



# Characterization of the farming and livestock production systems and the potential to enhance livestock productivity through improved feeding in Illani, Agarfa District, Bale Highlands, Ethiopia

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The three regional 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 the program's monitoring, evaluation and impact assessment. <http://africa-rising.net/>



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# Introduction

The role of livestock in food security in the highland production system is important. In the highlands farmers predominantly depend on animal power for cultivation, planting, weeding, threshing and transporting (Branning and Persson, 1990). Draft animals provide draft power for cultivation of nearly 96% of the highlands cultivated land (Brannang and Persson, 1990). Raising livestock is an important, often the main source of income for most of the smallholder farmers in Ethiopia. They are important as producers of meat, milk and eggs, which provide high value protein (Cheeke, 1993).

They have long played a key role in supplying calories and protein for human food in virtually all parts of the world, both directly (in the form of animal products) and indirectly (in form of manure and draft power for crop production and generation of income). However, livestock production is constrained by different factors such as disease, inadequate quantity and quality feed and poor management.

The Feed Assessment Tool (FEAST) was used to characterize the livestock production system with a Particular focus on the feed-related aspects smallholder farmers of Ilani kebele in Agarfa district of Bale high lands, Ethiopia.

The Feed Assessment Tool (FEAST) is a systematic and rapid method to assess local feed resource availability and use at site-level. It helps in the design of intervention strategies aiming to optimize feed supply and utilization through technical and organizational interventions.

The feed assessment study was conducted from November-December 2013 and was carried out by researchers from Sinana Agricultural Research Center (SARC) with backstopping from the International Center for Agricultural Research in the Dry Areas (ICARDA). The objectives of the study were to provide an overview of the farming system and to identify the major livestock production problems, opportunities and potential interventions with particular emphasis on livestock feed aspects for improving the production and productivity of livestock.

# Methodology

## Study site

The study was conducted in Illani *kebele* of Agarfa district which lies 446 km Southeast of Addis Ababa. Agarfa is located in the Bale highlands of Ethiopia. The altitude of the area ranges from 2606 meters above sea level (m.a.s.l.). Illani is 5 km from Agarfa town, the administrative center of Agarfa district. The GPS coordinates of Illani are 07°15'49.7"N and 039°51'38.9"E.

## Sampling method

Prior to the site and farmer selection, the team from SARC and ICARDA held discussions with focal experts from zonal and district agricultural offices on the general objective of the study and the long-term benefits of the farming community from the survey. Based on basic information available at district level, the study *kebele* was selected with the participation of the District Livestock Officer. The potential of the *kebele* for livestock production and the accessibility to the main highway were considered in selecting the *kebele*. Subsequently, the selected *kebele* in the district was visited and discussions held with the Development Agents. The Development Agents were given guidance to select 18-20 farmers, both male and female, based on the size of land holding.

## Survey structure and format

All selected farmers (17 men and 4 women) participated in focus group discussions to provide an overview of the farming system and to identify constraints and opportunities for improving livestock production in the *kebele*. Key informant farmers were selected from each category of landholding (small, medium, large). Accordingly, 9 farmers, 3 from each category of land holding were individually interviewed.

## Data analysis

The FEAST excel macro program ([www.ilri.org/feast](http://www.ilri.org/feast)) was used for data analysis. Narrative responses collected from the group discussions were examined and reported.

# Major findings

## Overview of the farming system

The farming system is classified as a mixed cereal-livestock production system with a cereal dominant cropping system. The farm land varies among the households. Majority of the households (60%) fall in the category of small farmers with  $\leq 2$  ha of land and 3% of the farmers in the *kebele* are landless, while 30% and the other 7% of the farmers fall under the category of medium and large farmers respectively (Figure 1). The average family size is 6 people per household.

