Assessment of livestock production systems, the potential of feed availability, farming system and livestock production problems in Fogera District, Amhara Region, Ethiopia

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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 to feast@cgiar.org. The International Livestock Research Institute (ILRI) is not responsible for the quality and validity of results obtained using the FEAST methodology

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Introduction

The major available feed resources in the study areas are natural pasture, crop residues, hay, stubble grazing and agro industrial by products, fodder trees and improved forages (Getachew Molla, 2014, unpublished). Comparably, the major sources of feed in Fogera district had were crop residues, natural pasture, hay, and crop aftermath (Teshome Derso, 2009). Firew Tegegne and Getnet Assefa (2010) also reported that the agro-industrial by-products, rice hull and rice bran, noug seed cake are the two most commonly available agro-industrial byproducts which are used as animal feed in Fogera district.

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 at three villages of Fogera district, Ethiopia. The feed assessment study was conducted from March 27 - April 1, 2013. The objectives of the study were to study the general feature of the farming and livestock system (provide an overview of the farming system) and to identify the major livestock production constraints and opportunities.

Methodology

Study site

The study was conducted in Fogera district which is located 625 km North to Addis Ababa and 55 Km from the Regional capital, Bahir Dar. It is situated at $110^0$41' to 110^0 53' north latitude and $370^0$41 to 110^0 53' east longitudes and at altitude of 1802 meters above sea level (m. a. s. l). The area receives a unimodal rainfall that ranges from 1103 mm to 1336 mm per annum and the annual temperature ranges from 19-20^0 C. According to the information from Woreda Office of Agriculture, the dominant soil type in the Fogera district is black clay soil (ferric vertisols), whereas mid and high altitude areas are characterized by orthic Luvisols. Three *kebeles namely* Alem ber, Woje Awuramba and Abua Kokit which are situated 20, 10 and 7 km away from Woreta town were respectively selected for the study.

Table 1: GPS coordinates of the study sites

S. Nº	Kebeles	villages	GPS coordinates	
			N	E
1	Alem ber	Chabi	$11^0$55'28"	$037^0$52'49.8"
2	Woje Awuramba	Timinda	$11^0$55'11.4"	$037^0$48'18.7"
3	Abua Kokit	Tach abua	$11^0$58'42"	$037^0$42'31"

Sampling methods

Based on basic information available at district level, the study *kebeles* were selected for this research work. The potential of the *kebeles* for livestock production and its accessibility were considered for selecting the *kebele/village*. 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 15-20 farmers, both male and female, based on the size of land holdings rang from small, through medium to large size.

Table 2: Selected kebeles for the study

Kebeles	Village	Farming system	Distance from Woreta (Km)	Characteristics
Abua Kokit	Tach abua	Rice-pulse	7	Lower land / Flood plain
Alem ber	Chabi	Teff-millet/ maize	20	Upper land
Woje Awuramba	Timinda	Teff-millet/ maize	10	Midland

Table3: Number of HHs, altitudes and geographical coordinates of the kebeles

Kebeles	No of HHs	Altituides (m.a.s.l)	GPS coordinates	
			N	E
Alem ber	1556	2050	1316995	0378379
Woje Awuramba	1979	1913	1319190	0379598
Abua Kokit	1045	1796	1324393	0358740

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 *village*. Key informant farmers were selected from three categories of land holding for the discussion groups. Accordingly, 9 individual farmers, 3 from each category were purposively selected and interviewed.

Data analysis

Both qualitative and quantitative data were collected from the group discussion. The qualitative information gathered during the group discussion is summarized and presented below. The quantitative data collected from the group and individual key informant farmers were entered into the FEAST excel template (www.ilri.org/feast) and the outputs are presented in the following section.

Major findings

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

Kokit kebeles (Tach Abua village)

Overview of the farming system

The farming system is classified as a mixed crop – livestock system where; Rice- pulse relay cropping dominates. The ownership of farm land varies among the households. The majority of the households fall in the small to medium category with land holding of 0.25 to 0.75 ha and 0.75 to 1 ha of land, respectively (Figure 4.11). There were about 5 landless farmers in the village. The average family size is 5 people per household.

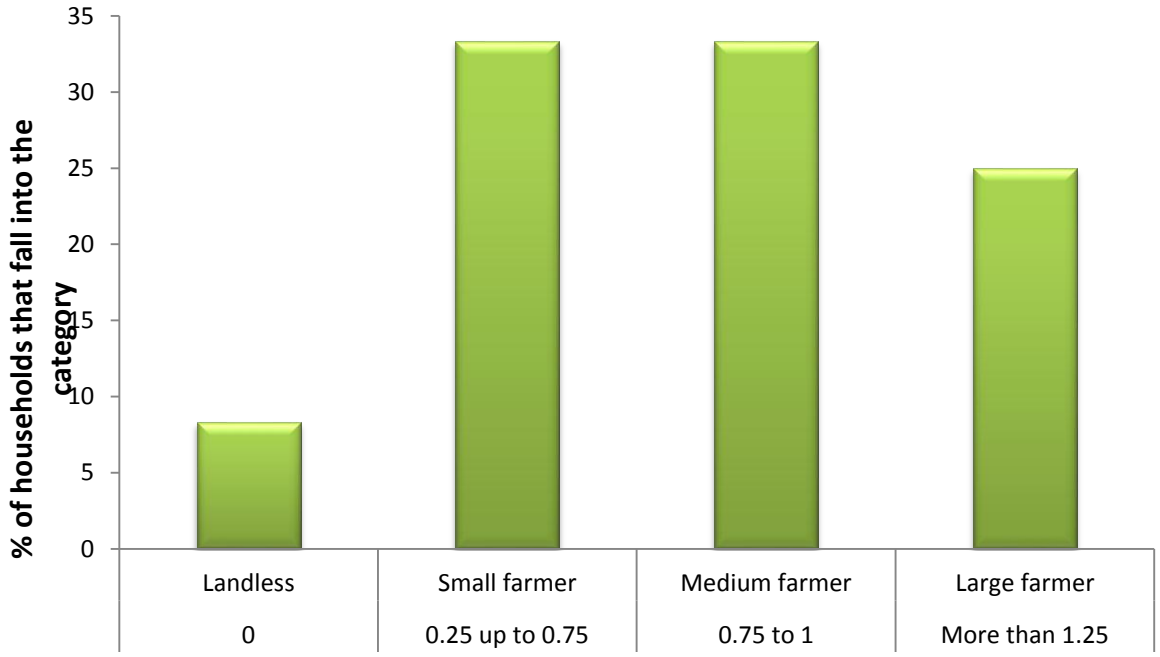


Figure 1: Average land size owned by various categories of farmers in tach abua

Crop production

Fluctuation in rainfall distribution was mentioned as a limitation for sustainable crop production. Farmers indicated that only some seasons are favorable for crop production. The crop production season is locally named after the time of harvest. Hence the main season, which extends from June to December, is called "*Meher*". As the area receives monomodial rain it is the main and very important season for crop production because long and adequate rainfall is received during this period. "Relay" cropping of pulses and spices is widely practiced after rice in the area. The relay period extends from September to January. Households in the area commonly grow a variety of food crops including; Rice (*Oryza sativa*), Grass pea (*Lathyrus sativus*), Chickpeas (*Cicer arietinum*), Oats (*Avena sativa*), Lentils (*Lens culinaris*), Tomato (*Solanum lycopersicum*) and Saff flower (*Carthamus tinctorius*). A few farmers grow naturally occurring pasture and oats and Sesbania as forage crops in there homestead area. Most of the farmers use their land for rice and grass pea. Fallowing is practiced by some farmers on pieces of land to grow grass for their livestock. Apart from the household consumption, the crops grown are mainly used as a means of income generation,

whereas the residues from cereal are the major source of livestock feed. However, small amounts of crop residues are used for house construction mainly for plastering and thatching roofs.

Irrigation water is accessible in the study area; about 50% of the farmers have access to irrigation. Farmers in the village use this irrigation water directly or through share cropping arrangements. Even though farmers mostly grow vegetables like tomato and onion, oats and grass pea are also grown on the irrigated land. The requirement for daily laborers is critical during rice weeding (July to August). Though, there is adequate job opportunity, about 5% of the farmers particularly the youth have left for Humera to work - sesame farms or merely looking for change. The cost of labor is approximately birr 80 (USD 4.3) per day including the meal and local drink. Farmers usually send their children to the school. Accordingly, about 15 students have left for Debre Tabore and Woreta from the village.

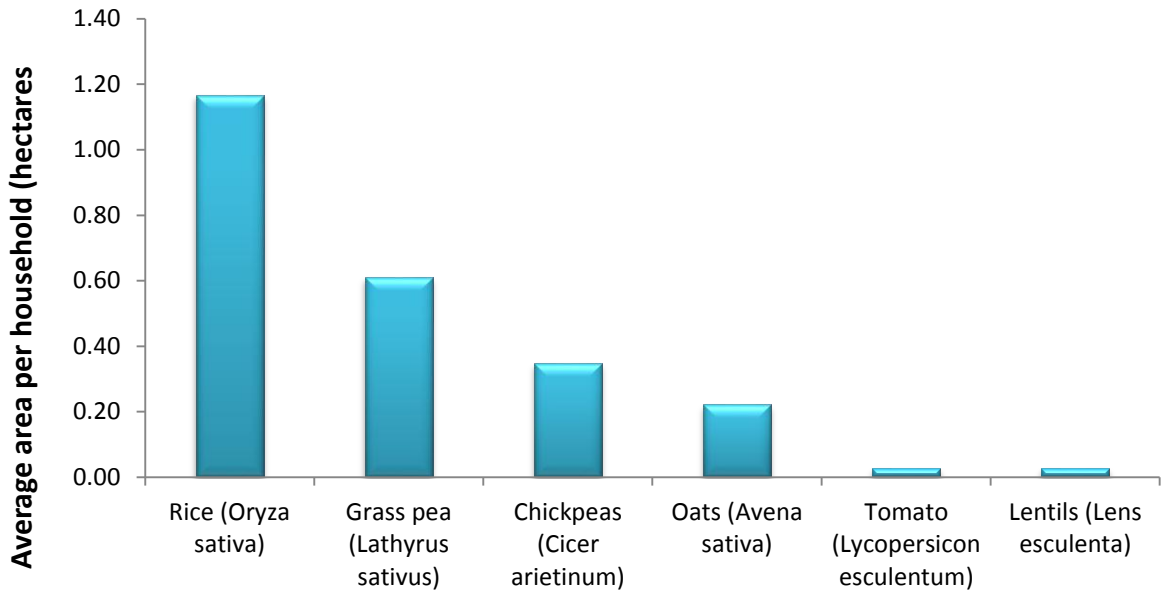


Figure 2: Major crops grown in tach abua village

For residents of this village cereals and vegetable crops (agriculture) are the main sources of income contributing about 68.3% of the household income. Small ruminant production, particularly sheep fattening, poultry for meat and eggs is also another important livelihood activity contributing about 9.72% to total household income. Cash crops (sell of onions, lentils, fenugreek, safflower and tomato) contribute 24.7% of the total household income Figure 4.13.

