

# Feed marketing in Ethiopia: Results of rapid market appraisal

Improving Productivity and Market Success of Ethiopian Farmers



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# Abstract

Despite the large livestock population in Ethiopia, the sector's contribution at the micro or macro level is well below its potential due to various reasons, notably feed shortage and diseases, compounded by inefficiencies in the livestock input and output markets. Feed marketing studies are scarce in Ethiopia. This study is aimed at assessing the feed marketing system in Ethiopia to generate a general understanding of the feed supply and demand characteristics, feed marketing, feed prices, market places, market actors, and market institutions. The types of fodder supplied in the country differ from place to place depending on the type of crops grown as conditioned by the agro-climatic conditions. Buyers and sellers have various perceptions about the quality of the fodder supplied to the market. There are competing uses of crop residues and hay in Ethiopia. Crop residues and hay are transported in a variety of ways. Most of the crop residues are retailed in the open market. Hay is mostly sold *in situ*. Agro-industrial by-products from flour and edible oil mills, grind mills and local brewery are sold in all of the study areas. There are about 15 feed mixers and millers in the country as observed during the study period. However, only five of them are manufacturing purely for sale; others produce for own consumption and to sell surpluses. Feed prices are rising sharply. Available price data indicated that there are significant price differences between farm gate and wholesale prices of crop residues and hay. Among the crop residues teff straw is most expensive. Among agro-industrial by-products, linseed cake is most expensive, followed by cotton seed cake. Most of the feed trading is informal. Implications to improve the feed marketing system are drawn.

# 1 Background

Livestock in Ethiopia perform important functions in the livelihoods of farmers, pastoralists and agro-pastoralists. Livestock are sources of food (meat and milk), services (transport and traction), cash income, manure (for soil fertility management and fuel), and serve as store of wealth and hedge against inflation. The subsector also provides year-round employment for a significant part of the rural population, which would perhaps remain unemployed otherwise (MEDaC 1999). Livestock are especially important sources of cash income to the poorer sections of the Ethiopian rural population and women, as is also true in many other developing countries (Delgado et al. 1999; Thornton et al. 2002). Beneficial income diversification investments can arise from cash income generated from livestock (Little et al. 2001).

Despite the large livestock population in Ethiopia, the sector's contribution at the micro or the macro level is well below its potential due to various reasons, notably feed shortage and diseases. These problems are compounded by inefficiencies in the input (feed, genetic material and veterinary services) and output (livestock and livestock products) marketing, including poor market infrastructure, lack of marketing support services and limited market information.

On the other hand, Ethiopia has favourable environment for livestock production. Improving the management and use of the vast communal grazing land resources, could contribute significantly to the alleviation of the feed shortage problem. Experiences to date show that collective action for communal grazing land management can contribute to the sustainable use of the resources (Gebremedhin et al. 2004). Curbing the free and uncontrolled grazing system, and introducing improved forage species, and cut and carry systems are other potential options that could contribute to the alleviation of the feed shortage problem, especially in the highlands of the country. The indigenous livestock breeds which have good meat yield potential could increase marketable surplus if improved management practices are used (Tegegne, personal communication, 2009).

Several studies have been conducted on fodder production and use in Ethiopia, both by national and international research organizations. However, the focus of the studies was limited to the agronomic and nutritional characteristics of feed resources, and animal responses to types of feeds and feeding practices (Bediye et al. 2001). Very few studies have addressed issues of feed supply and marketing. There is a serious dearth of information on the types of feed markets, the supply and demand conditions of feed, and how the feed markets operate.

The major feed resources in the country are crop residues and natural pasture, with agro-industrial by-products and manufactured feed contributing much less. The importance of natural pasture is gradually declining because of the expansion of crop production into grazing lands, redistribution of common lands to the landless and land degradation. In the Ethiopian highlands crop residues are the major feed resources. Zinash and Seyoum (1991) reported that about 70% of crop residues in the highlands are used as animal feed. In the lowlands of the country natural pasture is the major source of feed. There are no reliable estimates of the animal feed resources in Ethiopia (EARO 2003). Some estimates reported that there could be about 14 million tonnes of crop residues and about 500,000 t of various types of agro-industrial by-products produced annually in Ethiopia (EARO 2003).

Through the realization of comparative advantages, market development induces specialization, and may increase productivity and production. Improved incentives through profitable market outlets can facilitate technical efficiency (technical productivity increases) of feed production, which could include better agronomic practices, improved genetic resources, and better use and conservation methods. Improving market efficiency will increase demand and margins to producers and other market actors. Hence, feed market development can be considered as an important factor in alleviating the feed shortage problem.

