



Characterization of the Livestock Production Systems and the Potential of Feed-based Interventions for Improving Livestock Productivity in Sinana District, Bale Highlands, 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.

Introduction

Crop-livestock farming is the major source of food and income in rural farm households in the highlands of Bale (Solomon, 2004). 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. Natural pasture, crop residues and stubble are the major sources of feed (Zerihun 2002; Solomon 2004). These feed resources are inadequate in quantity and quality and fluctuate seasonally.

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. FEAST was used to characterize the livestock production system and in particular feed-related aspects of smallholder farmers of Sinana district, Ethiopia. The feed assessment study was conducted on July 2 - 6, 2012 and was carried out by researchers from Sinana Agricultural Research Center (SARC) with backstopping from International Livestock Research Institute (ILRI) and 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 Sinana district which lies 430 km Southeast of Addis Ababa. Sinana is located in the Bale highlands of Ethiopia. The altitude of the area ranges from 2200 to 2600 meters above sea level (m.a.s.l.). The area receives an annual rainfall of 750-1000 mm. The average annual maximum and minimum temperatures are 21°C and 9°C respectively. The soil types of Sinana district are mainly pellic verisols, eutric nitosols and chromic luvisols (Ethio-Italian, 2000). Three *kebeles* namely Selka, Sambitu and Walta'i Barisa which are about 40, 12 and 15 km from Robe town respectively were selected for the study. Robe town is the administrative centre of Sinana district.

The GPS coordinates of Selka, Sambitu and Walta'i Barisa *kebeles* are 07°02'00.4"N and 040°13'15"E; 07°05'23.4"N and 040°33'41"E; 07°09'21.2"N and 039°56'50"E respectively.

Sampling method

Prior to site and farmer selection, the team from SARC, ILRI 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 project. Based on basic information available at district level, the study *kebeles* were selected with the participation of the District Livestock Officer. The potential of the *kebeles* for livestock production and the accessibility to the main highway were considered in selecting the *kebeles*. Subsequently, the selected *kebeles* in the district were visited and discussions held with their respective Development Agents. The Development Agents were given guidance to select 18-20 farmers, both male and female, based on the size of land holding.

Table 1: Selected *kebeles* for the study

<i>Kebeles</i>	Production system	Distance from Robe (Km)	Altitude
Selka	Crop-livestock system, high livestock (sheep) density	40	2457
Sambitu	Crop-livestock system, (lower livestock density)	12	2454
Walta'i Barisa	Crop-livestock system, with intermediate of the two <i>kebeles</i> in livestock density	15	2453

Survey structure and format

All selected farmers 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 each *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 from each of the study *kebeles*.

Data analysis

The information gathered during the group discussions was examined and reported. The quantitative data collected from individual key informant farmers were entered into the FEAST excel template (www.ilri.org/feast) and analyzed.

Major findings

The major findings from PRA group discussions and individual interviews from each of the three *kebeles* are discussed separately below:

Selka

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 fall in the category of medium farmers with 4 to 7 ha of land (Figure 1). There are no landless farmers in the *kebele*. The average family size is 6 people per household.

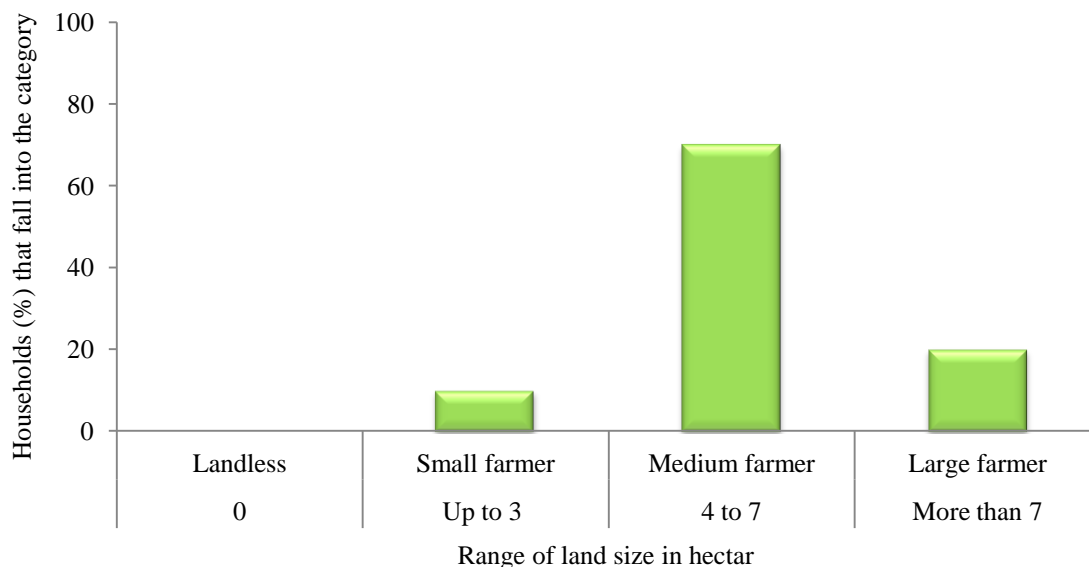


Figure 1: Average land size owned by various categories of farmers in Selka

Farmers described two distinct seasons favourable for crop production. The two seasons are locally named by the time of crop harvest. The season, which extends from March to July is named "*Ganna*" (*Belg*) while the season from July to December is called "*Bona*" (*Meher*). Among the two cropping seasons, "*Bona*" is the main season and is very important for crop production because of the long and intense rainfall during this period.

The dominant crops grown are cereals (wheat, barley and emmer wheat) and highland pulses (field pea and faba bean) as shown in Figure 2. Most of the farmers use their farm land for cultivating cereal and pulse crops alternatively in the two cropping seasons. Fallowing is not commonly practiced. 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.

There is no water source available for irrigation in the study area, hence crop production is rain-fed. Since land preparation and harvesting of crops is mechanized, the requirement for daily laborers is not a critical problem for majority of the farmers. However, labor is required during planting (especially for farmers using oxen to plough their farm land), weeding (herbicide application) and crop residue collection from the farm. The cost of labor is approximately 60 Ethiopian Birr (ETB; USD 3.3) per day. Cereals are the main source of income contributing to about 59% of the household income. Small ruminant production, particularly sheep fattening, is also an important livelihood activity contributing about 12% of the total household income. Off-farm businesses such as trading and hand craft activities are also a means of income generation for the farmers (Figure 3).

