

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

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Abstract

This report highlights results of an assessment of feed production, marketing and utilization and an analysis of the feed value chain in three villages (Jawe, Upper Gana and Hayse) of Lemo district of Hadiya zone, SNNPR, south central Ethiopia. Information used in this report was collected through focus group discussions and individual interviews with feed producers, traders and consumers and through direct observations. A focus group discussion was carried out with a group of 17 representative farmers in Jawe, 19 farmers in Gana and 3 dairy producers in Hayse villages. Selection of farmers for group discussion took into account wealth status (land holding), gender, age, farming experience, knowledge of the participant about the farming system in the area and the level of education. Results showed that grazing plus some stall feeding was the dominant system of livestock keeping in Jawe and Gana, followed by mainly stall feeding and some grazing in Jawe (25%) and mainly grazing (33%) in Gana. Overall, crop residues (24%), natural pasture (23%) and collected fodder (17%) were the main sources of livestock feed pooled over the two sites. The number of animals owned by each family was observed to be low. Farmers in Jawe and Gana, rural kebeles or villages that are far away from Hosaina town, indicated that they occasionally purchase feed, while those in Hayse indicated that they purchase regularly. Farmers purchase feeds in varying amounts from feed retailers in Hosaina town and from Licha Hadiya Farmers' Cooperative Union (Licha Coop Union), which owns a flour mill and a small feed processing plant. The respondents indicated difficulty of access to credit for feed purchase. Although Omo and Wisdom Micro-finance Institutions were reported to operate in the area, the borrowing process was reported to be unfavorable. For the feed processed at Licha Coop Union, 75% of the ingredients are wheat bran produced at its own flour mill, while oil seed cakes and other ingredients are obtained from Addis Ababa area. Buyers of feed products from the firms include: dairy farmers in Hosaina town and its environs, some rural farmers, research centers, and some individuals engaged in occasional fattening activities. The feed processing plant of Licha Coop Union complains of low demand for feed and frequent power interruption as problems whereas the smallholder farmers in Jawe and Gana and the dairy farmers in Hayse reported difficulty of access to feed (not available in their vicinity, transport problem and high price of feed when available) as the main constraints to purchased feed use.

Introduction

In Ethiopia, the economic contribution of the livestock sector is low owing to a number of constraints (Chanyalew *et al.*, 2009). Among these, feed shortage is considered to be very important (EEA, 2006). Thus it is vital to address this constraint if improvements in livestock productivity are to be achieved. To design feed interventions, appropriate entry points need to be identified at the outset before strategies are put in place. This requires appraisal of the existing production systems through appropriate system analysis tools such as value chain approaches.

A commodity value chain encompasses a full range of activities and services required to bring a product from its production to sale in its final markets (Anandajayasekera and Gebremedhin, 2009; Ayele *et al.*, 2012). It includes input supply, production, retailing and consumption. For example, at one end of livestock value chain are the producers who raise the animals and at the other end are the consumers who consume the livestock products, and in the middle stages are other actors undertaking intermediate activities. Value chains may also include a range of services needed to maintain function including technical support (extension), business enabling and financial services, innovation and communication and information brokering. Value chains can be simple when producers directly sell to the consumers but long and complex when other actors play roles in buying, processing, transporting and selling to the end user.

The value chain approach facilitates mapping and characterization of feed production activities, identification of the actors involved as well as their roles and the nature of the interaction between them (Anandajayasekera and Gebremedhin, 2009; Rich *et al.* 2011). Value chain analysis focuses on issues of value creation and market opportunities and linkages. The use of this framework for analyzing feed value chains is a recent experience in Ethiopia. Based on the existing realities, feed value chains may consist of various functions such as input supply, production, processing, marketing and consumption. They may also consist of a range of enablers and supporters interacting within the borders of a given locality or beyond borders in different ways to sustain the operation of the entire value chain. This suggests the need to visualize the input supply, production, marketing and utilization of feed through a value chain lens to better understand the constraints and to be able to put in place appropriate value chain improvement strategies. The present study was undertaken to understand livestock feed value chains in Lemo district of Hadiya zone based on case studies at three villages in the district with the following objectives.

- To appraise important features of livestock production activities and characterize the crop-livestock production systems of the area;
- To map the feed value chain functions and identify actors involved along the chain;
- To identify major constraints and opportunities, and suggest appropriate feed value chain improvement strategies.

Materials and methods

Description of the study site

The current appraisal was undertaken at Jawe, Upper Gana and Hayse kebeles of Lemo district of Hadiya zone, Southern Nations, Nationalities and Peoples Regional State (SNNPR), south central Ethiopia. Hadiya Zone is among the most intensively cultivated and densely populated areas of Ethiopia. Enset based mixed crop-livestock production is the main agricultural production system. The major crops produced in the area include enset, wheat, barley, tef, faba bean and potato. The farmers also keep different types of livestock including cattle, sheep, goats, equines and poultry.

