# Assessment of livestock feed production and utilization systems and analysis of feed value chain in Jeldu district, Ethiopia

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# Abstract

This report provides an overview of the findings of the assessments regarding livestock production, feed availability, feeding systems and an appraisal of concentrate feed value chain in two selected villages (Melka and Birbirsa) in Jeldu district of West Shewa Zone in the central highlands of Ethiopia. The field survey was conducted in the first week of January 2014 and information was collected from feed producers, feed traders and feed consumers through focus group discussions, a structured questionnaire, key informant interviews and personal observations. The report outlines the major types of feeds available in the area, livestock feeding systems, constraints and opportunities of the prevailing feed utilization systems and provides a description of the concentrate feed value chain and associated actors.

# Introduction

Shortage of feed supply and poor nutritional quality of available feed resources are the major constraints affecting livestock productivity in Ethiopia (Tolera et al., 2012). The problem is more intense in the highlands of the country where more than 75% of both the human and livestock population are concentrated. This state of affairs was confirmed in a recent assessment of livestock production system and feed resources availability at micro level in Jeldu district (Derese et al., 2014) of West Shewa Zone in central highlands of Ethiopia.

It is thus important to tackle the feed shortage issue to ensure economically viable and environmental friendly livestock production. The feed resource base for livestock producers in the highlands includes feeds produced on-farm and those obtained from off-farm sources. While roughage feeds are mainly produced on-farm by the farmers, concentrate feed ingredients are produced as by-products of agro-industries located in different parts of the country and being channeled to the smallholder farmers through various chains. Understanding of the feed production system including distribution and utilization is useful to identify and design proper interventions to improve feed supply, and hence livestock productivity. This requires application of appropriate system analysis tools such as value chain analysis.

In a broad sense, a value chain can be defined as the full range of activities required to bring a given product to final consumers passing through the different phases of production, processing and delivery (IDRC, 2000). It can also be defined as a market-focused collaboration among different stakeholders who produce and market value-added products. The above definitions can also apply to livestock feed value chains and analysis of the feed value chain is essential for an understanding of the core processes, activities and the major actors involved in the chain. It also helps to identify the critical constraints limiting the production, delivery and proper utilization of feeds for improved livestock production. The concept of feed value chain analysis is a relatively recent phenomenon and has not often been applied in Ethiopia. The work of Getu et al (2012) on the dairy-feed value chain and that of Beneberu et al (2012) in sheep-feed value chain are some of the few efforts which need to be mentioned, but information regarding the feed value chain per se is lacking. This study was therefore conducted in two selected villages of the Jeldu district in west Shewa Zone, central highlands of Ethiopia with the following specific objectives:

- To assess the overall system of livestock production, focusing on feed availability and feeding systems in the study area
- To identify and map the core functions, actors involved and activities in the concentrate feed value chains in the area

# Methodology

## Site description

Jeldu district is located about 110 km NW of Addis Ababa in the West Shewa zone of the Oromia Regional State in central Ethiopia. The district has an altitude ranging from 1800 – 3000 m above sea level (a.s.l) and receives an average annual rainfall of 938 mm. The average minimum and maximum temperature of the area is 9°C and 27°C, respectively (Ayele, 2012). The district is characterized by a crop-livestock mixed farming system with barley, potato, wheat, teff and sorghum being the major crops grown in the area. According to the woreda agricultural office sources (Ayele, 2012), the livestock resource base of the district is estimated to be about 123,000 tropical livestock units (TLUs).

## Data collection procedures

A field survey was conducted during the first week of January 2014 in order to assess the concentrate feed value chain in the district. The focal site for this study was Kolu-Gelan kebele administration located about 5 km from Jeldu town. Two villages with reasonable potential for both crop and livestock production (namely Melka and Birbirsa) were selected with the help of the district livestock production expert and village level development agents. Both villages have a similar farming system (integrated crop-livestock system) and their only difference was the availability of some irrigation access at Melka. Fifteen smallholder farmers (10 males, 5 females) representing different age groups, land size, farming experience and gender were selected from each village and contacted to collect information from the small-scale feed consumers' perspective. A large scale commercial dairy farmer based at Ambo (zonal town of West Shewa) was contacted as a case study respondent to capture the views of commercial farmers as feed consumers. Some concentrate feed ingredient producers and feed traders operating around Jeldu, Ginchi, Ambo and Guder were also contacted.

Data was collected through a checklist-based focus group discussion (FGD), key informant interviews, individual interviews using a structured questionnaire and personal observations. All the 15 farmers selected from each village participated in the FGD followed by individual interview of 13 farmers (3 females) in Melka village and 11 farmers (2 females) in Birbirsa village (Figure 1). A representative commercial dairy farmer at Ambo was visited and interviewed as a key informant at his farm (Figure 2). Moreover, a few feed producers (oil processors, grain millers) and feed traders (retailers) who agreed to provide information were individually contacted and interviewed as key informants at their respective working areas at Jeldu, Ginchi and Ambo. The data was analyzed using SPSS.

Figure 1. FGD and individual interviews with feed consumers (smallholder farmers)

Figure 2. Partial view of a commercial dairy farm visited at Ambo (large scale feed consumer)

# Results and discussion

## Household characteristics of the respondents

Table 1 presents the major household characteristics of the surveyed farmers in the two selected villages of the Jeldu district. The responding households at Melka village had an average age of 49.8 (SD = 12.4) years and have been engaged in livestock production for an average of 27 years. The total average land owned per household was reported be 2.8 ha of which about 0.6 ha was devoted to feed production including natural pasture in Melka village. About 23.1% of the respondents in the village also reported that they were members of different cooperative societies.

The average age of the households at Birbirsa village was 48.5 (SD = 11.1) with a mean experience of about 24 years in livestock production. The total average land size per household in this village was reported to be 3.0 ha out of which 0.7 ha was used for feed production. Considerable proportion (63.6%) of the surveyed households in Birbirsa village also reported to being members of cooperative societies.