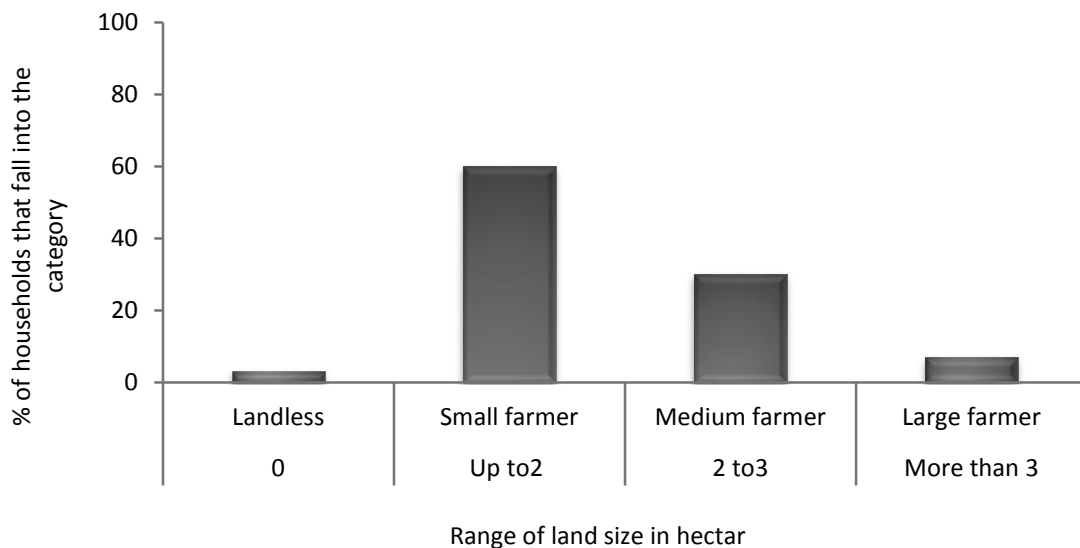


Figure 1: Average land size owned by various categories of farmers in Illani

Farmers described two distinct cropping seasons. The two seasons are locally named by the time of crop harvest. The season, which extends from March to July, is named *genna (belg)* while the season from July to December is called *Bona (meher)*. Among the two cropping seasons, *bona* is the main cropping season and is very important for crop production because of the long and intense rainfall during this period. The dominant crops grown are wheat, barley, maize, field peas and tef as shown in Figure 2. The crops grown are mainly used as a means of income generation whereas residues from cereal and pulse crops are the major source of livestock feed.

Crop residues are also used for mulching to improve the soil and as raw material for wall construction of local houses. Crop production is rain-fed, there is no irrigation in the area. Labour is required for land preparation upto harvesting. Labour is required during planting (especially for farmers using oxen to plough their farm land), weeding (herbicide application) and crop residue collection from the farm. Labour is not readily available throughout the year. The main labour source is family labour rather than hired labour. Shortage of labour is a critical problem mainly during harvesting of all crops except wheat. Wheat harvesting is mechanized. Farmers manage the labour shortage by organizing themselves in work in groups (*dabo*).The

cost of daily labour is approximately Birr 35 (\$ 1.9) per day for ploughing and weeding. During harvesting, farmers do not hire labour on daily basis rather they give out contracts of Birr 150 (\$ 7.9) for 0.167 ha of land. Farmers also sometimes hire labour on yearly contractual basis. They give the labourer a piece of land (0.67 ha) in addition to Birr 600 (\$ 31.6), food and accommodation. Many peoples leave the farm for education, thus exacerbating the labour shortage.

Crop production is the main source of income contributing to about 56% of the household income. Dairying and off-farm businesses such as trading and hand craft activities contribute 10% and 12% respectively. Other sources of income are shown in Figure 3.

