

Using FEAST to characterize the farming and livestock production systems and the potential to enhance livestock productivity through improved feeding in Serera, Doyogena District, Southern Ethiopia

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Introduction

Livestock production plays a significant role in the improvement of farm households in rural area of Ethiopia. But, its productivity both per capita and total is low and this is the main reason for its very small (18%) contribution to the national Gross Domestic Product. The poor performance of the livestock sector in the country is due to different reasons such as high livestock numbers in households, poor quality of breeds, insufficient amount of good quality feeds and seasonal variation in their availability, poor health of livestock and inadequate health services, inefficient management of livestock, poor infrastructure, poor marketing and credit facilities, inadequate knowledge of integrated mixed farming system, inability of the farmer to exploit these resources due to different priorities. Recent increases in livestock production have mainly been due to expansion of herds, not improvements in productivity. Among the aforementioned problems, feed scarcity is often cited as the primary constraint to livestock productivity in crop-livestock mixed farming systems. A report on sheep value chain assessment conducted by Areka Agricultural Research Center and ICARDA, indicates that feed supply is a major bottle neck for livestock production in the area. Thus, tackling this problem through proper and strategic intervention is expected to bring some improvement in livestock productivity.

The Feed Assessment Tool (FEAST) is a systematic method to assess local feed resource availability and use. It offers a systematic and rapid methodology to assess feed resources at site level with a view to developing a site-specific intervention strategy to improve and optimize feed supply, utilization and animal production through technical or organizational interventions. FEAST differs from conventional feed assessment approaches that focus on the feeds, their nutritive value, and ways to improve it. FEAST broadens this assessment to account for the importance of livestock in local livelihoods, the relative importance of feed problems locally, the local situation related to labour, input availability, credit, seasonality and markets. This tool was used to characterize the farming and livestock production system including feed resources and related aspects of smallholder farmers in Serera, Doyogena district of Kembata-Tembaro zone in Southern Ethiopia.

The feed assessment study was conducted on 28 - 29th December 2013 by researchers from Areka Agricultural Research Center (ARC) with backstopping from International Center for Agricultural Research in Dry Areas (ICARDA).

The objective of the study was to provide an overview of farming system and identify the major livestock production challenges, opportunities and possible potential interventions with special emphasis on livestock feed and related aspects for the improvement of livestock production and productivity in Serera.

Study site

Doyogena district is located in Kembata-Tembaro zone, a distance of 258 km South-West of Addis Ababa at an altitude ranging from 1900 to 2748 meter above sea level (m.a.s.l). It comprises of 14 sub-districts with 17,264 hectares of land coverage. Crop cultivation covers 86% of the land area, forest and bushes cover 11.8%, 2% is grazing land and 0.2% is degraded land. The district has two

major agro-ecologies, *Dega* (70%; cold) and *Woinadega* (30%; dry warm), that represent altitudes of 1500m-2500m, temperatures of 10°C-16°C and average annual rainfall of 900-1400 mm.

Doyogena is one of the major mandate research areas of Areka ARC and intervention area for ICARDA through community based sheep breed improvement program. Currently, three different projects such as large ruminant synchronization, community based sheep breed improvement and regional watershed projects are being undertaken by Southern Agricultural Research Institute in the district through collaboration of different research and development stakeholders.

The maximum, average and minimum land holding per household in the district is 3.5ha, 0.75ha and 0.25ha respectively. The major crops grown in the area include enset, wheat, potato and faba bean. Serera, the village (*kebele*) where the study was undertaken, is situated 5 km from Doyogena on the way to Wolaita Sodo. Serera has an area of 713.5 hectares. It lies in the Dega agro ecology.

Sampling method

Discussions were made with livestock experts and work process leaders from the District Office of Agriculture on the objective of the study and the farmers' selection criteria. The farmer selection considered farmers from the whole *kebele* and targeting those involved in crop and livestock farming. Female participation was encouraged. Based on that, twenty two farmers (2 females and 20 males) from the *kebele* were selected by Development Agents.

