academicJournals

Vol. 4(8), pp. 113-127, October, 2013
DOI: 10.5897/IJLP2012.0145
ISSN 2141-2448 ©2013 Academic Journals
http://www.academicjournals.org/IJLP

International Journal of Livestock Production

Full Length Research Paper

Enhancing the productivity of livestock production in highland of Ethiopia: Implication for improved on-farm feeding strategies and utilization

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Accepted 13 September, 2013

The feed assessment tool (FEAST) was used to characterize the farming and livestock system. Prior to data collection, a sustainable livelihoods framework (SLF) approach was used in August 2012. The result of the study depict that the contribution of grazing to dry matter (DM), metabolizable energy (ME) and crude protein (CP) content was relatively high for the above average group farmers who reserve more land for the growth of grazing pasture and crop residue (barley and wheat) through land renting. Due to limitations of grazing and crop residue resources farmers in the below average group were forced to use the purchased feeds and it contributes more to the CP, ME and DM of the total diet of their livestock in the order of importance. The problems that were raised by the farmers encompass shortage of feed, unavailability of credit services, shortage of veterinary service and lack AI service. The study recommends the development of herbaceous forage legumes and fodder trees species which can mitigate the constraints of feed scarcity. Training on cost effective livestock ration formulation techniques to reduce the feed shortages observed and to supply the livestock with quality and palatable feeds requires due attention.

Key words: Feed, livestock, crude protein, dry matter, metabolizable energy.

INTRODUCTION

Ethiopia is known for its large and diverse livestock resource endowments. Livestock is primarily kept on smallholdings where it provides draught power for crop production, manure for soil fertility and fuel, and serves as a source of family diet and source of cash income (from sale of livestock and livestock products). However; livestock contributes more in rural households' livelihood, the advantage we fetch from the resource is insignificant and not compromised with the livestock potential (Asfaw et al., 2011). The combined factors responsible to low benefit obtained were low emphasis withdrawn to the sector and poor husbandry (poor feeding, diseases management, housing and technology) accessed and supplied (Mohammed et al., 2004).

Nowadays the demand for livestock products is increasing from time to time due to the population increase in the country as well in the world. Making improvements in the raised factors so as to enhance our livestock's productivity and production helps the country to ensure food security and to earn benefits from the sector. Characterization of the farming and livestock production of an area and formulating the proper technology and feeding system could support for the improvement in productivity of the livestock.

Lemu-Bilbilo district is located in Arsi zone in Oromia regional state of Ethiopia. The district is characterized by crop-livestock mixed farming system where livestock in general and dairy production in particular contributes

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significantly to livelihoods of the smallholder farmers. Local cattle are the pre-dominant breeds reared in the area. Market oriented dairy production based on crossbred dairy cows is also practiced in the district. The benefit fetched from livestock sector is not as significant as the district's potential. In order to improve the production of livestock and to enhance the benefits obtained from the sector understanding the problems and opportunities existing with this sector is important.

The feed assessment tool (FEAST) was used to characterize the farming and livestock production system and in particular feed-related aspects of the Bekoji Negeso Peasant Association (PA) in Lemu-Bibilo district. The purpose of FEAST is to offer a systematic and rapid methodology for assessing feed resources at site level with a view to developing a site-specific strategy for improving feed supply and utilization through technical or organizational interventions. Different studies in Ethiopia and elsewhere in the world were attempted to estimate on farm feeding strategies and options using FEAST methodology, e.g., Felix (2011) in East Wollega Province, Ethiopia; Luke (2010) in Kenya, Bangladeshi, Nepal and India, and Ben et al. (2010, 2011) in Uganda. Therefore, the aim of the study was to gain an understanding of the overall farming production system with a particular focus on enhancing the livestock feeding strategies employed by farmers, identify key constraints and opportunities for livestock production, and to point out possible areas of intervention that could improve livestock productivity.

METHODOLOGY

Description of the study area

The survey was conducted in Lemu-Bilibilo district located in Arsi zone, Oromia Regional State of Ethiopia (Figure 1). The district is among the highland area delineated as dairy shed area due to their comparative potential for improved dairy production. Lemu-Bilbilo district is located about 235 km South-East of the capital Addis Ababa on the highway towards Bale zone. The area receives an annual rainfall of around 1100 mm, of which more than 85% is during the main rainy season (June to November). According to the district agricultural office, the altitude of the area is 2567 m above sea level (masl), and the average annual temperature ranges from 6 to 26C.

Specifically, the study was conducted in Bokoji Negesso PA with an altitude of 2876 masl. Out of a total 2678 ha (91.8%) is allocated for crop production, 5.8% is for grazing and about 2% of the PA land is covered by forest. Bada (highland) and Bada-dare (mid-altitude) are the major agro-ecologies of Bokoji Negesso PA, which accounts 80 and 20%, respectively.

Sampling

For this study, Limu-Bilbilo district was purposively selected based on dairy potentiality as well as the district inclusion in the Agricultural Productivity Program (AGP). Bekoji Negesso PA was purposively selected based on accessibility and dairy potential amongst 27 PAs for future intervention strategies aiming to optimize feed utilization and animal production.

To undertake this study a total of 36 farmers were purposively selected for group discussions using the participatory rural appraisal (PRA) approach for FEAST on the basis of sustainable livelihood framework (SLF) results from three villages (Cheffa, Mirtilaman and Tulu-Negeso) so as to represent the community of Bekoji Negeso PA. These villages were taken from the three dominant farming systems in the PA, that is, Cheffa and Tulu-Negeso from livestock and crop dominating farming systems, respectively and Mirtilaman from mixed farming zone.

Methods of data collection

The Feed Assessment Tool (FEAST) was used to characterize the farming and livestock production system and in particular feed-related aspects of the Bekoji Negeso Peasant Association (PA) in Limu-Bibilo district. The purpose of FEAST is to offer a systematic and rapid methodology for assessing feed resources at site level with a view to developing a site-specific strategy for improving feed supply and utilization through technical or organizational interventions (Luke, 2010; Ben et al., 2011; Felix, 2011).

FEAST comprises two main elements. The first is a focused PRA exercise, which aims to provide an overview of the farming system with particular emphasis on livestock feed aspects. The second component is a simple and brief quantitative questionnaire, designed to be completed with selected farmers under the guidance of the FEAST facilitator. The assessment was carried out on 11-12 July, 2012. The study was conducted by researchers from Kulumsa Agricultural Research Center (KARC) with technical backstopping from the International Livestock Research Institute (ILRI) and the International Centre for Agricultural Research in the Dry Areas (ICARDA).

Prior to data collection for feed assessment tools, sustainable livelihoods framework (SLF) approach was used in June 2012 with the objectives of obtaining better insight on the major livelihood determinants of the community. SLF used to stratify households based on their access to different capital assets available to them. It is a way to improve understanding of the livelihoods of the community and to recommend and plan new development activities and avail different technology options based on their livelihood assets and their current capacity. It is an important tool, which developed in contrary to the assumptions of "one fits for all".

Based on the Focus Group Discussion (FGD) for SLF analysis, farmers prioritize the prominent variables in their livelihood assets (natural, capital, financial, physical and human capital). These can include natural resources, technologies, their skills, knowledge and capacity, their health, access to education, sources of credit, or their networks of social support. A total of 52 farmers participated in the FGD for prioritizing the variables which are crucial for their livelihoods, then based on the response obtain from farmers, the prioritized variables were selected and used for the SLF individual interview.

Farmers' extent of their access to these assets is also strongly influenced by their vulnerability context, which takes account of trends (for example, economic, political, and technological), shocks (for example, epidemics, natural disasters, civil strife) and seasonality (for example, prices, production, and employment opportunities). Access is also influenced by the prevailing social, institutional and political environment, which affects the ways in which people combine and use their assets to achieve their goals.