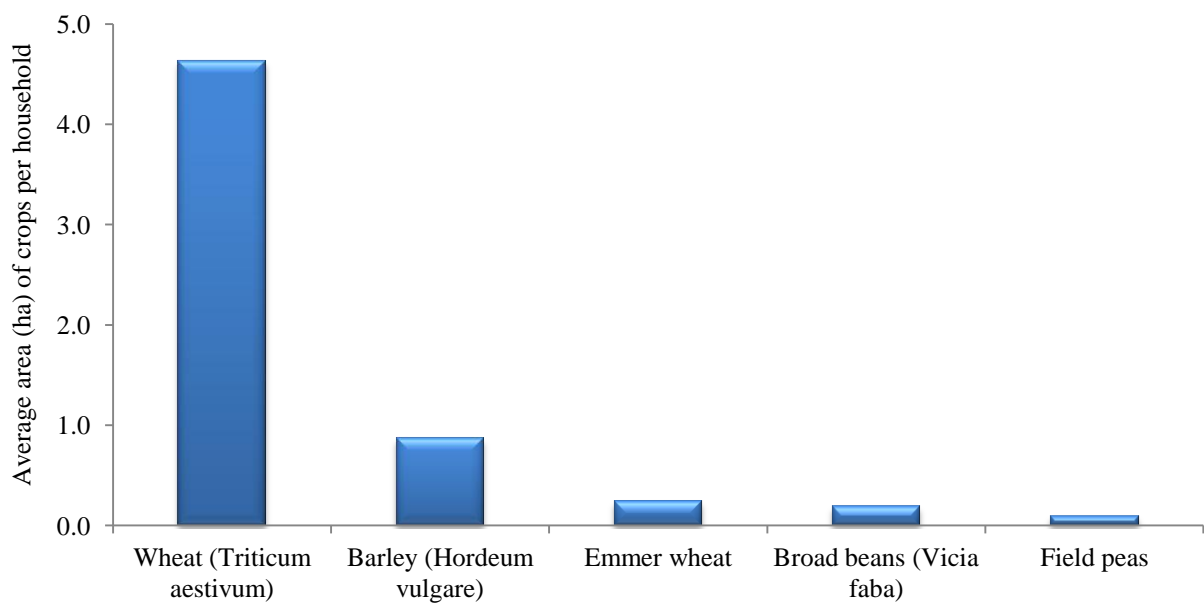


Figure 2: Major crops grown in Selka

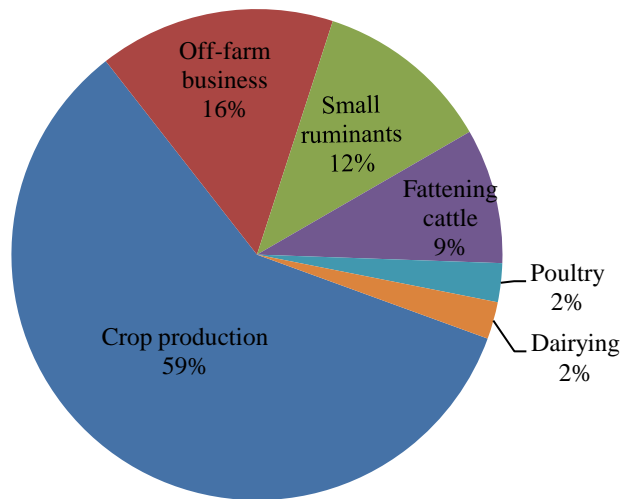


Figure 3: Contribution (%) of livelihood activities to household income in Selka

Livestock production system

The livestock production system in the study area is mainly extensive. Local breeds are predominant and are characterized by low milk production. Cattle and small ruminants are the most important livestock species in Selka. Cattle are mainly kept for the purpose of draft power, manure, meat, milk and cash income. Activities such as crop threshing and transportation of crop residues are performed by cattle (mainly by draft animals). Small ruminants especially sheep are also a major source of meat, manure and cash.

Cattle are the most important livestock species in the area (Figure 4). Farmers reported that approximately 85% of the households own local dairy cows, whereas about 95% of the households own draft cattle and sheep. Only 10% of the household keep improved cattle breeds. 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 house their animals in open barns constructed using cactus near or in the homestead.

Selka has an animal health clinic equipped with commonly required drugs. Hence, veterinary services are easily available when required by the farmer. The cost of treating an animal depends on the type of ailment. On average 30 ETB (USD 1.6) is charged for treating a sick animal. Artificial insemination (AI) is not available due to semen shortage, distance from the source and unavailability of technicians in the area. Farmers use their own local bull service. Improved bull service is not commonly used.

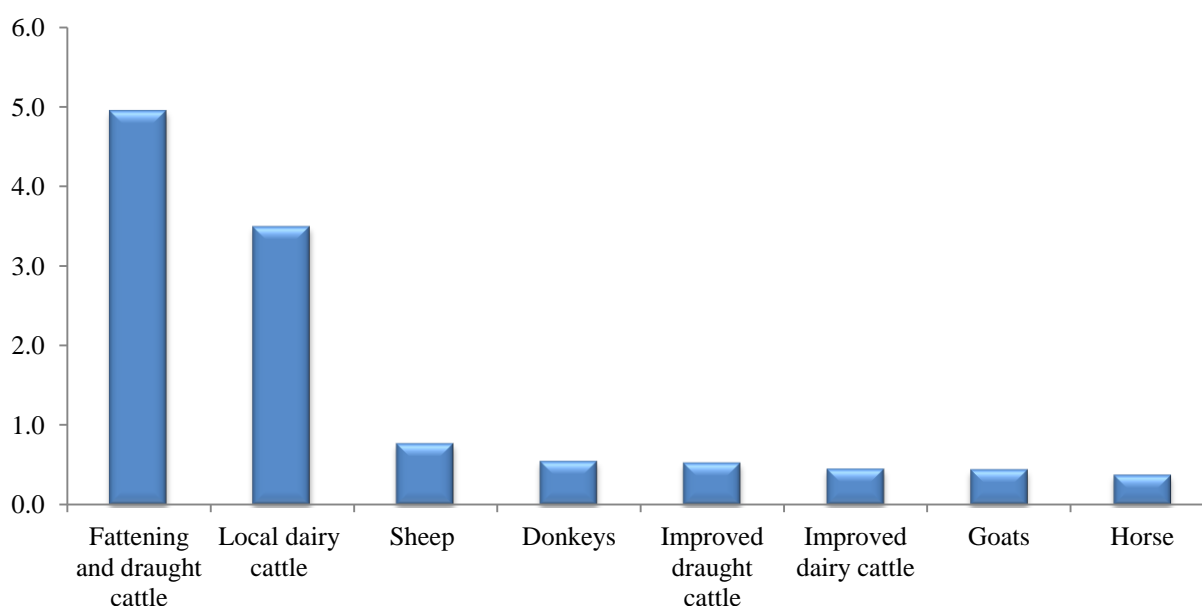


Figure 4: Average livestock species holdings per household in Tropical Livestock Units in Selka

Feed and feeding

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 40% of dry matter (DM) of the total diet (Figure 6). Crop residues are also the major contributor to dietary metabolizable energy (ME) and crude protein (CP), contributing 23% and 24% 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 given small quantities 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 mainly fed when grazing land is very scarce. This is from the end of March to the beginning of June.

Cultivated fodder crops particularly maize and fodder oats are produced by some farmers and contribute about 36% DM of 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. 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 (Figure 6). 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 10% of DM, 12% ME and 10% of CP to the total diet of the existing feed resource. 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 and wheat bran 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 chopping and mixing with salt and concentrated agro-industrial by-products. 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. The contribution of the purchased concentrates as a dietary source of DM is the least as indicated in Figure 6.

Generally, farmers indicate that feed shortage is critical from the end of January to beginning of June (Figure 5). 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.

