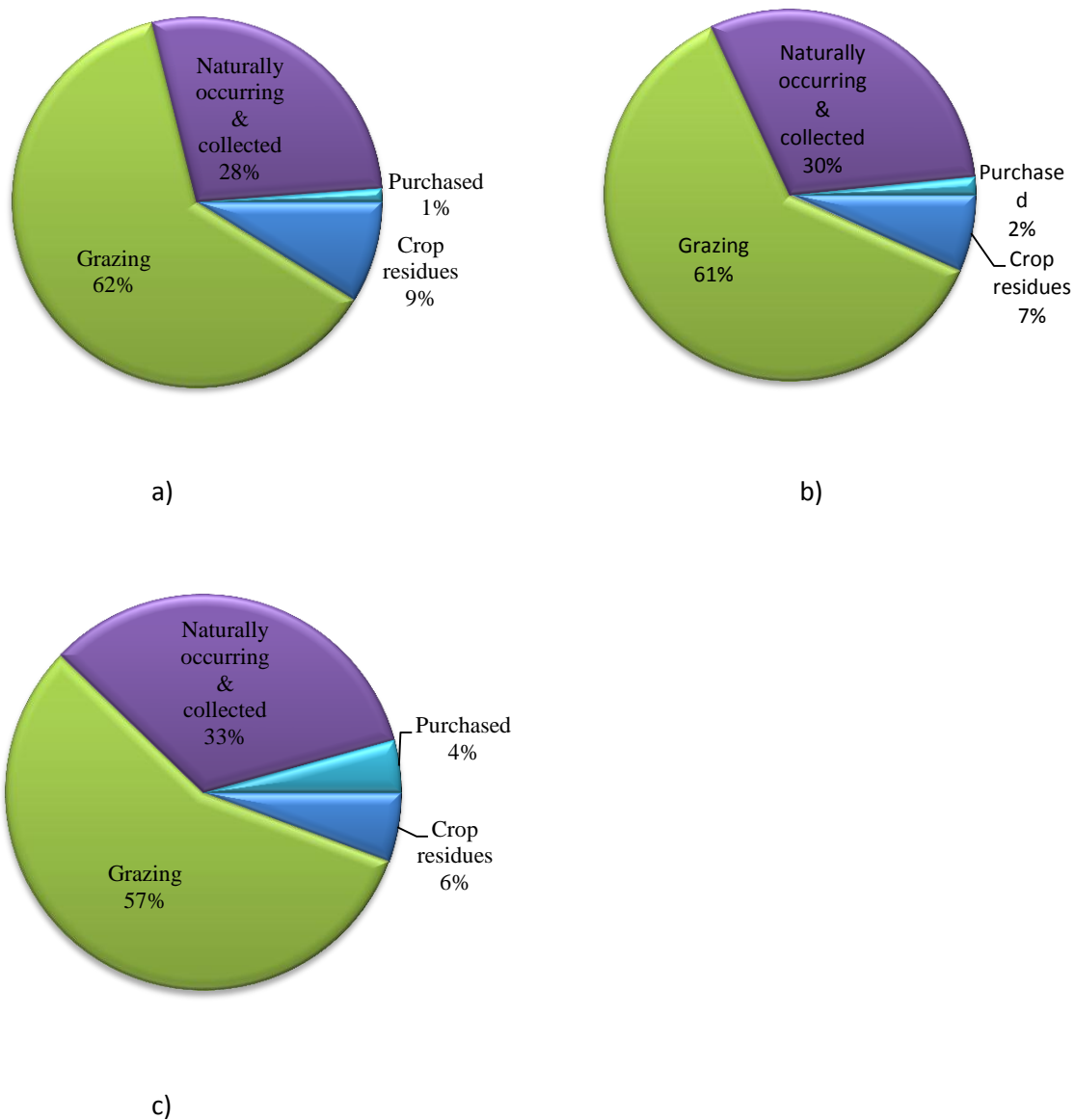
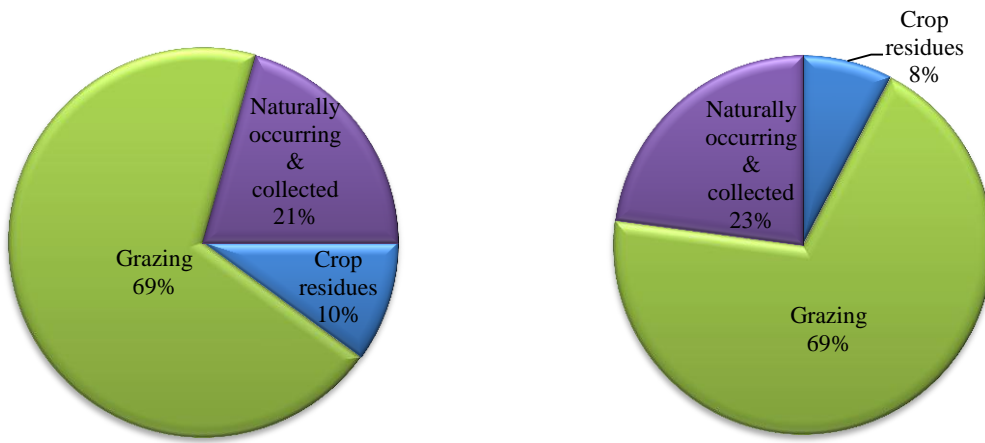
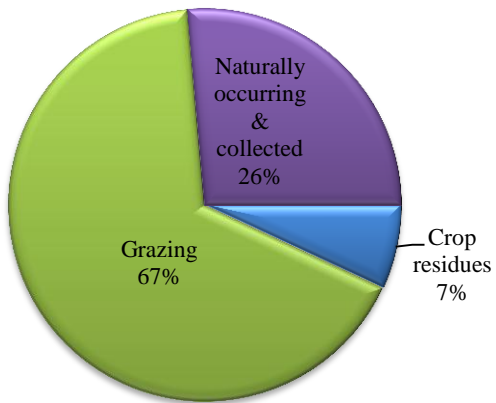