Table 1. Some socio-economic characteristics of the responding households

| Village | Variable | Mean | SD | Min. | Max. |
|---|---|---|---|---|---|
| Melka | Age | 49.8 | 12.4 | 40 | 76 |
| (n=13) | Experience in livestock production (yrs) | 26.8 | 8.5 | 20 | 50 |
| | Total land size owned (ha) | 2.8 | 2.2 | 1.1 | 9.5 |
| | Land used for feed production (ha) | 0.6 | 0. 6 | 0.1 | 2.0 |
| | Members of cooperatives (%) | 23.1 | | | |
| Birbirsa | Age | 48.5 | 11.1 | 31 | 58 |
| (n=11) | Experience in livestock production (yrs) | 23.7 | 9.9 | 6 | 35 |
| | Total land size owned (ha) | 3.0 | 1.3 | 1.0 | 5.0 |
| | Land used for feed production (ha) | 0.7 | 0.5 | 0.3 | 2.0 |
| | Members of cooperatives (%) | 63.6 | | | |

## Livestock holding

The livestock species raised in the study areas include cattle, sheep, donkeys, horse and chickens. Cattle followed by sheep, horse and chicken are the dominant species raised by majority of the surveyed households in both villages (Figure 3). As shown in Table 2, the number of the different livestock species owned per household was comparatively higher at Birbirsa village than at Melka.

Table 2. Numbers of different livestock species owned per household in the two villages

| Village | Species | Mean | SD | Min. | Max. |
|---|---|---|---|---|---|
| Melka (n=13) | Cattle | 6.6 | 2.9 | 2 | 12 |
| | Sheep | 5.0 | 3.7 | 2 | 14 |
| | Donkey | 2.0 | | | |
| | Horse | 1.9 | 0.7 | 1 | 3 |
| | Chicken | 4.7 | 3.4 | 2 | 12 |
| Birbirsa (n=11) | Cattle | 8.4 | 5.7 | 3 | 22 |
| | Sheep | 10.7 | 6.4 | 2 | 20 |
| | Donkey | 2.0 | | | |
| | Horse | 3.1 | 1.7 | 1 | 5 |
| | Chicken | 11.0 | 6.3 | 2 | 20 |

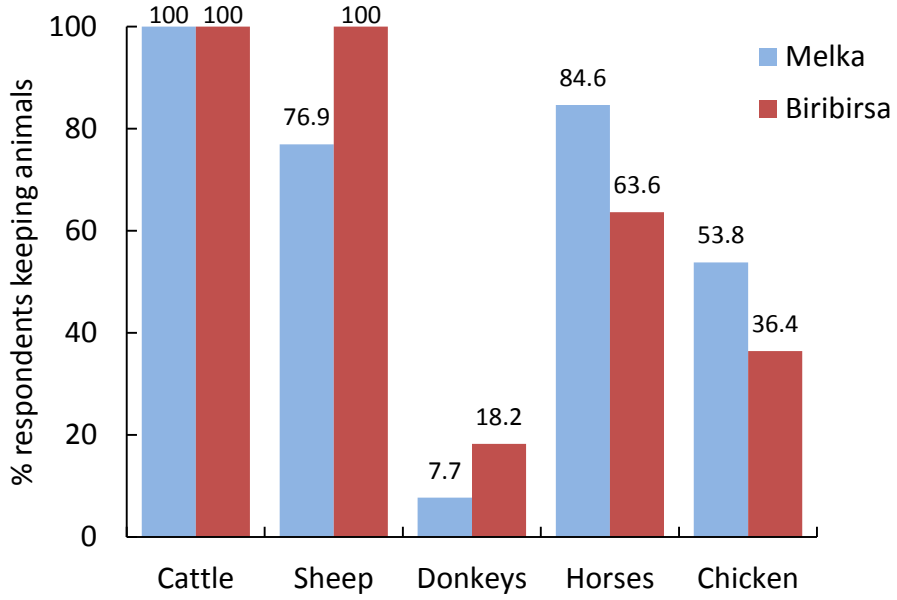


Figure 3. Percentage of respondents keeping the different livestock species

Table 3 and Figure 4, respectively indicate the number of cattle owned per household and the proportion of respondents owning the different cattle types. As shown in Figure 3, cows were the major cattle type owned by 100% of the respondents followed by oxen (95.8%), bulls and other males (87.5%), female calves (58.3%) and heifers (33.3%) of the respondents. Generally, the size of the different cattle herds per household was small, but comparatively better at Birbirsa village (Table 3).

As indicated in Table 4, most of the cattle owned by majority of the surveyed households in both villages belong to the highland land zebu breed, while some farmers also reported keeping a few Boran cows and their crosses with HF or Jersey.

Table 3. Cattle herd structure of the responding households

| Cattle herd type | Village | |
|---|---|---|
| | Melka (N=13) | Birbirsa (N=11) |
| Oxen | 1.8 (1-3)* | 2.2 (1-4) |
| Cows | 2.1 (1-3) | 2.7 (1-9) |
| Bulls and bull calves | 1.7 (1-4) | 1.8 (1-3) |
| Heifers | 1.6 (1-2) | 4.0 (3-5) |
| Female calves | 1.3 (1-2) | 1.4 (1-2) |