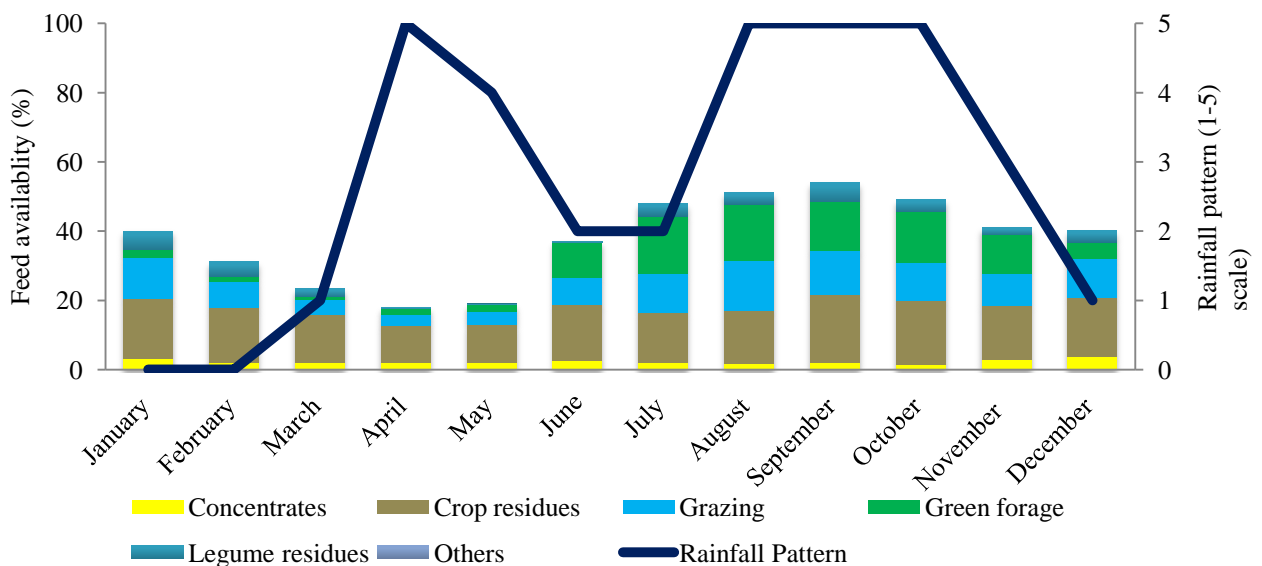
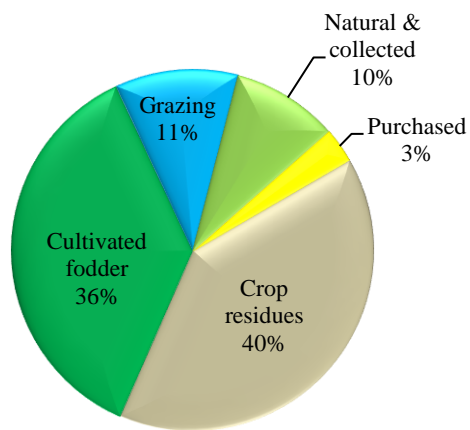
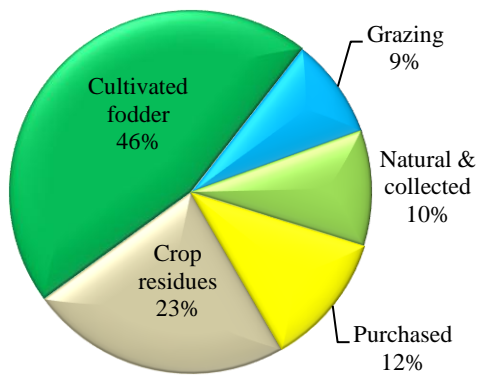


Figure 5: The composition of the livestock diet throughout the year in relation to the rainfall pattern in Selka

a)



b)



c)

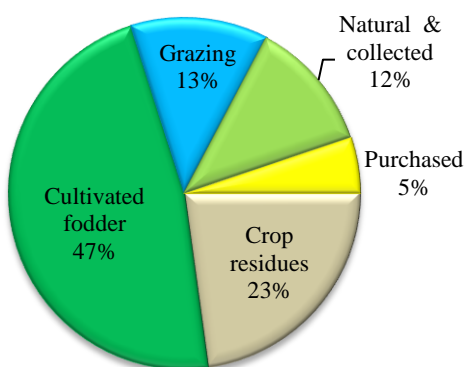


Figure 6: The contribution of various feedstuffs to DM (a), CP (b) and ME (c) to livestock diets in Selka

Problems, issues and opportunities

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

Table 2: Livestock-related problems identified by farmers in Selka and the corresponding suggested solutions

Problem (in order of importance)	Problems identified	Proposed solution by the farmers
1	Inadequate source of clean water	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.
2	Shortage of feed in quantity and quality	<ul style="list-style-type: none"> ▪ Proper utilization of the existing feed resource such as crop residues and grazing lands ▪ Allocate some portion of their land for feed production (for cultivated forage and grazing) ▪ Minimize the number of animals to few improved and productive ones ▪ Better allocation and utilization of lands for different purposes including for use as grazing land
3	Lack of AI service	<ul style="list-style-type: none"> ▪ Adequate and timely provision of AI services by the government and others ▪ Use of improved bull service
4	High incidence of disease and parasites	Further improvement/strengthening the existing veterinary clinics with manpower and drug supplies
5	Lack of adequate knowledge	Training in livestock improvement related topics is required
6	Cash shortage	There is need to strengthen cash credit and agricultural input providers such as cooperatives

Summary

Key issues

- Shortage of feed in quantity and quality
- Inadequate source of clean water
- Shortage of grazing pastures
- Lack of access to AI services

Metrics

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

Sambitu

Overview of the farming system

The area is characterized by mixed crop-livestock production with cereal production as the main activity. The average farm size per household is about 4 ha. Farm size per household has been decreasing over time as a result of increasing population pressure. Households are composed of an average of 8 members.

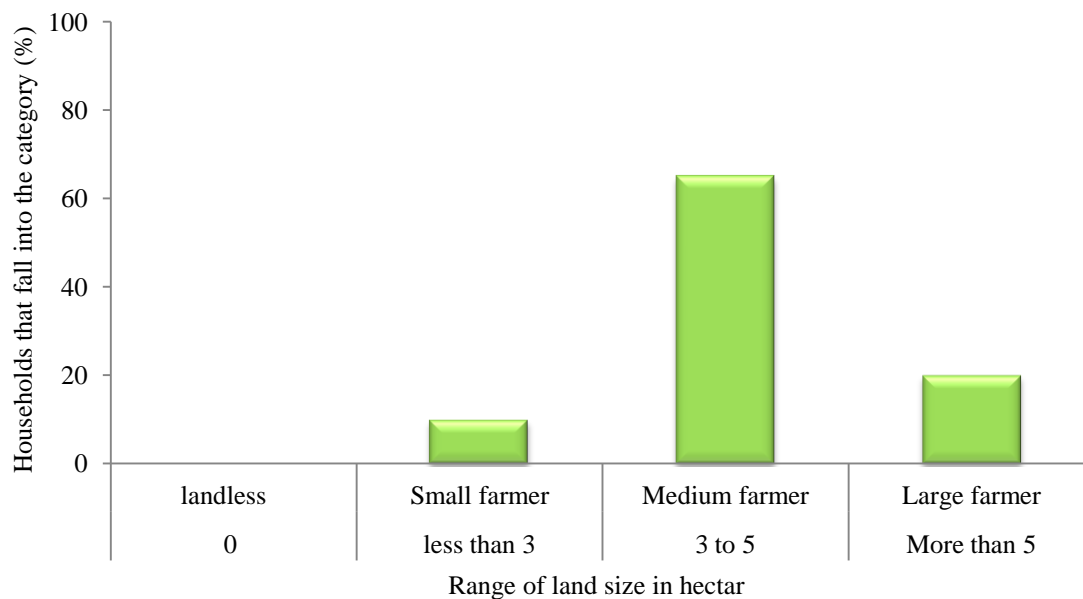


Figure 7: Average land size owned by different categories of farmers

The cropping seasons described by farmers are similar to the Selka *kebele*. The main rainfall occurs from early July to end of September. However, according to the farmers, nowadays the rainfall distribution is erratic and not adequate. There is a river used for irrigation but due to poor development of irrigation facilities, only about 1-2% of all households in the area are able to utilize this resource.