Survey structure and format

A focus group discussion using participatory rural appraisal (PRA) and individual interviews were conducted to collect data for the study. All selected farmers were allowed to participate in the PRA group discussion. Information on general farming, livestock production and management system and problems and opportunities for livestock production was collected from the PRA group discussion. Nine farmers from three different landholding classes (small, medium and large, 3 farmers from each class of land holding size) were purposively selected from the group for the purpose of individual interviews that focused on data collection on crops grown, income sources, feed availability and seasonality.

Data analysis

Narrative reports collected from group discussion were examined and reported. Individual interview results were analyzed using the FEAST excel temple (www.ilri.org/feast).

Results

The farming system in Serera is classified as an Enset-based mixed crop-livestock production system. Farm land size varies among the households. Depending on the landholding size, farmers in the *kebele* were classified into three categories: small, medium and large. Majority of farmers have medium-size landholding (Table 1). The average landholding in the area is 0.5 hectare per household. Land shortage is a serious problem as a result of high population density, thus farmers use land for more than one crop per year. There is no fallowing practice with the aim of

rehabilitation, however, small portions of cultivated land are reserved for the purpose of grazing oats. Landholding and family size classes for the *kebele* are indicated in Table 1 below.

Table 1: Category of farmers, range of land size and % of HH that fall in the category in Serera kebele

Category of farmers	Serera Kebele		
	Range of land size (ha)	% of HH fall in the category	Family size
Small farmers	Up to 0.75	20	3
Medium farmers	> 0.75 to 1.5	55	8
Large farmers	> 1.5	25	12

Farmers in Serera classified cropping seasons into two namely *Belg* and *Meher*. *Belg* season occurs from January to June whereas *Meher* cropping season occurs from July to December. Each cropping season includes activities starting from planting up to harvesting. The *Belg* season depends on begin of the rains in February or March. Majority of farming activity is based on rainfall except very few farmers who use minor irrigation systems such as hand dug wells, water harvesting structures (which last for short periods) and springs for vegetable production. 3% of households use these irrigation systems.

Farmers scored the average rainfall pattern through the year as shown in Table 2. The score was given on a scale of 0-5, where 5 = Very excess, 4 = Excess, 3 = Medium, 2 = Small, 1 = Very small and 0 = no rain.

Table 2: Rainfall score for Serera as given by farmers

Kebeles	Month											
	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Serera	0	0	1	3	2	4	5	5	3	1	0	0

Labour shortage is not a major problem with regards to the needs of agricultural activity. Daily labourers on contract basis are employed by a few farmers during critical harvesting times. In this case, farmers pay 350 - 400 birr (\$ 17 - 20) for a quarter hectare of land that is completed within two days by three persons.

Major crops grown in the sub-district include wheat, barley, bean, pea, potato, cabbage, and enset as shown in Figure 1. Wheat, enset and potato are the dominant food crops grown in area.

