Characterization of the farming and livestock production systems and the potential to enhance livestock productivity through improved feeding in Ballo Aminga, Gasera District, Bale Highlands, Ethiopia

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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 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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## Contents

Introduction ................................................................................................................................. 2  
Methodology ................................................................................................................................. 3  
  Study site ..................................................................................................................................... 3  
  Sampling method ......................................................................................................................... 3  
  Survey structure and format ........................................................................................................ 3  
  Data analysis .............................................................................................................................. 3  
Major findings ............................................................................................................................... 4  
  Overview of the farming system ................................................................................................. 4  
  Livestock production system ..................................................................................................... 8  
  Feeds and feed resources ............................................................................................................ 9  
Summary ....................................................................................................................................... 13  
  Key issues ................................................................................................................................. 13  
  Metrics ...................................................................................................................................... 13
Introduction

Livestock plays a vital role in the rural livelihood community of Bale highlands. Regardless of their numeric and economic importance as well as the tremendous potential, the production and productivity of livestock is very low mainly due to poor nutrition, disease incidences and poor management. High population pressure and increasing demand for food is pushing smallholder farmers to cultivate grazing lands so as to satisfy food demand of increasing human population growth rates in the highlands. This is a primary cause for shrinkage/diminishing of grazing land in the area. Shrinking of grazing land has contributed to livestock feed problems quality, quantity and seasonality.

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 Ballo Aminga kebele, Gasera 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 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 Ballo Amenya kebele of Gasera district which is located in Bale highlands in the South Eastern part of Ethiopia. The altitude of Ballo Aminga is 2395 meters above sea level (m.a.s.l). It is located about 57km away from Robe, the administrative town of Bale Zone town. The GPS coordinates of the kebele are 07°22’13.7”N and 040°12’18.3”E.

Sampling method
A multidisciplinary team of researchers from SARC and ICARDA participated on the study. Prior to farmer selection, the team had discussion with focal experts from District Agricultural Office up on the general objective of the study. Ballo Aminga was purposively selected for the study. It is among those which the crop livestock project by ICARDA is implementing. Moreover, the site has good potential of livestock production, accessibility to road and other important infrastructure. Subsequently, the selected kebele in the district was visited and discussions made with the kebele development agents. The development agents were given guidance to select 17-20 household farmers of different age groups including men and women based on the size of landholding. The selected farmers were the farmers from small, medium and large size landholding category.

Survey structure and format
The total of 16 farmers (13 male and 3 female) were selected for the study. All selected farmers participated in group discussions using the participatory rural appraisal (PRA) approach to provide an overview of the farming system, to identify constraints and opportunities for improving livestock production in the area. Nine key informant farmers 3 from each category of landholding (small, medium, large) were purposively selected and individually interviewed from each of the study kebeles.

Data analysis
The FEAST excel macro program (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 a mixed cereal-livestock production with a cereal dominant cropping system. The average family size is 8 people per household. The family size is large because they are predominantly Muslims, who have 2 or more wives in a household. On average the farm land size is 4 ha. The majority of the household fall in to the category of medium farmers with 1 to 4 ha of land while the numbers of landless farmers in the kebele are very low (Figure 1). Farmers indicated that farm land size and family number are related. Household with large farmland have larger family sizes compared to small farmland holders. Due to high rainfall and the nature of soil (vertisol), waterlogging is the most important production problem in the study area. Hence, fallowing of the cropland is common.