Research methodology

Information used in this report was collected through focus group discussions and individual interviews with feed producers, traders and consumers as well as direct observations in the area. A focus group discussion was carried out with 17 representative farmers in Jawe village and a group of 19 farmers in Upper Gana (to be referred to hereafter as Gana) and 3 dairy producers in Hayse village. Selection of farmers for group discussion took into account wealth status (land holding), gender, age, farming experience and level of education of the farmers. During the group discussion, the farmers were allowed to debate and the final note was taken when the group reached consensus concerning the issue under discussion.

In addition to the smallholder farmers in Jawe and Gana and the dairy farmers in Hayse kebeles, producers of feed ingredients such as oilseed cake (one oil processing plant) and wheat bran (Sifona Flour Mill and flour mill of Licha Hadiya Cooperative Union) and compound feed (Licha Coop Union Feed Processing Plant) and two feed traders were also interviewed about production and marketing of feeds and associated issues. The data gathered through focus group discussions were categorized into thematic areas and logically structured, described and discussed. The quantitative information collected from individual interviews was summarized and analyzed using descriptive statistics.

Results and discussion

General household characteristics

Table 1 presents summary statistics of the surveyed farm households at Jawe and Gana villages. The mean age of the farmers at Jawe was 48 (SD=14.6) years. The study indicated that on average the farmers have around 26 years of farm experience, and have a land area of around 1.1 ha, out of which 0.09 ha is under forage. At Gana, the average age of the respondents was 39 (SD = 9.6) years, which was lower than the values reported for Jawe village in this study. Farmers at Gana village had a farming experience of about 20 (SD=9.9) years. The mean area of land owned by the farmers was 1.4ha (SD=0.83), out of which around 0.05 ha was allocated for feed production. The area of land allocated for forage production in both Jawe and Gana was lower than values allocated to native hay production (0.68 ha) or improved forage (0.43 ha) species in Nekemte peri-urban area (Geleti *et al.*, 2014).

Table 1. Summary statistics of household characteristics at the two study villages (n=16 for Jawe; n=12 for Gana)

Village	Variable	Mean	SD	Min.	Max.
Jawe	Age (years)	47.6	14.0	30	70
	Farm experience (years)	25.9	13.1	4.0	52
	Area of land owned (ha)	1.08	0.85	0.5	4
	Land allocated for forage (ha)	0.09	0.14	0.0	0.1
Gana	Age (years)	38.7	9.56	27.0	60
	Farm experience (years)	20.3	9.86	6.0	40
	Area of land owned (ha)	1.44	0.83	0.4	3.0
	Land allocated for forage (ha)	0.05	0.09	0.0	0.3

Feeds and feeding systems

Information regarding livestock feeding system in the area is presented in Figure 1. Grazing plus some stall feeding was the dominant livestock feeding system practiced by 50% of the respondents in both Jawe and Gana villages. This was followed by 'mainly stall feeding and some grazing' in Jawe (25%) and by 'mainly grazing' (33%) in Gana.

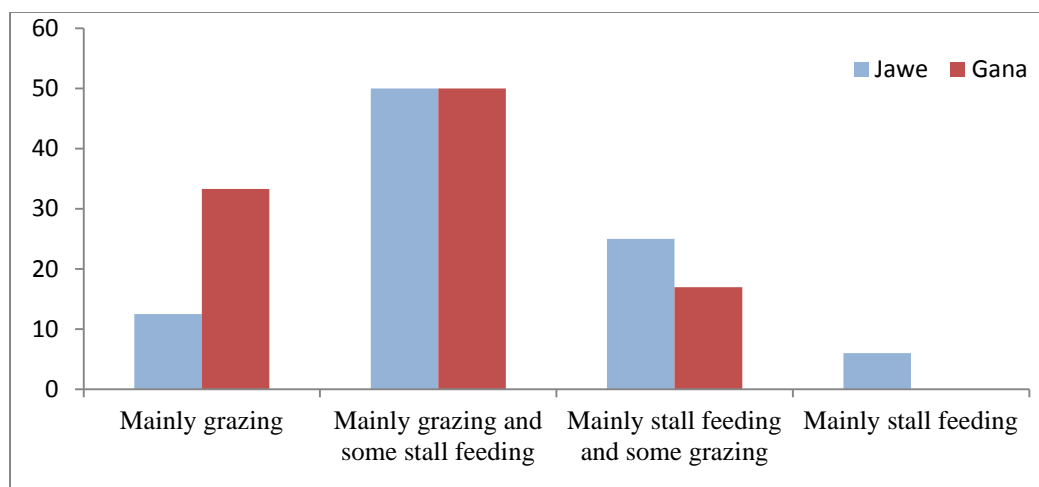


Figure 1. System of livestock keeping in the two study areas as indicated by the farmers interviewed (% of respondents)