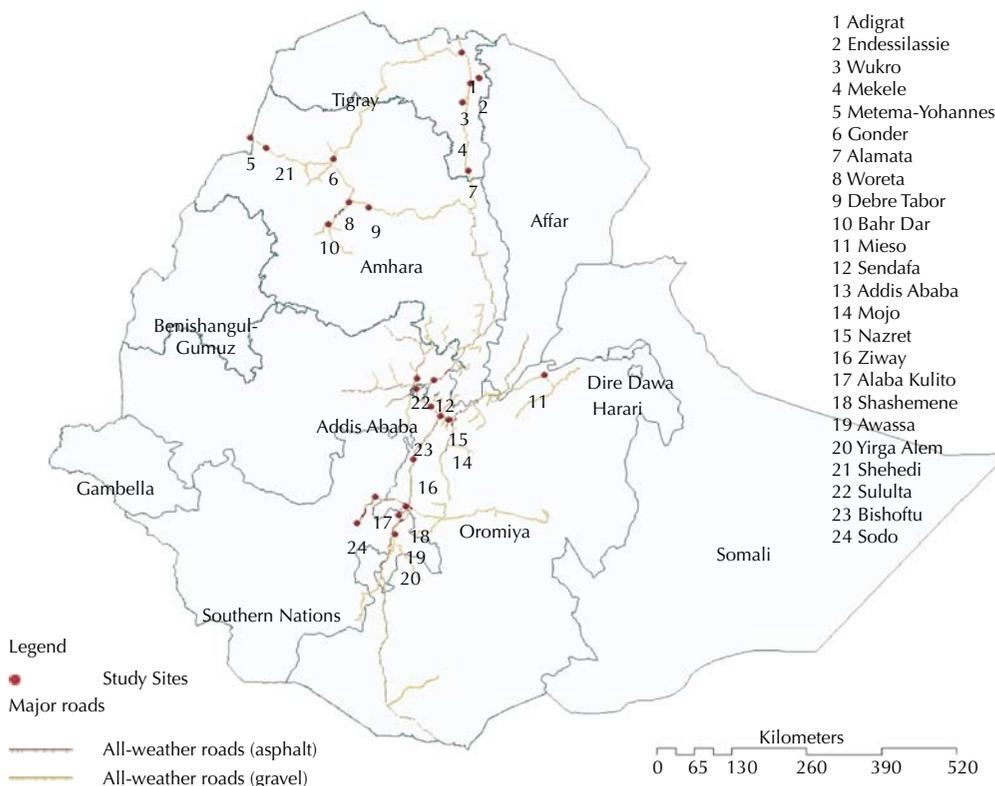
Sound empirical analysis needs to precede the formulation of strategies to improve the functioning of feed markets in Ethiopia. Through rapid market appraisal, this study is aimed at assessing the feed markets in Ethiopia, with particular focus on the four regional states of Tigray, Amhara, Oromia and the Southern Nations, Nationalities, and Peoples region (SNNPR). It aims at generating a general understanding of the feed supply and demand characteristics, feed marketing, feed prices, market places, market actors, and market institutions.

The paper is organized as follows. The next section presents the methodology used in the study. Section three presents brief description of the study areas. Sections four, five and six deal with fodder supply and demand, agro-industrial by-products supply and demand, and manufactured feed supply and demand, respectively. Section seven presents analysis of feed prices, while section eight presents market places, market actors, and market institutions. Section nine concludes the paper and draws implications for improving the operation of feed markets in Ethiopia.

## 2 Method of study

The research is based on rapid market appraisal (RMA) methodology (Holtzman 1995; Morris 1995). Rapid market appraisal methods can be efficient ways of obtaining quick policy-relevant information that can provide guidance for development interventions and for guiding quantitative studies that ensue rapid appraisal studies. Rapid market appraisal studies basically generate information that is largely general and qualitative. However, to the extent possible, rapid appraisal studies include analysis of quantitative information collected from secondary sources and other rapid appraisal methods.