The SLF analysis considered farmers' access to different livelihood assets such as physical, natural, financial, human and social capital (Figure 2). Since FEAST comprises two main elements. For the first part of PRA exercise, a total of 36 farmers were purposively selected for FGD. In the meantime, the SLF outcome was used to categorize farmers into three groups; above average, average and below average. In line with the results of

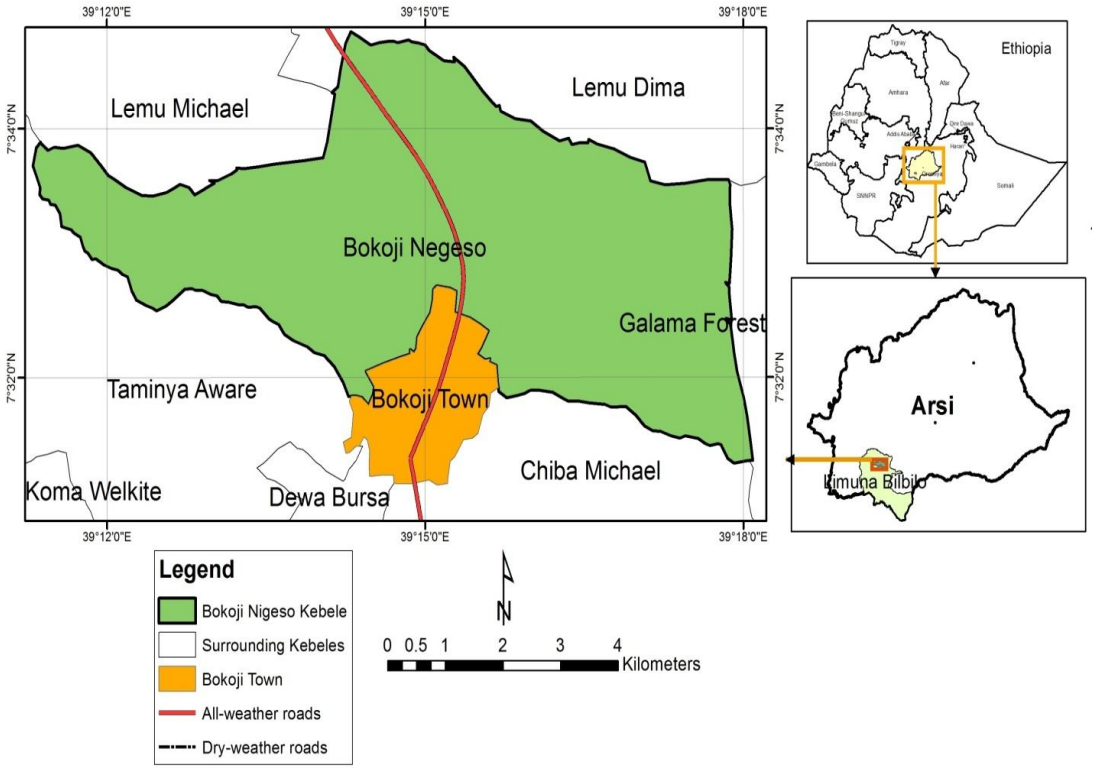

Figure 1. Map of the study area. Source: GIS source of Ethiopian Institute of Agricultural Research (EIAR).

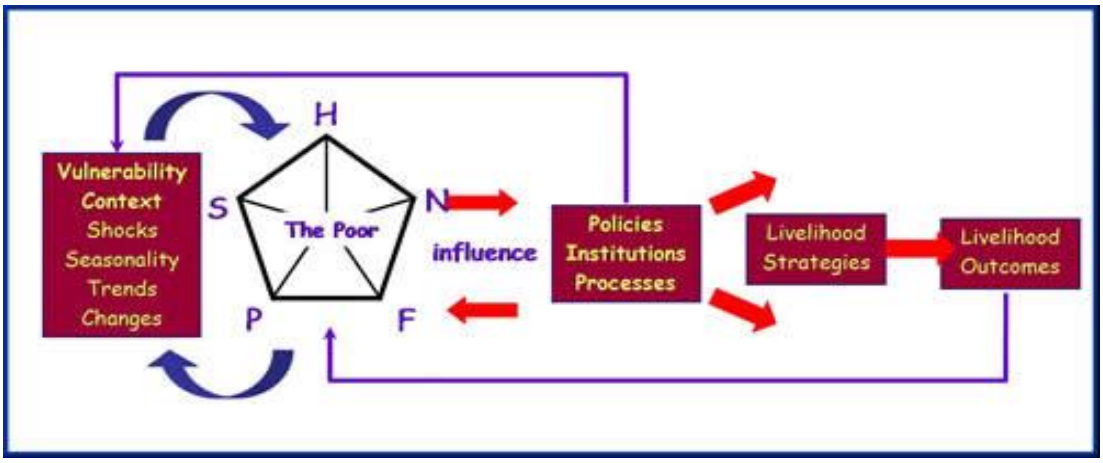

Figure 2. Schematic form of the SLF.

SLF, 9 farmers from the above average groups and 9 farmers from below average were selected as key informants for the second component of FEAST, that is, individual interviews using semi-structured questionnaires.

Data analysis

The quantitative data from individual interviews of 18 farmers (above and below average group) were entered and analyzed using the FEAST excel template (www.ilri.org/feast). FEAST qualitative data collected through FGD were examined and summarized for each major topic and linked with FEAST individual interview output.

The discussion topics of the FGDs for FEAST were focused on livestock holding, cultivated and collected fodder, purchased feed, crops grown on farm, contribution of grazing for the diet, source of household income, ruminants production per household, sale of livestock and livestock products and seasonality of feed availability. This information provides detail about on-farm feeding strategies and contribution of livestock for livelihoods.

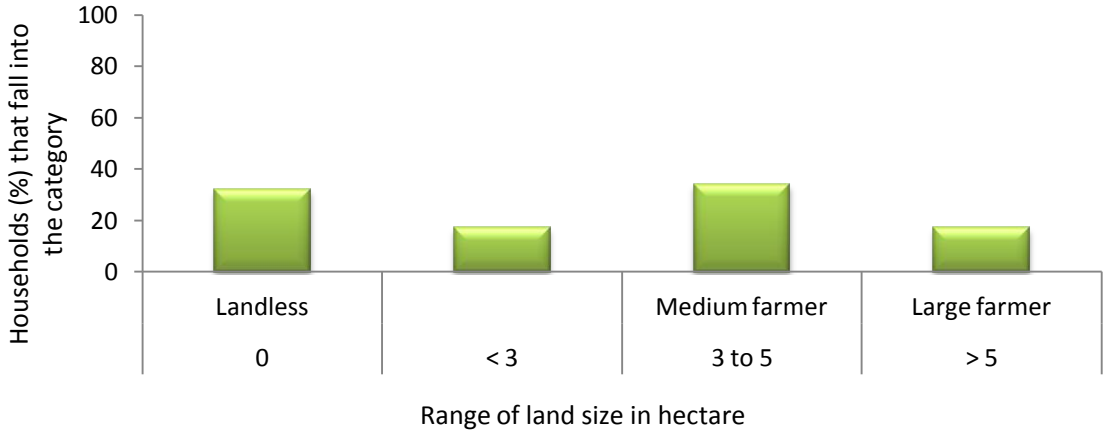

Figure 3. Average land size owned by the above average group.

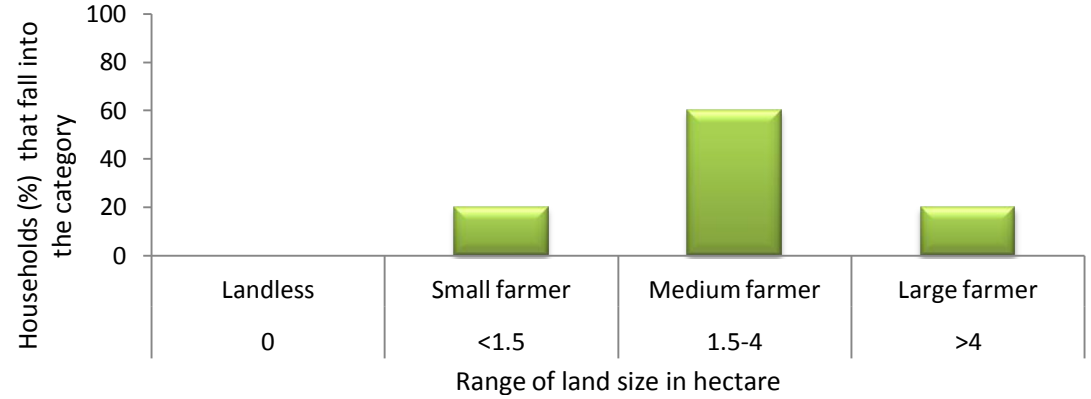

Figure 4. Average land size owned by the below average group.