The ranking of the major feed resources in the study villages as captured from the perception of the interviewed farmers are presented in Table 2. About 75% of the farmers in both Jawe and Gana reported that natural pasture is the main feed resource in their area. On the other hand, 25% of farmers in Jawe and 17% farmers in Gana reported crop residues as the main feed whereas 63% of the farmers in Jawe and 67% in Gana indicated that crop residues are the second most important feed resources in the area. The result generally showed that livestock crop residues and natural pastures are the main sources of livestock feeds in both sites. This concurs with other reports from mixed-crop livestock production systems where the contribution of crop residues was considerable in feeding livestock (Assefa, 1999; Eshete, 2002; Mengistu, 2004; Tolera, 2007). Roadside grazing and collected fodder are the next most important feed resources for both Jawe and Gana kebeles. Overall, crop residues (24%), natural pasture (23%) and collected fodder (18%) were the main sources of livestock feed pooled over the two sites.

Table 2. Major feed resources for livestock as perceived by the respondent farmers (% of respondents)

	Jawe				Gana				Overall
	1 st	2 nd	3 rd	4 th	1 st	2 nd	3 rd	4 th	
Natural pasture	75.0	12.5	0.0	0.0	75.0	25.0	0.0	0.0	23.4
Crop residues	25.0	62.5	6.3	0.0	16.7	66.7	16.7	0.0	24.2
Collected fodder	0.0	6.3	25.0	37.5	8.3	0.0	8.3	58.3	18.0
Roadside grazing	0.0	6.3	31.3	18.8	0.0	8.3	58.3	0.0	15.4
Purchased feed	0.0	6.3	6.3	25.0	0.0	0.0	0.0	16.7	6.8
Planted forage	0.0	6.3	25.0	6.3	0.0	0.0	0.0	16.7	6.8
Enset by products	0.0	0.0	6.3	6.3	0.0	0.0	0.0	0.0	1.6
Conserved forage	0.0	0.0	0.0	6.3	0.0	0.0	16.7	8.3	3.9

The number of animals owned by each family was observed to be low (Figure 2). The average number of livestock holding per household was higher in Jawe than in Gana. In both villages the herd structure is dominated by oxen because of their importance as sources of draught power for farm operations (land preparation and threshing) in the smallholder mixed farming system. It was also reported that most farmers own chickens with a mean of around 5 birds per household in each kebele.

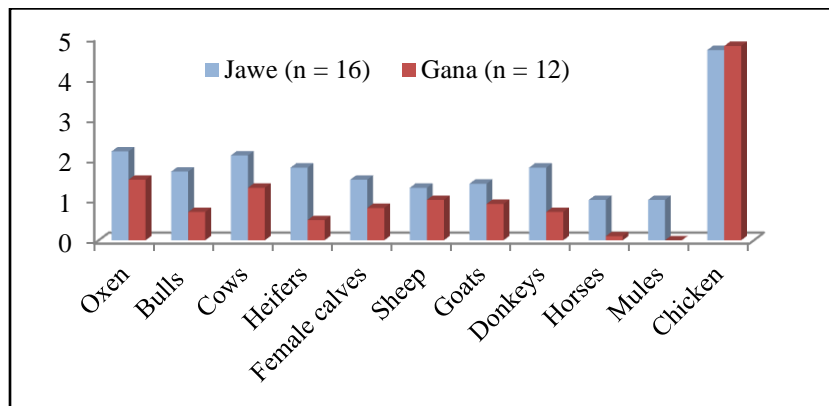


Figure 2. Livestock species owned by famers at the two study villages

The mean area of land (in ha) from which livestock feed resources were collected during the three months preceding the time of this study is presented in Table 3. Land under improved forage species was observed to be generally low (0.09 ha at Jawe and none at Gana). Native grass hay was collected from 0.09 and 0.08 ha at Jawe and Gana, respectively. Green maize stover after green cob harvest is collected from an area of land of 0.08 in Jawe and 0.09 ha in Gana. The study also showed that farmers allocate more land to small cereals (wheat, barley and tef) from which straws used for livestock feed are collected. Accordingly, it was indicated that straws were collected from an area 0.6 ha of land per household at both Jawe and Gana.

Regarding concentrate ingredients, over the three months preceding this study, farmers purchased an average of 66 and 22 kg of wheat bran at Jawe and Gana villages, respectively. In the same way, limited number of farmers practice home mixing of feeds, the frequency being 31 and 17% for Jawe and Gana, respectively (Table 3).