There are two cropping seasons namely genna and bona (Table 1). Genna extends from March to August while bona begins in July and extends up to the end of December. The two seasons usually overlap in the months of July. Even though the two seasons are favourable for crop production, it is in the bona season that farmers produce more crop yield in the year. Moreover, different types of crops are cultivated in this season. The season begins in June and extends up to the mid of September while harvesting begins at the end of November and is completed at the beginning of January. In the case of genna, planting starts in March while harvesting starts in July and completed in August.
Table 1: Cropping seasons occur in the study area

<table>
<thead>
<tr>
<th>Season</th>
<th>Jan</th>
<th>Feb</th>
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<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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</thead>
<tbody>
<tr>
<td>Genna</td>
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<td>Bona</td>
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</table>

The majority of the farmland is used for cereal crop production. The major crops grown include wheat, barley, linseed, maize, tef, field pea and faba bean (Figure 2). It is very common to cultivate cereal and pulse crops alternatively in the two cropping seasons. Cereals crops are mainly produced during *bona* while more pulse crop is produced during *genna*. The crops are grown for subsistence and as means of income generation. The residues from cereal and pulse crops are the major livestock feed resource in the area. Very few proportions of crop residues of wheat and field pea are left on the farm which could contribute for soil improvement. Farmers use straw of tef to mix with mud for wall construction of local house.

Figure 2: Major crops grown in Ballo Aminga
There is no water source available for irrigation in the area and hence crop production is totally rain-fed. In contrary to other areas where machinery is used, cropping activities such as harvesting is carried out manually. Hence, the requirement for hired daily labourer is very high mainly for planting and crop harvesting. Farmer use family labour instead of hiring daily labour from outside. Children help with farm activities after school and during holidays. Moreover, there is a custom of neighbours and friends supporting each other during times of heavy workloads, locally known as ‘Debo’. Hired daily labourers are not easily available due to limited areas of crop production in the area.

Most of the time, the productivity of crop land is poor in most areas are waterlogged during planting. The cost of daily labourers depends on the type of the work and agreement made between employer and labourer. The labour charge for planting is about 50 Ethiopian Birr (ETB; $2.5) per day. Harvesting charges go up to 150 ETB per day. The price of harvesting tef is higher than harvesting other crops due to the difficulty of tef harvesting. Some farmers contract daily labourer based on the amount of activities rather than on a daily basis.

The main livelihood income source of the farmer is from crop production. Cereal crops which is used for food and as cash source contributing about 49% of all household income. This is because crop production is the major agricultural activity in this area. Off-farm business such as trading, handcraft, labour, small ruminant fattening and dairying are important activities contributing for the household income (Figure 3).

Figure 3: Contribution of livelihood activities to household income (%)
Livestock production system

Livestock production is dominantly traditional with a subsistence-oriented production system. Livestock is an important component of the mixed farming system and is well integrated with crop production. Livestock species kept by the farmers comprise cattle, sheep, goats, equines and chicken (Figure 4). Local breeds of cattle are the dominant species, mainly used for draft power, milk and meat production, source of income, manure for fuel and soil fertility. Cattle mainly draft animals are also used for crop threshing. Moreover, livestock also have an important socio-cultural role in the area.

The herd structure and composition of livestock varies per household. The average livestock holding per household is about 6, 2, 5 and 3 for local dairy cows, draft cattle, sheep and goat respectively. More than 99% of the households own local dairy cows and draft cattle. Poultry production is traditional with local breeds.

The management and feeding of poultry is very poor as compared to the other animals. The milk production is varies depending on the feed availability and the type of animals. On average the milk yield produced from local dairy cows is 2-3 liters/day. Cattle fattening is not widely practiced. Few households (10%) fatten their oxen after they are used for draft purposes. Some farmers provided night time shelter to their lactating and pregnant, calves and small ruminants. While, the others large animals are kept in open enclosures and in corrals.