RESULTS AND DISCUSSION

Overview of the farming system

On the basis of land holding status, noticeable differences were observed on the number of the respondents in the above and below average groups, where 30% of the farmers in the above average group are landless farmers as compared to landless is nil in the below average group (Figures 3 and 4). Age variation could be the expected reason for the differences observed. Land distribution took place in the area long years ago or before more than 20 years and this implies older farmers were accessed to and owned land during the distribution. The youth who did not own during the distribution period might get small plots of land from family based on the family's willingness and their total land ownership.

In the above average group most landless farmers are educated and aware of improved agricultural technologies that contribute to enhance productivity. They rent and access land for farming purposes. These landless farmers are predominantly educated young farmers. These youthful farmers engage in the farming systems with new ideas, knowledge and have better access to trainings which help them to focus more on market oriented farming system.

The main crops grown in the study area were barley, faba bean, field pea and wheat (Figures 5 and 6). Other crops include linseed and rape seed. Barley was the main grown crop by both above and below average. Linseed was grown by farmers of both groups whereas vegetables were only grown by below average farmers. Access to irrigation was minimal. Only 3.5% of the households in the PA used irrigation from Gonde and Dima rivers. The irrigation users are the farmers who can afford irrigation pumps from the above averages and those who live near the rivers from the below averages. In general, most crops are grown under rainfed condition by most farmers in the PA.

Farmers use family labor for most farming activities. However, during peak seasons labor is hired. Farmers in both groups use hired labor, but there are differences in level of hired labor utilization between the groups. The

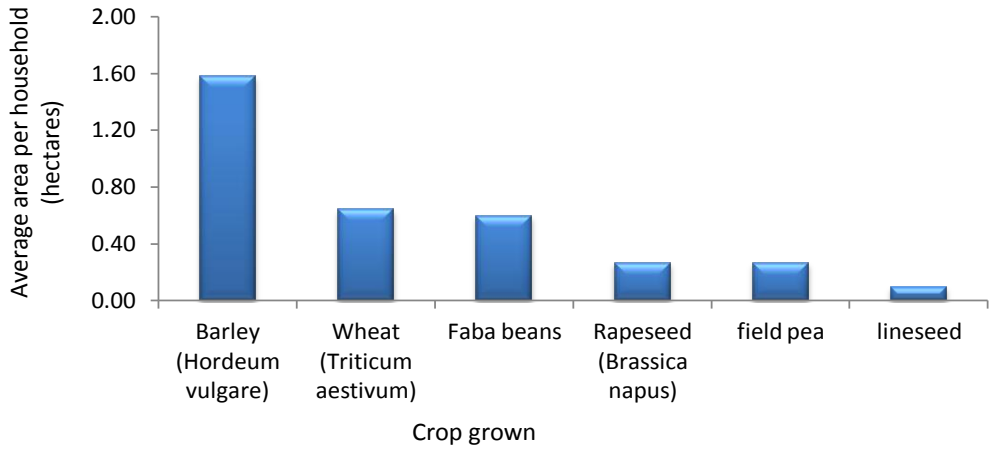

Figure 5. Crop grown by the above average group.

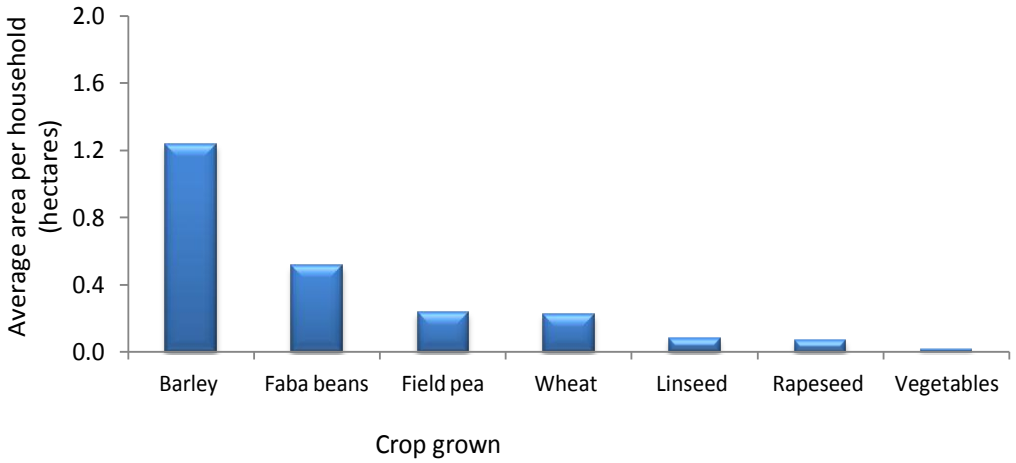

Figure 6. Crop grown by the below average group.

above average farmers use more hired labor than the below averages due to their engagement in large level of crop production. The availability of the hired labor varies among the seasons which mean in the peak season the demand for labor rises which leads to the shortages of hired labor and vice versa in other seasons. Activities for peak labor requirement are plowing, weeding, harvesting and threshing. Cost for hired labor was 45 ETB[1].

There is credit service providing institutes like Oromia Credit and Saving Institute (OCSI) in the study area. Even if farmers have access to formal credit sources, they tend not to use this service due to many factors. Farmers explain that the credit offered by OCSI is too small to procure dairy animals and it should be repaid within one year starting from date the loan is taken. The other problem regarding credit service is the procedures followed to engage in the credit service. In order to get credit services the farmers should form a group of 5 to 10 farmers. For the credit taken by the whole members of the group every member is responsible particularly in the loan repayment. For instance, if a member resists paying the credit, the members will share the burden and the farmers fear such burdens. Due to these factors farmers in the area abstain from using the credit service. Even though the financial service is more important for the below averages than the above once, the credit offering institutes treat both groups similarly.

Contribution of household income

Figure 7 shows that major livelihood income sources for the above average groups comes from the sale of cash crops, food crops and dairying, constituting 36, 25 and 13%, respectively. Contrary to this, remittance (22%), fattening of sheep and goat (22%), cash crop (12%) and dairying (12%) were the major livelihood income sources

[1]Ethiopian Birr (ETB), during the survey time 1$=17.25 ETB

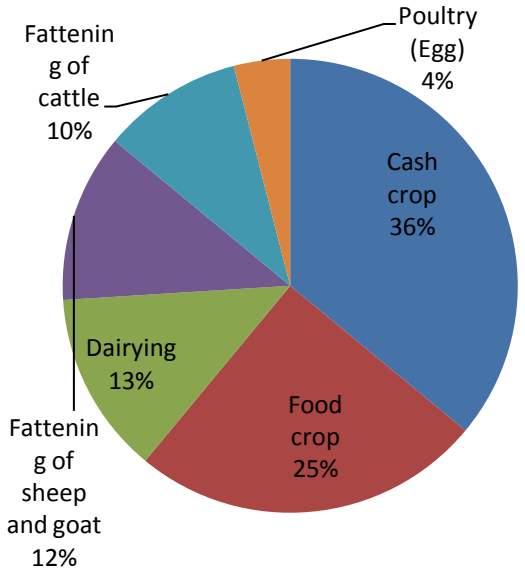

Figure 7. Contribution (%) of livelihood activities of above average group to household income.