Table 3 Area of land (ha) from which various types of feed were collected (in the three months prior to the study) and quantity (kg) of concentrate ingredients purchased (3 months estimate)

Category feed	Villages	
	Jawe	Gana
Planted forage (ha)	0.04	0.00
Cut native grass (ha)	0.09	0.14
Green stover, mainly maize (ha)	0.08	0.09
Dry straws of small cereals like wheat, barley and tef (ha)	0.59	0.58
Bran (kg)	65.5	21.8
Farmers who reported practicing home mixing of feeds (%)	31.3	16.7

Table 4 shows the purchase channels for livestock feed in the study sites. Accordingly, 33% of the farmers buy feeds from farmer (producers) in their surroundings. Purchase of concentrate ingredients from small retailers, large retailers and flour mills were reported by 24%, 9% and 3% of the respondents. None of the farmers from either kebele reported purchase of feed from feed processors and wholesalers.

Table 4. Purchase channels (% of respondents reporting on the specific purchase channel used)

Channel	Village		Overall mean
	Jawe	Gana	
Producers (farms)	25.0	41.7	33.3
Small retailers	31.3	16.7	24.0
Large retailers	18.8	0.0	9.4
Flour processors	6.3	0.0	3.1

At Jawe, selection of feed purchase channel mainly depended on transport cost (22.9%) and on trust (20.8%) and simplicity (12.5%) of the system (Table 5). The study showed that 12.5% of the farmers have no insight regarding the factors influencing the selection of purchase channel which could imply that these farmers are not using any purchased feed on their farm. In the same way, at Gana, farmers indicated that simplicity of the channel (13.9%) followed by transport cost (11.1%) influence the choice of feed purchase channel. Around 25% of the farmers interviewed at this site did not have a clear understanding of the factors affecting purchase channel. In both sites, financial constraint and price volatility were reported to be prevalent problems.

Table 5. Factors influencing choice of feed purchase channel as stated by the respondents in the study villages

Factors	Jawe			Mean
	1 st	2 nd	3 rd	
Availability	6.3	0.0	0.0	2.1
Expected price level	6.3	18.8	6.3	10.4
Lack of money	12.5	0.0	0.0	4.2
Lack of insight	12.5	12.5	12.5	12.5
Security	6.3	0.0	0.0	2.1
Transport cost	25.0	12.5	31.3	22.9
Trust of the system	12.5	18.8	31.3	20.8
Variability of price	6.3	0.0	0.0	2.1
Simplicity of the system	0.0	25.0	12.5	12.5
Quality	0.0	6.3	0.0	2.1
Social influence	0.0	0.0	6.3	2.1

	Gana			Mean
	1 st	2 nd	3 rd	
Expected price level	25.0	0.0	0.0	8.3
Lack of insight	25.0	25.0	25.0	25.0
Transport cost	8.3	8.3	16.7	11.1
Trust of the system	0.0	0.0	41.7	13.9
Variability of price	8.3	25.0	0.0	11.1
Simplicity of the system	0.0	33.3	8.3	13.9
Not available	33.3	0.0	0.0	11.1
Increase throughput	0.0	8.3	0.0	2.8
Timing of purchase	0.0	0.0	8.3	2.8

Constraints associated with concentrate feeding as ranked by the farmers interviewed are presented in Table 6. At Jawe, 27.1% indicated that high cost of concentrate is a critical challenge. Lack of financial resources (25%), high transport cost (18.8%) and poor access to concentrate feed (16.7%) were also very critical. A similar situation was also observed in Gana, with high feed cost (27.8%) and lack of adequate knowledge about the benefits of concentrates (19.4%) and poor access to market (22.2%) being important factors. The rising price of concentrate feeds and their increasing transaction costs as viewed by farmers in the present study sites was also in agreement with observations documented earlier (Geleti *et al.*, 2012).

Table 6. Constraints in feeding concentrate as ranked by respondents (% of respondents ranking the indicated constraints)

	1 st	2 nd	3 rd	Mean
Jawe				
High cost of feeds	18.75	43.75	18.75	27.1
High variability in prices	6.25	0.00	6.25	4.2
Lack of finance	56.25	18.75	0.00	25.0
Poor knowledge of feeds	12.5	12.5	0.00	8.3
Poor access to market	6.25	0.00	43.75	16.7
High transport cost	0.00	25.00	31.25	18.8
Gana				
High cost of feeds	33.33	8.3	41.67	27.8
High variability in prices	0.00	33.3	0.00	11.1
Lack of finance	8.33	8.3	16.67	11.1
Poor knowledge of feeds	25.00	25.0	8.33	19.4
Poor access to market	33.33	16.7	16.67	22.2
High transport cost	0.00	8.3	8.33	5.6
Supply problem	0.00	0.00	8.33	2.8

Table 7. Perceptions of farmers regarding the opportunities for enhancing the use of concentrates