Farmers have access to government and private animal health clinics, however, there is shortage of trained manpower and drugs in the area. The cost of drugs is very high in private clinics as compared to the government animal health clinics. Some animal feed inputs such as wheat bran and linseed cake are available in the nearby local market. Artificial insemination services for cross breeding of the local cows with exotic breeds have been practiced to some extent. The service is given free of charge. However, it is not efficient probably due to semen quality and limited knowledge of technicians. The use of improved bulls is not common, farmers use their own local bull service.
The major feed resource includes crop residue, natural pasture and fallow land grazing, weeds from farm lands and stubble. Cereal and pulse residues contribute about 45% of dry matter (DM) of the total diet (Figure 6). Straws of wheat and barley are the dominant cereal residues. Pulse straws of faba bean and field pea straws are commonly available in the area. Crop residues are also major contributor to the crude protein (CP) and dietary metabolizable energy (ME) contributing 31% and 39% respectively. The residues from cereals and pulses are mixed and stored around the homestead in heaps. Most of the farmers improve the feeding value of crop residues by chopping them into smaller sizes and mixing with water, concentrated feeds such as wheat bran, local brewery by product ‘atela’ and salt. Oxen and dairy cows get priority to feed on better quality treated crop residues.

Natural pasture is also a major feed resource for livestock feeding in the study area. The availability and productivity of grazing land is better in this kebele because it is less suitable of crop production due to water problems of the farmlands. Grazing is commonly practiced throughout the year. It is mainly done around homestead, private grazing land ‘kalo’, community land, roadside, and marginal land. Aftermath grazing and fallow lands, following the crop harvest also provide feeds for livestock.
As indicated in the Figure 6, grazing contributes about 33, 35, and 31% dry matter (DM), crude protein (CP) and metabolizable energy (ME) respectively of the total diet. Stall feeding from naturally occurring and collected feeds such as weeds from cropland (such as wild oats) is practiced by some farmers especially during the rainy seasons. These feed resources are given mainly to lactating and pregnant cows, draft oxen and calves. Beside, hay making, is also common in some few farmers. These feed types contribute about 17% of DM, 21% of CP and 20% ME of the total diet.

In the study area, farmers improve the feeding value of crop residues by chopping and mixed with salt and other concentrated agro-industrial by products. Linseed cake and wheat bran are the common concentrate feeds used by the farmers in order to increase crop residues intake and palatability. The availability and the cost of these concentrates vary from season to season. Generally, due to its high price, farmers do not always using them, hence the low contribution of these purchased concentrates to the overall diet (Figure 6). Few farmers supplement their animals especially during dry season, when they target to fatten the animal. Similarly, the use of cultivated fodder crops such as maize and fodder oats is very minimal due to shortage of improved forage seed and inadequate information of cultivated forage.

Figure 5: The composition of the diet in Ballo Aminga kebele throughout the year in relation to the rainfall pattern
Figure 6: The contribution made by the various feedstuffs to DM (a), CP (b) and ME(c) of the diet
## Problems, Issues and Opportunities

The main important livestock development problems and the appropriate improvement options suggested by the farmers are summarized as follows:

<table>
<thead>
<tr>
<th>Problem (in order of importance)</th>
<th>Problems identified</th>
<th>Proposed solution by the farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cash shortage</td>
<td></td>
<td>• Strengthening cash credit and agricultural input providers such as cooperatives</td>
</tr>
</tbody>
</table>
| 2 Shortage of improved cattle breeds | • Improving provisions of AI service by GOs and other NGOs through strengthening the required facilities and manpower status of technicians  
• Selection of better performance of local animals for milk and meat improvement  
• Use of improved bull service |
| 3 Incidence of disease and parasites | • Establishment of animal health clinic with adequate manpower and facilities.  
• Improving management of animals so that to minimize the risks of disease |
| 4 Water                          |                     | • Use of pipe water  
• Harvesting and use of rain water |
| 5 Shortage of feed in quantity and quality | • Improving the feeding value of crop residues by mixing with different concentrated feeds  
• Collection and storing crop residues for the critical period of feed shortage  
• Production of improved forage crops at arable lands  
• Better management of grazing lands for grass establishment  
• Decrease the number of local breeds and replace by few improved and productive breeds |
Summary

Key issues
- Cash shortage
- Shortage of improved cattle breeds
- Incidence of disease and parasites
- Shortage of water
- Shortage of feed in quantity and quality

Metrics
- Milk yield: 360 L per cow per year
- Meat off take: not applicable