This study was conducted in the 4 Ethiopian regional states of Tigray, Amhara, Oromia and the SNNPR with particular focus on 23 towns and the city of Addis Ababa, and their environs (Figure 1).<sup>1</sup> Eight of the study sites are Pilot Learning *Woredas* (PLWs) (districts) of the Improving Productivity and Market Success (IPMS) of Ethiopian farmers project (two PLWs in each region).<sup>2</sup>



**Figure 1.** Feed market rapid appraisal study sites.

1. See next section for brief description of the study sites.

2. See IPMS website [www.ipms-ethiopia.org](http://www.ipms-ethiopia.org) for more information about the project.

Data were collected through group discussions and interviews with key informants (natural pasture/grass hay producers, millers and mixers, feed traders, cattle traders, feed buyers, and dairy and feed supply cooperatives). Data were also collected based on interviews with key observants: experts of the respective *Woreda* Offices of Agriculture and Rural Development (OoARD) and development agents (DAs), experts of the Regional Bureaus of Agriculture and Rural Development (BoARD), experts of the urban agriculture offices, experts at the Federal Ministry of Agriculture and Rural Development (MoARD), and staff of the Integrated Livestock Development Project (ILDP) operating in North Gondar Zone. Drawing on their experiences in the PLWs, the IPMS Research and Development Officers (RDOs), and Research and Development Assistants (RDAs) have been useful sources of information.

Additional data were collected from secondary sources, including records of regional and district level sources, customs authority branch offices, traders, and NGOs. Personal observations of feed market places (open markets and shops), dairy and fattening farms, feed producing orchard farms, feed production plots, abattoirs, and miller and mixer firms supplemented the data collection method. See Annex 1 for the list of organizations contacted from which information was collected.

Following the framework of value chains and associated business development services, the rapid market appraisal study attempted to collect and analyse information on feed production and supply; feed transportation and storage; feed marketing, demand and use; prices; feed quality; and market places, actors and institutions.

## 3 Description of study sites

This chapter describes the important characteristics of the study areas that are relevant to the feed production, supply and marketing. Emphasis is given to characteristics related to crops grown, livestock reared, feed types produced and supplied, market oriented livestock production, and feed processing. Below, we present brief descriptions of the study sites by region. The important characteristics of the study sites in the regions of Tigray and Amhara (northern and northwestern Ethiopia) are given in Table 1, and those of the study sites in the regions of Oromia and SNNPR (central, eastern, southern and southwestern Ethiopia) are given in Table 2.

### 3.1 Tigray Region

All the study sites in Tigray are district capitals, except Adigrat, which is a zonal capital and Mekelle, which is the regional capital. Alamata is located at a lowland agro-ecology, while Endasselassie and Adigrat are located at highland agro-ecology, with the rest located in the intermediate highland agro-ecology<sup>3</sup> (Table 1). The types of crops grown differ accordingly, with subsequent influence on the type of feed supplied and marketed. Wheat and barley straws dominate in the intermediate to highland ecologies. Dairy is the most widely practised market-oriented livestock production, with cattle fattening practised in few cases. A new flour mill has started operation in Alamata with a capacity of 200 quintals of wheat per day. Currently the flour mill is at a testing stage processing about only 25–30 quintals of wheat per day.

Several flour mills operate in Mekelle and its surroundings. Wheat bran is the major agro-industrial by-product supplied in the study sites in Tigray, while oilseed cakes are uncommon. There is substantial *in situ* sale of hay in and around Mekelle town. Several public institutions sell hay *in situ* on their compounds. Dairy is the major commercial-oriented livestock production in the town, although there are also signs of emerging cattle fattening businesses. Endasselassie is the capital town of the district of Atsbi Wonberta in eastern Tigray which is an important supplier of sheep and goats to the nearby markets, including the capital, Mekelle. Adigrat is the only town in the study areas in Tigray where oilseed cakes ('noug', linseed and sesame seed cakes) are traded widely. Interestingly, the oilseed cakes supply to Adigrat comes from such distant towns as Shire Endasselassie in Tigray (about 200 km away) and Gondar in Amhara (about 550 km away).

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3. For the purpose of this study, we used three classes of agro-ecologies: lowland (below 1600 meters above sea level (masl)), intermediate highland (between 1600 and 2200 masl) and highland (above 2200 masl). The classification is based on the major types of food–feed crops grown.