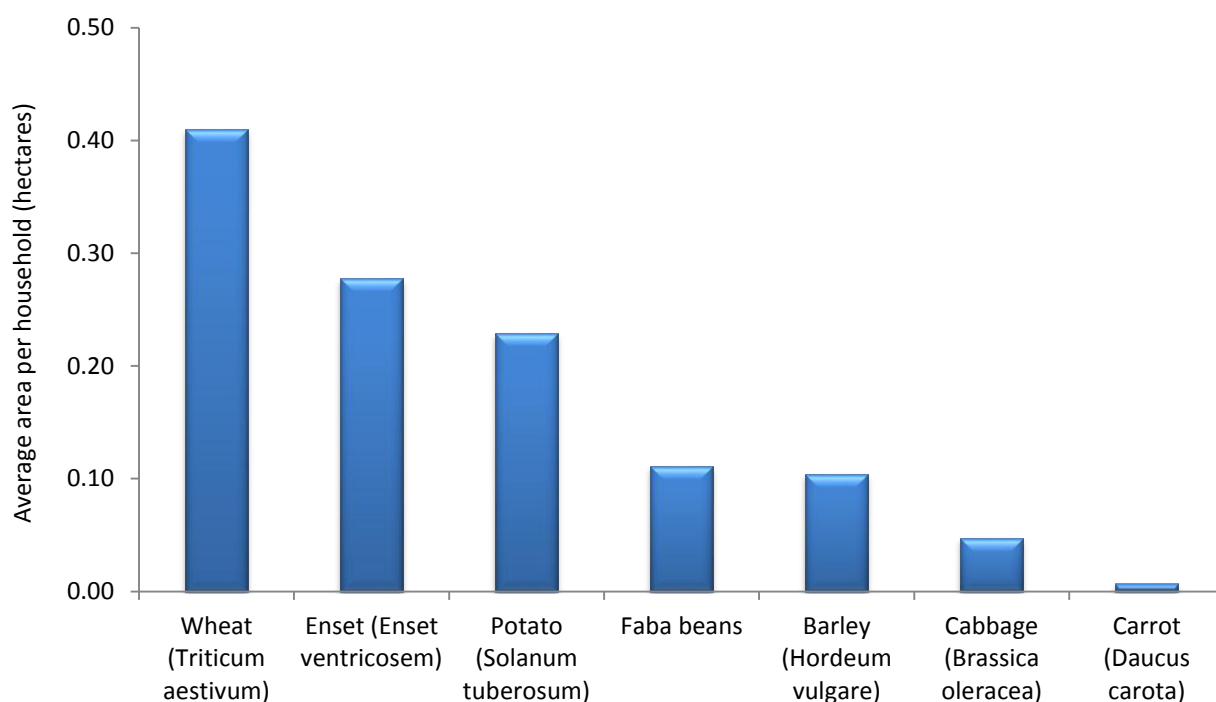


Figure 1: Major crops grown and average area (ha) per household in Serera kebele

Livestock production and management

Farmers mentioned many purposes of keeping livestock such as milk and meat production, egg production, cash source (from sale of animal and their products), source of manure and source of power for trashing and traction. Different species of livestock are kept by farmers in Serera.

Livestock species kept by farmers, average holdings of a given species and % of households that own the species are indicated in Table 3 below.

Table 3: Livestock species, percent of HH that own the species and average number of animals per household in Serera kebele

Livestock species	Serera Kebele		
	Use	% of HH that own the species	Average number of animal per household
Local dairy cow	Milk, butter, cheese, calf crop for sale and manure	95	2
Improved dairy cow	Milk, butter, cheese, calf crop for sale and manure	10	1
Draught cattle	Traction, trashing and manure	80	1
Fattening cattle	Cash source, meat and manure	7	1
Sheep	Cash source, meat, manure,	75	3
Goats	Cash source, meat and manure	3	1
Poultry-Village	Eggs, meat, cash source	80	5
Horse	Transportation and trashing	10	1
Donkey	Transportation and trashing	80	1
Mule	Transportation	0	0