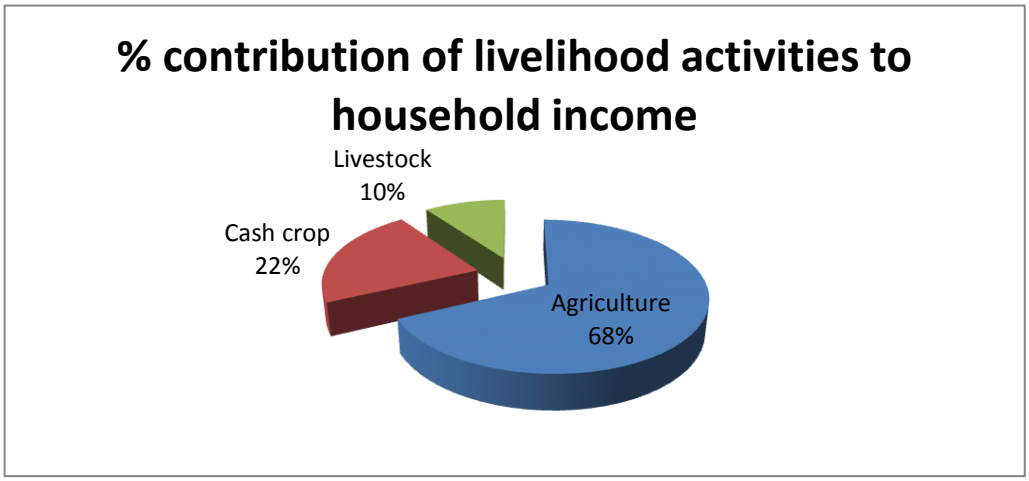


Figure.3: Percent contribution of livelihood activities to household income

Livestock production system

The livestock production system is extensive. Local breeds such as the so called Fogera breed are predominant in the study area and they are characterized by low milk production. Cattle, sheep, poultry village and equines are the most important livestock species in Kokit. Dairy cattle are mainly kept for the purpose of milk, draught power, calf replacement, threshing, manure, for meat and generation of cash income. Draught animals are also important for the livelihood of the farmer. Oxen provide similar benefit as dairy cattle except for milk production. Small ruminants especially sheep and poultry are also a major source of meat and cash income.

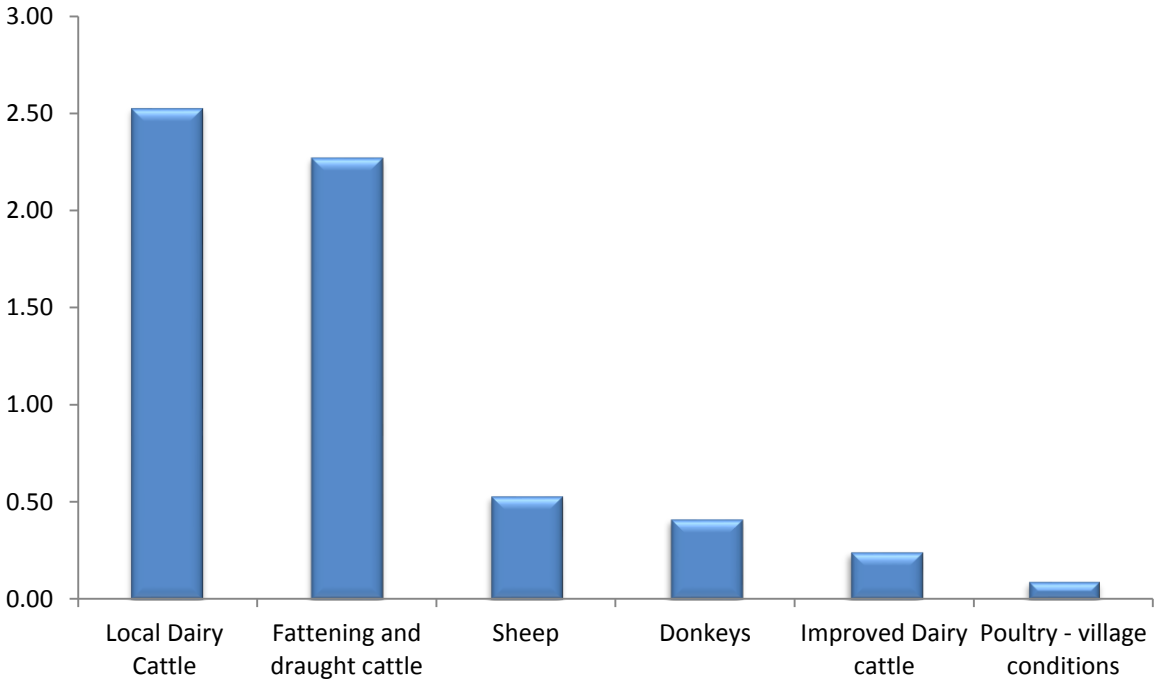


Figure 4: Average livestock holding per household in tropical livestock units (TLU)

Cattle are the most important livestock species in the area (Figure 4.14). Farmers reported that 91.7% of the households own local dairy cows, whereas 25% of the households own draught animals, 17% of the households own sheep and fatten cattle. Only 3.3% of households keep improved cattle breeds. 100% of the household keep village poultry. In Tach Abua there are two approaches of housing animals. The first one is - from November to June animals stay outside (either

tethered or kept open fence around the home). Conventionally, farmers believe that keeping animals in open air reduces disease prevalence. The second approach is practiced from June to November - animals stay at home to protect/shelter them from the rain.

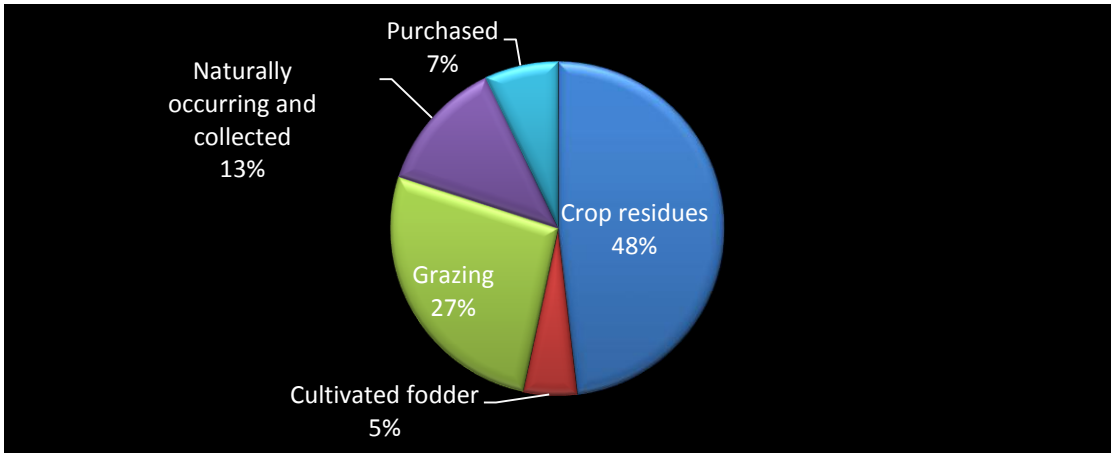
In Kokit there is no veterinary clinic. The clinic is found 7- 10 km from the village; hence veterinary services are not easily available when required by the farmers. The cost of treating an animal depends on the type of disease. However, the mean cost is about birr 70/ head for one time service in private veterinary clinic. Similar to the clinic, artificial insemination (AI) is available at the woreda capital. Price of one AI service plus cost of transport for technician is 20 birr per service. Mostly farmers use their own local bull service. A bull service is free of charge. Even if there are some cross breed bulls, controlled service is not available.