Jawe	1 st	2 nd	3 rd	Mean
Changing production practices	12.5	6.3	43.8	20.8
Expanding livestock enterprises	18.8	18.8	0.0	12.5
Improved feed access to livestock farmers	43.8	12.5	0.0	18.8
Improving quality	6.3	0.0	12.5	6.3
Increase in milk production	18.8	37.5	12.5	22.9
Own enterprise becoming efficient	0.0	25.0	6.3	10.4
Lack of natural pasture as trigger	0.0	0.0	25.0	8.3
Gana				
Changing production practices	25.0	16.7	8.3	16.7
Expanding livestock enterprises	8.3	0.0	33.3	13.9
Improved feed access to livestock farmers	8.3	16.7	8.3	11.1
Improving quality	0.0	16.7	0.0	5.6
Increase in milk production	16.7	16.7	16.7	16.7
Own enterprise becoming efficient	8.3	8.3	16.7	11.1
High demand for feed	16.7	0.0	0.0	5.6
Increasing current returns to justify expansion	16.7	25.0	16.7	19.4

Farmers also reflected their views on the potential opportunities that could trigger the use of concentrate feeds in the area (Table 7). At Jawe, increase in milk production (23%), changing production practices (21%) and improved feed access to livestock farmers (19%) were some of the opportunities they think would enable use of concentrate feeds. At Gana, increasing current returns to justify expansion (19%), changing production practices (17%) and increase in milk production were suggested to be potential opportunities that would enhance integration of concentrate feed ingredients in livestock feeding system. The present appraisal also indicated that concentrate feed ingredient and improved forage production and utilization is triggered more when integrated with market-oriented activities (example dairy production in Hayse site) where use of concentrate and improved forage production and utilization was widespread. This also concurs with the claims of Ayele *et al.* (2012) and Ergano *et al.* (2010) who stressed that feed interventions would be better enabled when integrated with market oriented livestock commodities but was at variance with what was observed for introduced forages by others (Geleti *et al.*, 2014).

Farmers' response to the issues associated with sources of information and advice is presented in Table 8. About 63 and 75% of the farmers at Jawe and Gana, respectively, indicated that they get advice and information on feed related issues, of which 50% of the farmers interviewed at Jawe and 58.33% at Gana indicated to get feed related information by visiting other farmers' fields. Development agents and other experts in the public extension service were the major sources of information on livestock production in general and feeds and feeding systems in particular.

Table 8. Sources of information and advice on issues related to feed in the two study villages (% of respondents)

Issue	Response	Village	
		Jawe	Gana
Get advice on feed related issues?	Yes	62.5	75.0
	No	37.5	25.0
Visit other farmers' fields?	Yes	50.0	58.3
	No	50.0	41.7
Nature of advice	Feed management; feeding system; efficient utilization of available feed resources		
Main sources of information	Development agents; other public extension experts		

Essential features of the feed value chain

The important features of feed value chain based on information gathered during the group discussion are presented in Table 9. Livestock producers (feed consumers) in Jawe and Gana indicated that they occasionally purchase feed, while those at Hayse reported that they purchase regularly (Table 9). All farmers interviewed in the latter location own dairy cattle and are well integrated with milk markets leading to high demand for commercial compounded feeds. Regarding feed price setting, it was indicated that there is no negotiation and that prices are fixed by the suppliers/retailers themselves. Wheat bran and oil seed cakes are the commonly purchased concentrate ingredients in both Jawe and Gana villages, while compound dairy feeds (obtained from Licha Flour and Feed Factory) and wheat bran (from flour mills and retailers) are commonly purchased by those farmers at Hayse. Price variability is an important aspect, with feed prices falling during dry seasons (associated with increasing volume of wheat and oil seeds supplied) and rising during the wetter months of the year, due to the opposite trend in ingredient supply to feed and flour processors.

Table 9. Essential features of feed value chain activities at selected rural sites in Hadiya zone based on discussion with consumers at three sites

Issue	Sites		
	Jawe	Layignaw Gana	Hayse
Feed purchasing practices	occasionally		Regularly
Commonly purchased concentrate ingredients	Dominantly oil seed cakes and wheat bran		Oilseed cakes, wheat bran, and compound dairy feeds are purchased
Extent of use of concentrate ingredients	low; triggered largely by targeted fattening activities and dairy production;		High, due to the widespread use of improved dairy cattle in the area
Finance for feed purchase	No access to credit for feed purchase; Omo and Wisdom micro-finance institutions operate in the area, but the process was inauspicious		Have access to credit source; they reported to get credit from the milk processing cooperative owned by the dairy farmers in this site
Feed price setting	No price negotiation; price fixed by the retailers		
Feed price variability	Low price in the dry seasons; high price during wet seasons		
Means of feed transport?	Donkey cart; head load depending on size		
Do you face feed transport problems?	Yes, remoteness from source		
Quality assessment	Sensory (smelling, touching, observing); physical form of the ingredients (brans vs. short, for example); inspection for mould development and dampness		
Willingness to pay for quality?	Yes		
Common types of feed purchased from local sources	Straws; enset and its residues; <i>atela</i> ; for enset byproducts price of <i>corm>pseudostem></i> leaves		
Feed packaging	Flour mills and oil processing plants normally package brans and oilseed cakes in 50 kg sacks. But retail shops can sell in smaller quantities if the buyers come with their own containers.		
Issues considered in selection of feed supplier	ease of access; quality of the product supplied; favorable price; willingness to offer credit		
Institutional constraint	No clear insight was captured concerning the institutional constraints affecting feed value chain;		