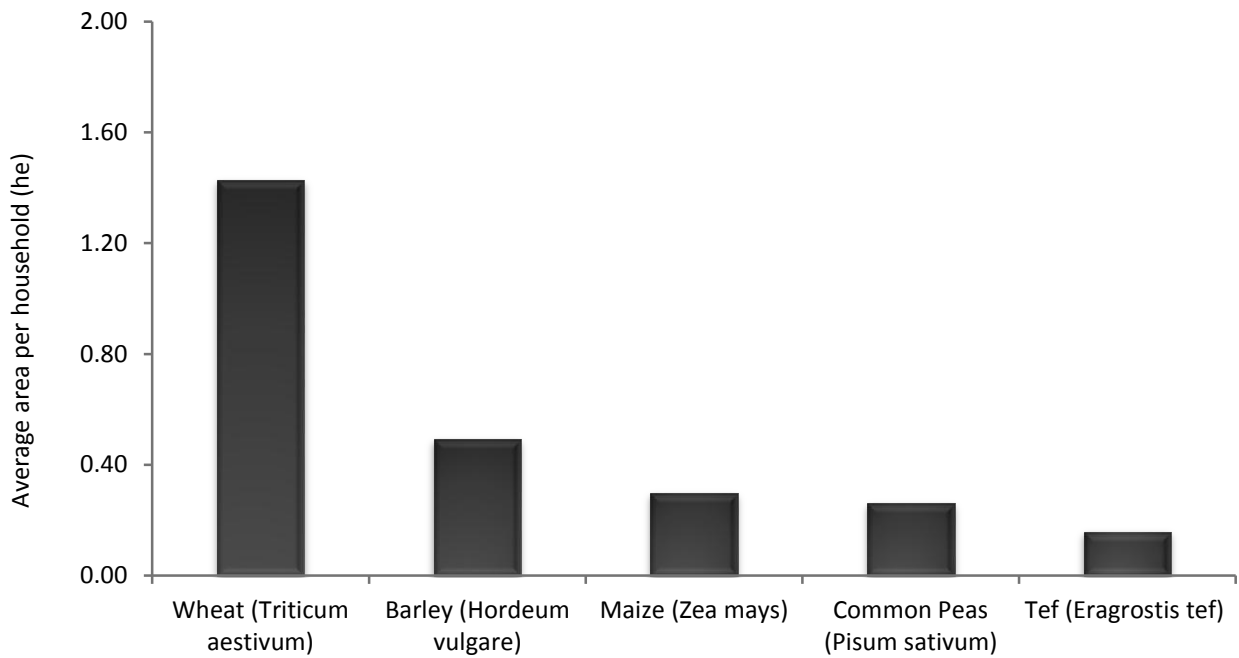


Figure 2: Major crops grown in Illani

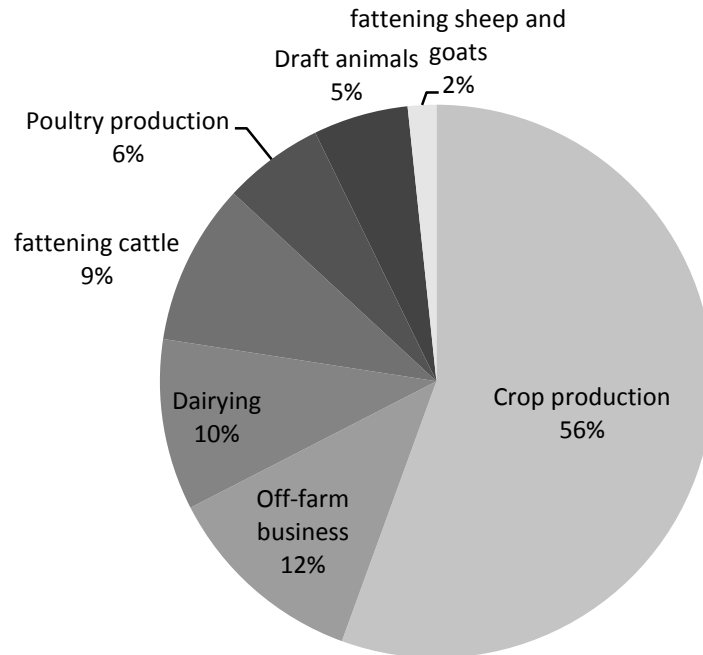


Figure 3: Contribution (%) of livelihood activities to household income in Illani