Feed and feeding

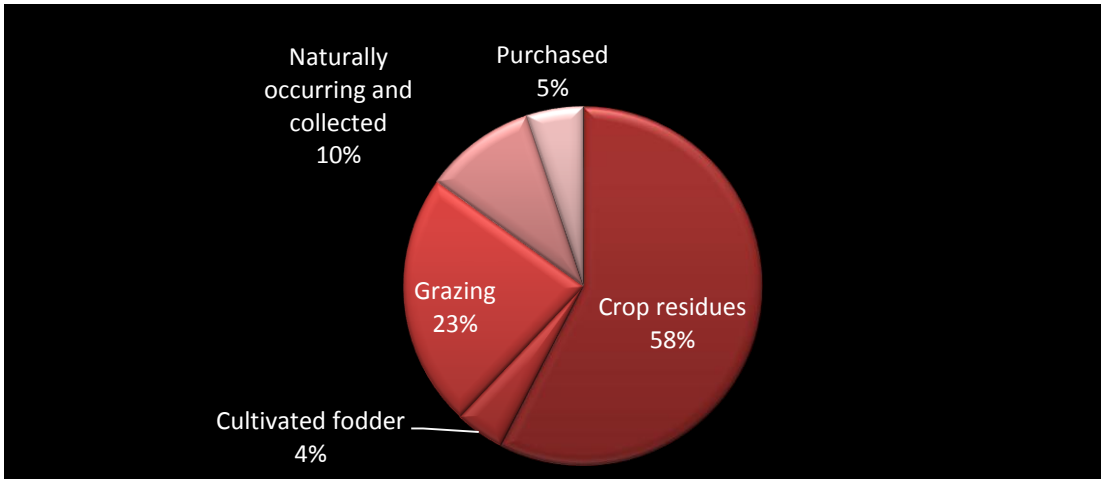
Crop residues, grazing, naturally occurring grass, collected green forage and cultivated fodder are the major feed resources. The major share of livestock feed is obtained from crop residues which contribute approximately 58% of dry matter (DM), 48% of dietary metabolizable energy (ME) and crude protein (CP) 48% respectively. Rice bran is also purchased for feeding to animals. Rice straw and grass pea haulm are the dominant crop residues. Crop residues are mainly fed when grazing land is very scarce; two feeding styles (tethering and free grazing) are common for the village. Besides, four different feeding arrangements are used that supply different feed source practices within a year (Figure 4.15).

1. February to April: farmers primarily feed residue of grass pea followed by rice straw
2. June to August: Rice straw, followed by communal grazing land and rice bran
3. September to October: Cut grass/ green grass and purchased feed (rice bran) are used and
4. November to January: new rice straw comes in to use.

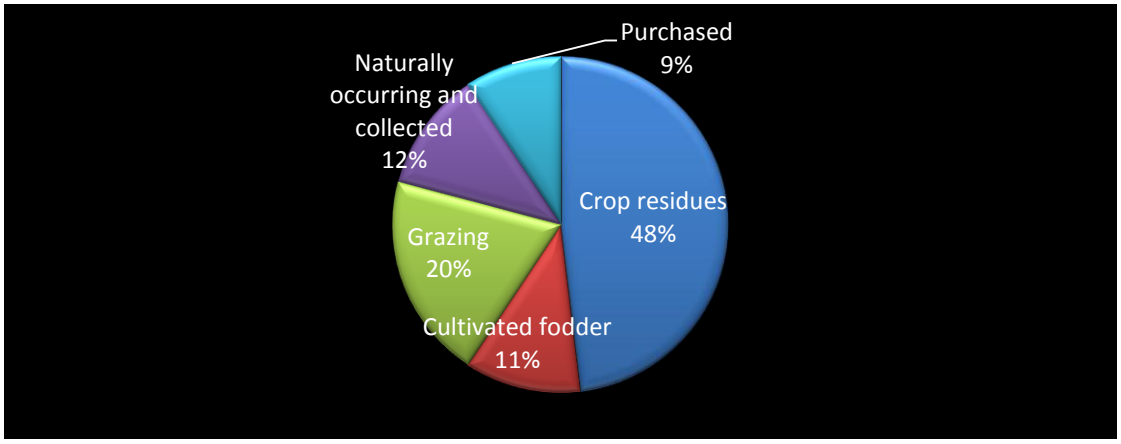
Even if there is not adequate grass, communal grazing land is used throughout the year. Only very few farmers have tried growing improved forage species. Naturally occurring and collected feeds such as weeds from cropland are also a good source of feed during cropping seasons. Feed processing is not very common in the village. Most farmers used to mix straw of grass pea with chick pea and rice bran. However, they have never learned to mix rice straw with any pulses residue, which otherwise could have an added value in improving the palatability and the nutritional content.



ME content of total diet



DM content of total diet



CP content of total diet

Figure 5: The contribution of various feedstuffs to dm, cp and me to livestock diets in tach abua village

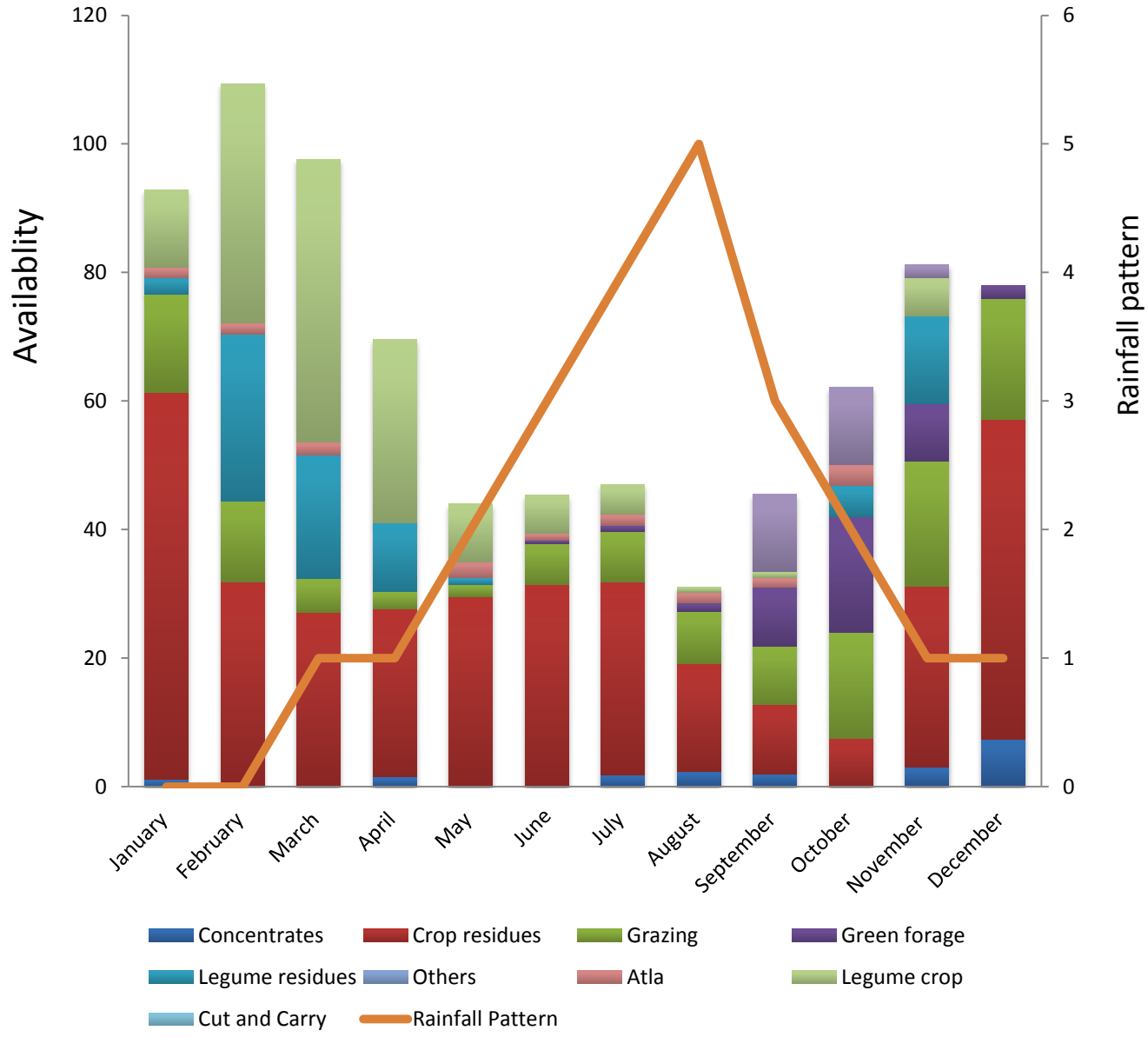


Figure 6: Composition of the livestock diet throughout the year in relation to the rainfall pattern in Tach Abua village

Problems, issues and opportunities

According to Tach Abua farmers, feed shortage is the main constraint for livestock production followed by lack of access to credit services and veterinary clinic, livestock disease and lack of improved breeds. A summary of the problems and proposed solutions is presented in Table 4.26.

Table 4: Problems and proposed solution for the production system

Problems	Suggested Solutions
1. Feed shortage	• Proper storage of crop residue, purchase and supply during shortage period, • Reduce free grazing and enable good growth of grass and treating crop residue with urea
2. Lack access to credit services	• Improve access to credit without collateral and on individual basis; • Improve the amount of credit offered to the farmers • Member of co-operative should be granted access to credit regardless of land possession
3. Lack of veterinary clinic	• Open veterinary clinic close to the village and supplied with necessary medicine
4. Livestock disease	• improve access to veterinary clinic • protect animal from grazing thorny weed called *Hygrophila auricata* • avoid open grazing (free grazing) • minimize mixing animal with different stocks to reduced contracting disease from other stock
5. Lack of improved breed	• Improve access to and proper utilization of AI services and utilize improved bull service that is freely available in the area

Alem ber kebele (Chabi village*)*

Overview of the farming system

The farming system of Chabi village is characterized by a mixed crop livestock system (Teff-millet/ maize). Average farm size of the village ranges from 1 – 1.5ha. Most of the village land is used for growing crops. A typical household comprises about 7 persons (residing in the village for at least 6 months of the year). Resident farmers commonly grow a variety of food crops- including; tef (*Eragostis tef*), finger millet (*Eleusine coracana*), noug (*Guizotia abyssinica*), maize (*Zea mays*), barley (*Hordeum vulgare*), common beans (*Phaseolus vulgaris*), chickpeas (*Cicer arietinum*), grasspea (*Lathyrus sativus*) and broad beans (*Vicia faba*). A few farmers grow Sesbania (*Sesbania sesban*) as a fodder crop and most of the farmers use naturally occurring pasture as the major forage crop.