Labor is not easily available throughout the year. Good opportunities to get jobs in the nearby town and the lack of culture to work as laborers on farms results in labor shortages in the area. The critical time for labor requirement is at the start of planting and during harvest. Farmers fulfill the labor requirements by hiring labor from other areas on contractual agreement basis for one or more years. These laborers are provided with crop land and farm inputs such as seed and fertilizers. They live with the families that hire them and manage livestock as well as other farm activities. The average pay per day is about 48-50 ETB (USD 2.8) including food and other expenses.

The main crops grown by households are shown in Figure 8. Wheat, barley and emmer wheat cover the highest portion of their farm land. Field pea is one of the main pulse crops grown in the area. There is no fallow season as farmers cultivate cereal and pulse crops alternatively during the two cropping seasons. Crop residues from these crops are mainly used for feeding animals. Barley straw is the most preferred residue by all types of livestock. Crop residues are also used for mulching cropping land and as raw material for building local houses.

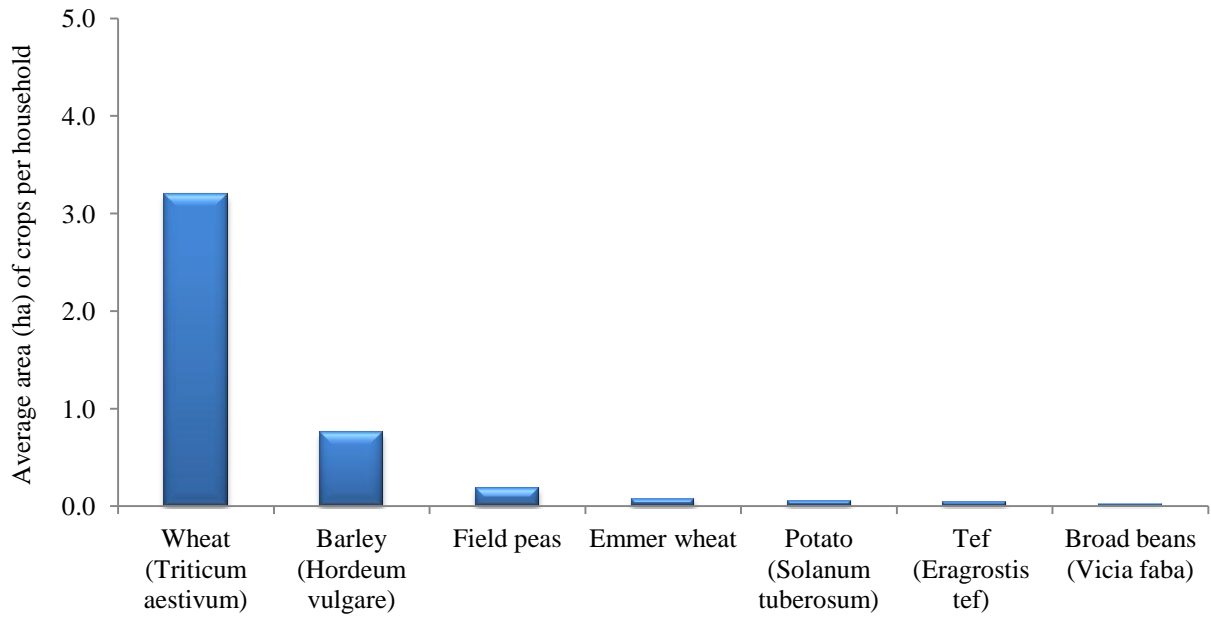


Figure 8: Major crops grown in Sambitu

Farmers utilize a wide variety of means to generate income (Figure 9). Crop production, in particular wheat, is the main livelihood source of income contributing about 68% of all household income. Sheep fattening, cattle fattening and off-farm activities contribute about 12%, 12% and 4% respectively to the livelihood income of the household.

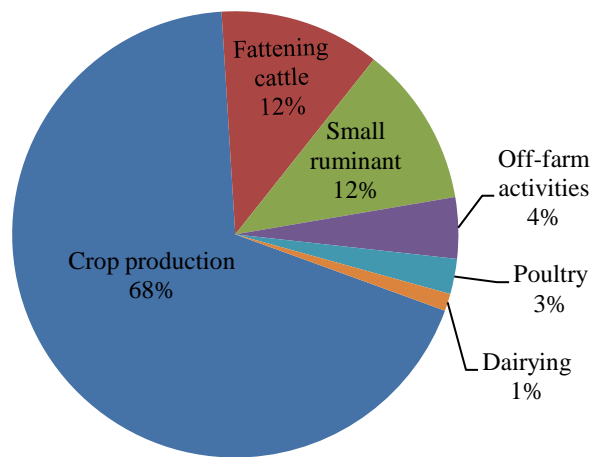


Figure 9: Contribution (%) of livelihood activities to household income in Sambitu

Livestock production system

Livestock species in the area include cattle, sheep, goat, horse, donkey and poultry (Figure 10). About 99% of the animals are local breeds. Only 1% of the households keep improved cattle breeds. The proportion of the households that keep local dairy cows and draft cattle is about 95% and 99% respectively. Approximately 60% of the households have sheep with the average number of three per household. Generally, cattle are kept for the purpose of draft power, manure, meat, milk and cash income. According to farmers, draft cattle are the most important animals because of their use for crop land cultivation, crop threshing and straw transportation. Sheep are also a major source of meat, manure and cash. Milk yield from local dairy cows is very low with an average yield of about 1-1.5 liters per cow per day. Except for a few farmers who sale milk in the local market, most of the milk is used for home consumption as liquid milk or in the form of butter and cheese.

Animals are kept within the homesteads overnight. They are kept in enclosures constructed from cactus or in small shelters attached to the living room of the main house.

Veterinary services are easily accessible. However, the services given are limited due to shortage of adequate facilities and drugs. The cost of veterinary treatment depends on the nature of the problem and the service provider. On average, farmers pay about 20 ETB (USD 1) per animal if the service is from the government animal health clinics. Artificial Insemination (AI) services are not accessible, farmers have to travel about 12 km with their animal to get AI service from Robe town. The use of improved bull services is also not well practiced; natural mating with existing local bulls is the common practice.

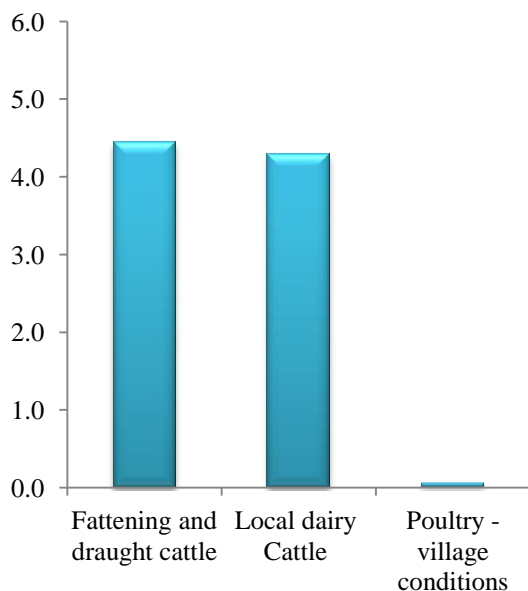


Figure 10: Average livestock species holdings per household in Tropical Livestock Units (TLU) in Sambitu

Feeds and feeding

Crop residues from cereals and pulses are the primary feed resources contributing about 37% of the total DM content of the animal diets. The residues are collected from farms immediately after crop harvesting. Crop residues are available twice per year. Most farmers store the crop residues to be used during periods of critical feed shortage. The residues are chopped and mixed with purchased concentrated feeds such as wheat bran and linseed cake before feeding. According to farmers, residues from pulses (field pea and faba bean) have to be chopped into very small pieces before feeding. Linseed cake and wheat bran are the common concentrates used to supplement dairy and fattening animals mainly during the dry season. Salt and flour by-products are also mixed with straws to increase the intake and feeding value of the residue. The contribution of the purchased feeds to the DM content is very low because the volume and frequency of their purchasing is very low.