* figures in brackets indicate ranges

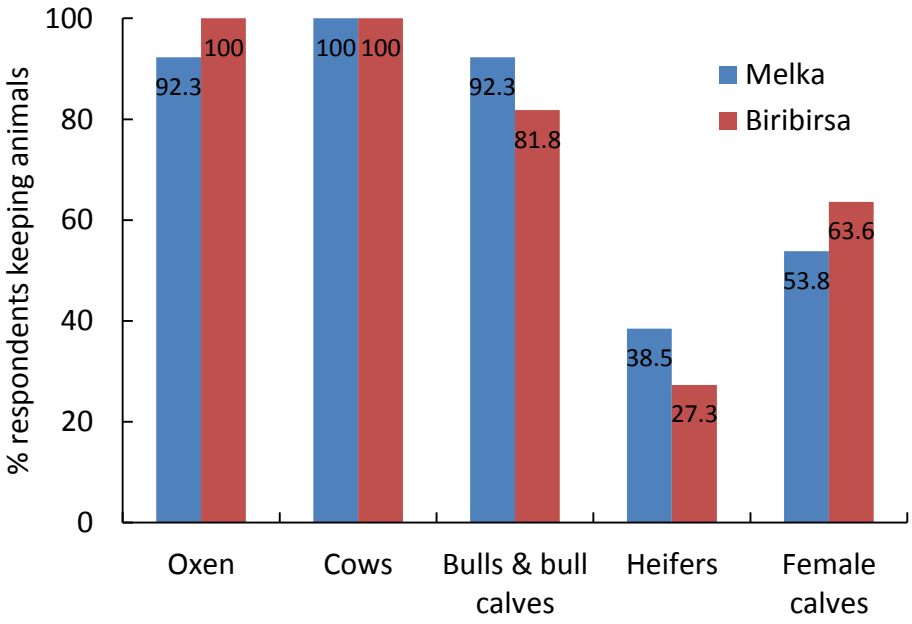


Figure 4. Proportion of respondents owning the different cattle herds

Table 4. Breed structure of the cattle herd owned by the surveyed households (% of respondents)

| Breed | Village | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Melka (N=13) | | | | | Birbirsa (N=11) | | | | |
| | Oxen | Cows | Bulls & male calves | Heifers | Female calves | Oxen | Cows | Bulls & male calves | Heifers | Female calves |
| HF* Pure | - | - | 8.3** | - | - | - | - | 11.1 | - | - |
| HF cross | - | - | 8.3 | 20 | 14.3 | - | 18.2 | 33.3 | 66.7 | 57 |
| Jersey Pure | - | - | - | - | - | - | - | - | - | - |
| Jersey cross | - | 7.7 | - | - | 14.3 | - | - | 22.2 | 33.3 | - |
| Highland zebu | 100 | 100 | 91.7 | 80 | 85.7 | 100 | 90.9 | 77.8 | 100 | 57 |
| Boran | - | 15.4 | - | - | 14.3 | - | - | - | - | - |

* HF = Holstein Friesian

** Percentage values were derived from the actual number of households owning the different cattle types indicated in figure 4 and not from N in both villages

## Available feed resources and systems of keeping livestock in the areas

The major feed resources available for livestock feeding according to the surveyed households in the study areas are shown in Table 5. About 8 categories of feed resources were reported to be available in the area of which natural pasture and crop residues were reported to be the most commonly used by all the surveyed farmers in both the villages. The majority of the respondents in both villages also use *atela* (a by-product of the local alcoholic beverage), mainly by mixing it with poor quality feeds like crop residues. Seasonal use of purchased feeds to fatten animals and for dairy production was also common mainly in Birbirsa village. The other feed resources reported to be available in both villages include roadside grazing, planted fodder, conserved forage and collected fodder. In terms of overall availability and contribution to livestock feed supply, natural pasture was reported to rank first followed by crop residue at both villages. Conserved forage and planted fodder were, respectively, reported to rank third in availability/contribution for livestock feeding at the study villages.

As indicated in Figure 5, grazing with some stall feeding constitutes the main system of keeping livestock according to 87.5% of the respondents in the two villages. All the surveyed households in Birbirsa village reported that they keep their animals mainly on grazing resources with some stall feeding. In Melka village grazing with some stall feeding was also the main system of livestock feeding (76.9% of the respondents), while about 23.1% of the respondents reported keeping of their animals on grazing alone. Generally, stall feeding was less developed indicating that low input-low output extensive system of livestock production is dominant in the study areas.

Table 5. Major feed resources available for livestock feeding according to the respondents in the study areas

| Feed resource | Proportion of respondents (%) | | | | | |
|---|---|---|---|---|---|---|
| | Melka (N=13) | | | Birbirsa (N=11) | | |
| Natural pasture | 100 | | | 100 | | |
| Crop residues | 100 | | | 100 | | |
| Road side grazing | 53.8 | | | 63.6 | | |
| Collected fodder | 23.1 | | | 54.6 | | |
| Planted fodder | 61.5 | | | 45.5 | | |
| Conserved forage | 46.2 | | | 36.4 | | |
| Purchased feed | 53.8 | | | 90.9 | | |
| Atela | 84.6 | | | 100 | | |
| The top ranking feed resources (% of respondents) | | | | | | |
| Feed type | Melka | | | Birbirsa | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd |
| Natural pasture | 69.2 | 30.8 | - | 90.9 | 9.1 | - |
| Crop residue | 30.8 | 76.9 | - | 9.1 | 90.9 | - |
| Conserved forage | - | - | 53.8 | - | - | - |
| Planted fodder | - | - | 30.8 | - | - | 54.5 |