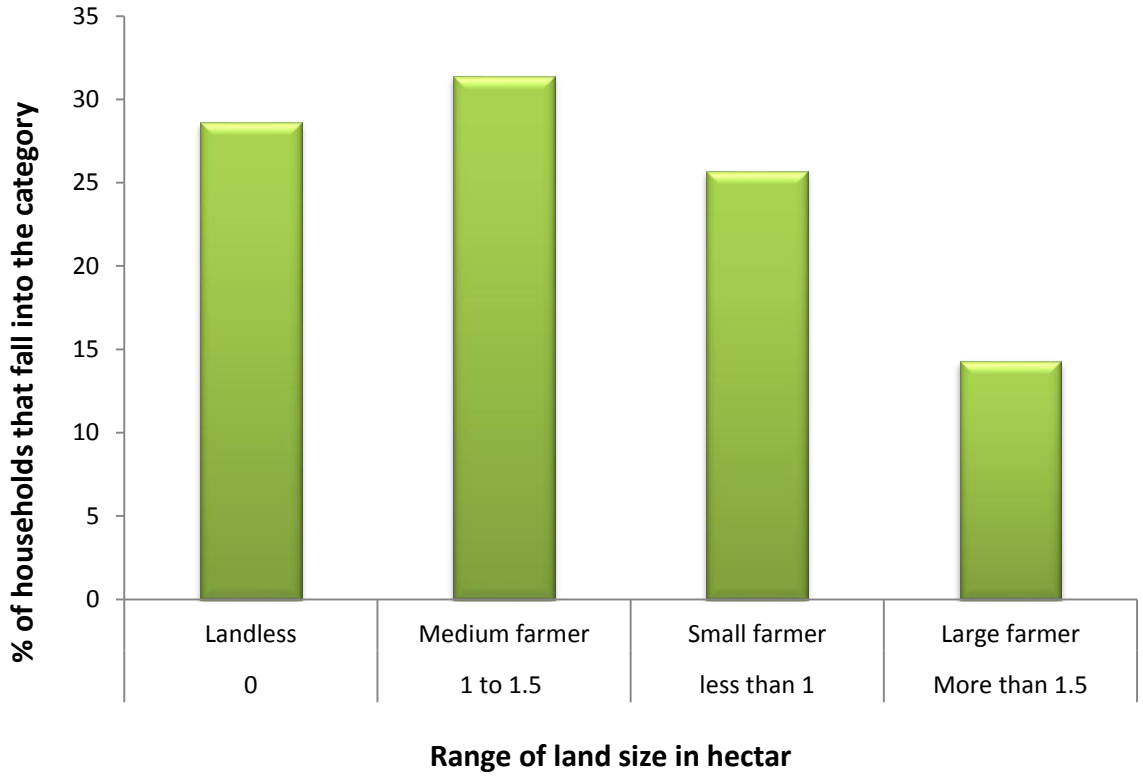


Figure.7: Average land holding of different wealth categories of farmers

Crop production

The cropping season starts from late May to end of December and there is only one cropping season. Similar to Kokit Kebele it is locally called “Meher”. The main rainfall occurs from early June to end of September. There is a river used for irrigation but due to low water availability in the area only 11.4% of the households are able to utilize this resource. Labor is not easily available during when it is needed the most- during the peak weeding and harvesting time. Labour is particularly needed – in September for millet and tef weeding and November to December for harvesting of these crops. As job opportunities are seasonal most local people leave their village to make living. Some youngster left their village for education. The average daily pay for casual labor including meal and local drink is birr 40 – 60 per day.

Fallowing is practiced after growing cereal crops. Farmer uses the fallow for grazing and hay making. Double cropping is widely practiced by the farmers. Hence, they use their land for more than one crop during one cropping season. They use land to - grow grass pea and chickpeas after tef, barley or

maize. The farmer use crop residues from these crops manly for livestock feed. Only small amounts of crop residue are used for house construction and mulching.

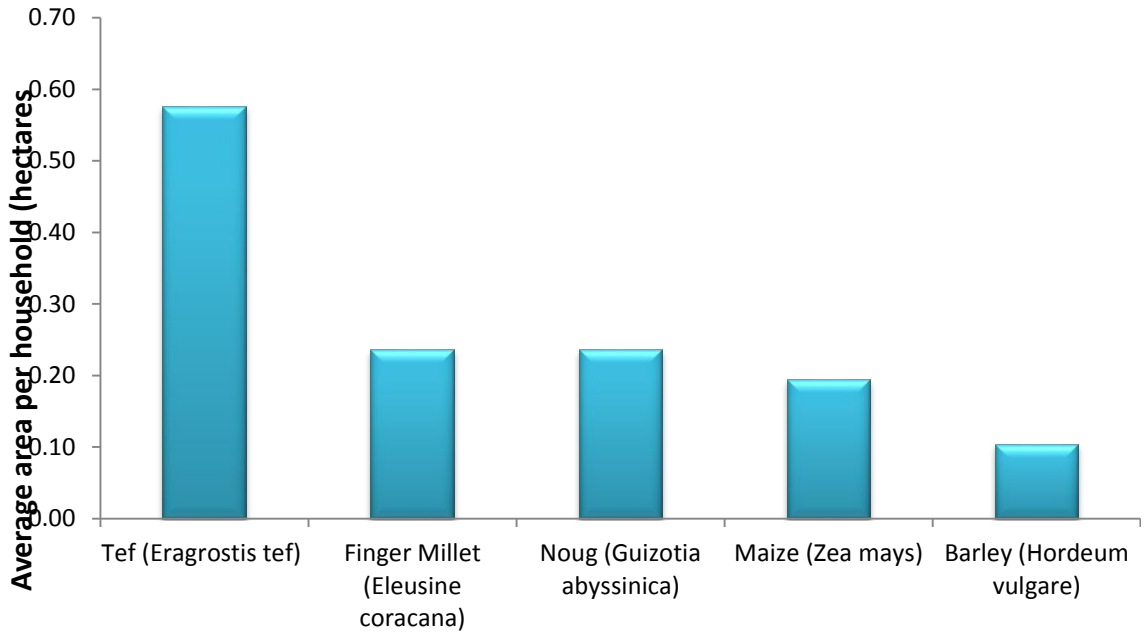


Figure 8: Major crops grown in chabi village

Crop sells are the primary contribution to household income. On average 57.7% of all household income comes from the sale of crops. Livestock sells make an important contribution about of 32.4% to the household income. Oil seeds such as noug and common beans as cash crop (business) contributing about 38% to the house hold income (Figure 4.19). However, the contribution of crop-as sources of income varies substantially from year to year based on rain fall availability.

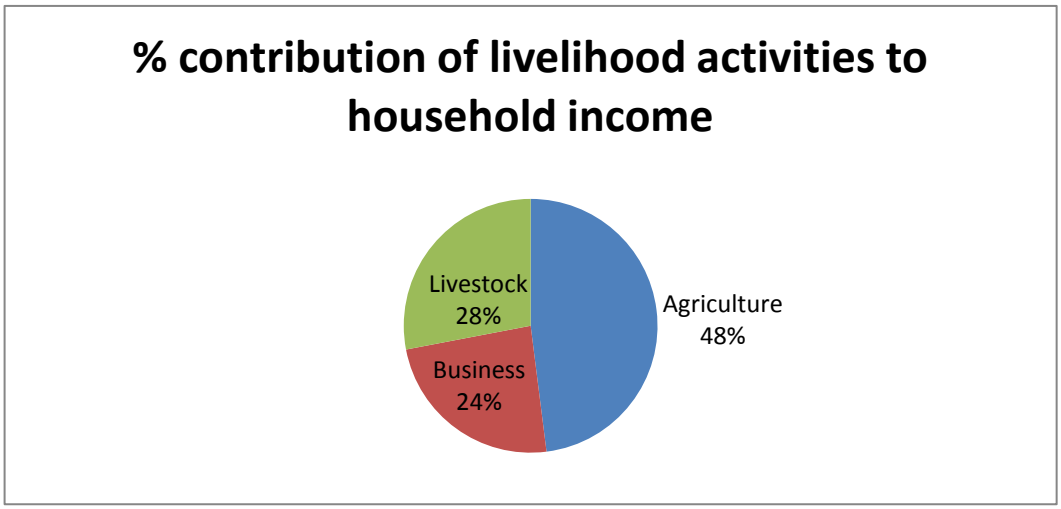


Figure 9: Contribution (%) of livelihood activities to household income at Chabi village

Livestock production system

Most of the farmers practice an extensive production system. However 14.3% of the households practiced a semi - intensive production system (they built housing for livestock). Livestock species in the area include dairy cows, oxen, goat, sheep, poultry and donkey (Figure 12). Only 8.5% of the households keep improved dairy cattle. The proportion of the household that keep local dairy cow, draught cattle, sheep, goat and poultry is about 77.14%, 74.3%, 37.1%, 8.6% and 100%, respectively. About 37.1% of the households own 3 sheep on average. Generally, dairy cows kept for milk, meat, calf replacement, manure, threshing, compaction (When animal mechanically differentiate crop from the straw or residue) and for income generation. Draught cattle are also used for breeding, meat, threshing, compaction, and for manure production. Goats are also used for generation of cash income, for meat, fertilizer and breeding. Milk yield from local dairy cows is very low with an average yield of about 0.5 -1 liters per cow per day. Milk is entirely used for home consumption in the form of liquid milk, butter and cheese; although a few farmers sell butter on the local market.

Animals are kept in the house during rainy season, however during dry season farmer's use a fencing system outside their house. Veterinary services are accessible. However, there is a shortage of qualified veterinary technicians. On average farmers pay about 25 birr per head per services. According to farmers the cost is expensive. Artificial insemination (AI) services are not accessible. Natural mating with existing local bulls is the common practice on the field.