Source: group discussion

The respondents indicated that purchased feeds are transported by donkey carts and head loads from point of sale to the respective farms. Remoteness from source is one of the constraints faced in feed transport. The farmers reported that they use methods such as smelling, touching and inspection of dampness, mould development and presence of inert materials for assessment of feed quality when they buy feeds. Regarding the price issue, the farmers indicated that they are willing to pay more for better quality feed. The use of concentrate ingredients also varies to some degree across the study villages. At Jawe and Gana, concentrate feed utilization was observed to be low, while at Hayse, due to the presence of improved dairy cattle, farmers regularly buy such feeds for their animals. There was also a tradition of marketing feeds obtainable from local sources, such as straws, enset by-products, native grass hays and *atela*.

Farmers can purchase ingredients or formulated feeds in variable quantities based on their capacity from feed retailers in Hosaina town and from Licha flour and feed factory. On the

contrary, private flour factories such as Sifona indicated that they disfavor retailing in small quantities. Regarding credit services, there is lack of access to credit sources for feed purchase.

Though Omo and Wisdom Micro-finance Institutions operate in the area, the conditions for accessing credit (be it for feed purchase or other purposes) seem unfavorable. In deciding the supplier from whom to buy feed, ease of access, quality of the feed ingredient supplied, favorable price and willingness of the supplier to offer feeds on credit were some of the issues considered. There were no complaints of institutional constraints affecting the feed value chain in the area. However, this might be associated with the farmers' lack of clear insight regarding the institutional factors that can affect feed value chain development in the area.

Features of feed value chain activities captured during the discussions made with feed processors are presented in Table 10. As was the case for the actors in the consumer domain, no negotiation was reported to exist in input and feed price setting. Regarding the source of inputs, Licha flour factory source wheat from farmers who are members of the primary cooperatives of the union as well as from the market and wheat sold by the government. For commercial concentrate feed compounding, 75% of the ingredients used is wheat bran sourced from the Union's own factory while oil seed cakes and other ingredients are obtained from Addis Ababa area and molasses is purchased from Wonji Sugar Factory. Sifona Flour factory sources wheat both from farmers and the government. Ingida Kassa Oil factory gets its oilseed supplies from distant places like Wollega, Arsi and Bale. Buyers of feed products from these commercial enterprises are dairy farmers in Hosaina town and its environs, some rural farmers, cooperatives outside of the zone, research centers, and some opportunistic fatteners who fatten cattle and small ruminants targeting major public holidays. Sifona Flour factory also indicated urban dairy farmers, feed retailers and opportunistic fatteners to be its important clients.

Table 10. Aspects of feed value chain activities captured during the discussions made with feed producers in Hosaina town

Issue	Producers		
	Licha Hadiya flour and feed factory	Sifona Flour factory	Ingida Kassa Oil Factory
Input price setting	No input price negotiation	No input price negotiation	No room for price negotiation; producers set the price based on cost of production and buyers take the price
Source of inputs	Wheat for flour production is sourced from member farmers; wheat bran for feed mixing sourced from own flour factory (75%); cakes and other ingredients from Addis Ababa area; molasses from Wonji Sugar factory	Wheat sourced from farmers and also allocated by government	Noug and linseed sources from as far as Wollega, Arsi and Bale (linseed only)
Buyers of feed products	Mainly dairy farmers in the town; some rural farmers; other coops from other zones; research centers; farmers engaged in occasional fattening operations	Urban dairy farmers; feed retailers mainly those who transport and retail feed at other towns; farmers engaged in occasional fattening operations	Retailers, livestock producers (farmers engaged in fattening and dairy production)
Technical efficiency	Operates below capacity due to low demand; power shortage; water shortage		Produces at 10% of the capacity due to high processing cost and low demand for oil; was not in operation at the time of the study
Processing risks	Unstable electric power and input supply; poor quality of wheat grain purchased from farmers		Unstable power and input supply; raw materials sourced from distant places with high transport cost
Problems in finding people who buy feed products	Yes, mainly during seasons of high feed availability		No. There is high demand for oilseed cakes but the problem is to find market for the oil
Type of feed packaging material	Sacks of 50 kg capacity		Sacks of 50 kg capacity. But can sell in 25 or 10 kg if the buyers bring own container
Do you offer credit for feed buyers?	No	Yes, mainly for clients who regularly buy wheat bran	
Institutional constraints	No excessive institutional constraint was indicated to prevail		
Quality standard based production of feeds	No		