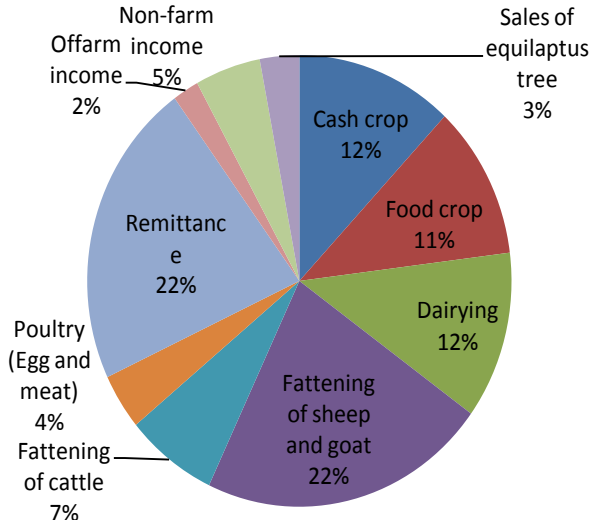

Figure 8. Contribution (%) of livelihood activities of below average group to household income.

for below average groups (Figure 8). This result signifies that the below average groups relies on the income sources generated from little investment areas like fattening of small ruminants. Furthermore, the farmers in below average group largely diversify their income sources to supplement their livelihoods and to reduce vulnerability to poverty and food insecurity. On the other hand, the above average group confines its involvement to major income generating activities such as the production of market-oriented crops (malt barley, highland pulse, oil crops and wheat) which fetch relatively better income.

The livestock production system

Livestock production is an integral component of the farming system of the study area. Every household keeps livestock such as cattle, sheep, goats, horse, donkey and poultry. Cattle are kept for food, cash, draught power and manure production. Local dairy cows in the area provide the households milk and manure.

The dominant livestock species owned by household in the two groups are indicated in Figures 9 and 10. Among the dominant species fattening and drought cattle are mainly kept by both groups. Contrary to our prior expectations, improved dairy cattle were the second important species for below average groups where local dairy cattle were for above average group respectively. Farmers in the below average group own relatively less grazing land, they keep few local dairy cattle by giving more emphasis to the improved once so as to reduce herd size to maintain productivity. Both groups keep sheep for home consumption and income generation while horses are kept for transportation and draught purposes.

Milk production

The dairy industry in the study area mainly comprises of smallholder farmers. However, according to the FGD results, the average herd size per household for local breeds is decreases while that of improved breeds it is increasing over the last five years. This is presumably affected by the shrinkage of grazing lands and increase of cultivated lands arising from the high population pressure. There is also lack of push factor to relieve pressure on land due to the unavailability of jobs in the urban centers for the young educated farmers. As a result, there is a change in the commercial orientation of farmers towards milk production.

In general, the majority of smallholder farmers engaged in dairy farming in the study area were characterized as follows:

1. The majority of the smallholder farmers on average held three local breeds and two improved breed cows. In some cases, exceptional progressive farmer owned as high as 37 improved breed cows, mainly Holstein-Friesian and Jersey breeds. The high number of local dairy breeds is partly attributed to the subsistence nature of the farming systems especially in crop dominated farming systems of Tulu Negesso and mixed farming systems of Mirtilaman villages. Farmers of this area do not perceive dairy production as a business mainly because of lack of awareness about the potential viability

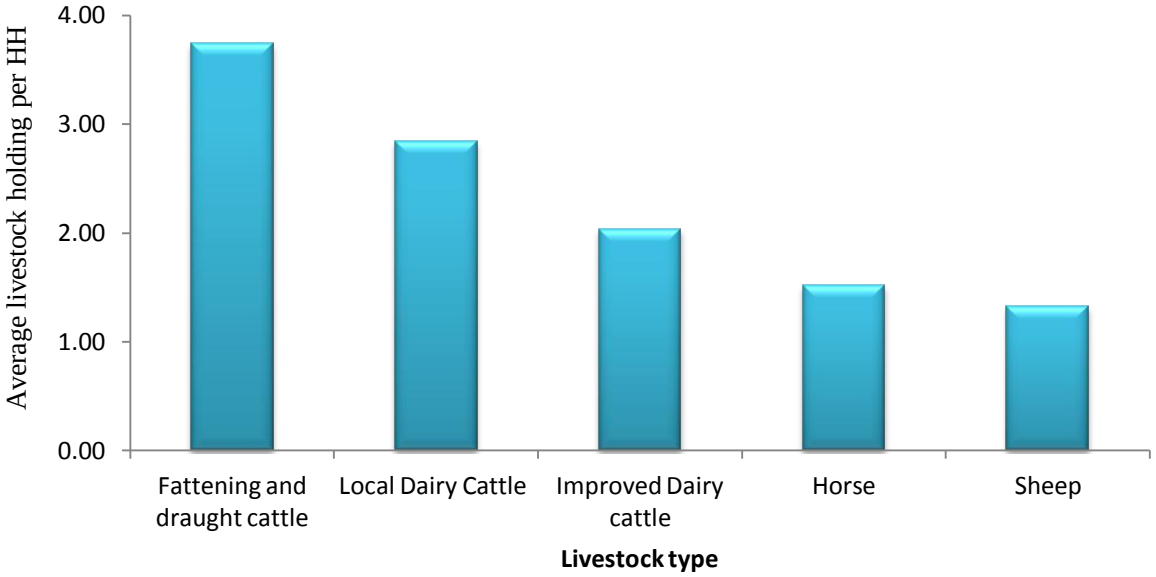

Figure 9. Average livestock species holdings per household (TLU) for the above average group.

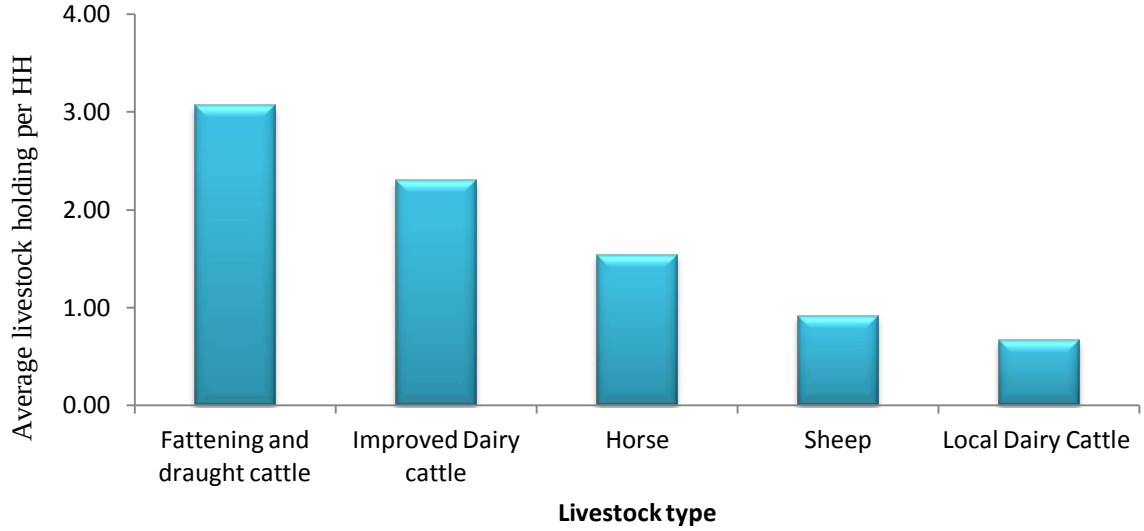

Figure 10. Average livestock holding per household (TLU) for the below average group.

of dairy farming, high price of concentrate feeds and the tradition of using local bulls partly due to the inefficiency and inaccessibility of AI services.

2. The feeding regime of the study area was dominated by communal grazing. However, very few farmers practice paddocking, indoor feeding (zero grazing) and cut and carry feeding systems for improved breeds. The overwhelming number of farmers use free grazing especially in the village of Chefa-Woligala, where there is a big communal grazing land locally named "*Lekuche*" grazing lands.