**Table 1.** Major characteristics of study sites in Tigray and Amhara regions

	Average altitude	Major livestock species reared in surroundings	Major crops grown in surroundings	Availability of flour mill and edible oil processors in town	Existent market-oriented livestock production in town <sup>1</sup>	Existent market-oriented livestock production in surroundings <sup>2</sup>
Tigray	1550	Cattle, sheep and goats	Sorghum, teff and maize	One flour mill	Dairy and cattle fattening	Dairy, beef and shoats
	2080	Cattle, sheep and goats	Wheat, barley and teff	Seven flour mills	Dairy and cattle fattening emerging	Dairy, beef and shoats
	2660	Cattle, sheep and goats	Barley, wheat and teff	None	Dairy	Dairy and shoats
	1990	Cattle, sheep and goats	Wheat, barley and teff	None	Dairy	Dairy and shoats
	2450	Cattle and sheep	Barley and wheat	One flour mill	Dairy	Dairy and shoats
Amhara	1800	Cattle, sheep and goats	Teff, wheat, barley and maize	Three flour mills, and several edible oil mills	Dairy and cattle fattening	Dairy and beef
	1800	Cattle, goats and sheep	Teff, rice and fingermillet	One rice polisher and some edible oil mills	Dairy and cattle fattening	Dairy, beef and shoats
	2690	Cattle and sheep	Barley, wheat, fingermillet and teff,	No flour mill, some edible oil mills	Dairy and cattle fattening	Dairy, beef and shoats
	2170	Cattle, sheep and goats	Barley, wheat and millet	Two flour mills, about 21 edible oil mills	Dairy and cattle fattening	Dairy and beef
	750	Cattle and goats	Sesame, cotton and sorghum	None	Cattle fattening	Beef and shoats
	750	Cattle and goats	Sesame, cotton and sorghum	None	Cattle fattening	Beef and shoats

1. This is to show that such enterprises are being run by urban producers. However, their importance can be low.

2. This is to show that such enterprises are being run by rural producers. However, their importance can be low.

## 3.2 Amhara Region

The study sites in Amhara are district towns (Woreta and Gende Wuha), zonal towns (Debre Tabor and Gondar) and regional capital (Bahir Dar) and an export border town (Metema Yohannes). While Bahir Dar, Woreta, and Gondar lie in the intermediate highland agro-ecology, Debre Tabor lies in the highland agro-ecology. Gende Wuha and Metema Yohannes are located in the lowlands (Table 1).

In Bahir Dar, there are two large-scale agro-industrial plants (viz. Bahir Dar Edible Oil Mill and Guder Agro-Industry Flour Mill), one small-scale flour mill and many small-scale edible oil processors. Woreta is the only study site where rice is produced extensively in the surroundings and where rice bran is an important feed.

Gondar town is among the largest seed cake producer in the country, perhaps due to its proximity to some of the major sesame, cotton and noug production areas in the country. One big and about 20 small-scale edible oil processors operating in the town supply seed cakes to livestock producers. A major brewery (Dashen Brewery) is located in Gondar. However, the brewery grain was not used as feed during the study period. Gende Wuha is the capital of the border district of Metema, while Metema Yohannes is the second major town in the district serving as an export border town to the Sudan. Metema district is predominantly a commercial crop production district, with sesame, cotton and sorghum being the major commercial crops. The district is endowed with large grazing area owing to its low population density and high soil fertility. As such, natural pasture and hay are widely available. Lack of proper use of the pastures, rather than availability, seems to be a major cause of feed scarcity in Metema district.

## 3.3 Southern Region

The study sites in the SNNPR are district towns (Yirgalem and Alaba), zonal towns (Soddo and Shashemene) and regional capital (Awassa). All the study sites in the SNNPR lie in the intermediate highland agro-ecology (Table 2).