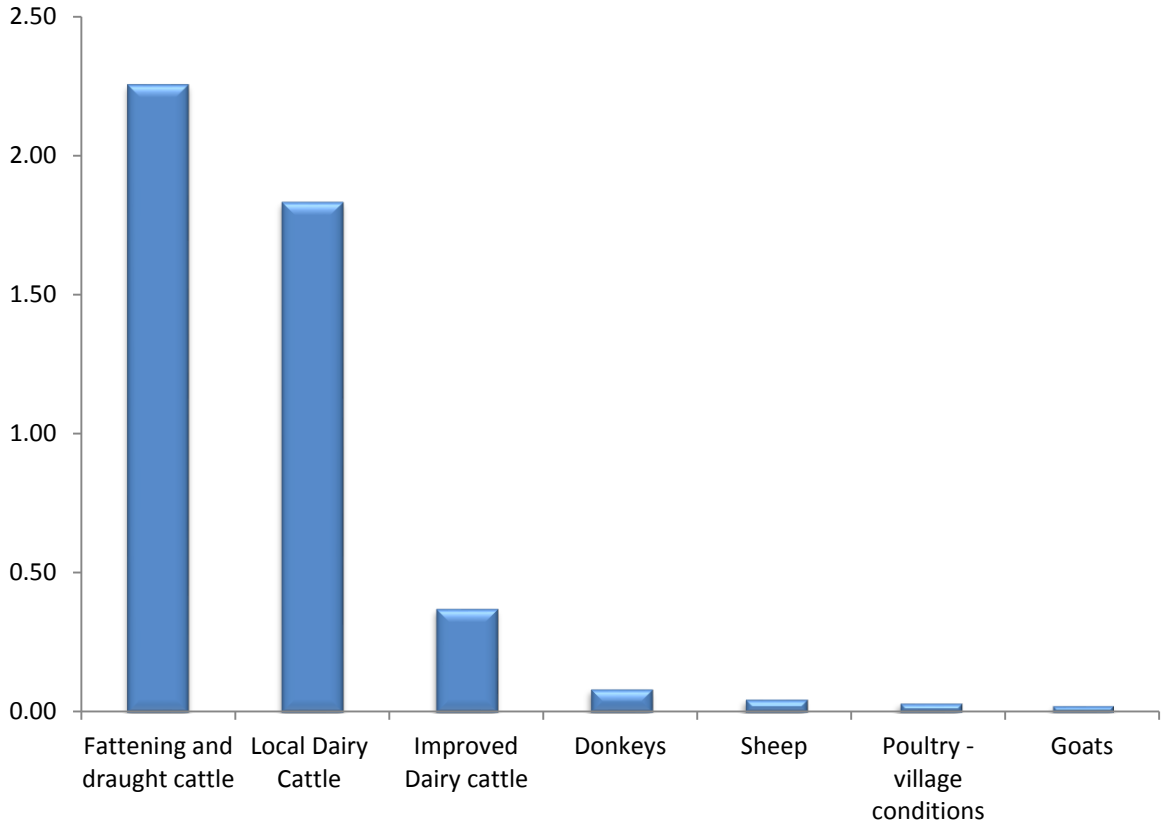
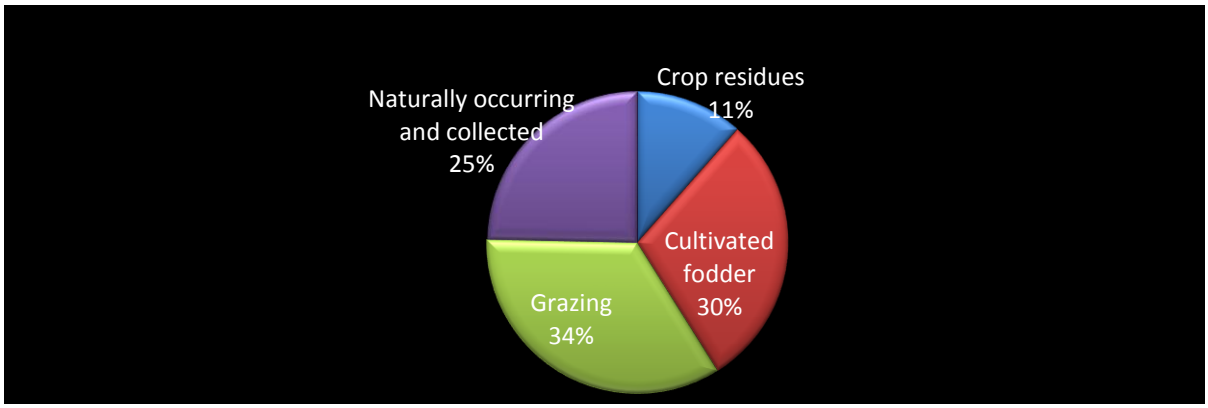


Figure 10: Average livestock species holdings per household in tropical livestock units (TLU) in Chabi village

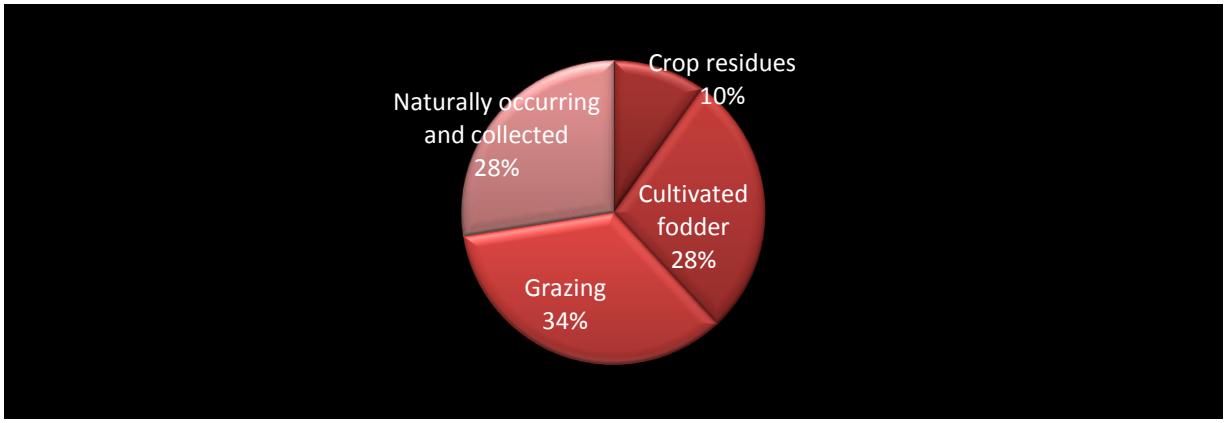
Feeds and feeding

The common feed resources include crop residues, grazing, hay, legume residues (chick pea) and green forge as shown in Figure 4.21. The contribution made by these feed sources to the diet varies throughout the year. During the main crop growing- season (June to November), grazing, natural occurring grass, green forage, collected feeds and cut and carry of grass comprise the major share of

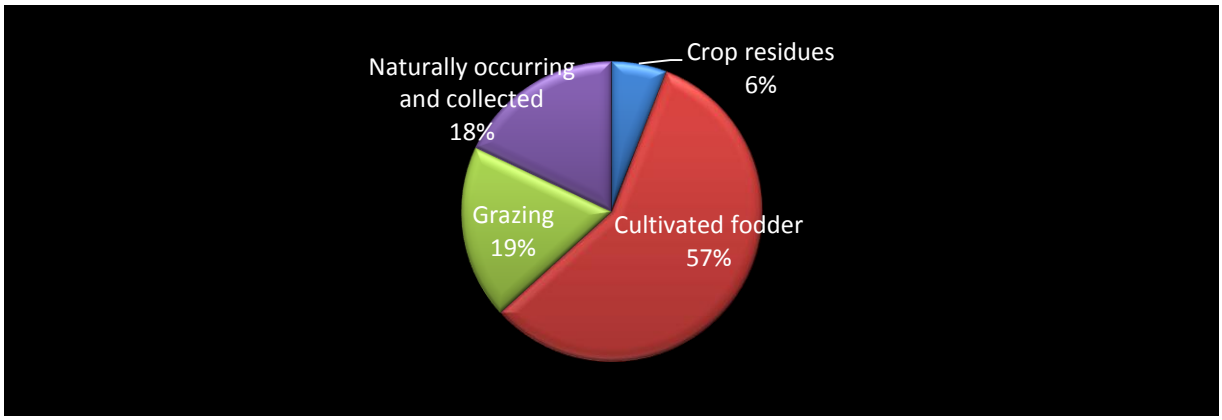
livestock feed. Grazing, cultivated fodders, naturally occurring and collected feed largely contribute to the DM, ME and CP content of the livestock feed. During rainy season animals are free grazed and stall feed. Feeding of cut and carry grass is also used. During the dry season, farmers tether feed crop residue to their animals. Hence, animals are shaded from the effect of the sun. In the area mixing of different crop residue is practiced such as, chick peas with grass pea and maize stover, noug straw with chick peas, barley straw and tef straw and also common beans with barley, noug straw and teff - straw is practiced in the area.