3. Average milk yield per dairy cow for local breeds was 2 L day^{-1} and for improved breeds it was 10 L day^{-1} (morning and evening milk). According to some key informants, there were farmers who get up to 17 L day^{-1} per cross breed dairy cow. This suggests that there is potential to raise yield per improved dairy cow from the current average of 10 L/day/cow to 17 L, which is equivalent to about 70% increases. The immediate problem of low milk yield was attributed to poor feeding, low genetic makeup of the existing breeds and general animal husbandry.

Veterinary and AI service

There are two categories of AI service providers in the district. These are government employees and Community Artificial Insemination (CAI) technicians who were selected and trained by the support of Oromia Livestock Agency and Food and Agriculture Organization (FAO). In the study sites, there was only one government employee who provides the AI services. Those who live in close proximity to the service get AI service from this source twice a week and pay 6 ETB for the services. In order to expand the AI service in the remote areas of the study site, Arsi zone bureau of agriculture with the technical and financial support of AI institution and FAO, provided trainings for nine secondary school graduate farmers. From the graduated AI technicians four of them provided with the necessary material of Nitrogen gun, glove, AI container, but the remaining five trained farmers are not given the necessary materials to start the services. The community service providers charges 12 ETB for one time AI service. In the remote areas of the study sites, farmers travel more than 4 km to get the AI services, this perpetuated farmers to use the local bull breeding services of cross breeds (Holstein-Friesian) for which they pay 15 TO 20 ETB**.**

There was one private clinic and three vet drug stores that provide veterinary services for farmers in the district. The prevalent animal diseases mentioned by farmers were mastitis, internal and external parasites such as lung worms, liver flukes and ticks. From the group discussions, we observed that the problems of AI and animal health service accessibility problems faced by both livelihood groups are similar.

Feeds and feeding

Feed availability

The feed resources in the study area were primarily composed of grazing, crop residue (cereals and legumes), and purchased feed, cultivated fodder and naturally occurring and collected fodder.

Crop residues

The study area is characterized as mixed crop-livestock farming system, in which both livestock rearing and crop production are practiced simultaneously as a means of the farmers' livelihoods. In mixed farming system, crop residues are mainly used as source of livestock feeds together with natural pastures. Crop residue was a major component in the diet of cattle in both groups. Animals rely on crop residue throughout the year when grazing material is scarce.

The dominant crop residues available and used as feeding options for livestock production includes straws of wheat, barley, linseed, faba bean and field pea. Due to its relative palatability of the straw, most of the farmers prefer barley straw to feed their dairy animals. The main source of crop residues was from own harvest, but in some cases, farmers also buy from the market or other farmers. Preferences for crop residues differ for different crops. Farmers usually prefer barley, linseed and wheat straw in their order of importance to feed their dairy cows and oxen. Meanwhile, straw of faba bean is usually provided to horses and donkeys.

Purchased feeds

During the rainy seasons, farmers rely mainly on natural pasture to feed their dairy animals. As a result, demand for concentrate feeds and their associated prices decrease during such seasons. However, farmers start seeking concentrate feeds as their natural pasture dwindles. They get these concentrates from flour and oil mills in Bekoji town. Since, the factories are close to the study area, farmers directly purchase wheat bran and oil seed cakes from the factory outlets. In the year 2011, the cooperative union succeeded in distributing 50 barrel of molasses to smallholder farmers of the study area with the average selling price of 2 ETB/kg.

According to the response of farmers, the price of the concentrate feeds increases from year to year. For instance, the price of oil seed cakes increased from 600 ETB/100 kg in 2010 to 900 ETB/100 kg in 2012 and for wheat bran it increased from 140 ETB/100 kg in 2010 to 360 ETB /100 kg in 2012. This is becoming unaffordable for farmers and it has a negative bearing on the milk supplied by smallholder farmers. Farmers tend to reduce the amount of concentrate feeding to livestock as its price increases. Moreover, most farmers provide supplementary concentrate feed only to oxen and lactating cows because of the high price, which made them costly to feed to other animals.

Most farmers did not have access to training on ration formulation and improved feeding techniques. They feed their animals based on their own experience and by copying what other farmers in the area are doing. As result the straw is usually fed to the animals without any form of process or manipulation prior to feeding. However, few progressive farmers were trained by ACDI/VOCA in ration formulation and improved feeding practices. They are serving as role models for other farmers in improving their feeding practices. These trained farmers are aware of mixing with linseed cake and wheat bran or salt as means of improving quality and its palatability.

In general feed scarcity both in terms of quantity and quality is the main feature of Bekoji Negeso for livestock production system. More land is allocated for cropping that shrinks the land for fodder production. Fodder crop species such as oat, vetch, maize and tree Lucerne are grown in the study area as indicated in Figures 11 and 12. Vetch and oat fodder crops were the most important

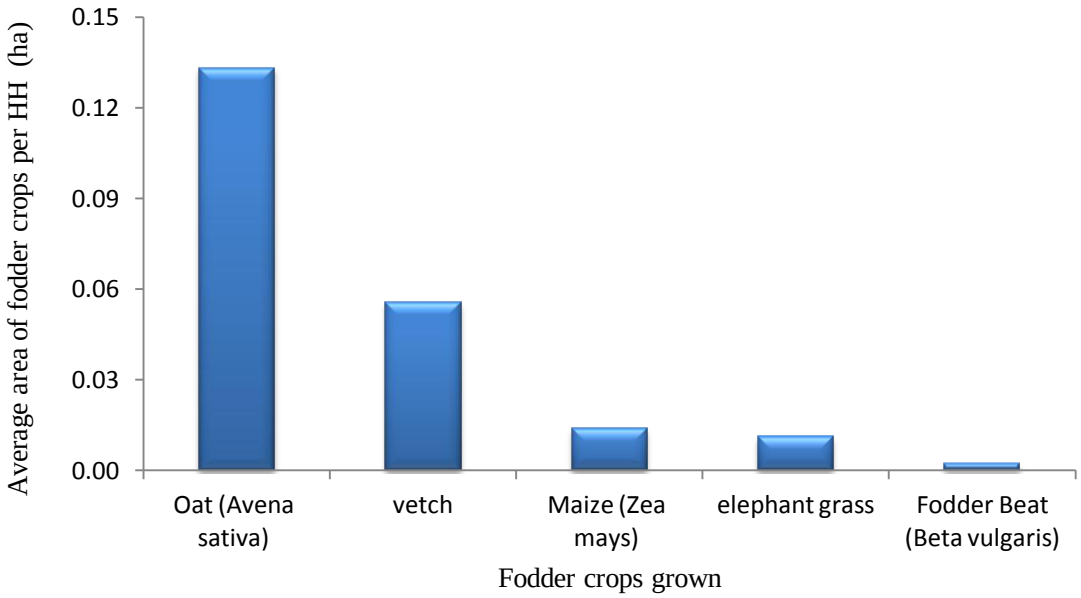

Figure 11. Fodder crops grown by the above average group.