**Table 2.** *Characteristics of study sites in SNNPR and Oromia regions*

	Altitude	Major livestock species reared in surroundings	Major crops grown in surroundings	Availability of flour mill and edible oil processors	Existing market-oriented livestock production in town <sup>1</sup>	Existing market-oriented livestock production in surroundings <sup>2</sup>	
SNNPR	Soddo	2160	Cattle, sheep and goats	Teff, barley and wheat	One flour mill	Dairy and cattle fattening	Dairy, beef and shoats
	Alaba	1800	Cattle, sheep and goats	Maize, wheat and teff	One flour mill	Dairy and fattening	Dairy, beef and shoats
	Shashemene	1940	Cattle, goats and sheep	Maize, teff, wheat and barley	A few flour mills and edible oil processors	Dairy	Dairy
	Awassa	1700	Cattle, goats and sheep	Maize	About 8 flour mills,	Dairy	Dairy and shoats
	Yirgalem	1780	Cattle, goats and sheep	Maize and enset	Two flour mills	Dairy	Dairy and shoats
Oromia	Mieso	1300	Cattle, goats and sheep	Sorghum	None	Dairy and cattle fattening	Dairy, beef and shoats
	Adama	1620	Cattle and goats	Teff and maize	Many flour mills and edible oil processors	Cattle fattening	Beef
	Mojo	1780	Cattle, goats and sheep	Teff, barley and wheat	No flour mill, one edible oil processor, one feed mixer and miller	Cattle fattening and dairy	Beef
	Zeway	1650	Cattle, goats and sheep	Maize, teff and barley	One edible oil processor	Dairy and cattle fattening emerging	Shoats
	Bishoftu	1930	Cattle, goats and sheep	Teff and wheat	Several flour mills and edible oil processors	Dairy and cattle fattening emerging	Dairy, beef and shoats
	Sululta	2600	Cattle, sheep and goats	Wheat and barley	None	Dairy	Dairy
	Sendafa	2570	Cattle, sheep and goats	Wheat and barley	None	Dairy	Dairy

Addis Ababa	2350	Cattle, sheep and goats	Teff, wheat, barley and maize	More than 70 flour mills, and many edible oil processors	Dairy and cattle fattening	Dairy and beef
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1. This is to show that such enterprises are being run by urban producers. However, their importance can be low.

2. This is to show that such enterprises are being run by rural producers. However, their importance can be low.

In Soddo dairy production is an important enterprise, although fattening is also practised in the lower altitude areas. Agro-industrial by-products such as wheat bran, linseed cake, noug seed cake and cotton seed cake are traded in Soddo town. A newly established wheat flour mill has gone operational. Alaba district is an important supplier of cattle and shoats to the surrounding markets, as well as to Addis Ababa. Market-oriented dairy is also practised in the Alaba town.

In both Awassa and Shashemene dairying is an important market-oriented livestock production.<sup>4</sup> Maize is the major crop grown in the surrounding areas and thus the major source of roughage feed. In the late wet season green maize stover is also marketed. Agro-industrial by-products are supplied to Shashemene from as far as Nazareth (about 210 km away) and Bale (about 250 km away). Similarly, market-oriented dairy is practised in Yirgalem town, and interestingly the town supplies milk to some of the rural areas in its surroundings. There is one flour mill in Yirgalem town, and another one in the nearby town of Aposto.

### 3.4 Oromia Region

The study sites in Oromia region are district towns (Mieso, Mojo, Bishoftu, Sululta and Sendafa) and zonal capitals (Adama, Zeway and Shashemene). The national capital of Addis Ababa is surrounded by several of the study districts in the Oromia region. Mieso is located in the lowland agro-ecology; Mojo, Adama, Bishoftu and Zeway are located in the intermediate highland agro-ecology; and Addis Ababa, Sululta and Sendafa are located in the highland agro-ecology (Table 2).

Mieso is the capital town of the only district among the study sites where mixed, pastoral, and agro-pastoral systems exist. Backyard fattening and dairying are the major commercial activities in Mieso. Cattle fattening is the major commercially-oriented livestock production activity in Adama town and its surroundings. It is estimated that there are more than 120 fattening farms in Adama town only. Teff is the major crop grown in the area and thus teff straw is an important feed. There are many flour and edible oil mills in the town which supply agro-industrial by-products including wheat bran, linseed cake, cotton seed cake and noug seed cake. Because of high demand for agro-industrial by-products, traders and producers in Adama also purchase agro-industrial by-products from Addis Ababa, Awassa, Bale<sup>5</sup> and other areas.

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4. It is interesting to note that fattening becomes the important market-oriented livestock production in the nearby town of Arsi Negele, which is only about 30 km north of Shashemene.

5. Bale areas (Bale Robe and Bale Goba, and Dodola) are important linseed growing areas and several edible oil factories operate in the areas.

Mojo is the capital town of Lome district which supplies large amount of teff straw to the neighbouring Adama district. In Mojo both commercial fattening and dairy are undertaken by large and medium investors as well as small farms. However, fattening is more popular than dairy in Mojo. There is a wide use of agro-industrial by-products including wheat bran, molasses and oilseed cakes in the district. Both urban and rural producers use agro-industrial by-products for fattening as well as dairy. There is no flour mill in the town, but there is one edible oil factory. The town and its surroundings are supplied with agro-industrial by-products from Adama and Addis Ababa. There is one feed mixer and miller at the periphery of the town.