DM content of total diet



ME content of total diet



CP content of total diet

Figure 11: The contribution of various feedstuffs to DM, CP and ME to livestock diets in chabi abua village

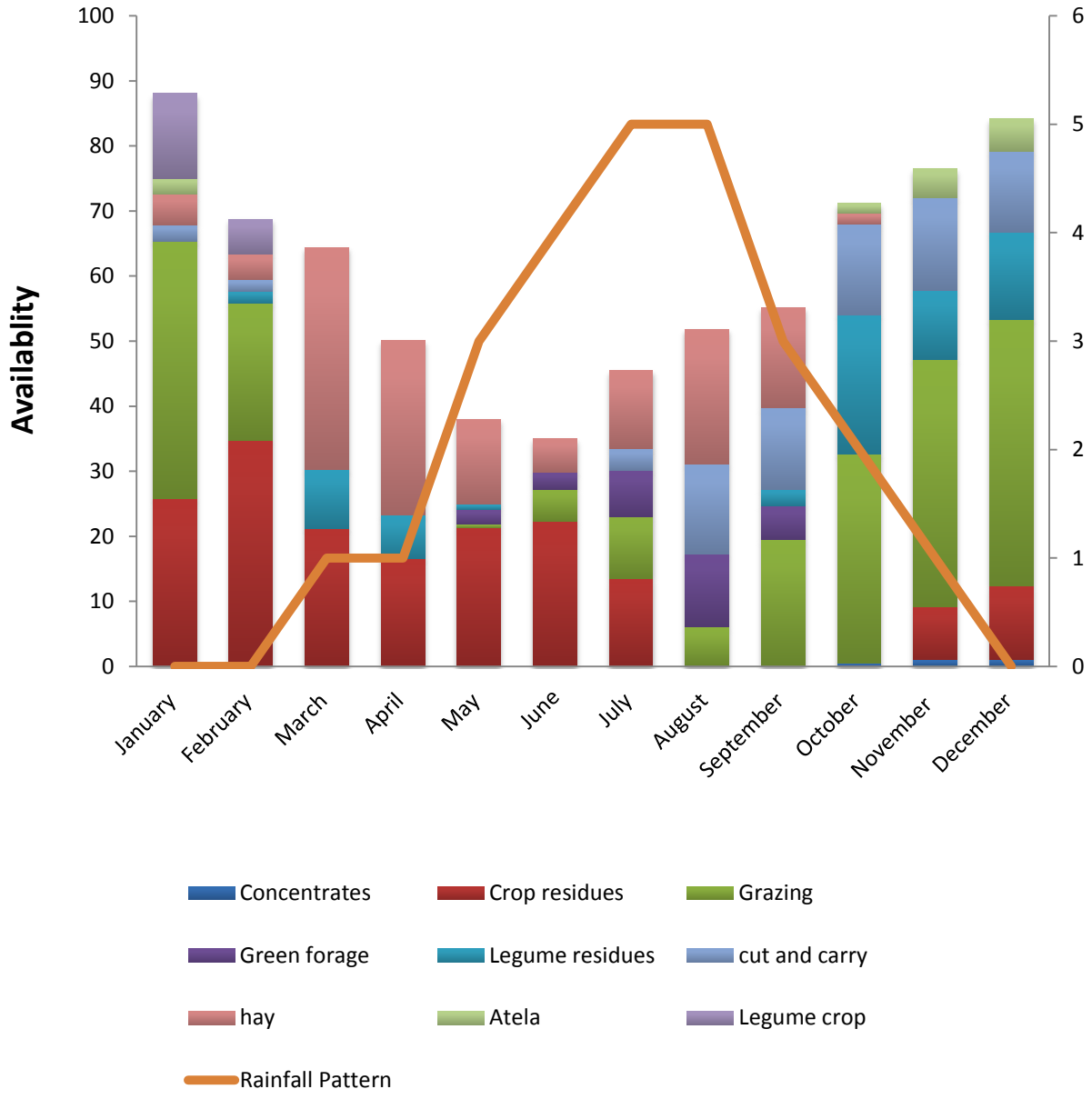


Figure.12: The composition of the livestock diet in chabi throughout the year in relation to the rainfall

Problems, issues and opportunities

According to the PRA discussion made with village residents, the following five major problems were identified in order of their importance (Table 4.27). In contrast to the Tach Abua village, lack of access to improved breeds was identified as number one problem for the village**.**

Table 5: Livestock-related problems identified by farmers in chabi village and the corresponding suggested solutions

Problems	Proposed solution by the farmers
• Breeds	• To buy improved bull by the farmers themselves • Provision of improved Fogera heifer and bull • Make available AI service
• Water	• Build water trough • Manage watering point
3. Feed shortage	• Improve grazing land through grazing land management (like weeding thorny weeds) • Timely collection and preservation of animal feed • Use gazing land/ reservation hay making
4. Housing	• To build house to protect animals from theft, rain and sun stroke • Use karral (shifting) • If we have 3 animal sell one animal to build animal house for the other.
5. Diseases	• Take animal to veterinary clinic • Control free grazing to reduce disease transmission • Tether feeding • Prevent mixing animal with other flock

Woje Awuramba kebele (Timinda village)

Overview of the farming system

The farming system is primarily a mixed crop - livestock system. Tef, millet and maize are among the major crops being grown at the village. Average farm size per household for the village is about 0.75 – 1.25 ha. A typical household size for Timinda villages is 6 people. Participants of the FEAST exercise for Timinda village are presented in Figure 4.23 below.

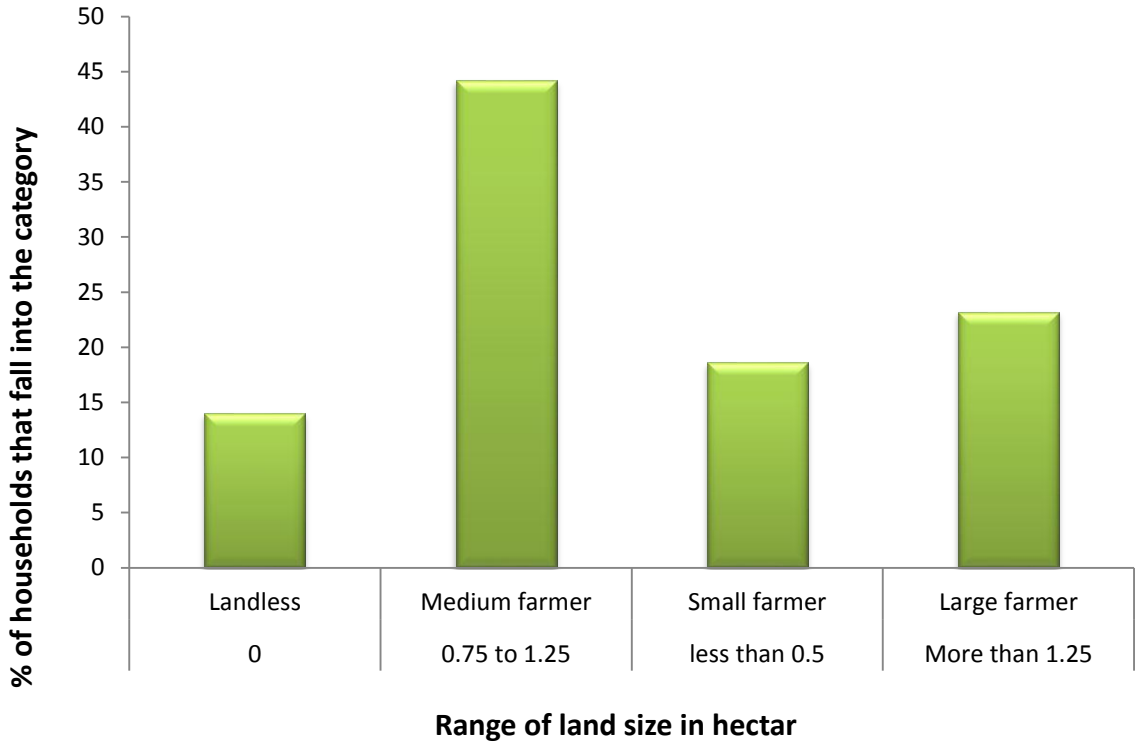


Figure .13: Average land size owned by different categories of farmers in timinda village

Crop production

Similar to the two previous villages, farmers describe one cropping season with relay cropping system. The season is called "Meher" and extends from June to end of December. Tef is the dominant crop in the area. It covers the largest share of the farm land. Crops like - maize, finger millet, noug, common beans, groundnut, chickpeas and barley are the other crops grown in the area. Fallowing farm land is practiced to increase land fertility and for grazing. Farmers of the village also practice growing more than one crop on one land and season. First farmers grow barely and tef then they grow grass pea, chickpeas and onion. Oil crop, noug and vegetables like onion are the major cash crop whereas the rest are mainly used for home consumption. Crop residues from the above crops including winnow dust of noug are used for livestock feed. However, a small amount is used for house construction and mulching.

Irrigation is practiced by the villagers; about 59% of the households use it for crop, onion and tomato production. Labor is not readily available as required. The requirement is critical during weeding and land preparation for millet, tef and maize from July to August and from October to November for harvesting tef and millet. Price for daily labor during these periods is birr 40 per day without food and local drink - if food and local drink is included the price will be 30 birr per day. Increase in cost of labor is associated to the migration of some farmers and students looking for work and education in nearby towns.

Credit services are available from - Amhara Credit and Savings Institution (ACSI), but farmers do not access it because they are unable to fulfill credit requirement such as organizing themselves in groups and also farmers are expected to get married to become entitled to the services.