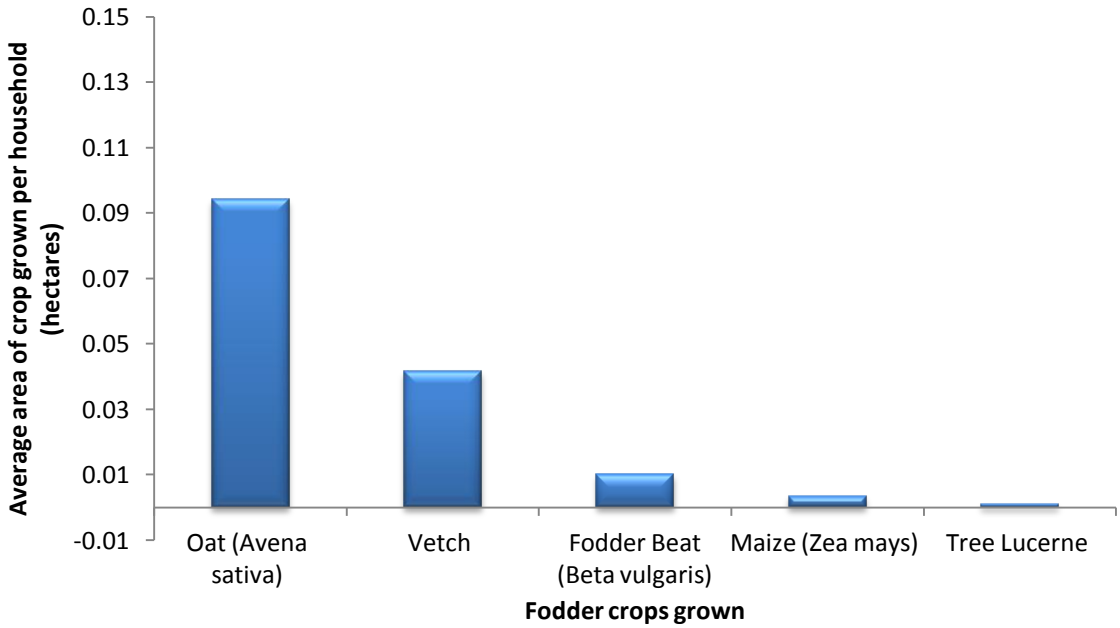

Figure 12. Fodder crops grown by the below average group.

improved forage crop adopted by both groups of farmers even though the acreage allocated to fodder crops is larger in the above average group compared to the below average group. Mixing straw with linseed cake, wheat bran or urea- molasses and chopping of maize, potato and oats was practiced in this village.

Industrial by-products available in the nearby Bekoji town are used to supplement the poor quality crop residues. The common industrial by-products in the area are wheat bran, molasses and linseed cake. The farmers get these supplementary ingredients from the flour factory, oil factory and traders through purchase. Farmers prefer wheat bran than others as the largest ingredient purchased due to its low price. Farmers in the above average group purchase feeds such as wheat barn, molasses, linseed cake, crop residues and salt constituting 50, 25, 15, 4 and 5%, respectively (Figure 13a). The below average group farmers also purchase

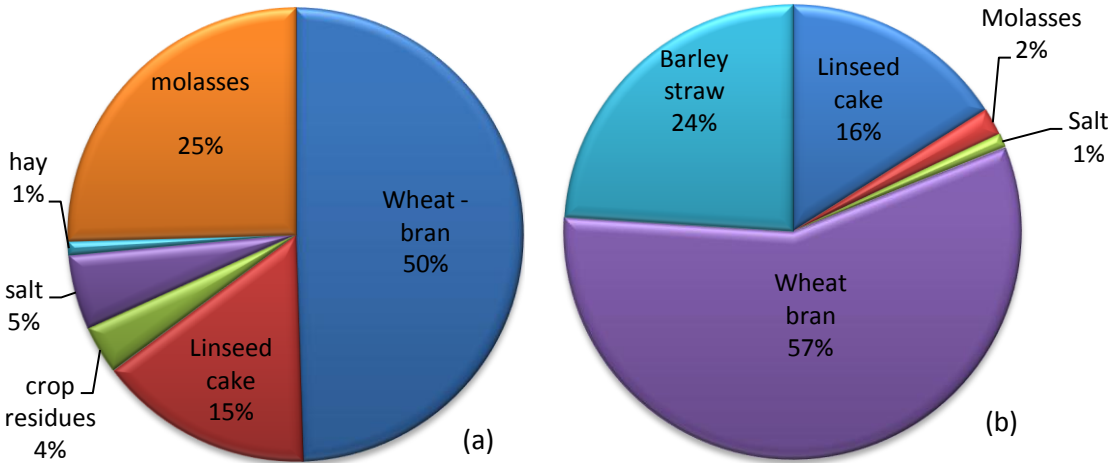

Figure 13. Quantity of purchased feed over the past 12 months (above (a) and below (b) average group).

feeds like wheat barn, barley straw, linseed cake, molasses and salt by the proportion of 57, 24, 16, 2 and 1%, respectively (Figure 13b). Molasses is provided to the farmers by the district's bureau of agriculture. Those farmers (in above average group) who have close communication, aware of it and capable to purchase use molasses in larger quantity. On contrary to this, subsistent less educated, less technology adopters in the below average group purchased less molasses due to communication and awareness gap, and purchasing power limitation.

Both groups prefer to purchase wheat bran in greater proportion, relatively due to its availability at the nearby floor factories and low price. Barley straw was purchased by below averages for its low cost while more molasses was purchased by above averages due to their ability to purchase and knowledge about its use. The amount of linseed cake purchased by both groups was almost similar and farmers obtained it from the oil factories in Bekoji town. Crop residue contributes much for the feed resource. Due to population pressure, marginal lands are being converted into cropland, and areas under grazing land have therefore substantially decreased in the PA.

Feed quality

Based on the information gathered from the above average group grazing, crop residues, and cultivated fodder contributes 49, 25 and 12 to the Dry Matter (DM) content of the total diet respectively (Figure 14a). Similarly, grazing, crop residue, and purchased feeds contributes 33, 23 and 20% of the DM respectively as to the below average groups (Figure 14b). This result is in agreement with what Ben et al. (2010) found in Bbaale dairy farmers association (DFBA) of Bbaale country, Kayunga district, Uganda. He found that grazing contributes the largest proportion of the feed base on a DM basis in the area and consequently Metabolizable Energy (ME) and Crude Protein (CP). Likewise, Luke (2010) found that the contribution of grazing to the dietary DM made by feeds were high in Mweiga district, central Kenya, where grazing contributes 34%, naturally occurring and collected 34%, purchased 25%, the reminder 4 and 3% were crop residue and cultivated fodder.

The level of feed resources contribution to the ME is shown in Figure 15a and b. Grazing, crop residues and cultivated fodders are the major feed resources that are contributing 49, 20 and 14% of the ME respectively as to the above average group and 32, 17 and 14% respectively to the below average group. This result is in conformity with what Ben et al. (2010) found in Bbaale dairy farmers association (DFBA) of Bbaale country, Kayunga district, Uganda, where he found that grazing, purchased feed and naturally occurring and collected were the major feed resources that are contributing 78, 13 and 9% of the ME respectively.

The crude protein content (CP) determines the feed resources quality and palatability, and the feeds varies in the CP contribution. For above average group grazing, cultivated fodder, purchased feeds, and crop residues contribute 42, 17, 16 and 15% to CP respectively whereas purchased feeds, grazing, and cultivated fodders contribute 35, 25, and 15% of CP in the total diet in the case of below average groups (Figure 16a and b).

The contribution of grazing to DM, ME and CP is relatively high for the above average group farmers who reserve more land for the growth of grazing pasture and crop residue (barley and wheat) through land renting. Due to limitations of grazing and crop residue resources farmers in the below average group are forced to use the purchased feeds and it contributes more to the CP, ME and DM of the total diet of their livestock in the order of importance. Farmers in the below average group have limited capacity in terms of land ownership and capacity

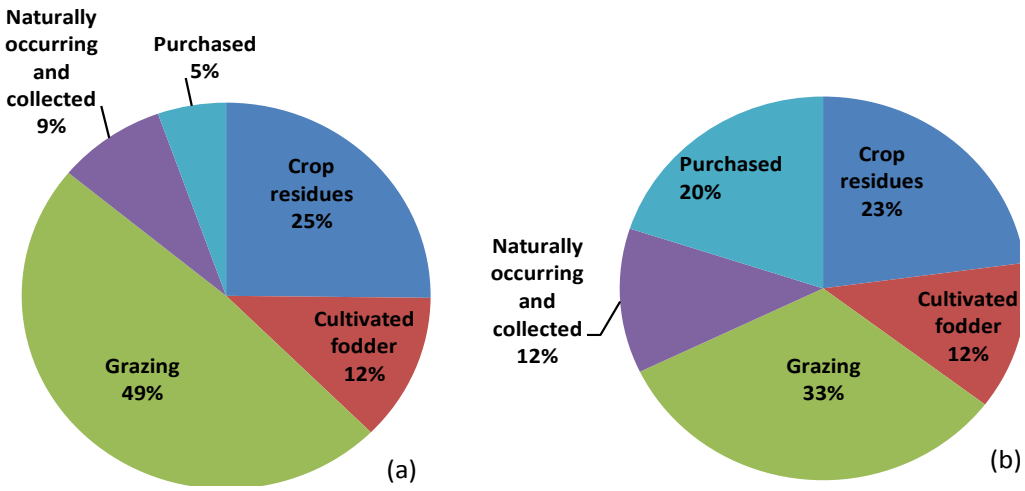

Figure 14. Contribution made by various feedstuffs to DM content of total diet of livestock of the above (a) and below (b) average group.