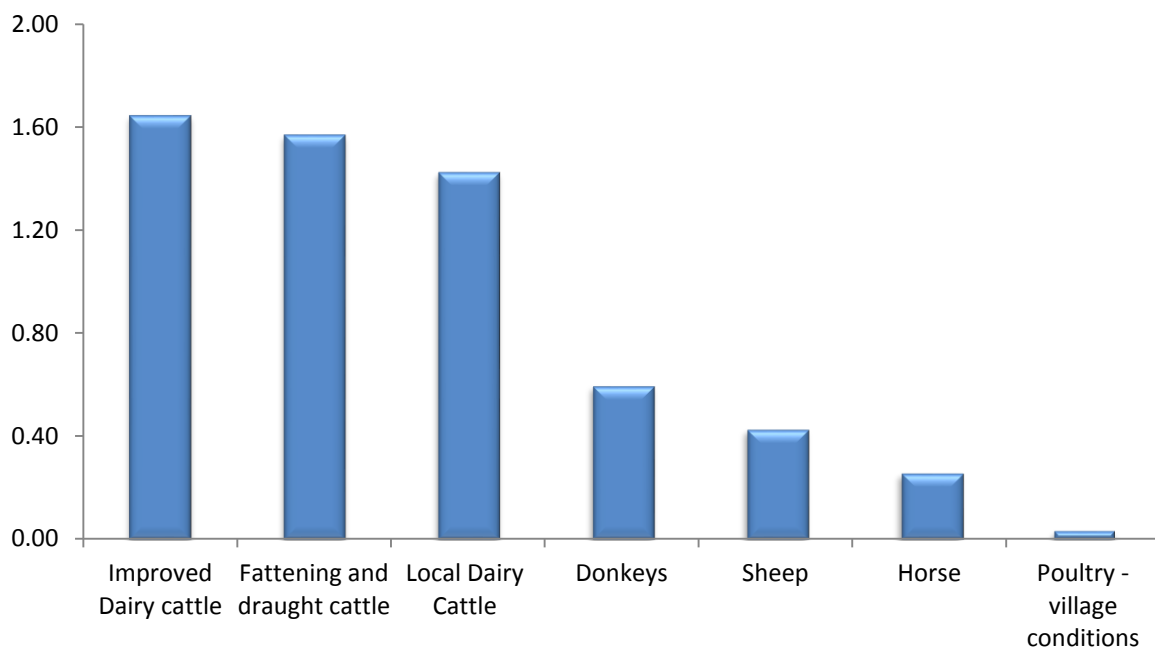


Figure 2: Average livestock species holdings per household in Tropical Livestock Unit (TLU) in Serera kebele

Farmers pointed out that they face financial constraints resulting in inability to fulfill input and material requirements for improved crop and livestock production. They indicated that there is a credit institution named Omo Micro-finance. However, the strong binding rules and regulations (e.g. one needs to save money in the credit and saving institute to get credit) and limited capacity of the service (small amount of money given - equivalent to the amount saved, few farmers can be given loans a one time) are major obstacles to farmers obtaining credit. Agricultural inputs and materials related to livestock production are also not readily available to the farmers.

Farmers sell food crops, livestock and their products and services to get income. The contribution of different income sources have been indicated in Figure 3 below.

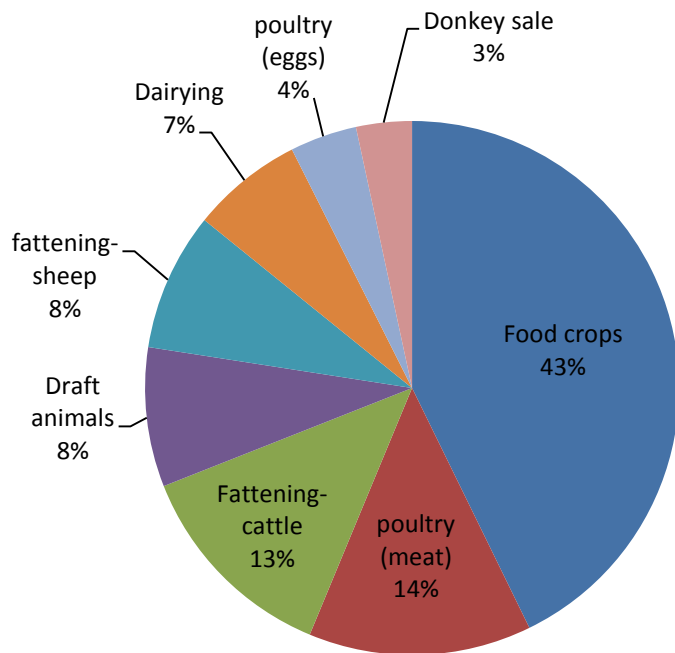


Figure 3: Contribution of livelihood activities to household income (as a percentage) in Serera kebele
 In the kebele, food crops are the most important household income contributors followed by poultry (meat) and fattening cattle.

Management of livestock species

In most cases, livestock are housed in separate partitions within dwelling house. There are no separate houses for livestock. Lack of awareness on livestock housing, fear of theft, predator risk and material shortage were some of the reasons that farmers mentioned as not having separate livestock dwellings.

Style of feeding varies depending on the season. Combination of stall feeding and tethering are very common during the cropping season when most farm lands are covered by food crops. There is also the practice of open grazing during the dry period after crop harvest. Major feed sources include crop residues (cereal and legume straw), natural grass (fresh cut), enset (leaf, pseudo stem and root part), cultivated fodder (oat and maize, improved planted grass (desho); Figure 4), grazing, different natural browses and purchased feed (bran). Farmers are accustomed to mixing straw with bran, *bole*, and water to feed lactating dairy cow and fattening oxen.