Figure 9: The contribution of various feedstuffs to DM (a), CP (b) and ME (c) to livestock diets in Gitlo



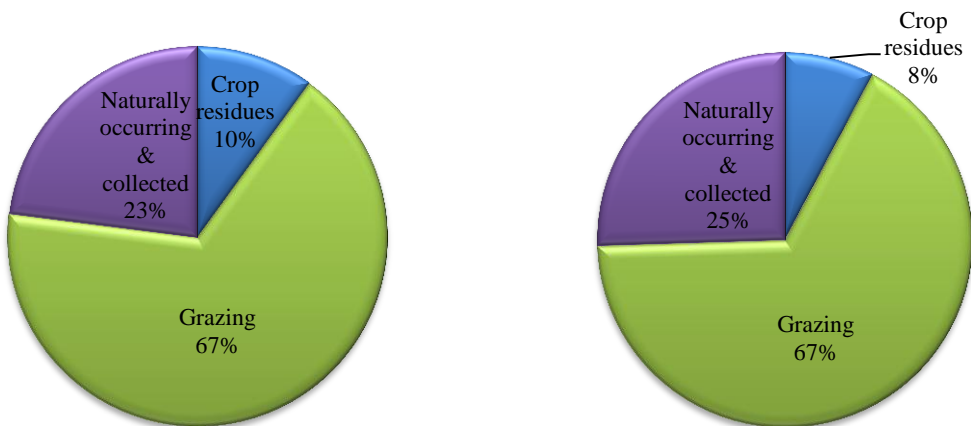
a)

b)



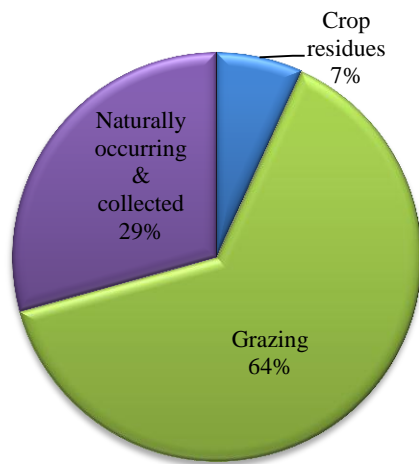
c)

Figure 10: The contribution of various feedstuffs to DM (a), CP (b) and ME (c) to livestock diets in Lakku



a)

b)



c)

Figure 11: The contribution of various feedstuffs to DM (a), CP (b) and ME (c) to livestock diets in Oda Buluq

4 Major problems of livestock production

Knowledge gap in improved livestock production (animal health, animal feeds and genetic improvement), finance and livestock markets are some of the major bottlenecks of livestock production in the areas covered during the current study. Pair-wise comparisons of the problems identified by farmers are shown in Table 2. Knowledge-gap was identified as the most important constraint to livestock production in all of the sites surveyed. Feed shortage was identified as the second most important constraint in both Lakku and Oda Buluq, but as third important problem in Gitlo. Health was the second bottleneck in Gitlo and identified as third in the other two *kebeles*.

5 Opportunities

- The presence of enthusiastic smallholder farmers in the three *kebeles*, who are willing to improve their livestock production.
- The *kebeles* have high cereal production potential due to their agro-ecology, thus high potential for abundant crop residues.
- The presence of community-based sheep breeding project in two of the study *kebeles* and the possibility of optimizing and scaling up of the experience to wider areas or adopting for other livestock species.
- The study *kebeles* part of the Agricultural Growth Program (AGP) districts. Horro district is also one of the USAID financed ICARDA wheat seed production sites, therefore the potential for higher wheat production exists and with it larger quantities of wheat straw.
- The presence of higher learning institution. Wollega University's College of Agriculture is in Shambu town and it has an experimental site at one of the *kebeles*. Farmers have the opportunity to inform themselves from ongoing research activities from the institution.
- Skilled and enthusiastic research staff at Bako agricultural research center, who are willing to work with the farmers.