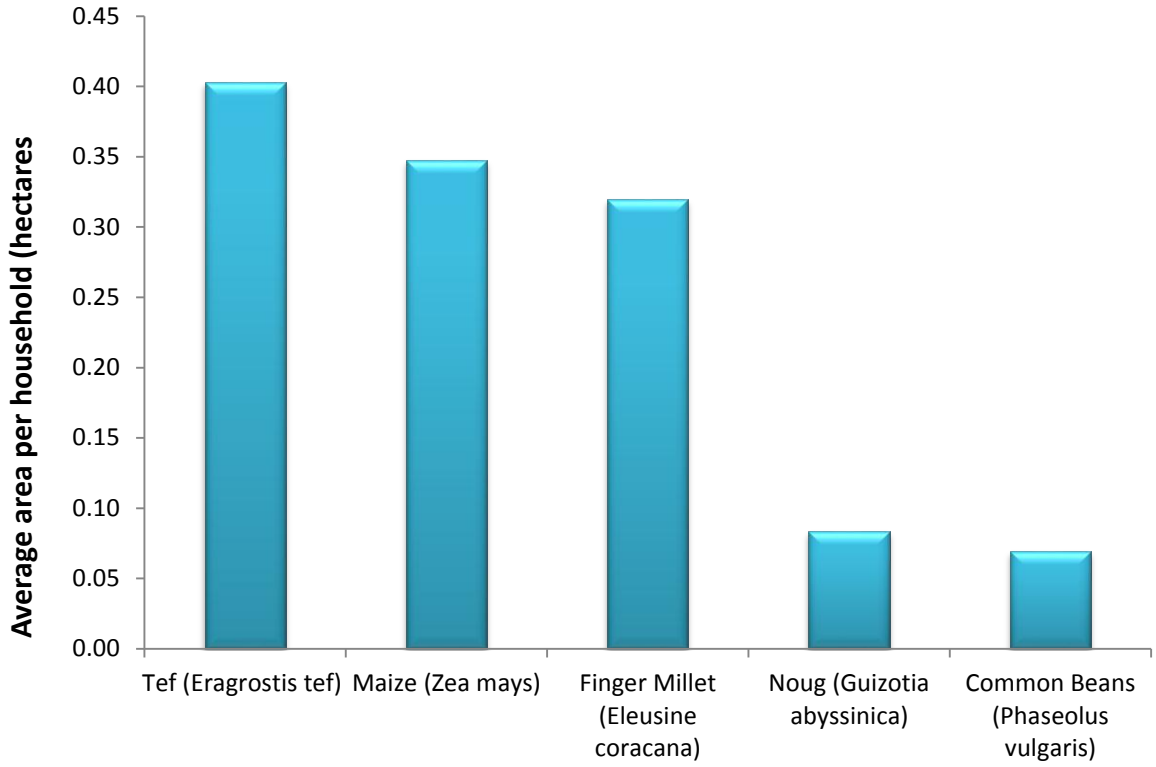


Figure.14: Major crops grown in timinda villages

Agricultural inputs such as plastic sheet, cement and irrigation equipment are not available but urea fertilizer is readily available. Agriculture is the main source of income contributing 70% to the household income (Figure 4.25). Business, that generate income from the sell of oil and vegetable crop (noug and onion) and small ruminant particularly goat and poultry for meat and egg contribute about 47.8% and 15%, respectively.

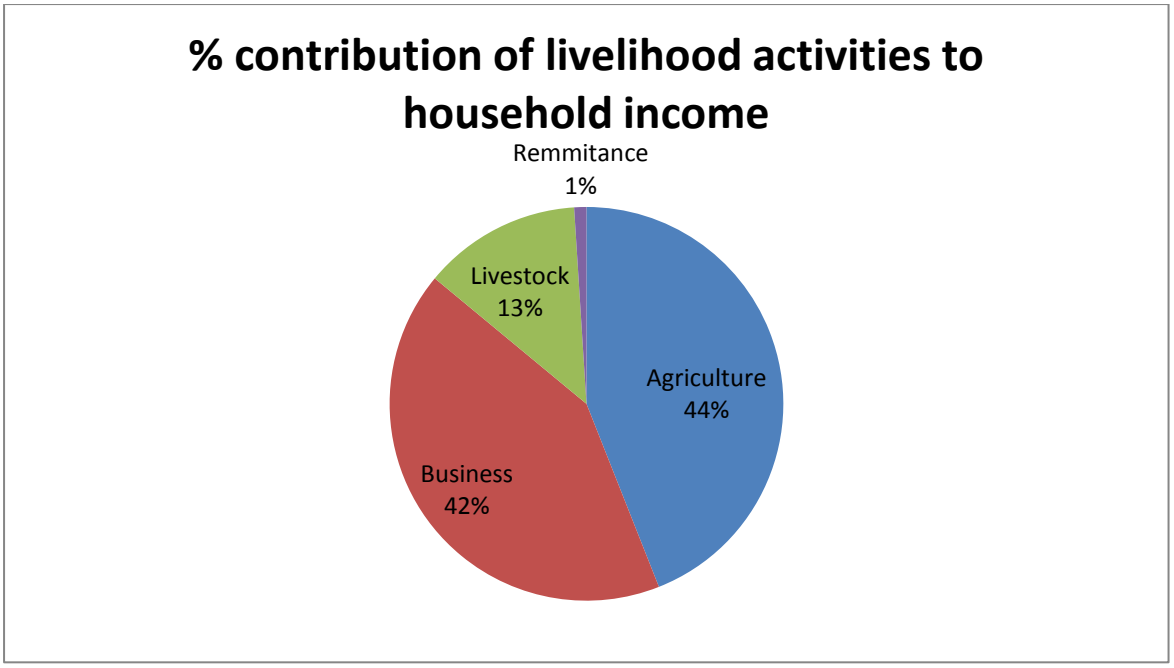


Figure.15: Contribution (%) of livelihood activities to household income in timinda village

Livestock production system

Almost all farmers keep the local cattle breed (Fogera breed). There is no improved livestock breed in the village. Draught cattle and local dairy cows are the predominant livestock species for the household. Dairy cattle are mainly kept for the purpose of milk, calf replacement, manure, meat and leather; whereas draught animals kept for similar purpose including for transport but not for replacement and milk production. Goats are also used for income generation, meat, compaction and manure production. Equines particularly donkey give transport, compaction and breeding (replacement) services. The milk yield of local dairy cows is very low on average 0.5 to 1 liters per cow per day. About 23% of the household use housing to shelter their livestock. From June to September farmers keep their livestock in house. However; from October to April farmers use kraaling to manure their crop land. Animal grazing is practiced throughout the year. However- stall feeding is practiced from February to July. But tethering animal is not practiced by the village. Farmers mix different crop residues to improve the palatability /intake/ of residues for example tef with millet straw.

There is no animal health clinic in the area; farmers move long distances to get veterinary service (Woreta and Diba kebele). The cost per treatment varies between private and government clinics. The government animal health clinic is cheaper costing only about 17 to 28 birr per animal/ treatment, whereas, the private clinic charges about birr 45 per animal/ treatment. There is no AI service around the village. Farmers select a good local bull traditionally and use for breeding purpose free of charge.

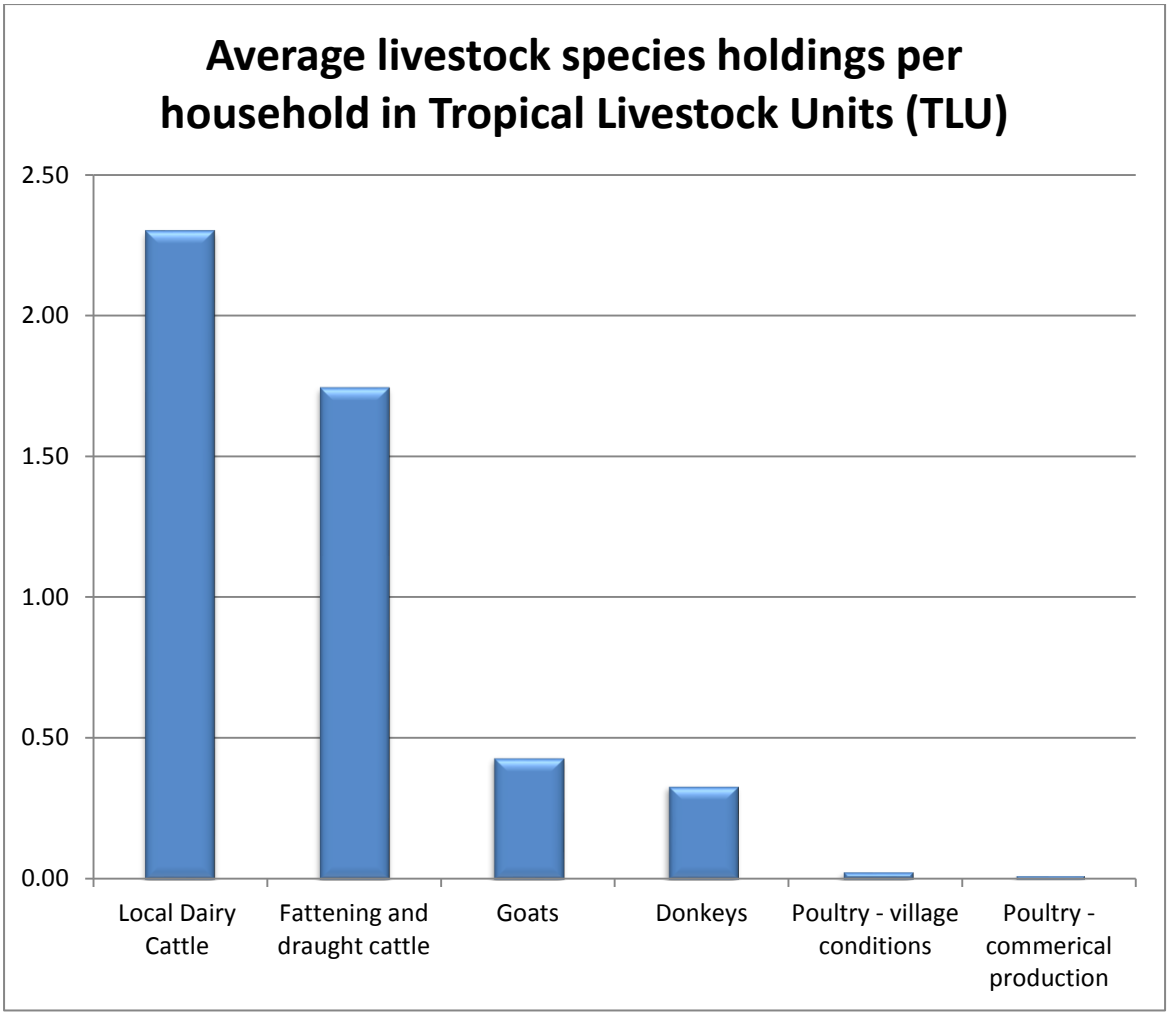
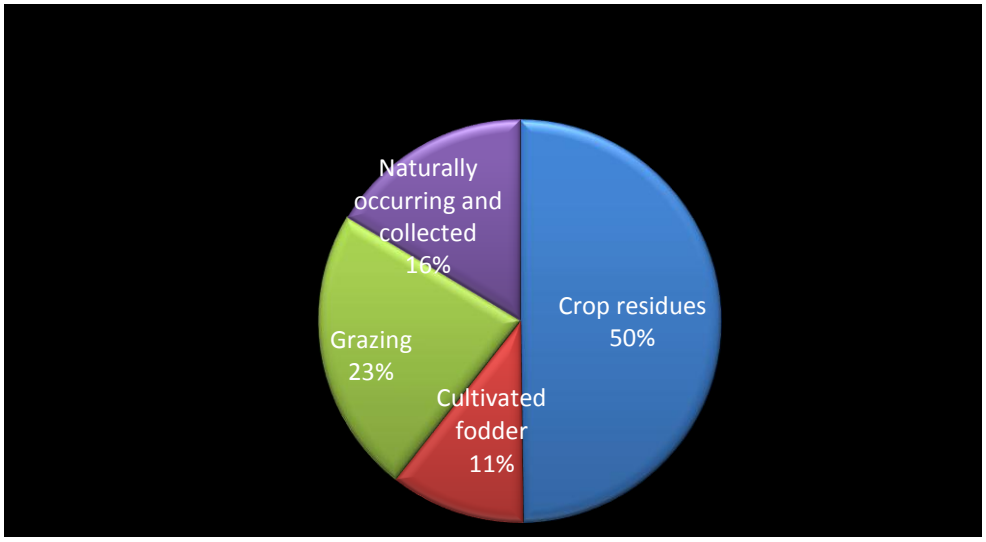