Feed shortage is one of the impediments for improved livestock production. Availability and quality of feeds varies along different seasons. Farmers as a coping mechanism use purchased feeds (Figure 6) enset (both residues and the part that used for human food), allocate part of cultivated land for the purpose of grazing, cultivating forages, collect naturally occurring fodders and collect and conserve crop residues (straw).

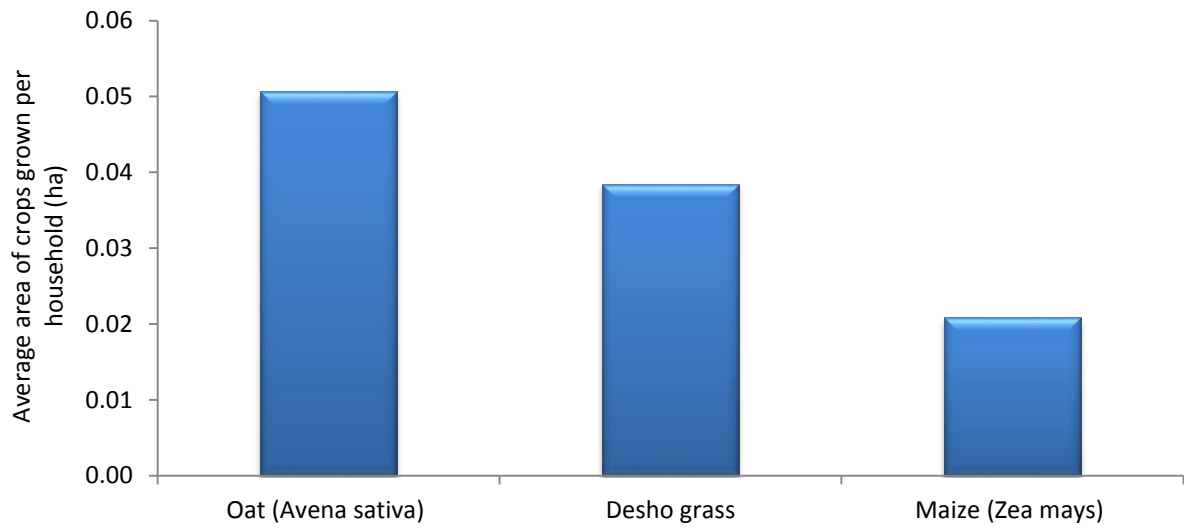


Figure 4: Fodder crops grown in Serera kebele

Oats and desho grass (Figure 5) are the dominant fodder crops grown by farmers in Serera kebele. Crop residues and enset are the major feed resources during dry spells (Figure