All the three factories indicated that they operate below the existing capacity due to low demand for the products and frequent interruption of power supply. Unstable power and input supply, poor quality of the wheat and oilseeds supplied by farmers seem to be the major constraints hindering their production efficiency. The factories also indicated that during seasons of sufficient feed availability, demand for feed ingredients falls. All the three firms indicated that they pack their products in fertilizer bags of 50 kg capacity. They also indicated that they do not need a separate license for selling feed as it is considered part of their license for operation of their respective mills. Licha Flour and Feed Factory indicated that the firm does not sell feed on credit, while Sifona Flour Mill and Ingida Kassa Oil Processing Plant indicated that they offer wheat bran and oilseed cakes, respectively, on credit, mainly to clients who regularly buy from them and whom they consider trustworthy. As was the case with consumers, no clear institutional problems affecting the operation of the firms were reported by the different processing plants. All the firms also indicated that they are not aware of quality standards of feeds and feed ingredients.

Functions, activities and actors in feed value chain

Based on the information gathered, the feed value chain was observed to have the following key stages (Figure 3): input supply, feed production, feed transport to place of sale by retailers, feed retailing, feed transport to farm from points of retail, storage and processing and consumption.

Input supply

For feeds produced on farm by farmers, inputs required include land, forage planting material, financial resources for purchase of inputs and feeds, and labour for various farm operations. During the group discussion, land was an important constraint affecting feed availability in the study areas. Further, other inputs such as forage seed, and other forage planting materials are not readily available. Credit is not readily available for feed related expenses. Although Omo Micro-finance operates in the area, the respondents indicated that the pre-conditions and the service delivery processes are not favorable. Compound feed is produced by the Feed Processing Plant of Licha Hadiya Coop Union, whereas wheat bran and oilseed cakes, the main ingredients used in the concentrate feed mixtures, are produced the Flour Mills and Oil Processing Plants operating in the area or occasional brought from other places such as Addis Ababa, Mojo and Debre Zeit areas.

Feed production

Generally, farmers reported that they use crop residues (enset by-products, wheat and tef straws) and native pasture hays as feed for their animals. Farmers also plant some improved forage species like elephant grass, fodder beet and *Dasho* grass (*Pennisetum pedicellatum*). Concentrate ingredients and compounded feeds are produced by flour factories and oil extracting entrepreneurs in Hosaina town.