In Zeway, small-scale dairy production enterprises are common. A few fattening businesses are also emerging. One edible oil mill is operational in the town and supplies cotton seed cake and linseed cake. Bishoftu town is located 45 km east of Addis Ababa on the way to Adama. Commercial dairy and poultry production are common in the town.

Several flour mills operate in the town and supply wheat bran to livestock producers. A number of agro-industrial by-product traders also operate in Bishoftu.

In Addis Ababa the major feeds used are hay, teff straw, and agro-industrial by-products. The agro-industrial by-products are produced within Addis Ababa. The hay is supplied to the city by traders, mostly from Sululta (about 25 km northwest of Addis Ababa) and Sendafa (about 20 km north of Addis Ababa). Teff straw comes from Bishoftu, Mojo (east of Addis Ababa) and Tulu Bolo (southwest of Addis Ababa). Most of the teff straw and hay are supplied baled. Loose teff straw and hay are also supplied to the city by farmers from the surrounding areas. Dairy is the major commercial-oriented livestock activity in the city. There are reportedly more than 400 dairy farms in the city. Of the total dairy farm in the city about 93% are small-scale businesses with 2–5 dairy animals. Small ruminant and cattle traders, and meat processors also demand feed for their animals. There are about 70 flour mills and many edible oil mills in the city. Addis Ababa is the major agro-industrial by-products supplier to different towns in the country.

In both Sululta and Sendafa hay is grown in large amount for commercial purpose. Both areas supply hay to the city of Addis Ababa, and the nearby towns of Bishoftu, Mojo, Adama and to the export market. In terms of volume of hay supply, Sululta is more important than Sendafa.

## 4 Fodder supply and demand

Fodder in this study is defined as consisting of crop residues, hay, green grass and fodder trees. The types of fodder supplied in the country differ from place to place depending on the type of crops grown as conditioned by the agro-climatic conditions. There are also places where fodder sale is low because of weak market-oriented livestock production.

### 4.1 Types of fodder supplied

#### 4.1.1 Crop residues

##### Teff straw

Teff straw is marketed in most of the study sites, perhaps because teff grows in a wide range of altitude and is a preferred straw. In the areas where teff straw is not supplied, it is primarily because teff is not grown. In some areas teff straws are differentiated by their colour. For example, in Shashemene area, teff straw comes in greenish or grey colours. Farmers reported that the greenish teff straw comes from the red teff varieties, while the grey colour teff straw comes from the white teff varieties. According to farmers, the greenish teff straw is more palatable. In the Bishoftu, Mojo and Adama areas, it was reported that there was a decrease in the amount of teff straw supplied since farmers were shifting from teff production to wheat production due to the rise in the relative price of wheat grain, although wheat straw is less demanded than teff straw and has lower price.

##### Barley/wheat straw

Barley/wheat straws are supplied mostly mixed, and sometimes pure. For example, in the Mekelle area, although pure barley or wheat straw is supplied, barley/wheat mix straw is the most supplied. If supplied pure, it is mostly wheat straw, since there is usually no pure barley production. Generally, barley/wheat mix straw is preferred to pure wheat or pure barley straw. Farmers reported that good quality barley/wheat straw has whitish colour. In Shashemene area pure wheat straw is one of the major types of feed available in the market.

##### Sorghum stover

Sorghum stover of both the sweet and non-sweet varieties is supplied. Different varieties of the non-sweet sorghum stover are also supplied, although in some areas some of the varieties are not used as feed. For example, four sorghum varieties, locally known as Wedi Aker, Meko, Yeju and Zole, are grown in Metema area. However, only the stovers of

the first three varieties are used as feed. Farmers reported that the Wedi Aker variety is the most preferred as feed.

It was also reported that selling stover used to be considered taboo in some of the study areas. For example, in Mieso area selling sorghum stover was considered as taboo until recently. Rather, farmers would prefer to give the stover as gift to those in need to feed their animals, which still is a common practice. If stover is sold to neighbours or relatives, sales price is usually lower than market price. In Alamata area, it was reported that stover sale started only about 10 years ago, mainly due to the increasing feed shortage due to drought and distribution of grazing lands to the landless youth.

### Maize stover

In the study areas, maize stover is sold mostly green; sale of dry maize stover is limited. In some areas, such as in the surroundings of Adama, maize production for green corn is common during the rainy season. Irrigated private and government farms also supply green maize stover. In some areas, green maize stover is sold *in situ* to traders who retail it in towns.