Figure 5: Fodder oats (left) and desho grass (right) on fields in Serera

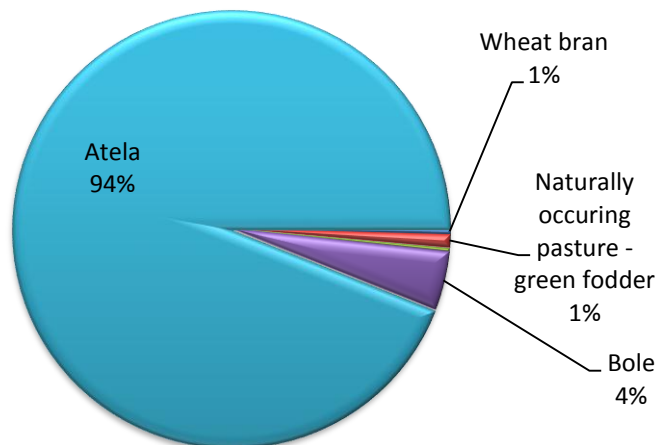
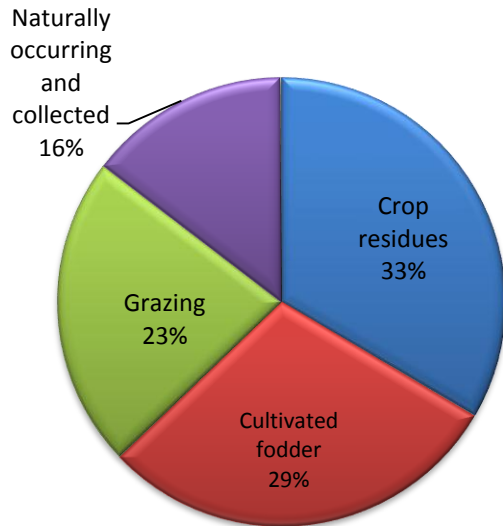
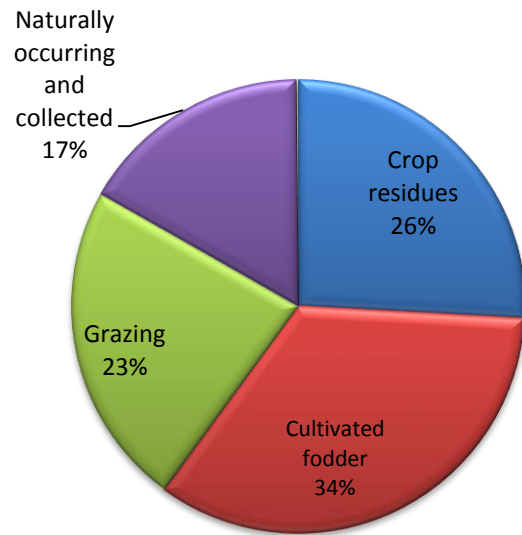


Figure 6: Quantity of feed purchased over a 12 months period in Serera kebele

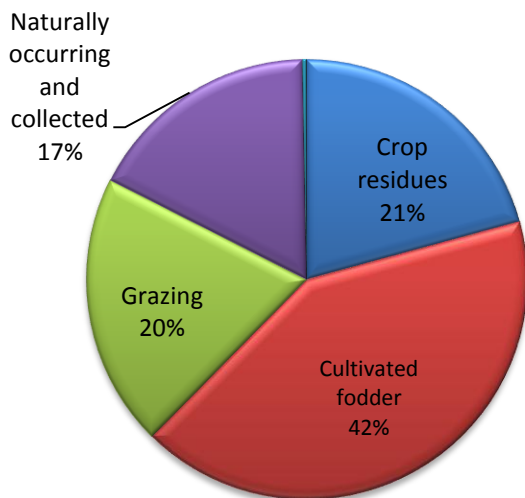
Over and above the shortage of feed availability, quality is also a serious challenge for improved productivity of livestock. Livestock in the area depends on the existing poor quality feed sources to satisfy their dry matter (DM), metabolizable energy (ME) and crude protein (CP) requirements. Dietary contribution of feed resources in Serera is indicated in Figure 7.



a



b



c

Figure 7: Dietary composition of feeds a. dry matter, b. metabolizable energy and c. crude protein in Serera kebele

Crop residue, cultivated fodder and grazing are the main source of dry matter content of the total diet. The ME content of the total diet is also obtained from these feed sources. Crude protein sources are mainly from the cultivated fodder namely oats, desho grass and maize.