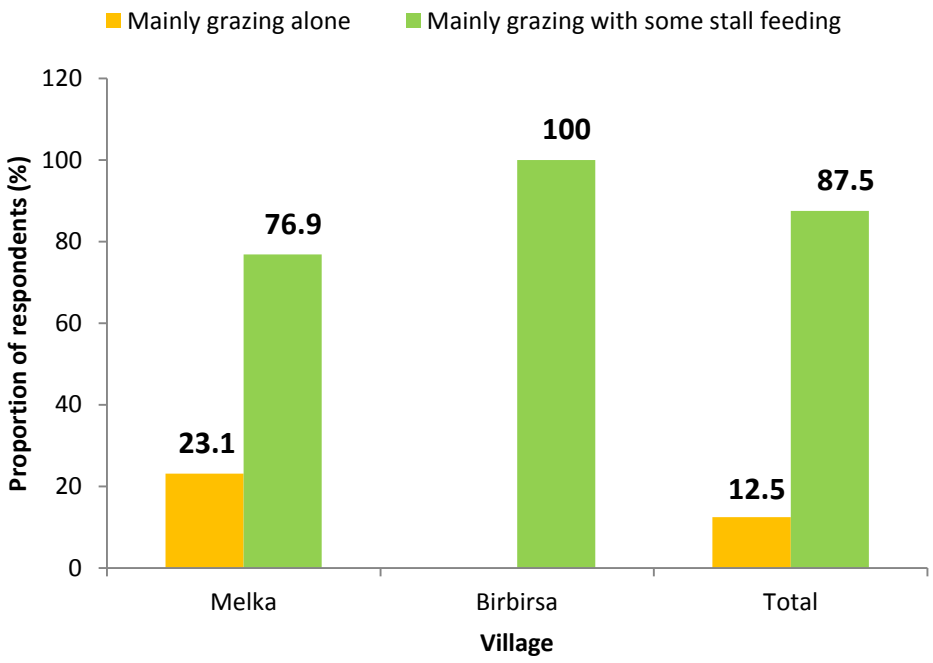


Figure 5. Main systems of livestock feeding in the study areas

## On-farm feed production

The types and quantities of different feeds produced on-farm during the last three months prior to the time of this study are shown in Table 6. At Melka village, 100% of the surveyed households reported that they produce crop residues followed by planted fodder (69.2%) and cut grass (38.5%) during the specified period. The average area from which the different feed types were harvested per household in the village was 1.70, 0.30 and 0.10 ha for crop residue, cut grass and planted fodder, respectively. About 8.06 t feed was estimated to be produced per household in the Melka village. Oats, tree lucerne and Desho grass were some of the forage crops reported to be produced in the area.

Similarly in the case of Birbirsa village, crop residues were the dominant feeds reported to be produced by 100% of the respondents followed by cut grass (54.5% of the respondents) and planted fodder (45.5% of the respondents). As most of the land owned by the farmers was devoted to crop production, crop residues were harvested from a considerably larger area (2.21 ha) in Birbirsa village than was the case at Melka. Planted fodder and cut grass were also reported to be produced on an area of 0.42 ha and 0.21 ha, respectively per household at Birbirsa. Overall, a total of 6.5 t feed was estimated to be produced per household from the different feed types harvested during the last three months prior to this study in Birbirsa village. Besides their own production, a few farmers also reported purchase of feeds such as cut grass for hay making and crop residues from neighboring farmers. Generally, the quantity of feed estimated to be produced on-farm per household was low at both villages indicating that livestock in the area obtain most of their feed supply from grazing.

Table 6. The types, area harvested and estimated quantities of different feeds produced on-farm by the surveyed households during the last three months prior to this study

| Village | Feed type | % of respondents | Area (ha) | Quantity produced | |
|---|---|---|---|---|---|
| | | | | Donkey cart | Ton* |
| Melka (N=13) | Planted fodder | 69.2 | 0.10 | 25.3 | 1.70 |
| | Cut grass/hay | 38.5 | 0.30 | 54.0 | 3.56 |
| | Green Stover | 7.7 | - | - | - |
| | Dry cereal crop/crop residue | 100 | 1.70 | 66.5 | 2.80 |
| | Total | | 2.10 | 155.80 | 8.06 |
| Birbirsa (N=11) | Planted fodder | 45.5 | 0.42 | 33.2 | 2.20 |
| | Cut grass/hay | 54.5 | 0.21 | 14.2 | 0.94 |
| | Green Stover | 9.1 | - | - | - |
| | Dry cereal crop/crop residue | 100 | 2.21 | 79.6 | 3.34 |
| | Total | | 2.84 | 127.00 | 6.48 |

* Estimation in ton was based on the average values of 66 kg (range: 50-85 kg) for 1 donkey cart of green feeds (planted fodder, cut grass, stovers), and 42 kg (range: 30-55 kg) for 1 donkey cart of crop residues as estimated by the farmers

## Commercial/purchased feeds utilization

The status of commercial/purchased feeds utilization by the respondents during the last three months prior to this study is shown in Table 7. The commercial feed ingredients reported to be used by farmers in the area were by-products of different agro-processing industries including linseed cake, noug cake, wheat bran and molasses. Linseed cake was the dominant by-product used by surveyed farmers at both villages. On average, about 2.8 quintals (Q) of linseed was reported to be purchased per household at the rate of 700 Birr/Q during the last 3 months prior to the time of this study in Melka village. Including the indicated transport and labour costs, a total of 2028 Birr was estimated to be spent on linseed cake per household during the specified period in the village. Moreover, wheat bran was the other important by-product purchased amounting about 5 Q with a total cost of 1375 Birr per household at Melka. Similarly, comparatively higher quantities of linseed cake and wheat bran were reported to be purchased by the surveyed farmers in Birbirsa village during the specified period. Retail shops were the major sources of commercial feed ingredients for the farmers in the area, while some farmers also reported to obtain the ingredients from the few food processing plants available at Jeldu town (Figure 6).