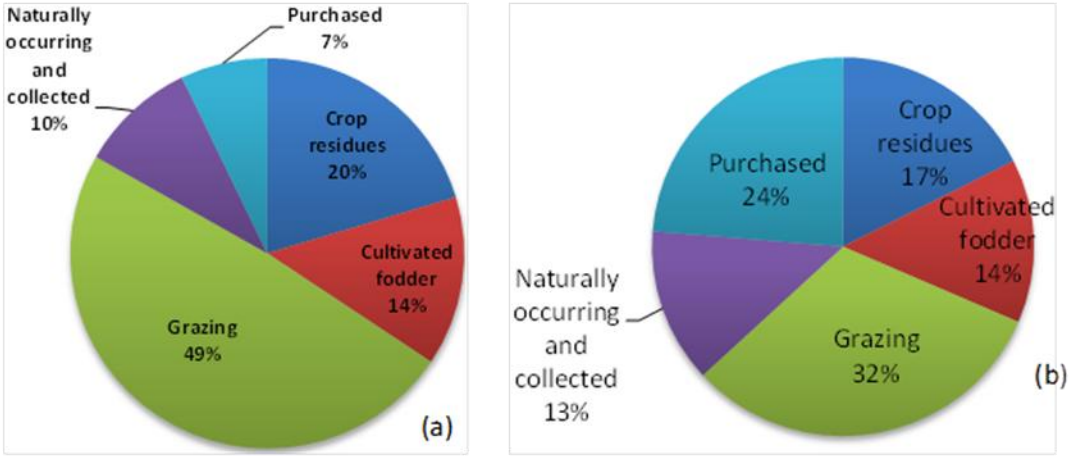

Figure 15. Contribution made by various feed stuffs to ME content of total diet of the livestock of the above (a) and below (b) average group.

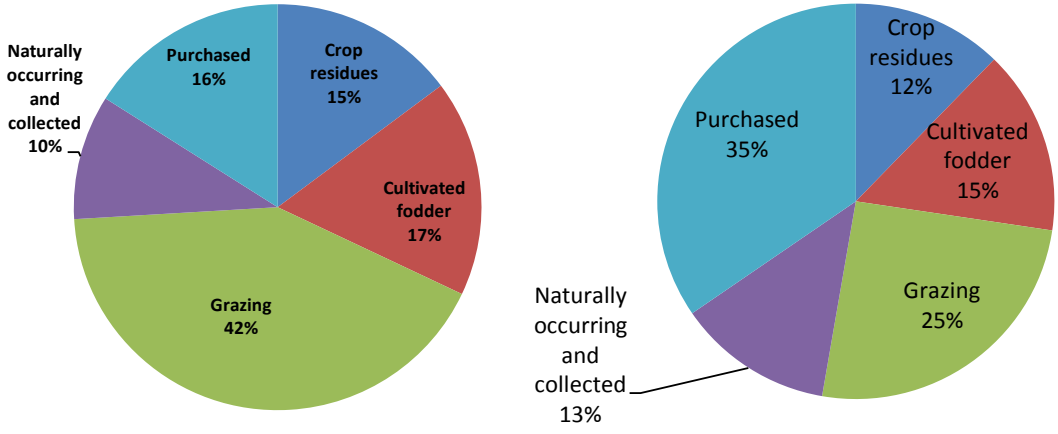

Figure 16. Contribution of various feedstuffs to the CP content of total diet of livestock of the above (a) and below (b) average group.

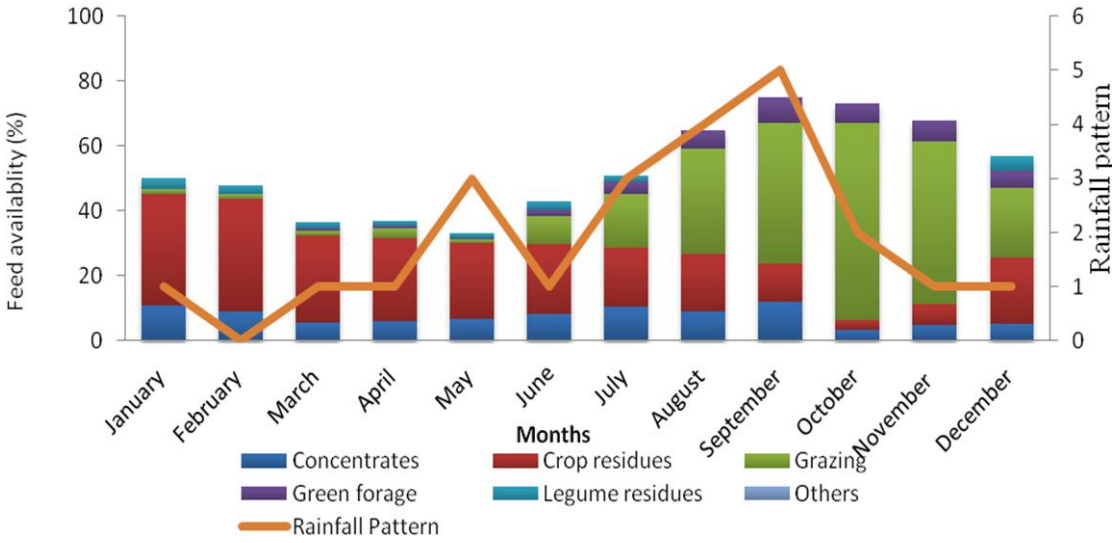

Figure 17. Composition of the diet through the year relative to the rainfall pattern for the above averages.

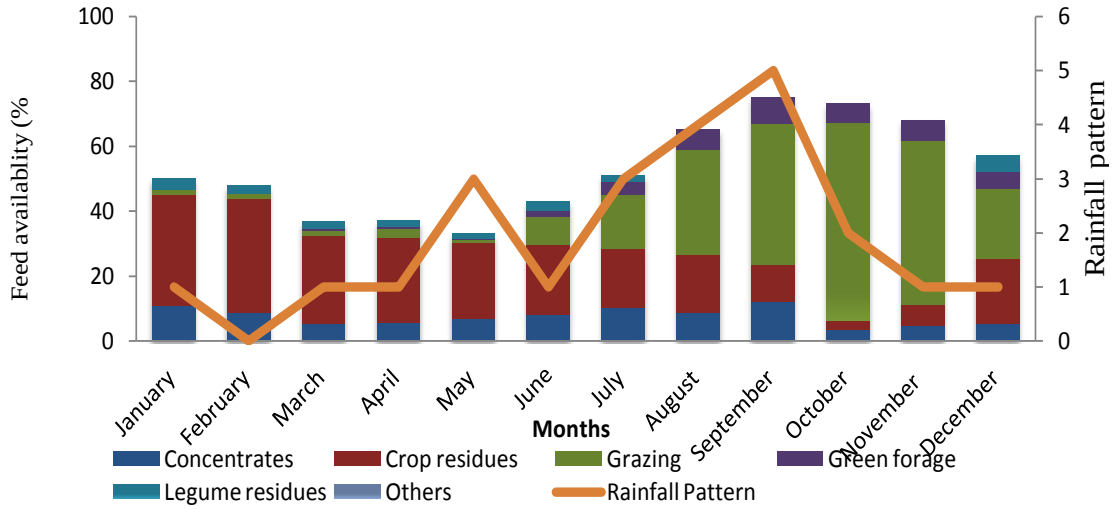

Figure 18. Available feed resource for below average groups.

to rent in land to produce adequate crop residues to use as feed resources and that is why they mostly depend on purchased feeds as sources of CP, ME and DM than the above averages.