### Fingermillet straw

Although fingermillet straw supply is not found to be widespread in the study areas, it is quite important in some of the study sites. For example, in Bahir Dar area, millet straw is one of the important crop residues supplied to the open market. Fingermillet straw is also sold in Alaba area, although the quantity was low. In Shashemene area fingermillet is grown but we failed to find information if the straw is sold. Similarly, fingermillet is widely grown in Woreta area, although we failed to find information if the straw is sold. Similarly, in Mekelle area, respondents reported that although fingermillet is grown, quantity supplied is very low because farmers prefer to use it as feed for their animals rather than selling it.

### Rice straw

Woreta area is the only place in Ethiopia where rice is grown widely. Rice straw is sold in the town of Woreta. In addition, rice bran is also sold. The misconception that rice straw reduces milk yield and might cause infertility has faded away and farmers now use rice straw as feed widely.

## 4.1.2 Natural pasture

### Hay

Hay is widely supplied across the study areas. Commercial hay production is practised in some of the study areas including Sululta and Sendafa in the surroundings of Addis Ababa, and Tseda village in the surroundings of Gondar town. Farmers in these areas allocate their land for hay production because it becomes waterlogged during the wet season or is more profitable to produce hay. The sell of hay generates good income to the farmers in these areas. Hay is also produced in public, community and religious compounds.

Farmers in Sululta area are important suppliers of hay to Addis Ababa and the export market. About 17 PAs produce hay in Sululta area and it was estimated that about 1 million bales of hay would be produced. A farmer in Sululta area supplies up to 100 to 200 bales of hay per year. It was estimated that one hectare of land might yield about 200 bales. However, due to the expansion of the flower subsector and urban development, hay production areas are declining.

In Bahir Dar area, hay is the most important roughage feed supplied and used. Hay production by farmers and in public and community compounds is common in the area. As reported by hay users and key informants, farmers who could not purchase fertilizers for crop production prefer to use their plots for hay production. In some areas, hay sale is a recent phenomenon. For example, in the Debre Tabor area, farmers reported that hay sale in the open market started only during the 1980s. In some of the study sites, farmers who do not own cattle exchange hay for traction power.

### Green grass

Green grass is also supplied in several of the study areas, although the volume is very low. In general, green grass supply comes from community and government institution compounds, grazing lands, road sides, irrigation lands, orchard farms, area enclosures, lake sides, swampy areas, cultivated plot sides and commercial grass production areas. Green grass is classified based on type and where it is harvested.

## 4.2 Quality of fodder supplied

Buyers and sellers have various perceptions about the quality of the fodder supplied to the market. Buyers use different methods to assess fodder quality, including visual

observation, smelling, and touch feeling. Visual observation is usually used to assess the colour, adulteration or physical spoilage of the feeds. This section presents the perceptions of buyers and sellers about the quality of fodder.

### 4.2.1 Crop residues

#### Teff straw

The quality of teff straw depends on the type of threshing method, adulteration with weeds and other foreign materials, odour and moisture content. According to farmers, cattle threshed teff straw is of higher quality than machine threshed straw, because the former contains finer straw particles and is more easily palatable. The retailers usually sort the teff straw they buy from farmers into clean and spoiled. Teff straw can be spoiled due to moisture, or being mixed with foreign materials such as weeds, or with leftovers from animals. The price of spoiled teff straw can be as low as 50% of the clean one. Usually, spoiled teff straw is used for construction, fuel, mattress making or as soil organic matter.

Mixing teff straw with weed and other foreign materials is not commonly reported. However, fatteners in Zeway purchase teff straw from Mojo because teff straw produced in Zeway area is usually mixed with weeds that grow with the crop. Sometimes farmers supply straw mixed with leftover from their animals. Spoiled teff straw is usually rejected by animals.

#### Barley/wheat straw

The quality of mixed wheat/barley straw depends on the proportion of the wheat and barley straws in the mix, type of threshing method, adulteration with weeds and other foreign materials, odour and moisture. In those areas where wheat and barley are grown mixed, the proportion of the mix makes a difference in the quality of the mixed wheat/barley straw. For instance, dairy producers in the study areas of Tigray prefer mixed straw with higher proportion of barley, followed by pure barley straw. Research results indicate that barley straw has higher crude protein values than wheat straw (Girma et al. 1996). Farmers reported that cattle threshed wheat or barley straw is of higher quality than machine threshed, for the same reasons as for teff straw.