Table 7. The types, quantities and prices of different commercial feed ingredients purchased by the surveyed households during three months prior to the study

| Village | Type of feed purchased | % of respondents | Quantity (Q) | Price (Birr/Q) | Transport (Birr/Q) | Labour (Birr/Q) | Total cost (Birr) |
|---|---|---|---|---|---|---|---|
| Melka (N=13) | Linseed cake | 15.4 | 2.75 | 700 | 20 | 17.5 | 2028.1 |
| | Noug cake | 7.7 | 0.01 | 600 | 20 | - | 62.0 |
| | Wheat bran | 7.7 | 5.00 | 250 | 10 | 15 | 1375.0 |
| Birbirsa (N=11) | Linseed cake | 54.5 | 0.89 | 800 | 21.7 | 17.7 | 747.1 |
| | Wheat bran | 9.1 | 3 | 250 | 15 | 15 | 840.0 |
| | Molasses | 18.2 | 5 L | - | - | - | 30.0 |

According to the surveyed farmers, commercial feeds are usually purchased by those farmers who are engaged in market-oriented livestock enterprises such as improved dairying and fattening. Demand for commercial feeds by the consumers also varies with seasonal variations in fattening activities, market supply, prices and perceived qualities of the locally available feed resources. As this assessment was made during the peak harvesting season following the main rains, high quantities of better quality feed were expected to be locally available in the area. Moreover, there might have been less fattening activities during the specified period as most farmers may fatten their oxen after finalizing threshing of crops and targeting better market opportunities during Easter. These factors could be among the reasons for the observed lower proportion of farmers that purchase commercial feed and small quantities of feeds purchased during the period covered by the study.

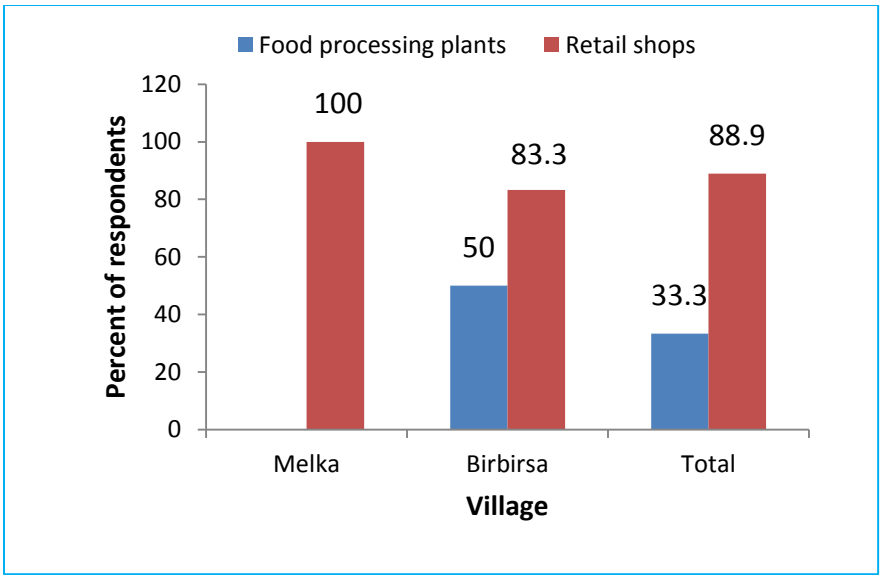

Figure 6. Sources of commercial feed ingredients for the farmers in the area

## Home mixing of feeds

Home mixing of different locally available and/or purchased feed ingredients was also practiced by the farmers prior to feeding their animals. Table 8 shows that 76.9% of the respondents at Melka and 100% of the respondents at Birbirsa village reported to practice home mixing of feeds. The purpose of mixing the different feed ingredients is to improve the quality and intake of the inferior quality feed resources such as crop residues. Three categories of home mixed feeds were identified according to the surveyed farmers *viz.* atela + crop residues + salt, atela + crop residues + purchased concentrates + salt, and atela + oats grain + salt at both the villages. The majority of the respondents (70% at Melka and 72.7% at Birbirsa) reported mixing atela, crop residues and salt. Mixing atela, crop residues, purchased concentrate ingredients and salt was reported to be practiced by 25% and 27.3% of the respondents at Melka and Birbirsa, respectively. Moreover, 22.2% of the respondents at Melka and 18.2% of the respondents at Birbirsa village reported to prepare compound feed by mixing atela, crushed oats grain and salt.

Figure 7 indicates the approximate proportions of different ingredients in the three categories of home mixed feeds. Crop residues constitute the major proportion in the first two categories of home mixed compound feeds, while atela accounts for higher proportion in the third category of home mixed feeds.

Table 8. Status of home mixed compound feed preparation and utilization by the surveyed households in the study areas

| Question | Response | Melka (N=13) | Birbirsa (N=11) |
|---|---|---|---|
| | | n (%) | n (%) |
| Do you practice home mixing of feeds? | Yes | 10 (76.9) | 11 (100) |
| | No | 3 (23.1) | - |
| Types of feed ingredients used for home mixing | | | |
| 1. Atela, crop residues and salt | | 7 (70) | 8 (72.7) |
| 2. Atela, crop residues, purchased concentrates and salt | | 2 (25) | 3 (27.3) |
| 3. Atela, oats grain (crushed) and salt | | 2 (22.2) | 2 (18.2) |