## Livestock production system

The livestock production system in the study area is mainly extensive. Local breeds are predominant and are characterized by low productivity. Cattle are the most important livestock species in Illani (Figure 4). Draft cattle are mainly kept for the purpose of ploughing, threshing, crop residue collection, manure, meat and cash income. Local dairy cows are kept for milk production, manure, threshing, reproduction, meat and cash income while improved dairy cows are kept for the same purpose to that of local dairy cows, except they are not used for threshing. Small ruminants especially sheep are also a major source of meat, manure and cash. Village poultry's are kept in the area for the purpose of egg production, home consumption and cash income both from sells of egg and sale of live poultry. Farmers reported that approximately 70% of the households own local dairy cows, whereas about 95% of the households own draft cattle. Only 10% of the household keep improved dairy cows. The average milk yield from the local dairy cow is about 1.5 liters per cow per day. The production of milk mainly depends on feed and water availability.

Most farmers keep their draft cattle, cows and pack animals in open barns constructed using cactus near or in the homestead. Goats, sheep and calves are kept in houses constructed for them. Illani has no animal health clinic at all. Farmers travel to Agarfa town, 5 km away, for animal health service and drugs. On average Birr 18 (\$ 0.95) is charged for treating a sick animal at the government clinic, while it is Birr 48 ETB (\$ 2.5) at the private clinic. Artificial insemination (AI) service is not well established. Mass insemination (by estrus synchronization of many cows at a time) is currently being implemented by the Agricultural Growth Program, however, it is not successful. Farmers pay Birr 10 (\$ 0.53) per head for AI service. Most of the Farmers use their own local bull service. Improved bull service is not commonly used.



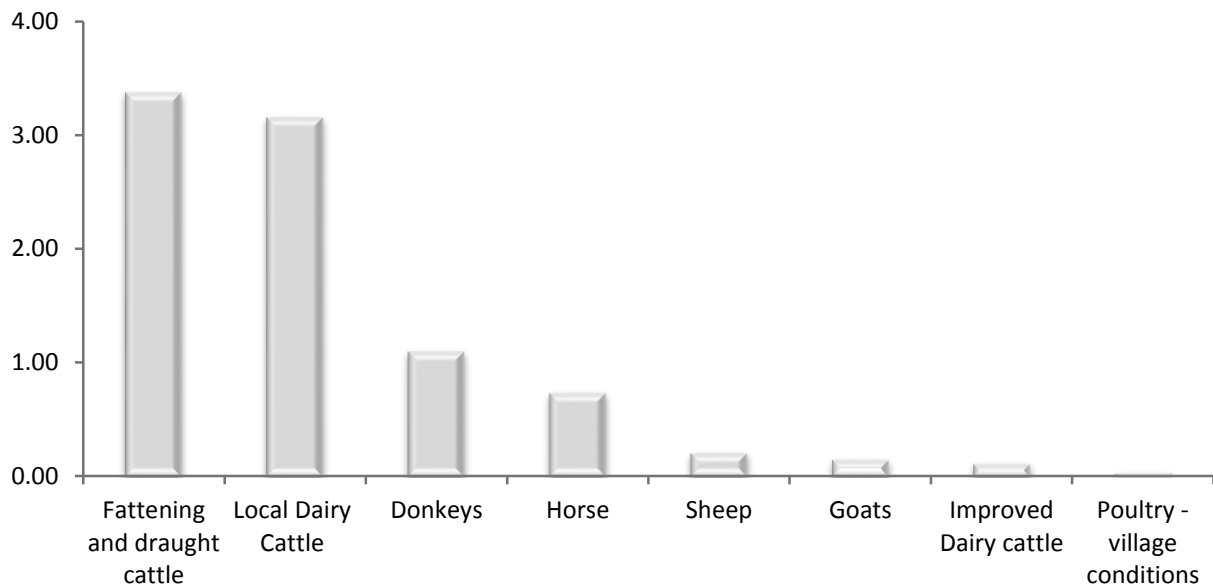


Figure 4: Average livestock species holdings per household in Tropical Livestock Units in Illani