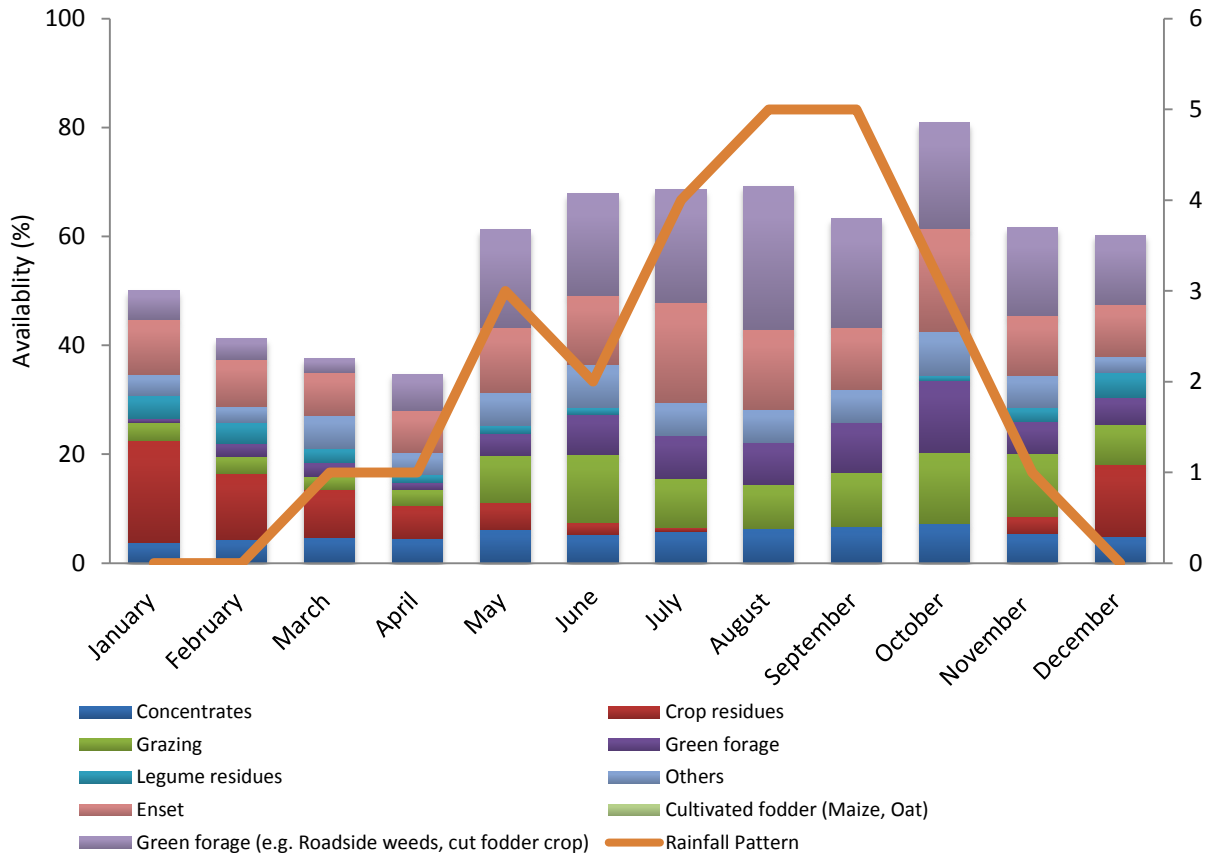


Figure 8: The composition of the livestock diet in Serera throughout the year in relation to the rainfall pattern

Health management

Farmers in Serera *kebele* have good access to veterinary services as there is animal health post in the *kebele*. Farmers reported that they mostly use public veterinary service because of the fair cost and good quality of drugs. However, public vet services occasionally face supply problems of required types of drugs which makes it necessary for farmers to seek private services. Service costs varies between public (cheaper) and private ones (expensive). Farmers pay 3-10 birr (\$ 0.15-0.5) and 2 birr (\$ 1.5) for treating cattle in public and private vet service respectively. This of course varies depending on the type of disease and treatment required.

Breeding management

Farmers have great interest to replace local low producing breeds of cattle with improved one. During the focus group discussion, farmers stressed that breed improvement service is very poor. Both Artificial insemination and bull services are not available in the *kebele*. Farmers are compelled to take their cows to neighboring *kebeles* such as Gomera Gewada, Angacha and Fendie (which on average takes about 5 hours for a return trip). 30-40 birr (\$1.5-2) is paid for one bull service. There might be up to two repeat services.

Problems, issues and opportunities

Major problems faced by farmers in Serera in relation to livestock production include feed shortage, improved breed shortage, financial shortage, knowledge gap (awareness problem) and poor animal health service. Farmers take different measures as coping mechanisms for some of the existing problems. Main problems, coping mechanisms and suggested solutions for the *kebele* have been listed in the following Table 4.