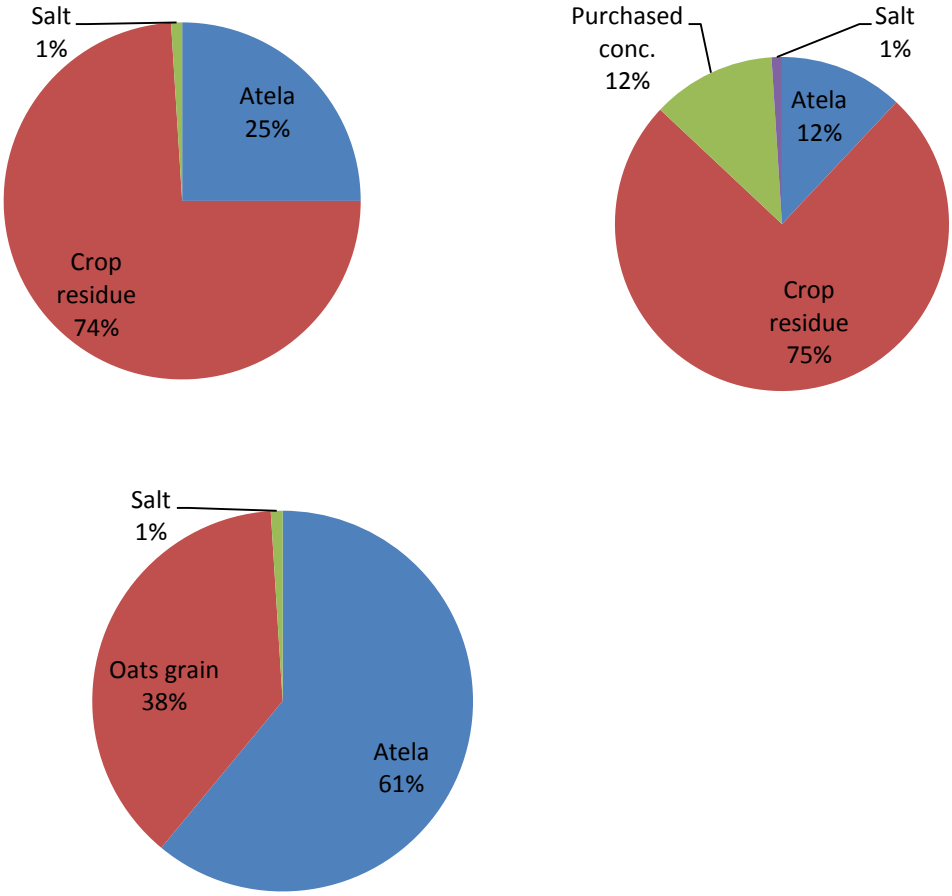


Figure 7. Average proportions of different feed ingredients in three examples of different home mixed feeds

## Major feed purchase channels and influencing factors

As indicated in Table 9, about 71% of respondents reported having experience of purchasing different feed ingredients for feeding their livestock, mainly cattle. The major feed purchase channels used by the surveyed farmers include small retailers, oil processing plants, farm level producers (for roughage feeds) and large retailers in that order of importance in both the villages. About 29.8% of respondents reported purchasing roughage feeds from other farmers in their surroundings, while 65.3%, 52.1% and 11.8% of the respondents reported that they purchase concentrate feed ingredients from small retailers, oil processors and large retailers, respectively.

Table 9. Feed purchasing practices and major channels used for feed purchase by the surveyed households in the two study sites (% of respondents)

| Question | Response | Melka (N=13) | Birbirsa (N=11) | Mean |
|---|---|---|---|---|
| Do you have experience of purchasing feed for your livestock? | Yes | 61.5 | 81.8 | 71.7 |
| | No | 38.5 | 18.2 | 28.3 |
| Channels used for purchasing feed | | | | |
| Farm level producers | | 37.5 | 22.2 | 29.8 |
| Oil processing plants | | 37.5 | 66.7 | 52.1 |
| Small retailers | | 75.0 | 55.6 | 65.3 |
| Large retailers | | 12.5 | 11.1 | 11.8 |

Although the numbers of producers and suppliers of concentrate feed ingredients were generally limited in the area, some of the major factors influencing choice of the feed purchase channels by the farmers are shown in Table 10. At Melka village, expected price level, trust of system, and price variability were reported to be the most important factors influencing choice of the feed purchase channel. Similarly, expected price level, trust of system and social influences were the important factors influencing choice of the feed purchase channel at Birbirsa village. According to the respondent farmers, choice of channel for feed purchase is mainly made based on relative price discount and there is limited customer loyalty to particular suppliers.

Table 10. Factors influencing the choice of feed purchase channels according to the surveyed households in the two study sites (% of respondents)

| Factors | Melka | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | Overall mean |
| Expected price level | 87.5 | 12.5 | - | 33.3 |
| Variability of price | - | 25.0 | 25.0 | 16.7 |
| Transport costs | - | 12.5 | - | 4.2 |
| Payment arrangements | - | 12.5 | - | 4.2 |
| Simplicity of system | - | 12.5 | 25.0 | 12.5 |
| Trust of system | 12.5 | 25.0 | 25.0 | 20.8 |
| Social influence | - | - | 25.0 | 8.3 |
| | Birbirsa | | | |
| | 1st | 2nd | 3rd | Overall mean |
| Expected price level | 85.7 | 14.3 | - | 33.3 |
| Variability of price | - | 28.6 | - | 9.5 |
| Transport costs | - | 14.3 | - | 4.8 |
| Payment arrangements | - | 14.3 | - | 4.8 |
| Simplicity of system | - | 14.3 | 14.3 | 9.5 |
| Trust of system | 14.3 | 14.3 | 14.3 | 14.3 |
| Social influence | - | - | 42.9 | 14.3 |

The major constraints of feeding concentrate feed ingredients and the opportunities available to enhance their utilization as perceived by the surveyed households in the two villages are presented in Tables 11 and 12, respectively. As shown in Table 11, high cost of feeds, poor knowledge of feeds, lack of finance, and shortage of supply of the required feed ingredients were the top ranking constraints limiting utilization of concentrates at Melka village. Similarly, the respondents from Birbirsa village indicated that high cost of feeds, poor access to market, lack of finance and shortage of supply were the major constraints limiting the use of concentrates. On the other hand, some of the potential opportunities perceived to enhance utilization of concentrates in the view of the respondents at both the villages (Table 12) include changing production practices, expanding livestock enterprise, improved efficiency of own enterprise and increase in milk production.