After rainy periods, households feed green fodder collected from road sides and cropping land. The fodder is primarily naturally occurring weeds such as wild oats. These contribute about 7% of DM, 8% of ME and 8% of CP to the diet of the animals. They are primarily fed to lactating cows, draft cattle and calves.

Fodder oats and maize are the two major fodder crops cultivated solely for animal feed. They contribute about 36% of the total DM of the animal diet. Their contribution to ME and CP is 40 and 41% respectively. They are fed to all types of animals, however, priority is given to lactating cows and draft oxen. Lack of forage seed and inadequate knowledge about improved fodder varieties are some of the reasons that limit the expansion and utilization of these improved forage species.

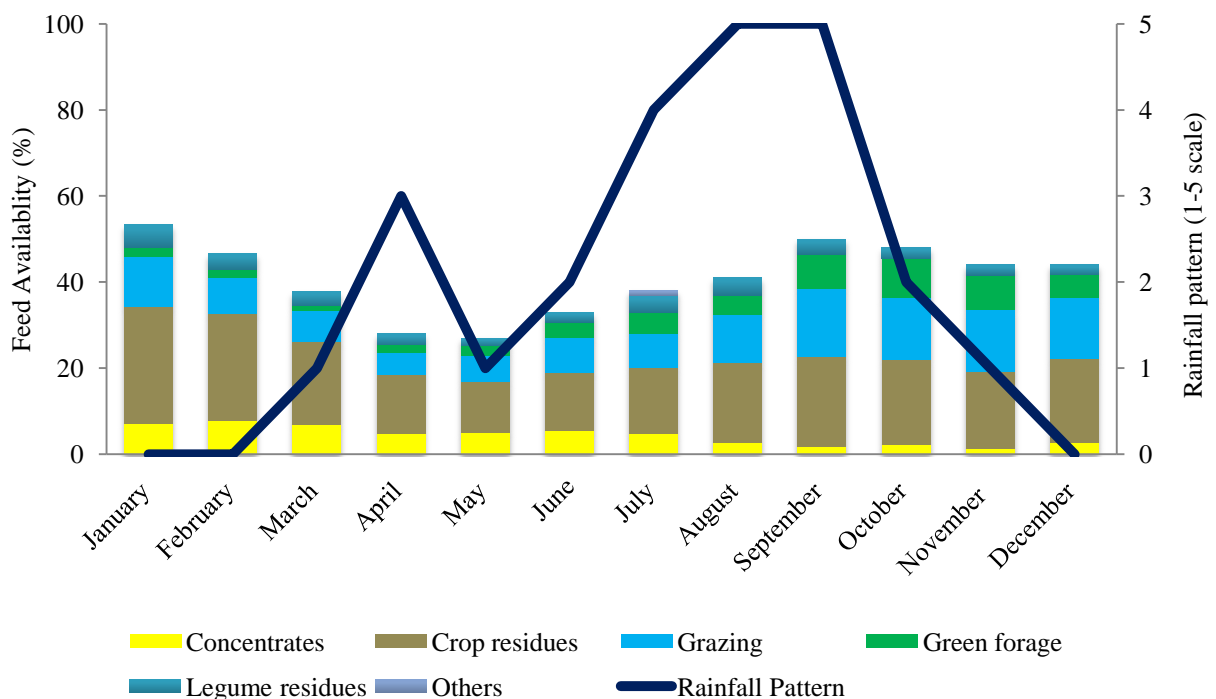


Figure 11: The composition of the livestock diet in Sambitu throughout the year in relation to the rainfall pattern

Communal grazing areas are scarce, thus grazing is usually done around homesteads, on community land, by the roadside and on marginal land. Although contribution of grazing as a feed resource is very low due to its poor productivity, grazing is practiced in most months of the year as indicated in the Figure 11. Aftermath grazing and fallow lands, following the crop harvest also provide feeds for all classes of livestock. Generally grazing contributes to about 11% of DM, 12% of ME and 9% of CP of the total diet.

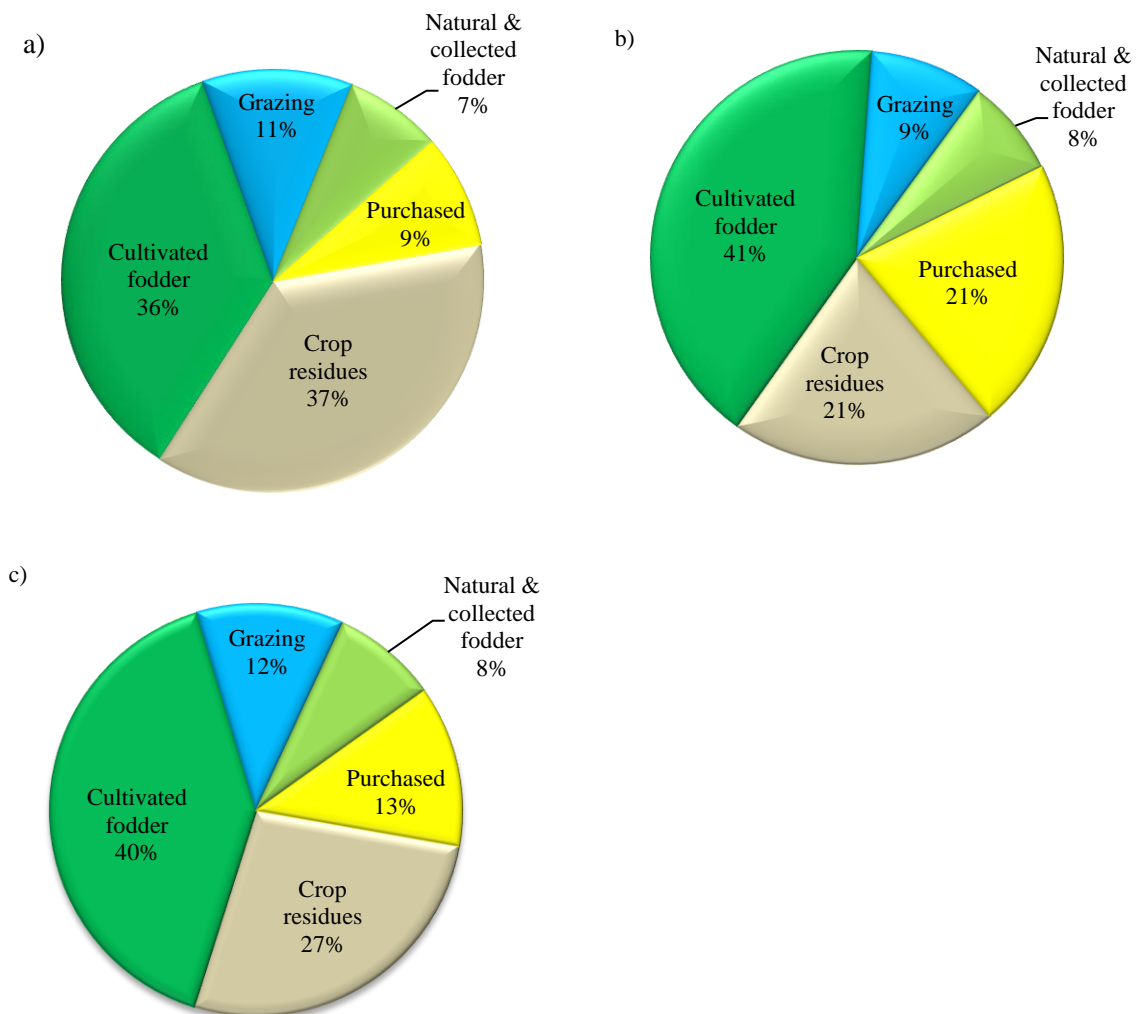


Figure 12: The contribution (%) made by various feedstuffs to the DM (a), CP (b) and ME (c) of livestock diets in Sambitu