Table 4: Problems, coping mechanisms and suggested solutions to livestock challenges in Serera *kebele*

Problems	Rank	Coping mechanism	Suggested solution by farmers
Financial shortage	1	<ul style="list-style-type: none"> ▫ Search for other informal credit sources (friends and informal credit suppliers – “Arata) ▫ Become member of credit and saving cooperatives. ▫ Sale small animals (calf, sheep, chicken) and crop (wheat, potato, etc). 	<ul style="list-style-type: none"> ▫ If appropriate credit service is arranged in such a way that farmers can get the required amount of money with fair interest rate.
Feed shortage	3	<ul style="list-style-type: none"> ▫ Use enset which otherwise was used for human food. ▫ Properly collect and conserve straw for use during dry seasons. ▫ Allocate small portions of cultivated land to grow pasture grass for grazing. ▫ Cultivate maize and oats for forage purpose. ▫ Purchase feeds like bran, ‘atela’ and grass 	<ul style="list-style-type: none"> ▫ Provision of improved forage seeds/planting materials. ▫ Increase awareness of farmers on improved forage production systems through practical training
Improved breed shortage	4	<ul style="list-style-type: none"> ▫ Taking animals (cows) to the area where bull service is available. 	<ul style="list-style-type: none"> ▫ Appropriate AI and/or bull service need to be arranged in a way that every farmer can get the service at the right time at the right place.
Knowledge gap	2	<ul style="list-style-type: none"> ▫ Sharing experience from other neighboring farmers. 	<ul style="list-style-type: none"> ▫ There should be practical training and appropriate extension system with regard to livestock system.
Lack of proper health service	5	<ul style="list-style-type: none"> ▫ Traveling long distance to get the service. ▫ Use private vet services at a high cost with the risk of expired drugs. ▫ Use traditional treatment (different medicinal plant leaf –eg Bisana leaf, smashed and mixed with water to drench case animal) 	<ul style="list-style-type: none"> ▫ Establish vet health post in the nearby area. ▫ Making available all necessary drugs ▫ Employ skilled experts

Pair-wise comparison of problems was made with farmers in during group discussion in the *kebele* so as to identify the more important problems in rank order.

Table 5: Pair-wise comparison of problems in Serera *kebele*

Problem	Feed shortage (A)	Finance shortage (B)	Breed shortage (C)	Awareness problem (D)	Poor health service (E)
Feed shortage (A)	A				
Finance shortage (B)	B				
Breed (C)	A	B			
Awareness problem (D)	D	B	D		
Poor health service (E)	A	B	C	D	
Total score	2	4	1	3	0
Rank	3	1	4	2	5

From the above pair-wise comparison table, financial shortage is the top most perceived problem for livestock production followed by lack of awareness and feed shortage.

Potential interventions include: Integration of improved grass and legume forages with other cropping and natural resource conservation activities, availing proper breed improvement service like AI, appropriate input supply like forage seed/planting material relevant for the area and farming system, and proper credit service supplemented with strong awareness creation through different practical trainings are the potential intervention areas to improve the existing situation related to livestock production.

Conclusions

Farmers are eager for change if they would be equipped with technical and financial support. Therefore, it can be concluded that change and improvements are possible if development and research organizations and concerned stakeholders intervene towards tackling the problems in line with suggestions given by farmers. Appropriate forage technologies that fit the agro-ecology and existing farming system need to be introduced to the area with the objective of improving feed availability and quality. Appropriate technology extension and knowledge transfer need to be employed in a way that can bring profitable and sustainable environmental friendly livestock production system in the area.

Summary

The demand for livestock and their products is on the increase in Serera and Doyogena district as a whole. Farmers realize the benefits of keeping livestock although the numbers and production levels of livestock are decreasing due to feed shortage, breeding, health and housing management problem and capital shortage. The existing extension system with regard to livestock system is too weak to bring change on livestock production improvement. Appropriate supply of improved forage technology packages, feeding systems and feed management, provision of proper breeding and credit services are some of the potential interventions suggested by farmers. Therefore, cooperation of different development and research organization and integrating different forage technologies and livestock operations with other farming activities may bring a solution.