Table 11. Major constraints in using concentrates as perceived by the surveyed households in the two study sites (% of respondents)

| Constraints | Melka | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | Overall mean |
| High cost of feeds | 53.8 | 15.4 | 15.4 | 28.2 |
| High variability in prices | - | 7.7 | 23.1 | 10.3 |
| High transport cost | - | 23.1 | 7.7 | 10.3 |
| Poor access to markets | - | 23.1 | 15.4 | 12.8 |
| Poor knowledge of feeds | 30.8 | 7.7 | 7.7 | 15.4 |
| Seasonality in milk production | 7.7 | - | 15.4 | 7.7 |
| Lack of finance | 7.7 | 23.1 | 7.7 | 12.8 |
| Shortage of supply | - | 23.1 | 15.4 | 12.8 |
| | Birbirsa | | | |
| | 1st | 2nd | 3rd | Overall mean |
| High cost of feeds | 54.5 | 18.2 | 9.1 | 27.3 |
| High variability in prices | - | - | 9.1 | 3.0 |
| High transport cost | - | - | - | - |
| Poor access to markets | 9.1 | 36.4 | 27.3 | 24.3 |
| Poor knowledge of feeds | 9.1 | 18.2 | 27.3 | 18.2 |
| Seasonality in milk production | - | - | 9.1 | 3.0 |
| Lack of finance | 27.3 | 27.3 | 9.1 | 21.2 |
| Shortage of supply | - | 18.2 | 27.3 | 15.2 |

Table 12. Available opportunities for enhancing use of concentrates as perceived by the surveyed households in the two study sites (% of respondents)

| Constraints | Melka | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | Overall mean |
| Expanding livestock enterprise | 30.8 | 15.4 | 7.7 | 18.0 |
| Improved feed access to livestock farmers | 7.7 | 15.4 | 15.4 | 12.8 |
| Changing production practices | 23.1 | 30.8 | 38.5 | 30.8 |
| Own enterprise becoming more efficient | - | 23.1 | 30.8 | 18.0 |
| Increase in milk production | 38.5 | - | 7.7 | 15.4 |
| Increasing current returns to justify expansion | - | - | - | - |
| | Birbirsa | | | |
| | 1st | 2nd | 3rd | Overall mean |
| Expanding livestock enterprise | 27.3 | 45.5 | 9.1 | 27.3 |
| Improved feed access to livestock farmers | - | - | - | - |
| Changing production practices | 63.6 | 27.3 | 9.1 | 33.3 |
| Own enterprise becoming more efficient | 9.1 | 9.1 | 27.3 | 15.2 |
| Increase in milk production | - | 9.1 | 36.4 | 15.2 |
| Increasing current returns to justify expansion | - | 9.1 | 18.2 | 9.1 |

Information regarding advisory services to the farmers related to feeds, the nature of the advice and the major sources of information were also assessed in the study. Table 13 shows

that 92.3% of the respondents at Melka and 90.9% of the respondents at Birbirsa villages reported that they get advisory services related to feeds. The frequency of advisory services offered to the farmers was reported to be around once per month in both the villages. Moreover, 75% of the respondents at Melka and 40% of the respondents at Birbirsa also reported that they visit other farmers' fields in order to share best experiences. The average number of other farmers' fields visited per household during the last 12 months prior to the time of this assessment was 3.1 and 3.5 for Melka and Birbirsa, respectively. Proper management of available feeds and proper feeding systems of livestock were the major areas of advice offered, while government extension staff, research institutions and NGOs such as Hunde were reported to be the main sources of information to the surveyed farmers in both villages.

Table 13. Reactions of the surveyed households regarding sources of information and advice related to feeds in the two villages

| Issue | Village | |
|---|---|---|
| | Melka | Birbirsa |
| Get advice related to feeds (% of respondents) | 92.3 | 90.9 |
| Frequency of advice obtained per month | 1.3 | 1.1 |
| Visit other farmers` fields (% of respondents) | 75.0 | 40.0 |
| Number of visits made per HH in the last 12 months | 3.1 | 3.5 |
| Nature of advice obtained from service providers | • Proper management of available feeds<br>• Proper feeding systems | |
| Major sources of information | • Government extension staff (DAs, woreda experts)<br>• Research institutions (Holetta)<br>• NGOs like Hunde<br>• Leaflets/brochures (Melka only) | |

# Core functions, actors and activities in the feed value chain

The core functions, activities and the major actors in the concentrate feed value chain in the study areas were shown in Figure 8. As the concentrate feed ingredients under consideration are the by-products of different agro-processing plants, the feed value chain follows the core functions involved in the production of the main products like oil and flour. Input supply, production, packaging, marketing/trading and consumption were the core functions defined in the value chain and brief descriptions of the activities and actors under each function are given below. The major enablers/service providers for proper functioning of the value chain are also indicated corresponding to the different core functions. Most of the available service providers are common along the different stages of the value chain and include the government extension system, research institutions, cooperative promotion offices and financial institutions such as micro-finances and banks.

| | Input/raw material supply | Production | Packaging | Marketing/Trading | Consumption |
|---|---|---|---|---|---|
| Activities | • Supply of oilseeds & cereal grains such as wheat for the food processing plants | • Crushing/grinding<br>• Production of different oilseed cakes and bran as by-products to the main product | • Packaging into different weight containers for storage & marketing | • Storage<br>• Transportation<br>• Trading/retailing | • Storage<br>• Feed mixing<br>• Feeding |
| Actors | • Smallholder farmers<br>• Middle men/grain traders | • Oil processors<br>• Grain millers | • Oil processors<br>• Grain millers<br>• Traders | • Oil processors<br>• Grain millers<br>• Small retailers<br>• Large retailers | • Small scale farmers<br>• Commercial farmers<br>• Gov`t institutions<br>• Feed producers themselves |
| Enablers/ Service providers | • Extension system<br>• Research institutions<br>• Cooperative promotion office<br>• Micro-finance | • Micro-financial institutions and Banks for the required credit services | | • Cooperative societies<br>• The extension system<br>• Research institutions | • Extension system<br>• Research institutions |

Figure 8. The core functions, activities and major actors in the concentrate feed value chain

## Input supply

The major inputs required by the food processing plants are the different oilseeds (noug, linseed) and cereal grains (wheat, barley). These inputs are mainly produced by the surrounding smallholder farmers and directly supplied to the processors. Moreover, middle men/grain traders are also involved in collecting the seeds/grains from farmers and delivering them in bulk to the processors. Key informant oil processors at Ambo and Guder reported sourcing oilseeds (mainly noug seed) from as far as Horro-Guduru Wollega Zone and Guliso area of West Wollega Zone through grain traders in addition to more local sources. The extension system, cooperative promotion office and micro-financial institutions are the main stakeholders supporting smallholder farmers in the production of the inputs.