Problems, issues and opportunities

The livestock-related problems and improvement options suggested by the farmers are summarized in Table 3 below:

Table 3: Livestock-related problems identified by farmers in Sambitu and the corresponding solutions that were suggested

Problem (in order of importance)	Problems identified	Proposed solution by the farmers
1	Shortage of feed in quantity and quality	Cultivating fodder crops such as maize and oats as well as other forage varieties Proper utilization of the existing feed resource such as crop residues and grazing lands Better awareness/training on improved feed technologies
2	Incidence of disease and parasites	Further improvement/strengthening the existing veterinary clinics with manpower and necessary facilities
3	Lack of AI service	Provision of A.I services by the Government and other bodies
4	Lack of adequate awareness	Training in livestock improvement
5	Cash shortage	There is a need to strength cash credit and agricultural input providers such as cooperatives

Summary

Key issues

- Shortage of feed in quantity and quality
- Incidence of disease and parasites
- Lack of access to AI services and improved dairy cattle breeds
- Lack of adequate awareness

Metrics

- Milk yield: 315 l per cow per year
- Meat off take: not applicable

Walta'i Barisa

Overview of the farming system

According to the older folks, livestock farming was predominant six to seven decades ago. Currently, the crop-livestock mixed farming system is dominated by cereal cropping. Increased human population has reduced the grazing lands, leading to reduction in the population and productivity of livestock. Consequently, this has forced farmers to shift to cereal-based mixed farming system which in turn has made livestock production a sub-system. The farm size per household is approximately 3 hectare with about 6 people in each household. According to farmers, the farm size per household is gradually decreasing as a result of increasing population pressure. The majority of the households fall in the category of medium land size farmers with 2 to 5 ha (Figure 13).

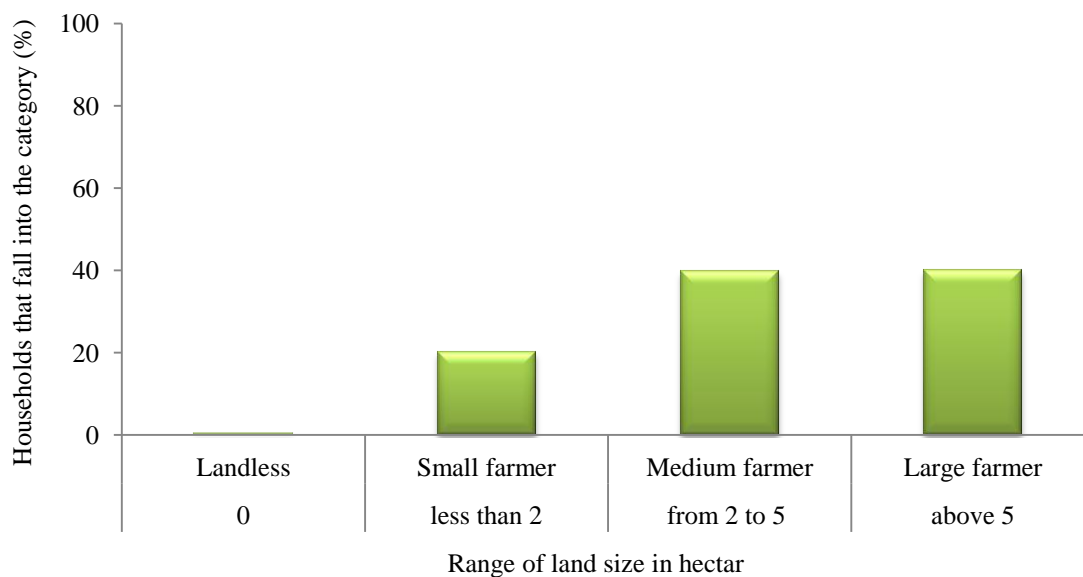


Figure 13: Average land size owned by different categories of farmers in Walta'i Barisa

Similar to the two previous *kebeles*, farmers describe two cropping seasons, locally named by the time of crop harvest. *Ganna (Belg)* extends from beginning of March to the end of July while *Bona (Meher)* extends from mid-July to end of December. *Bona* is the main season and is very important for crop production because of the long and intense rainfall during the season.

Wheat is the dominant crop. It covers the highest proportion of the farm land. Barley, emmer wheat and field pea are the other crops grown. Cereal and pulse crops are cultivated alternatively during the cropping seasons. Fallowing farm land is not practiced in the area. Wheat is the major cash crop whereas the other crops are mainly used for home consumption. Cereal and pulse crop residues are major livestock feed resource. They are also used for mulching to improve texture of the soil and as raw materials for wall construction of local houses.

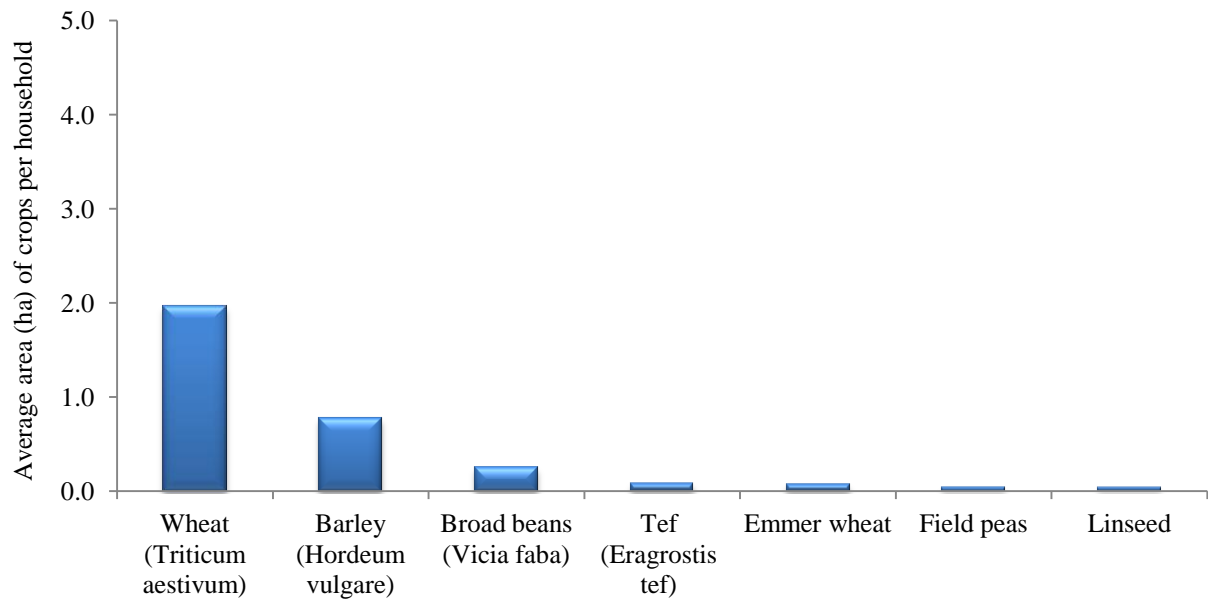


Figure 14: Major crops grown in Walta'i Barisa

Although irrigation is available in the study area, only about 0.6% of the households use it for crop production. Daily labor is not readily available as required. The requirement is critical during land preparation, planting, harvesting and crop residue collection. Activities such as management of livestock are undertaken by family labor, mainly children and women. However, family labor is not adequate to undertake farm activities since most household members leave the farms for work and education in nearby towns. To overcome the problem of labor shortage, farmers prefer to contract people on long term agreements from other areas. These contractual laborers are provided with farm land of about 0.5 hectare and farm inputs such as seeds and fertilizers. The cost of hiring these individuals is estimated to be 40 ETB (USD 2.2) per day.