Feed seasonality

Livestock feed is seasonal. There is severe shortage during the dry season and at the start of the rains. The most critical periods are from February to May, when all feed resources are virtually depleted and conservation of straw of wheat and barley is inadequate. Whatever has been conserved is preferentially fed to dairy and draught animals as they require additional intake of food during plowing, planting, lactating and pregnancy. But the high energy demand of working and dairying animals is not met and their conditions and productivity deteriorate during this period. Green fodder of oat and vetch contributes to the diet of lactating dairy and draught oxen in the area as supplementary feed.

From the result of the Figures 17 and 18, we can assume there is no difference in feed availability thought the year for both groups. However, the contributions made by these feed resources to the diet vary throughout the year due to variation in the rainfall pattern. The contribution of crop residue and grazing is high as compared to the others. In the dry season (from

December to July) crop residue is the dominantly used feed as well grazing contributes more in the rainy season (from July to November) in both farmer groups. This finding is in line with what Felix (2011) found in East Wollega Province, Ethiopia, where he stressed that grazing is the primary component of the diet throughout the year. The contribution of grazing to the total diet accounts for 85 to 90% according to farmers. When rainfall levels decreases crop residues become a more important feed source.

Problems, issues and opportunities

In this study the major problems observed and identified by both groups of farmers are more or less similar except communication and awareness gap which are the below average group's problem. The problems that were raised by the farmers in both farmer groups with regarding to livestock production were shortage of feed, scarcity of water, unavailability of cash or credit services, shortage of veterinary service, lack of AI service, awareness and communication gap as mentioned in Table 1.

Shortage of feed at the end of dry season when all crop residues have been consumed and pasture growth is poor, was the major constraint for livestock production in the area. The feed shortage also appears even in the rainy seasons since more of the lands are occupied by crops. The degree of the problem varies among the groups. The farmers in the above average reserve more grazing lands than the below averages. This implies that feed shortage is more serious for the below averages.

Farmers in the below average group were less educated, less trained, resistant in technology adoption than farmers in above average group. These farmers were less aware of the functions of improved technologies due to less extension contacts, communication habits and information gap and they are less benefited from new information and technologies. So, frequent capacity building training on general livelihood welfares so as to create awareness about the importance of new and improved technologies through close communication with the responsible experts are proposed as solution by the key informant.

Regarding credit the problem was similar among the groups, but credit service was more important to the below averages so as to minimize their financial constraints to undertake their agricultural activity such as livestock production through accessing to improved breeds. Other constraints like water problem, vet and AI service shortages were quite similar and equally important for farmers in both groups.

Opportunities

Opportunities that contribute to the improvement of the sector do exist in the area. These opportunities were:

1. Accessibility of all-weather road in the district as well to the PA: The all-weather road that passes through the district connects it to different cities like Addis Ababa, Adama, Shashamane, Assasa, Bale robe and the like. This creates opportunities to supply the livestock products to them and to access inputs easily from this area.
2. Good agro-ecology with favorable climate: The district possesses good climate with longer rainy seasons which is suitable for pasture growth. The grazing lands in the district are also relatively large as compared to other areas.
3. Good policy road map which aimed that for bringing the desired change in the livestock sector. Nowadays more emphasis is given to improve the livestock production and productivity so as to earn more benefits from the sectors. For instance, for the year 2013 the Oromia Livestock Agency gives priority for improving the effectiveness and accessibility of the AI services through use of oestrus synchronization that will use mass artificial insemination campaigns for the coming season.
4. Change of life styles in the urban centers coupled with urbanizations and rapid population growth stimulates for high demand for food particularly livestock products which are rich in protein. The need for livestock products (meat, milk, eggs and milk products) indicates the opportunities regarding livestock production.
5. The availability of adequate industrial by-products from oil and flour factories in the nearby Bekoji town. The availability of adequate crop residues of wheat and barley is also the important opportunity existing for livestock production in the area. The possibility of maintaining the required feed qualities by mixing the industrial by-products with the crop residues is again another opportunity.

Areas of intervention

Based on the problems existing in the area, taking the possible potential interventions as required is crucial for revitalizing the livestock production and productivity of the study area. The areas looking for the interventions are:

1. Due to availability of agricultural by-products that can be used as supplements, farmers should be introduced to the formulation of simple rations using these supplements. Demonstrations should be carried out preferably on-farm so as to reach the below average farmers who have lesser contact or may tend to shy away from approaching extension workers or attending training forums.
2. Farmers are already growing fodder crops such as vetch and fodder oats. Therefore, integration of forage legumes into the cereal cropping through intercropping, ley farming or other existing methods should be encouraged as such integrations are reported to enhance the nutritive value of crop residues.

Table 1. Paired wise matrix ranking result of the problems of livestock production.

Problems in order of importance	Problem identified by farmers in both groups	Proposed solution by farmers in both groups
1	Feed shortage	Improved forage development and decrease local livestock breeds
2	Lack of water	Natural water resource development and installation of tap water
3	Lack of credit/cash	Increase accessibility to credit service
4	Shortage of VET and AI service	Training of farmers in AI service and increase number of vet. Technicians
5	Awareness and communication gap (in below average group)	Frequent capacity building training on general welfares of livelihood, create close communication habit with livestock production experts through training

Source: Emanated from FGD.

3. Development of herbaceous forage legumes and fodder trees species which can mitigate the constraints of feed scarcity. Incorporation of these species are important as part of sustainable farming system. Particularly leguminous forages are important feed sources for supplementation of low quality crop residue. Fodder trees also provide an important source of feed and have considerable potential for increased use, especially to maintain green leaf into the dry season.
4. Training on cost effective livestock ration formulation techniques to reduce the feed shortages observed and to supply the livestock with quality and palatable feeds.
5. Accessing the farmers with credit or cash with reasonable amount and loan repayment periods by reducing long processes required to access credit and further awareness creation trainings on how to get credit, about the repayment periods and amount of credit offered for livestock related activities like dairy production, purchase of heifers and fattening of cattle.
6. Poor conception rate could be results of poor AI service which identified by farmers as the main constraint and this issue is caused by poorly trained AI technicians and poor quality semen. This points the need for improvement on the timely availability and effectiveness of AI services through well-trained AI technicians and use of selected semen at the time of heat period. This can be achieved through:

a. In-service training of local service providers: To enhance the technical skills and knowledge of the AI technicians' short-term trainings and refresher courses on relevant areas of AI services will play central role for enhancing the livestock sector of the study area.
b. Training of farmers on community bull selections and AI services (especially heat detections and reporting**)** or encouraging the use of farmer AI technicians where it is necessary. Furthermore, training farmers about the elements of the AI procedure: properly recognizing the signs of estrous, improving farmer's awareness about the impact of the stress immediately prior to or post insemination should help to improve conception rates. Educating farmers about the importance of maintaining the cow on an appropriate plane of nutrition will also help maintain pregnancies through to parturition.

7. Disease is one of the constraints which limit productivity in the district. Improving animal health must be part of a strategy which requires attention to improve the production of the sector.
8. Development of ground water resources and installation of tap water are areas that need intervention to reduce water shortages in the area.
9. Since available crop residues provide feed for various types of animals, further studies needs to be undertaken to determine which crop residues are ideal for which particular livestock species so as to enhance acceptance of crop residues by individual species thereby limiting refusals and avoiding preferential feeding that may lead to unnecessary wastage.

Conclusion

This survey emphasizes the need for technology approaches that integrate crop-livestock approaches. The predominant reliance on crop residue requires production of high quantity and quality of the residues that would be nutritionally beneficial to livestock. It also reveals that farmers within a community are not homogenous. This emphasizes the important of the presence of effective extension services that reach out to farmers by particularly carrying out on-farm demonstrations to promote the development of appropriate technology that can be adopted readily at the farm level.

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