## Feeds and feed resources

Crop residues, natural pasture, cultivated fodder crops and stubble grazing are the major feed resources. Since the majority of the cultivated land area is allocated to cereal and pulse crops production, the major share of livestock feed is obtained from crop residues which contribute approximately 59% of dry matter (DM) of the total diet (Figure 5). Crop residues are also the major contributor to dietary metabolizable energy (ME) and crude protein (CP), contributing 52% and 48% respectively. Cereal straws such as wheat, barley and emmer wheat are the dominant crop residues. Legume residues such as faba bean and field pea are also commonly used as animal feeds. There is wastage of crop residues since all of the residues are not well collected from the threshing ground. The collected residues are piled in stacks near homesteads and animals are fed in the morning and evening. Draft oxen are fed on the residues before and after work. Some farmers combine cereal and pulse residues and store them around the homestead. These residues are predominantly fed when grazing land is scarce, from end of December to the end of August (Figure 7). Farmers usually do not feed the residue of linseed to their animals because of abdominal disturbance.

Cultivated fodder crop particularly fodder oats are produced by some farmers and contribute minimally to the diet, 2 % DM, 2% ME and 3% CP to the total diet. They are mainly fed to lactating cows, calves and draft oxen. Majority of farmers do not grow improved forage crops although they have great interest to. Scarcity of land, lack of forage seed and poor extension services are some of the reasons that limit utilization of forage crops. Grazing is practiced throughout the year but the dietary contribution from grazing is low when compared to that of crop residues (Figure 5). This is because grazing land is scarce and its nutritive value is also very low especially during the dry periods. Grazing is usually done around the homestead, on

community land, by the roadside and on marginal land. Aftermath grazing, following the crop harvest also provides feed for all classes of livestock.

Naturally occurring and collected feeds such as weeds from cropland are also a good source of feed during the rainy seasons. They contribute about 17% of DM, 21% ME and 25% of CP to the total diet (Figure 5). Stall feeding of collected green feed from the crop land particularly wild oat (*Avena fatua*) is common in the area. These feed resources are mainly given to lactating and draft oxen by the roadside during the day and at home in the evenings.

Linseed cake, wheat bran and milling by products are the common concentrate feeds used by the farmers to increase crop residues intake, palatability as well as the feeding value. Most farmers in the area treat straws of crop residues by re-threshing and mixing with salt, concentrated agro-industrial by-products and emmer wheat. Farmers involved in dairying and fattening of oxen and sheep especially use these locally made feed rations for their animals. The availability and the cost of the concentrates vary from season to season. Farmers do not regularly use them due to their high price. Wheat flour by product, wheat bran and linseed cake are among purchased feeds for livestock (Figure 6) though their contribution as a dietary source is very limited (Figure 5).

Generally, farmers indicate that feed shortage is critical from the beginning of April to end of August (Figure 7). During this period, the availability of grazing pasture and green forage resource is very scarce and livestock rely mainly on crop residues which are low in feeding value.