Livestock related inputs such as improved breeds, forage seed, urea and plastic sheeting are not readily available. Cash credit is available but the farmers do not access it because they are unable to fulfill credit conditions such as organizing themselves in groups. Mistrust among existing groups and inability to repay the interest timely are common problems. Farmers are, therefore, not interested in applying for credit. Wheat is the main source of income contributing about 57%. Small ruminant and cattle fattening activities contributes about 18% and 15% respectively.

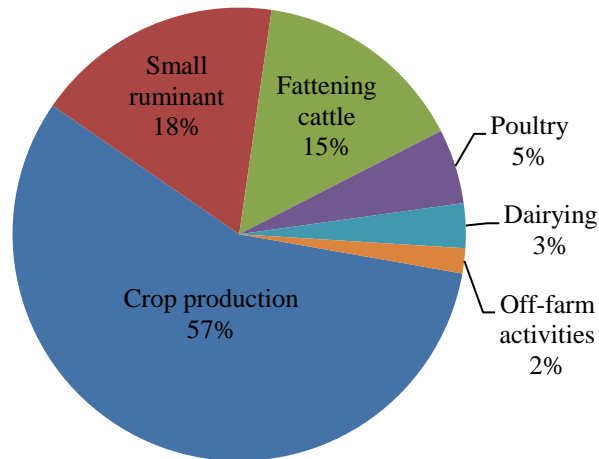


Figure 15: Contribution (%) of livelihood activities to household income in Walta'l Barisa

Livestock production system

The indigenous zebu cattle breed locally known as Arsi breed is about 95% of the cattle population. The few crossbreed populations are mainly Friesian Holstein and Jersey crosses. More than 95% of the households keep local dairy cows and draft cattle. Draft cattle and local dairy cows are the predominant livestock species in households (Figure 16). Cattle are kept mainly for the purpose of draft power, manure, meat, milk and cash income. Equines and small ruminants are also important livestock for the livelihood of the farmer. Activities such as crop threshing and transporting crop residues are usually performed by draft animals. Small ruminants especially sheep are also a major source of meat, manure and cash for the households. The milk yield of the local dairy cows is very poor, on average 2 liters per cow per day. Dairy cows, draft cattle and equines are usually kept overnight in enclosures made of cactus near the homestead. Calves and small ruminants are housed in small barns. There is one animal health clinic in the area. However, it lacks trained manpower, adequate drugs and equipment. The cost per treatment varies between private and government clinics. The governmental animal health clinic is cheaper (30 ETB (USD 1.7)) than the private clinic (75 to 80 ETB (USD 4.4)). Artificial insemination (AI) is not available in the area. Farmers use improved bull service from their neighbors at no cost.

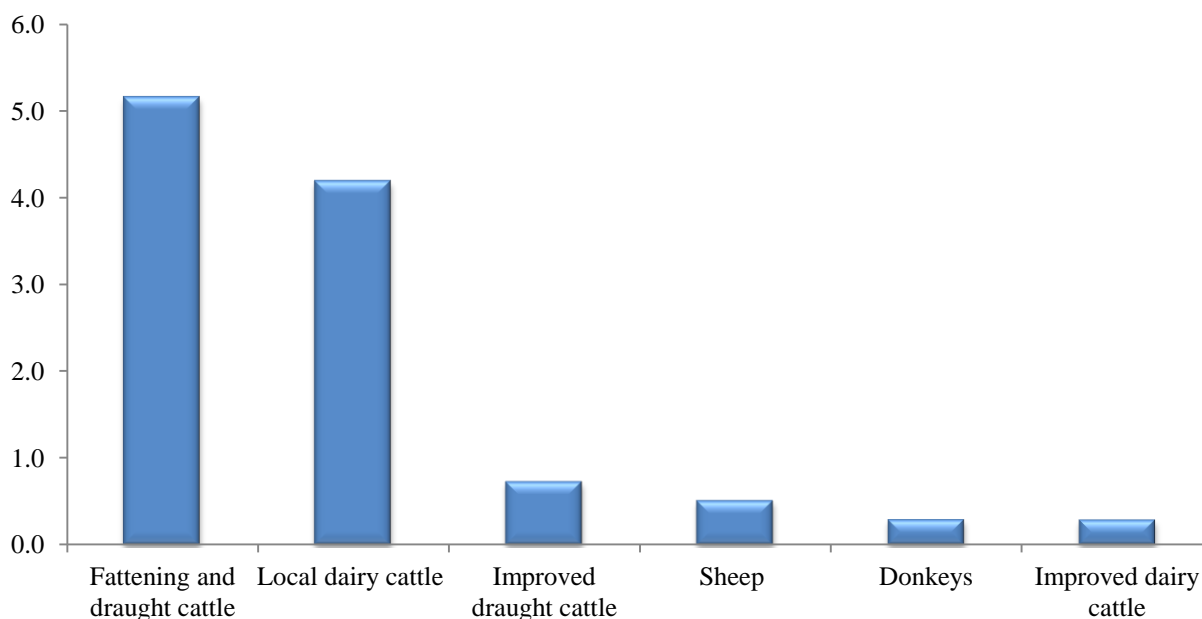


Figure 16: Average livestock species holdings per household in Tropical Livestock Units (TLU) in Walta'i Barisa

Feed and feeding

The major feed resources in the study area include crop residues, pasture from grazing lands, naturally occurring and collected fodder. Crop residues contribute about 38% to DM, 29 to ME and 22% to CP of the total diets. Cereal straws such as wheat, barley and emmer wheat are the dominant crop residues. Residues from faba bean and field pea are also commonly used as animal feed. These residues are available during most months of the year although the availability is relatively lower from the end of March to beginning of August (Figure 17).

Cultivated fodder crops mainly maize and fodder oats are produced by some farmers and contribute to about 29% DM of the total diet. They are primarily fed to lactating cows and draft oxen. Majority of farmers do not cultivate improved forage crops although they show interest in them. Lack of forage seed and poor extension services are some of the reasons that limit the production of forage crops.

Communal pasture land is overgrazed and this results in poor re-growth of grasses and dominance by unpalatable species. Few farmers allocate small portions of their land for grass establishment. These enclosures are locally known as “kalo”. They protect these areas from animals during the wet season (mainly July to November) for rejuvenation of the existing grass and allow their draft animals to graze those areas at the end of rainy season. Grazing is usually done around homesteads, community land, roadsides and marginal land. Aftermath grazing and fallow land following the crop harvest also provide feeds for all livestock.

