Characterization of the farming and livestock production systems and the potential to enhance livestock productivity through improved feeding in Nake, 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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Introduction

Livestock production is an integral part of the mixed crop-livestock farming system of Nake kebele in the Bale highlands. Livestock ensures the availability of nutrition and income for the farming community throughout the year. Besides, livestock provide draft power and manure for crop production and transportation for various purposes. Livestock and crop production are interdependent in the Bale highland where livestock holding was observed to have significant effect on crop cultivation (Solomon et al., 2009). However, 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.

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 Gasera district of Bale highlands, 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 Nake kebele, Gasera district which located in Bale highlands of the South Eastern part of Ethiopia. Nake is 60km from Robe, the administrative town of Bale Zone. The GPS coordinates of Nake are 07°01’04.7”N and 040°23’31.9”E.

Sampling method
The team from SARC and ICARDA held discussions with focal experts from zonal and district agricultural offices prior to the site and farmer selection. The general objective of the study and the long-term benefits of the farming community from the survey were discussed. 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 (14 men and 4 women) participated in group discussions using the participatory rural appraisal (PRA) approach 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 land holding size from each of the discussion groups. Accordingly, 9 farmers, 3 from each category of land holding were purposively selected and individually interviewed.

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 classified as a mixed cereal-livestock production with a cereal dominant cropping system. The farm land varies among the households with an average landholding size of 3 hectares. The majority of the households (60%) fall into the category of medium landholding farmers with 1-3 ha of land. Only about 5% are landless farmers (Figure 1). Due to the large family size, the farm land is in short supply for most of the households. In most cases, each household is responsible to allocate cropland for a family member who gets married and has to live separately. In the past, 20 to 30 years ago, fallowing was practiced to improve the productivity of the land. However, nowadays fallowing cropland is rare unless the family is unable to cultivate their land due to the shortage of labour (death of household head) or financial constraints. Farmers may be obligated to fallow land if the cropping season is not favorable due to very high rainfall. The average family size is 7 persons per household.

Figure 1: Range of land size in hectare

There are two distinct seasons favourable for crop production (Table 1). The seasons are locally named as genna and bona. Genna extends from the middle of March to the beginning of August. Planting of the major crops during this season is usually carried out in the months of March and April, while harvesting begins in July and ends in August. Bona season extends from July to the beginning of January. July and August are the months of planting while harvesting is completed mainly at the beginning of January.
The *bona* season is the main season favorable for crop production. Most of the cultivated land is covered with crops during this season. In all the two seasons, planting and harvesting activities usually last for one to two months depending on the type of crops produced.

Table 1: Cropping seasons occur in the study area

<table>
<thead>
<tr>
<th>Name of the season</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<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>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gena</em></td>
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<tr>
<td><em>Bona</em></td>
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</table>

Most farm lands of Nake are used for cereal crop production. The dominant crop grown includes wheat and barley (Figure 2). Most of the farmers use their farm land for cultivating wheat since this crop is one of the major sources of income and food for the families. Moreover, the productivity of wheat is very high due to improved seeds and other improved technologies.

The residues from cereals such as straws of wheat, barley, tef and pulse crops such as faba bean are the major livestock feed resources in the area. Crop residues are also used as mulching to incorporate in the cropping land for soil improvement and as raw material for wall construction of local houses. Very few farmers (2%) have begun crop production (mainly vegetables) using water pump irrigation. The practice is not well known in the area. Crop production in the area is almost depends on rain.

Labour requirements are very high mainly during planting and harvesting. However, hired labour is in short supply during most period of the year. Farmers indicated that there is very high labour requirement during harvest time of *gena* season and planting time of *bona* season because of the overlapping of the harvesting and planting activities of the two seasons in the months of July and August. Most of the farmers use family labour instead of hiring daily labour. However, there are some farmers who hire labourers on contractual basis for a year or longer.

In most cases, the payment for the hired contractual labourers is Birr 200 (\$ 10.4 for 0.25 ha of crop land for one year (two cropping seasons). The area of crop land to be provided and the amount of cash paid varies from farmer to farmer depending on the intensity of the work and the size of the cropland that the household owns. Inputs such as seed and fertilizer required by the labourer are provided by the employer farmer during the first year. Additional costs such as food and clothing are covered by the employer. Daily labourers are hired mainly during planting and harvesting periods by a few farmers. The cost of daily labourers is about Birr 50 (\$ 2.59) per day for planting and about Birr 150 (\$ 7.8) for harvesting. It is not common for people to leave the farms in search of employment elsewhere because farm activities are throughout the year (two cropping seasons). However, almost all households send their children to school.

The main livelihood income source of the farmer is from crop production. The contribution of crop which is used as cash and food is about 61 % of the total household income (Figure 3). Off-farm activities such as petty trading and handicrafts are also important means of income generation for the farmers (contributing 17%).
Figure 2: Major crops grown in Nake

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

Traditional livestock production system is predominant in the area. Cattle, sheep, goat, horse, donkey and poultry are the main livestock species kept by the farmer. Almost all cattle type are local breeds with low production and productivity. Cattle maintained mainly for the purpose of draft power, manure, as a source of meat, milk and cash income to the households. About 95% of the dairy cows kept by the farmers are local dairy cows with low milk production. On average the milk yield produced from local dairy cows is 2 lit/day. Currently, there is some efforts by livestock agency to improve the blood level of indigenous dairy cows in the area.