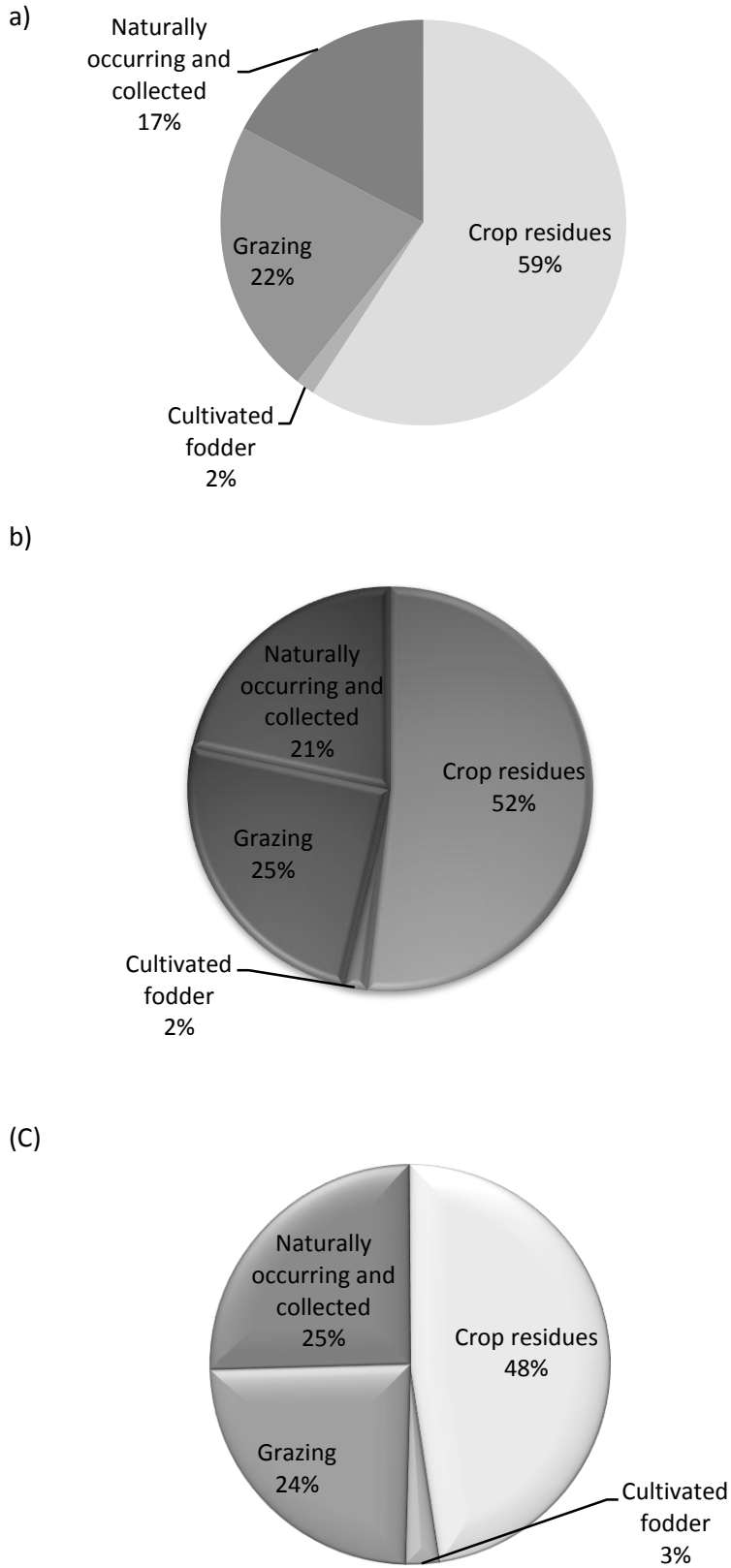


Figure 5: The contribution of various feedstuffs to DM (a), ME (b) and CP (c) to livestock diets in Illani