Production

Large scale food-processing plants are generally lacking at Jeldu district and in West Shewa Zone in general. Instead, the few small-scale oil extracting plants and grain millers operating in the area are the main actors engaged in the production of different concentrate feed ingredients as by-products to their firms. However, there are some large scale oil and flour processors at Ambo which could potentially supply by-products. Production performance of the processors varies depending upon seasonal variation in supply of the raw materials. Although there is a better supply of raw materials following the main harvesting season, most of the large scale processors (especially oil processors) at Ambo and Guder reported to operate below their capacities due to shortage of oilseeds. According to key informants at Ambo and Guder, oil extraction rate from noug (Niger seed) ranges from 32-36% depending on the geographical origin of the seed. This corresponds to the production of 64-68kg noug cake from every 100kg of noug seed processed through mechanical oil extraction methods. According to the sources, high amounts of oil were reported to be extracted from noug seed originated from Horro-Guduru area (36%) followed by Guliso area (35%), while the amount of oil extracted from noug seed obtained from Shewa was reported to be low (32%). This could be attributed to differences in soil properties and variations in other climatic factors in the different areas.

## Packaging

Packaging is the process of packing the product in a size suitable for handling, storage and marketing/distribution. Packaging can be performed both by the processors and traders. Sacks accommodating 100 kg and 50 kg of the product are used for packing by the processors for bulk sales. Moreover, both the processors and retailers also sell the feed ingredients beginning from a minimum of 1kg as required by the different consumers. However, neither the processors nor the traders package the feed ingredients in containers less than 50 kg sacks. Thus buyers who want smaller quantities have to bring their own containers when they purchase feed ingredients.

## Marketing/Trading

Marketing/trading is performed by the processing plants themselves, small retailers and to some extent by large retailers. There is seasonal variation in the demand, supply and prices of the feed ingredients. Feed prices are usually determined by the suppliers (producers, traders)

while the consumers (especially smallholder farmers) have limited negotiating power. Supply and prices of the different feed ingredients such as oilseed cakes directly depend on the prices of the main product (oil). When the demand and price of oil increases, processors are encouraged to produce and sell more oil and in the process large quantities of oilseed cakes are produced and can be accessed in the market with relatively low prices. At the time of this study (1$^{st}$ week of January 2014), retail price per kg was reported to be 7-8 Birr for linseed cake, 5-6 Birr for noug cake and 2.5-3 Birr for wheat bran at Jeldu. But, at Ambo price per kg of the ingredients during the same period was 6, 4 and 2 Birr, respectively for linseed cake, noug cake and wheat bran. Prices of the concentrate feed ingredients are also highly variable depending on seasonal availability of raw materials (such as oil seeds), and seasonal demand for the ingredients, which varies depending on the extents of different operations like fattening. As fattening is mainly practiced targeting the major religious and national festive holidays, the demand for concentrate feed ingredients increases accordingly leading to high prices during the times prior to the festivities.

Neither the suppliers/traders nor consumers had information on the quality of the feed ingredients in marketed feed. Hence, there was no real pricing system based on quality of the feed ingredients in the area. Visual assessments on freshness, storage condition (like exposure to moisture), mould development, smell, colour and contamination with foreign materials were some of the major methods used by the consumers to assess feed quality during purchase.

## Consumption

Small scale farmers who are engaged in market-oriented livestock enterprises (improved dairy, fattening), large scale commercial dairy farmers and government institutions engaged in livestock research and development are the main consumers of the concentrate feed ingredients. The producers who are engaged in livestock/dairy production as in the case of an oil processor at Ginchi are also the consumers of the feed ingredients. The small scale farmers usually visit the market every week or two to purchase the feed ingredients required for feeding in that specific period as they do not have either financial capacity or storage facilities to procure large quantities of feed and use for extended periods of time. As a result, the farmers are highly affected by the temporal variability in prices of the feed ingredients. Moreover, there are cases where the farmers are not able to find the feed ingredients in the market due to seasonal variation in supply. On the other hand, large scale feed consumers such as a commercial dairy farmer at Ambo who has better financial capability and storage facilities purchases large quantities of feeds during the times when by-products are abundant in the market at reasonable price.

# Conclusions

- Cattle are the dominant livestock species reared and natural pasture and crop residues constitute the major feed resources available in the study areas.

- The feeds produced on the farm (crop residues, native pasture hay and improved fodders) are mainly consumed on farm.

- Farmers engaged in market-oriented livestock production such as improved dairy and fattening activities also use bought-in concentrate feed ingredients for supplementing the farm-produced roughages.

- Some of the major constraints identified in the concentrate feed value chain in the area include: seasonal shortages in supply of required inputs, shortage of food processing plants and/or below capacity performance of the existing ones, limited supply and high cost of the feed ingredients (by-products), and poor knowledge of feeds and feed markets. In order to alleviate these problems, technical and policy supports including market linkages that can stimulate on-farm feed production and enhance the performance of feed and livestock value chains would be necessary.

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