Some few farmers also try to introduce improved dairy cows with exotic blood level from the other areas. Draft cattle are the most important animal for the farmers. The major agricultural activities such as crop land preparation and threshing are performed by draught cattle. Sheep and goats are mainly kept as a means of immediate cash generation besides sources of good quality of meat for the family. In the past horses are used as pack animals for transporting humans, now a days horses are mainly used for cart pulling. Donkeys also are doing a lot of activities including transporting different items and threshing crops. Almost all farmers that owns draft cattle and have donkey since these animal are very important for crop production.

Appropriate managements including housing and barn cleaning are not practiced by most of the farmers. Housing for large animals is not known rather fencing is used to keep the animal overnight. However, calves and small ruminants are usually kept in small barn attached to the living house to protect from wild animals and heavy rain. In the kebele there is animal health clinic however, there is shortage with regard to trained manpower, necessary vaccinations and drugs used for treating different disease. Hence, farmers need to travel long distance for better treatment of the animal. If it is a government clinic the cost for treating sick animal is varying from 25 to 30 birr per animal. However, the price to be paid for treating sick animal is usually increased at private animal health clinic.

Currently, artificial insemination (AI) is being practiced in some extent. However, farmers indicated that it was not efficient probably due inadequate knowledge gaps from the technicians and semen quality used. AI service is given free of payments. On the other hand there is no improved bull kept for this purpose. Hence, farmers use their own local bull service.
Feeds and feeding

The major feed resources include crop residue, natural pasture, weeds from farm lands and stubble grazing. Cereal and pulse residues have the major share of livestock feed contributing about 70% of dry matter (DM) of the total diet (Figure 6). Straws of wheat, barley and emmer wheat are the dominant cereals residues while faba bean and field pea straws are commonly available in the area. Crop residues are also the major contributor to crude protein (CP) and dietary metabolizable energy (ME), contributing 57% and 62% respectively. The residues from cereals and pulses are mixed and stored around the homestead. These residues are mainly fed to oxen and lactating cows during periods of critical feed shortage from December to February (Figure 5). The contribution of grazing lands as feed resource is lower than that of crop residues. It contributes only 13% DM of the total diet. Grazing is mainly done around homesteads, community land, roadside, and marginal land. Aftermath grazing following crop harvest also provides feeds for all classes of livestock. Naturally occurring and collected feeds such as weeds from cropland are a good source of feed especially during the rainy seasons. They contribute about 13% of DM, 20% of CP and 16% ME of the total diet of the existing feed resource. Stall feeding of collected green feed resource from the cropland particularly wild oat (Avena fatua) is common in the area. These feed resources are fed to lactating and draft oxen by the road side during the day and at home in the evenings. Most farmers in Nake treat straws of crop residues by chopping and mixing them 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 residue intake, palatability as well as the feeding value. The availability and the cost of concentrates vary from season to season. Generally, due to their high price, farmers do not use them often. The contribution of the purchased concentrates to the diet is very low. Only few farmers supplement their animals especially during dry seasons and when they target to
fatten the animal. The contribution of cultivated fodder crops such as maize and fodder oats as dietary sources is also low. Most of the farmers do have interest to cultivate improve forages. However, there is shortage of improved forage seed and inadequate information on cultivated forage species. As indicated in Figure 5, feed shortage is high from the months of April to June since the availability of crop residues and green forage is low during these months. While the availability of crop residues and stable grazing is good from the beginning of December to the end of February. Starting from August, green forage is the important feed resource.

Figure 5: The composition of the diet in Nake kebele throughout the year in relation to rainfall pattern
Figure 6: The contribution (%) of various feedstuffs to DM (a), CP (b) and ME(c) of the livestock diet in Nake.
Problems, issues and opportunities

The major livestock problems and the appropriate improvement options suggested by the farmers are summarized in Table 2 below:

<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</td>
<td>Cash shortage</td>
<td>• Strengthening cash credit and agricultural input providers such as cooperatives</td>
</tr>
<tr>
<td>2</td>
<td>Incidence of disease and parasites</td>
<td>• Improving or strengthening the existing veterinary clinics with manpower and necessary facilities</td>
</tr>
<tr>
<td>3</td>
<td>Shortage of improved cattle breeds</td>
<td>• Adequate and timely provision of an artificial insemination services by GO and other bodies</td>
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<tr>
<td></td>
<td></td>
<td>• Use of improved bull service</td>
</tr>
<tr>
<td>4</td>
<td>Shortage of feed in quantity and quality</td>
<td>• Proper utilization of the existing feed resource such as crop residues and grazing lands</td>
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<tr>
<td></td>
<td></td>
<td>• Allocate some portion of their land for feed production (for cultivated forage and grazing)</td>
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<tr>
<td></td>
<td></td>
<td>• Minimize the number of animals to few improved and productive ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Proper allocation and utilization of lands for different purposes including for grazing land</td>
</tr>
<tr>
<td>5</td>
<td>Lack of adequate awareness</td>
<td>• Training in the livestock improvement in general is required</td>
</tr>
</tbody>
</table>
Summary

Key issues
- Shortage of cash
- Incidence of disease and parasites
- Shortage of improved cattle breeds
- Shortage of feed in quantity and quality
- Lack of adequate awareness

Metrics
- Milk yield: 360 liters per cow per year
- Meat offtake: not applicable