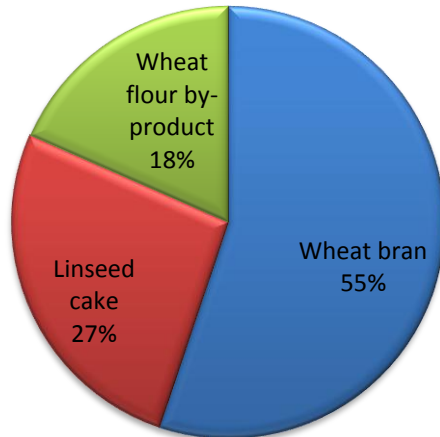


Figure 6: Quantity (%) of feed purchased over a 12 month period in Illani

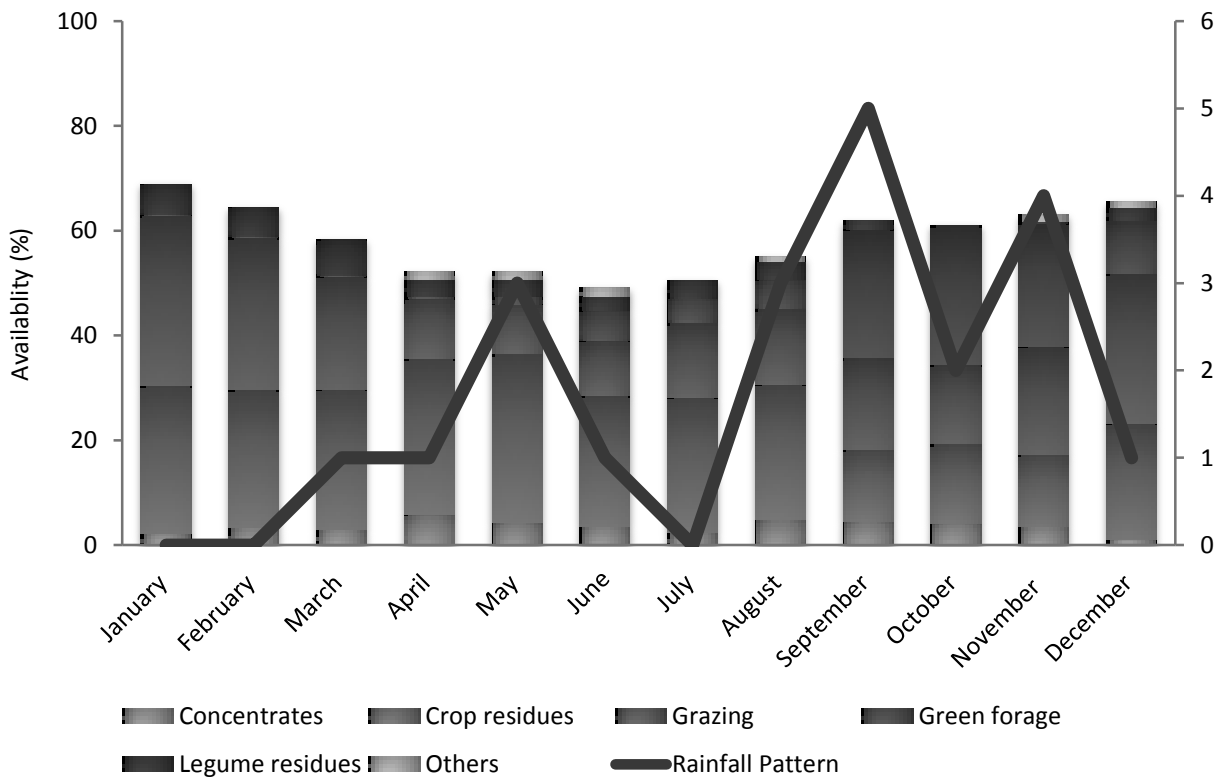


Figure 7: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Illani

## **Problems, issues and opportunities**

There is shortage of land, both for crop cultivation and livestock keeping. Grazing land is gradually declining due to farmers' priority to allocate land for crop cultivation. Since their land is suitable and productive for crop cultivation, farmers usually prefer to allocate their land for crop cultivation rather than leaving it for grazing. Though crop inputs such as fertilizer, herbicides insecticides and fungicides are available, farmers face difficulty in affording these inputs due to their high price. The supply of inputs especially chemicals through traders is not effective in solving the targeted problem. The farmers do not trust the traders Farmers reported that the ineffectiveness of these chemicals may be due to dilution (adulteration) by the traders. Supply of improved seeds of both food crops and forages is also another constraint to crop/livestock production in Illani.

The major livestock-related problems, their priority ranking according to farmers and the appropriate improvement options suggested by the farmers are summarized in Table 1 below.

Table 1: Livestock-related problems identified by farmers in Ilani and the corresponding suggested solutions