Table 2: Major identified problems for livestock production and suggested solutions by farmers

No.	Identified problems	Ranks of problems in:			Suggested solutions for the identified problems
		Gitlo	Lakku	Oda Buluq	
1.	Knowledge-gap	1	1	1	Awareness raising of farmers through training on improved animal husbandry practices in general and market-oriented animal production in particular
2.	Feeds	2	3	2	Improved forage production, conservation and utilization of crop residues, establishment of backyard forage production and reduction of number of animals owned by focusing on productivity
3.	Health	3	2	3	Equipping veterinary clinics with necessary equipment, drugs and skilled technicians in Gitlo and Oda Buluq. Training of community-healthy workers and proper feeding and housing management for animals
4.	Market	5	-	-	Cultivation of high value horticultural crops, animal fattening, undertaking off-farm activities and devising mechanisms to access credit on an individual basis
5.	Finance	4	-	4	Market oriented animal production and organizing farmers into cooperatives
6.	Housing	-	3	5	Provision of proper housing management to all species and classes of animals
7.	Breeding males	-	-	6	Adopting the experience of the ongoing ICARDA-ILRI-BOKU project members on breeding stock selection, management and share/use

6 Potential interventions

- Farmers reported that lack of knowledge was the predisposing factor for not exploiting the potential of the livestock sector to the fullest. Hence, training would be instrumental to enhance knowledge base and attitude/behaviour change of the farmers and livestock extension workers.
- Large quantities of crop residues are produced from both pulses and cereals. However, only few are properly used as animal feeds. Major crop residues are either burned or thrown away. Utilization and conservation of crop residues should be encouraged. Since wheat is a major crop in the area and wheat straw is of low nutritive value, convenient and affordable methods of improving wheat straw quality should be sought.
- Crop production is expanding at the expense of grazing lands and this is a difficult scenario to revert. Existing research institutions in the area (Wollegga University's College of Agriculture,

BARC) need to undertake research on how to maximize quality residue production to be used as animal feeds. These could be through breeding for dual-purpose crops (both grain and biomass) and/or improving the agronomic characteristics of cereal and pulse crops.

- Land was reported as one of the limiting factors inhibiting expansion of agricultural activities in the areas. Thus, rather than cultivation of improved forages, establishment of backyard forage production such as fodder trees production is recommended. The trees are multipurpose and can provide feed, fuel, serve as live fences and shade. Backyard production of fodder trees is not land demanding. In addition, fodder tree production is not labor demanding except during early stages of establishment (raising and transplanting of seedlings).
- Intervention of animal feed problem alone cannot bring radical improvement in animal productivity. It has to be accompanied by proper animal healthcare. The livestock sector has to get due attention from district and zonal administrative bodies. Proper vaccination for economically important diseases, periodic de-worming and spraying for both internal and external parasites, respectively would undoubtedly complement the feed problem intervention suggested. To realize these, upgrading animal health technicians, training some enlightened farmers as community animal health workers, equipping the veterinary posts with necessary equipment are needed.
- Reduction of the number of animals owned per household was also suggested as one of the potential solutions of the feeds problem in the areas. However, numbers of animals per household in the three areas has already decreased due to shortage of land. Only about 4-5 heads of breeding cows, 2 heads of draught oxen and only 8-15 heads of sheep are owned per household in the study areas (Table 1). In the mixed crop-livestock system, one must have three to five breeding cows to have replacement oxen for ploughing. Due to this, it would hardly be possible to reduce the existing numbers of animals owned per households any further. Genetic improvement (either through selection or crossbreeding) may improve productivity per animal.

Shortage of improved genotype, particularly improved breeding males, was raised as one of the major problems in Oda Buluq. Respondents of the *kebele* suggested that adopting the experience of the ICARDA-ILRI-BOKU project which is currently operating in Gitlo and Lakku kebeles can solve their problems. The ICARDA-ILRI-BOKU project started in 2007 with the major objectives of improving sheep productivity and income of small-scale resource-poor producers by providing access to improved animals that respond to improved feeding and management. Since then, about 80 breeding rams have been selected at different times with active involvement of sheep producers and distributed to members for use. Before the intervention of the project, it was hardly possible to find breeding rams in flocks of the project members. Currently, there are enough breeding rams in the flocks and lamb production has also been increasing. Optimizing and scaling up of the project to other areas and adopting the community-based sheep breeding experiences to other livestock species can solve the shortage of breeding males in herds/flocks.

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