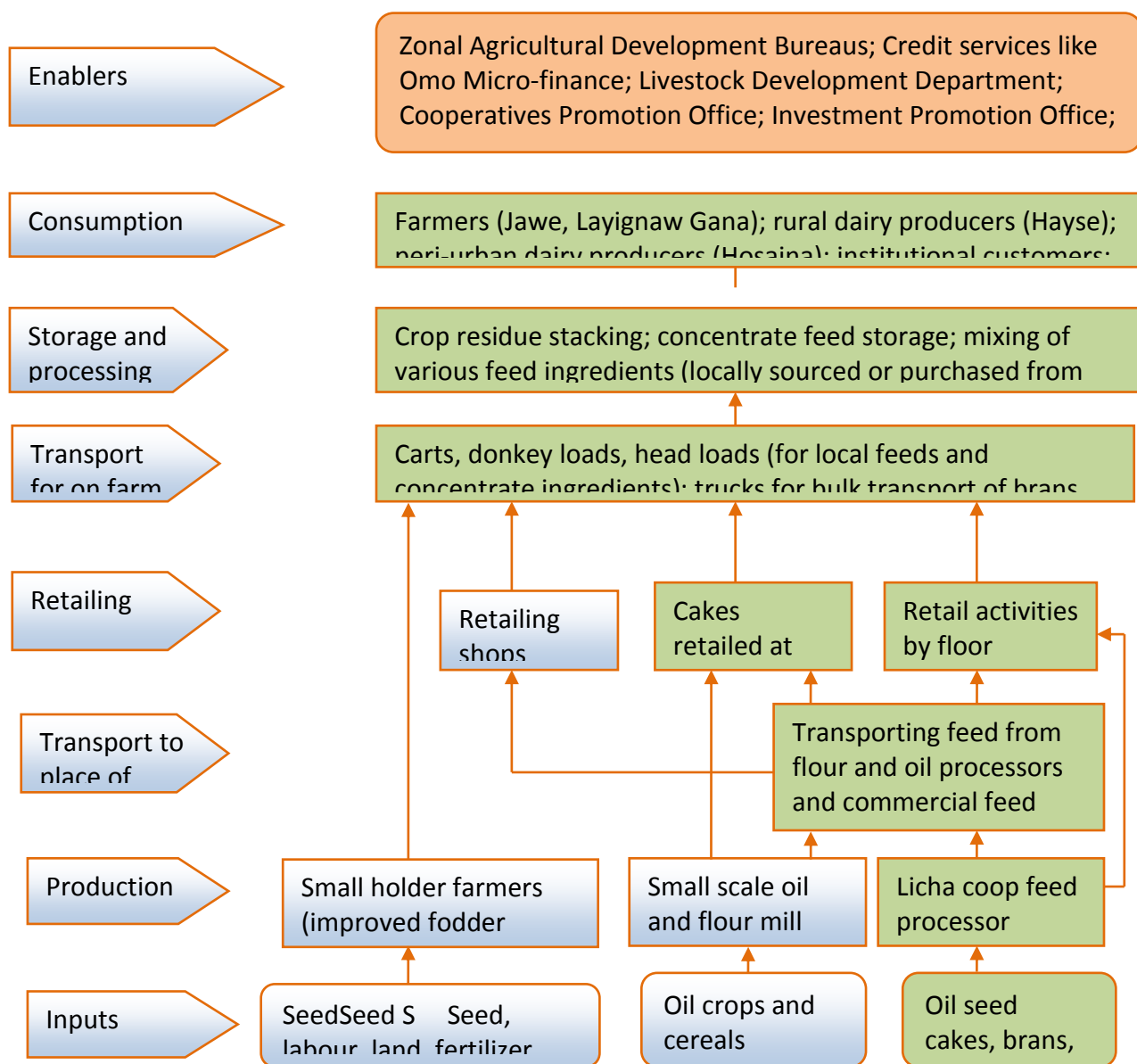


Figure 3. Schematic diagram depicting the feed supply chains in Lemo district

Source: Illustration based on information gathered from the field study

Feed marketing

The interviewed farmers showed that they buy feeds from neighboring farmers (crop residues, native grass hays). They also purchase mixed concentrate feeds and other concentrate ingredients from processors or retailers in Hosaina town. Generally, feed supply and price fluctuates depending on season. Typical small farmers far away in the rural areas in Jawe and Gana kebeles face challenges in terms of access to concentrates feeds and ingredients because of high feed prices, financial constraints of the farmers and distance from the supply sources. On the other hand, the milk producers' cooperative members in Hayse and in the suburbs of Hosaina town have better access to concentrate feed supply and to credits and other inputs required for sustainable milk production. Where credit constraints affect the use of potential technological interventions, it would be necessary to facilitate the provision of such services in order to support technology dissemination for enhancing productivity of livestock through use of the necessary inputs and technological interventions.

Feed transport

Feed transporting activities take place at two stages; first retailers buy and transport ingredients from source to place of retail; then farmers on the other hand buy feed from retailers, oil and flour processors and transport the feed to their farms. A key challenge in feed transport mainly for rural farmers is the distance from source. Farmers use head loads or donkey carts to transport feed from source to farm. At farm level, feed was produced and transported by family labour to the place of use or site of stacking.

Retailing

Feed retailing activities are undertaken by feed retailers who buy ingredients from the source and retail the feed in Hadiya town. The compound feed processor (Licha Hadiya) and other flour and oil processing plants operating in the area sell their products either directly to livestock producers at the gate of their factory or through retailers in Hosaina town. Indeed, the Licha Hadiya retails commercially compounded feed and wheat bran, whereas the other flour mills and oil processing plant retail only the ingredients, wheat bran and oilseed cake, respectively.

Storage and processing

Crop residues and native grass hays are conserved for livestock feeding during lean periods. The most commonly stored feeds for periods of feed shortage are crop residue (wheat and barley, mainly as observed in Hayse area). Some farmers store native hay and crop residue by stacking, storage of concentrate feed and mixing of various feed ingredients at feeding.

Consumption

Smallholder farmers (Jawe, Gana); rural dairy producers (Hayse); peri-urban dairy producers (Hosaina town), and institutional customers (like research centers) were the main consumers of livestock feed in the area. Generally, feed formulation was observed not to be species or physiological status specific. Licha Hadidya, the only factory that commercially produces mixed feeds was observed to produce feed for dairy animals but the factory reported that it also sells the same type of feed for other classes of livestock. It is planning to start compounding of calf and poultry feeds based on the emerging demand for this type of feed in the future.

Conclusion

This appraisal focused on assessment of feed production and feeding systems and analysis of feed value chains in Lemo district. Important attributes of the feed value chain based on the perceptions of the farmers and feed manufacturers were also assessed. Native pasture grazing and crop residues dominate the on-farm livestock feed resource base. On-farm production and utilization of improved forages is minimal. Formal and informal feed value chains co-exist in the sites with the latter being more important in feed sourcing mainly for typical small holder farmers. Key value chain constraints include: lack of credit, unfavorable credit service delivery processes, high feed cost and feed price variability. Shortage of land was a major constraint limiting on-farm feed production and causing shortage of overall feed supply. High cost, financial constraint, poor access to market and lack of adequate knowledge about the benefits of feeding concentrates were found to be the main constraints limiting access to and use of concentrate feeds in the study area. It is thus important to alleviate these constraints to have a well functioning livestock feed value chain. Organizing/strengthening functional farmers' cooperatives and linking livestock production activities to markets could play important roles in this regard.

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