Problems (in order of importance)	Problems identified	Proposed solution by the farmers
1	Inadequate source of water	<ul style="list-style-type: none"> <li>▪ Better management of the existing water resources, collecting rain water for dry periods, utilizing the existing limited water sources by making water reservoirs or ponds. Extracting the ground water with the assistance of government and non-government organizations.</li> </ul>
2	Disease	<ul style="list-style-type: none"> <li>▪ Establishment of well-equipped animal health clinic with drugs, and other important facilities and trained (experienced) man power at <i>kebele</i> level</li> </ul>
3	Shortage of feed in quantity and quality	<ul style="list-style-type: none"> <li>▪ Proper utilization (improvement) of the existing feed resource such as crop residues and grazing lands</li> <li>▪ Allocate some portion of their land for feed production (for cultivated forage and grazing)</li> <li>▪ Minimize the number of animals to few improved and productive ones</li> <li>▪ Better allocation and utilization of lands for different purposes including for use as grazing land</li> </ul>
4	Cash /Credit shortage	<ul style="list-style-type: none"> <li>▪ strengthen credit and agricultural input providers such as cooperatives</li> </ul>
5	Shortage of improved breeds	<ul style="list-style-type: none"> <li>▪ Improving local breeds step by step through cross breeding with improved breeds.</li> <li>▪ Establishment of research center working on breeding and distributing these improved breeds to farmers.</li> </ul>
6	Lack of knowledge and skills	<ul style="list-style-type: none"> <li>▪ Improving extension service and applying expert advices</li> <li>▪ Training and awareness creation</li> </ul>

# Summary

## Key issues

- Disease, traditional breeding and management practices limit livestock productivity and hence income, resulting in poor incentives for farmers to adopt improved technologies.
- Resource allocation: The root cause for the current feed shortage is the declining resources dedicated to livestock production. There is increasing “encroachment” of grazing resources, available lands being used for crop production. There is also limited opportunity for the development of cultivated forage due to farmer’s priority of allocating their land for crop production.
- Lack of improved breeds: there is no any research work on gradual improvement of local breeds.
- Attitude of farmers towards livestock production: Livestock, particularly sheep, pack animals and poultry are kept as Scavengers with practically no input, though they are the major source of livelihoods.

## Metrics

Milk yield: 489 liters per cow per year

Meat off take: not applicable

## Potential interventions

Cereal production is dominant and crop residues are the main livestock feed resources. Farmers incur a lot of wastage due to poor collection of the residues from the threshing grounds. Farmers in these *kebele* need to be educated on proper collection methods of crop residues as well as conservation of the residues. Alternate cropping of pulses and cereals offers an opportunity for improved crop residue quality. Therefore, more studies should be undertaken in these areas to determine the appropriate intercropping sequences and intercrop combinations and this information should be disseminated to the farmers so that they achieve maximum benefits of improved crop residue quality.

In the *kebele*, several farmers have already started cultivation of fodder crops such as oats. This feed resource is mainly fed to lactating cows, calves and draft oxen. To strength the fodder production, there is a need to further introduce, evaluate and popularize improved forage legumes and grass varieties with high herbage yield and quality. Improved perennial and annual fodder varieties such as elephant grass, vetch and alfalfa would increase the quantity and quality of available feed. Cooperatives in the area should be encouraged to source for and regularly supply certified forage seeds to farmers. Extension workers should be encouraged to carry out on-farm demonstrations of improved forage varieties.

The rapid increase in human population and increasing demand for food has resulted in the conversion of pasture land into cropping land. Thus, grazing is gradually being restricted to areas that have little farming potential such as swampy areas, roadsides and other marginal lands. At the *kebele*, there are privately owned grazing enclosures (locally named as '*kalo*') located around the homesteads and farmlands. The establishment of these enclosures needs to be promoted. The limited grazing lands are overgrazed and their productivity is very poor especially during the dry periods. This results in poor growth of grasses and domination by invasive unpalatable species. Improving the feeding potential of the limited grazing land resource through different management options such as over sowing with suitable forages species, awareness creation on proper grazing management and hay making from enclosures could be useful.

Weeds from the crop lands are important feed resources for livestock mainly during the wet season. Farmers in the *kebele* have been collecting weeds such as wild oats from the farm lands and feeding them to their animals. Excess feed material that is produced during these rainy periods could be collected and stored as hay for the periods of critical feed shortage. Moreover, there is a need for more awareness creation on the utilization of weeds from the farmlands as they could be risky for animal health due to extensive herbicide application.



## Ways forward

Labour constraints are very limiting, therefore, any technologies and approaches introduced or disseminated to the farmers in the *kebele* should take labour issues into serious consideration. Technologies and approaches should integrate both crops and livestock. Animal husbandry and management issues should also be considered.

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