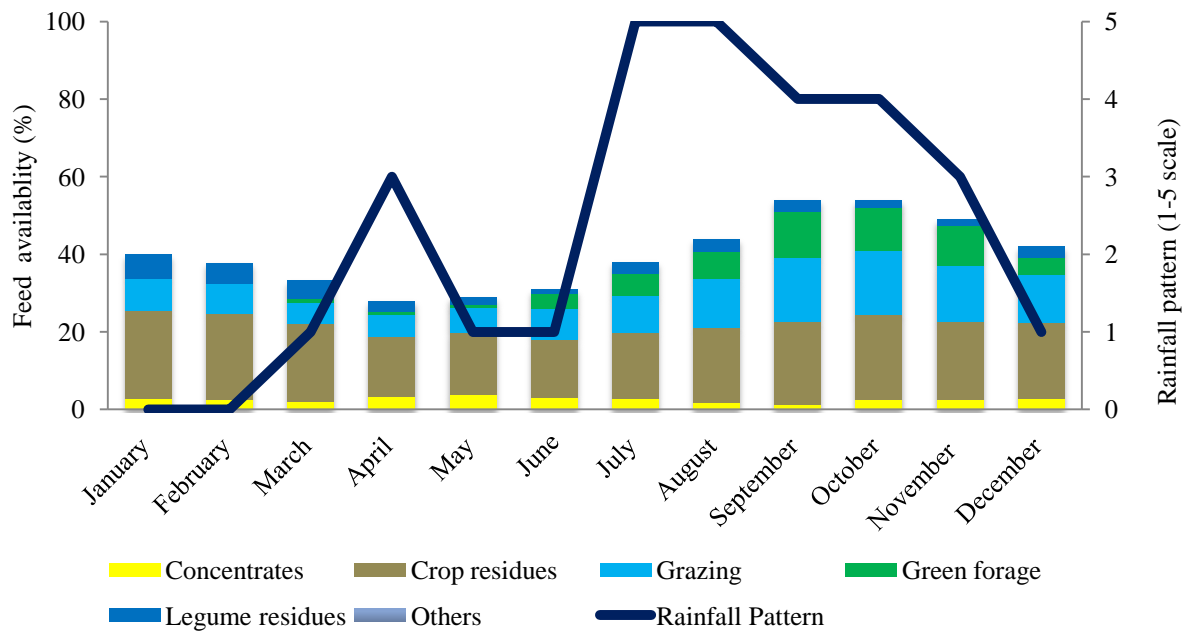
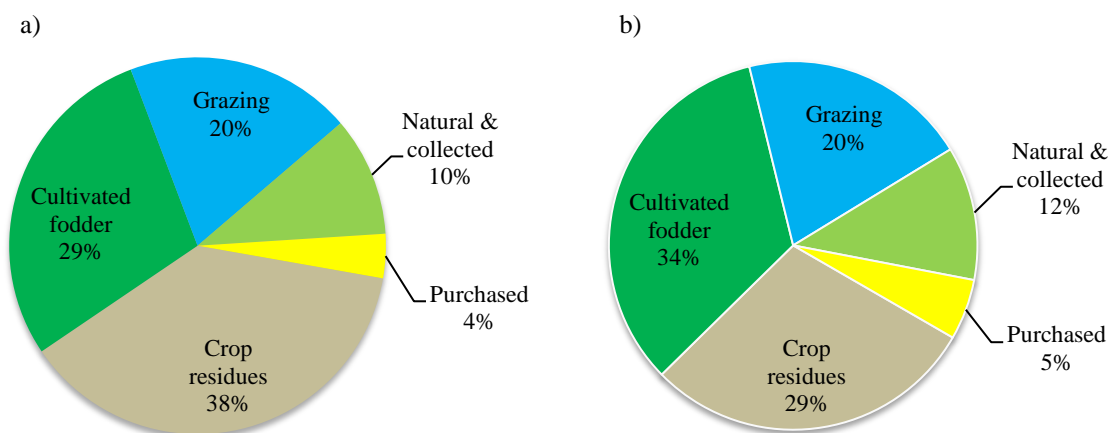


Figure 17: The composition of the livestock diet in Walta'i Barisa throughout the year in relation to the rainfall pattern

Naturally occurring and collected feeds such as weeds from cropland are also a good source of feed especially during the rainy seasons. They contribute to about 10% DM, 12% of ME and 12% of CP of the total diet (Figure 18). These collected green feeds particularly wild oats are fed to mainly lactating cows and draft oxen. Straws of cereal and pulse crops are usually chopped and mixed with salt and agro-industrial by-products. The commonly used concentrate feeds are linseed cake and wheat bran. The availability and cost of these concentrates vary with seasons. Only few farmers supplement their animals during the dry season and when they target to fatten them.



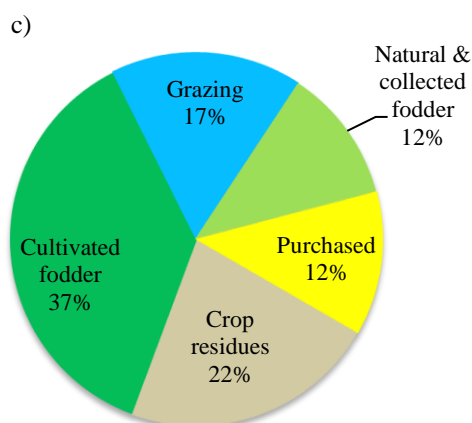


Figure 18: The contribution (%) of various feedstuffs to DM (a), CP (b) and ME (c) of livestock diets in Walta'i Barisa

Problems, issues and opportunities

The important livestock-related problems and the appropriate improvement options suggested by the farmers are summarized in Table 4 below:

Table 4: Livestock-related problems identified by farmers in Walta'i Barisa and the corresponding solutions suggested

Problem (in order of importance)	Problems identified	Proposed solution by the farmers
1	Shortage of feed in quantity and quality	Training on proper utilization of existing feed resources and improved varieties Cultivating improved feed varieties such as fodder oats Cultivating maize for the purpose of animal feed Minimize the number of animals to few improved and productive ones
2	Lack of adequate awareness	Training on livestock production and management Information exchange from the nearby farmers
3	Cash shortage	Strengthening cash credit providers
4	Incidence of disease and parasites	An animal clinic with manpower and necessary facilities
5	Lack of AI service	Adequate and timely provision of an artificial insemination services by the Government and other organizations Use of improved bull service

Summary

Key issues

- Shortage of feed in quantity and quality
- Inadequate source of clean water
- Lack of access to AI services
- Incidence of disease and parasites

Metrics

- Milk yield: 384 l per cow per year
- Meat off take: not applicable

Discussions

Opportunities

- Abundance of crop residue.
- Intercropping of cereals and pulses guarantees an improvement in the quality of crop residues.
- Farmers are receptive to the idea of forage crops although limitations abound.
- Sheep fattening and milk production are dominant livestock activities, thus need for supplementary feeding.

Potential intervention

Cereal production is dominant and crop residues are the main livestock feed resources. Farmers, however, incur a lot of wastage due to poor collection of the residues from the threshing grounds. Farmers in these *kebeles* 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 all the three *kebeles*, several farmers have already started cultivation of fodder crops such as maize and oats. These feed resources are mainly fed to lactating cows, calves and draft oxen. To strength the fodder production activities, there is a need to further introduce, evaluate and popularize improved forage legumes and grass varieties with high herbage yield and quality. These technology options would be more successful in Sambitu *kebele* where there are water sources for irrigation and at Selka where there is more land availability. 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.

Sheep fattening and dairy production are major livestock preoccupations in the study areas. Since farmers currently supplement these animals with linseed cake and wheat bran, there is an opportunity to introduce to farmers the formulation of simple rations, specific to individual species and their varying physiological stages. This would allow for efficient utilization of the supplements and opportunities for on-farm preparation of supplement mixtures.

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. Aftermath grazing also provides feeds for all classes of livestock. At Walta'i Barisa, there are privately owned grazing enclosures (locally named as 'kalo') located around the homesteads and farmlands. However, the proportion of land allocated for grazing in Selka and Sambitu is very small. Moreover,

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 Selka 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

Similar trends were observed in all the *kebeles*, as they are all predominantly cereal based systems. Labour constraints are very limiting, therefore, any technologies and approaches introduced or disseminated to the farmers in these *kebeles* should take labour issues into serious consideration. Technologies and approaches should integrate both crops and livestock. Animal husbandry and management issues should also be taken into consideration.

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