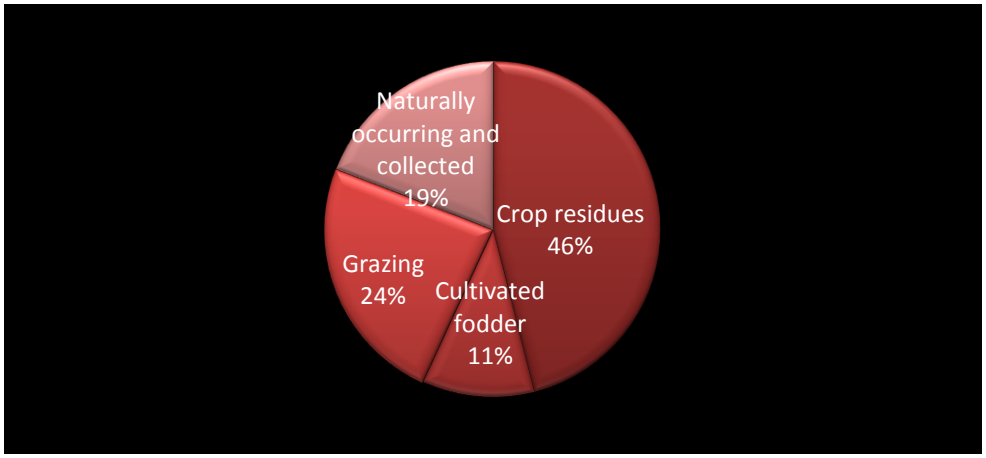
Figure 16: Average livestock species holdings per household in tropical livestock units (TLU) in timinda village

Feed and feeding

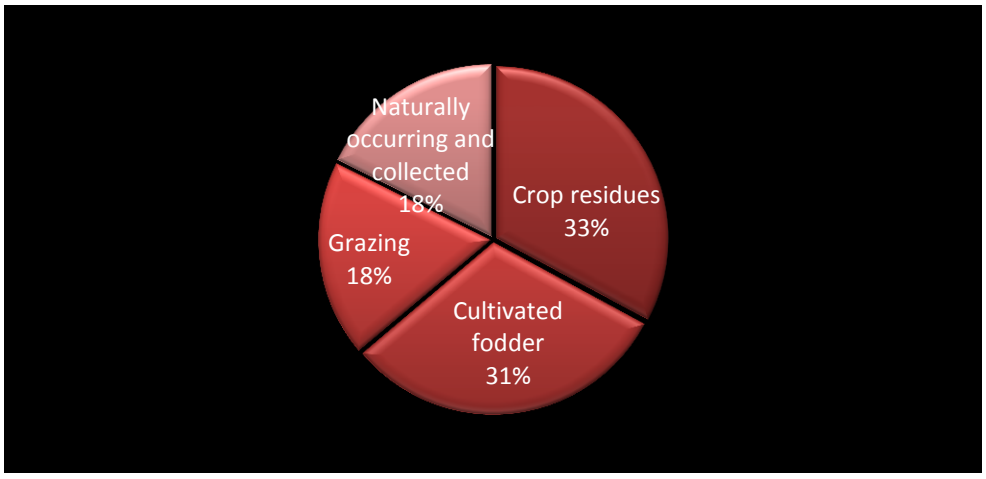
The major feed resource in the area includes crop residue, pasture from grazing lands and naturally occurring and collected fodder. Straw from tef, millet, maize and barley is the dominant crop residue. Crop residue contributes 33% CP, 46 % ME and 50% DM of the total diet. Residue from common bean, chickpeas and grass peas are also a commonly used as animal feed. Naturally occurring and collected feeds such as weeds from cropland are also a good source of feed especially during rainy seasons. They contribute to about 16% DM, 19% ME and 18% CP of the total diet. Timinda farmers practice a cut and carry system.



DM content of total diet



ME content of total diet



CP content of total diet

Figure.17: The contribution of various feedstuffs to DM, CP and ME to livestock diets in timinda village

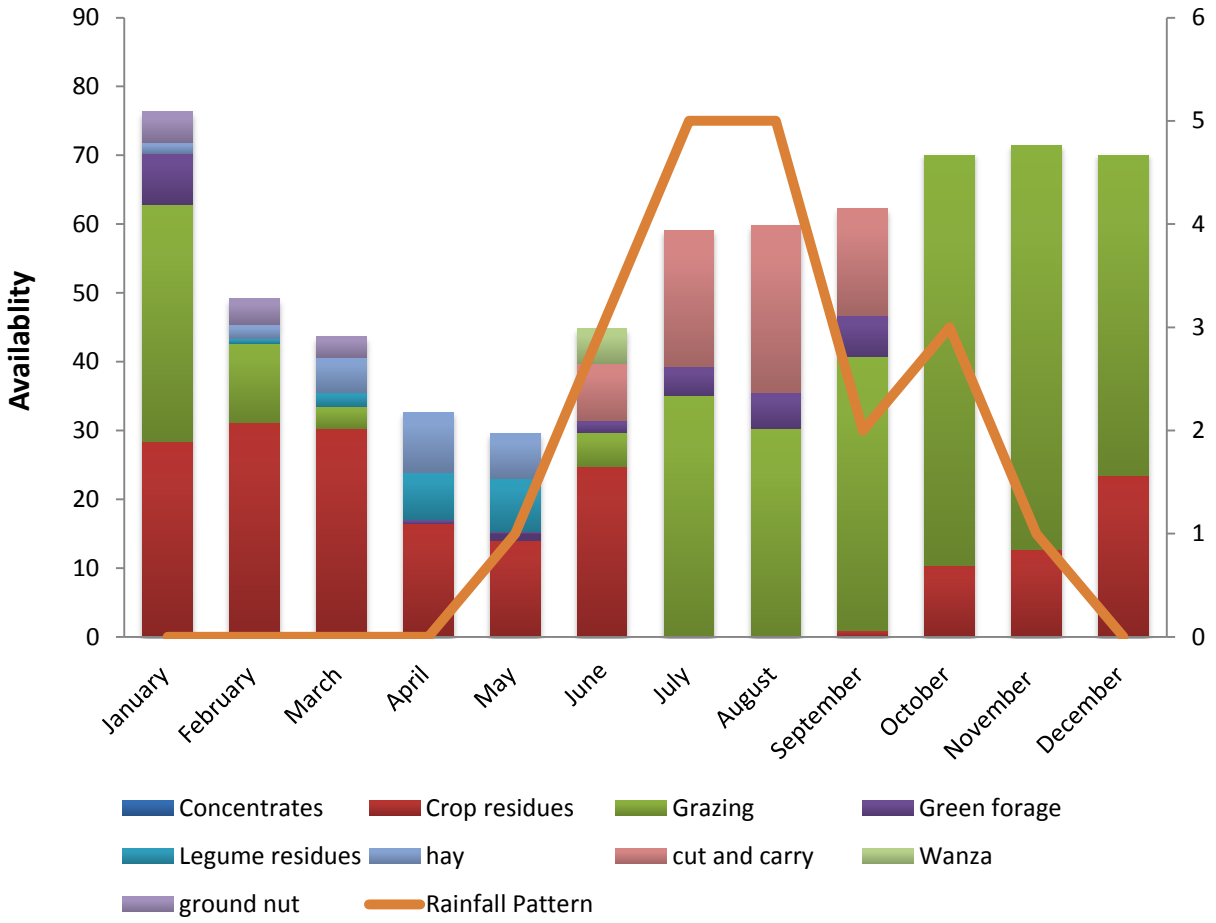


Figure 18: The composition of the livestock feed in timinda village throughout the year in relation to the rainfall pattern

Problems, issues and opportunities

PRA exercise has been carried out with Timinda village residents. Table 4.28 presents brief summary of the existing problems and potential solutions for the village in order of their priority/ importance for the village in habitants.

Table 6: Livestock-related problems timinda village and the corresponding solutions

Problems	Suggested solution
1. Feed shortage	• Allocated some portion of the land for growing feed • Feed fodder plants to animal • Use purchased feed during time of shortage
2. Disease	• Try to put in place the control grazing system • Making available vaccination to the animal • Access their animals to clean water • Give animal enough amount of feed
3. Breed	• Improve access to improved breed • Improve local breed by selecting the best • Replace the local breed by the improved one • Improve the local animal by using AI
4. Credit	• Access to credit services at lower interest rate • Improve social interaction to improve access to credit service
5. Water	• Spring development • Wise use of available water

Conclusions

Crop production is the main contributor to household income in the mixed crop livestock production system. Average farm size in the three villages ranges from 0.75 to 1.5 ha per house hold. Almost all of the farm land is used for crop production. Every household has one milking cow on average and 2-3 sheep or goats. The primary crops grown in the area are rice, finger millet and grass pea. Constraints of crop production and livestock productivity differ among the different villages.

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