#### Sorghum stover<sup>6</sup>

The quality of sorghum stover depends on the variety/cultivar and post harvest management. Stover of sweet sorghum is of higher quality as feed compared to other

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6. Little quality differences in green maize stover was reported by producers or users.

cultivars. Sweet sorghum stover is reportedly heavier in weight and more easily palatable. In Metema area stover from sorghum variety locally known as Wedi Aker, which is shorter, is more preferred to straw from other sorghum cultivars grown in the area. Quality of the stover also depends on the way it is stored. Stovers should be stored in slant standing position to protect them from termite and rain. According to farmers poor quality stover has black colour, offensive odour and has developed mold.

Farmers attempt to preserve the feed value of sorghum stover by using different harvest and storage techniques. For example, in the Metema area, farmers harvest sorghum while the stalk is greenish, pile it in the field in heaps for a short time for proper curing, transport it to their residence and store it on wooden bed prepared for that purpose. In the Mieso area, farmers pile sorghum stovers in slant standing position in order to minimize termite attack.

## Fingermillet straw

Respondents indicated that generally the feed quality of fingermillet straw was good and that some farmers even prefer to feed it to their animals rather than sell it. However, literature review indicates that crude protein value for millet stover was reported to be around 4.5% and not different from other cereals like sorghum and maize stovers (Kabatange and Kitalyi 1989).

### 4.2.2 Natural pasture

#### Hay/green grass

Hay quality depends on variety, stage of maturity at harvest, leafiness, curing and protection from moisture. Good quality hay is greenish in colour, leafy and has normal odour. There is also quality difference due to source or place of origin. Price of hay is also influenced by the type of the grass. In Sululta, it was reported that farmers have developed the practice of harvesting hay at optimal stage to maximize the feed quality of the hay. Quality of green grass depends on variety and place of origin. Farmers perceive that green grass from swampy areas is of poorer quality.

## 4.3 Packaging and transportation

Crop residues and hay are transported in a variety of ways: human back, equines, carts, and sometimes by trucks. Loose teff, barley/wheat straws and hay may be transported

in sacks. In Addis Ababa, baled teff straw supplied from the surrounding rural areas is transported on trucks. Teff straw supplied by individual farmers from the rural areas surrounding Addis Ababa is transported on donkeys. Sometimes, loose teff straw is also transported on trucks. Sorghum and maize stover are supplied mostly on human back and by carts.

## 4.4 Units of sale

### 4.4.1 Crop residues

#### Teff straw

Teff straw is sold in different units, including sacks, heaps and bales. For example, there are two common types of teff straw sales arrangements in the rural areas around Adama and Bishoftu: based on bales or heaps. If sale is made at farm gate based on bales, the straw heap will be baled by the buyer and the producer will be paid by the number of bales. Teff straw sale is also effected in donkey loads, usually when sold directly to users. Retailers usually buy heaps of straw at farm gates in the rural areas or donkey loads from farmers in the open market for retail in the same markets. Generally, across the study areas, straw traders tend to prefer to buy teff straw in bales, while users (urban as well as rural) prefer to buy in heaps. Retailers sell teff straw in different lots at the open market.

#### Barley/wheat straw

Pure barley or wheat straws, or barley/wheat mixed straws are sold in sacks, heaps or bales. In Mekelle area, those who have large number of animals prefer to buy heaps of straw at farm gate. In Shashemene area, wheat straw is mainly sold in sacks of about 8 kg. In Bishoftu area, the straw is sold in sacks, where three sacks of straw make one donkey load. In Mojo area, most of the transaction is done at farm gate in baled form. Traders retail barley/wheat straw in different lots at the open market.

#### Sorghum/maize stover

Sorghum stover is sold mostly in heaps and donkey or cart loads.<sup>7</sup> Retailers sell sorghum stover in different lots at the open market. In some areas such as Zeway, green maize stover is sold on per unit stover basis.

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7. In Metema, one heap of sorghum stover is usually 2–3 donkey cart loads.

## 4.4.2 Natural pasture

### Hay

Hay is sold *in situ*, in human load,<sup>8</sup> donkey load, heaps or bales. In some areas (e.g. Gondar and Zeway) hay is bought by a group of people (comprising of about 25 individuals) and divided among them. Different public ground compounds sell hay *in situ*. Airports, schools, churches, municipality offices etc. sell hay *in situ*. The amount of hay supplied from these sources is usually large and thus sold on auction. Sometimes dairy producers lease in plot for hay production and manage the plots (e.g. weeding and harvesting) themselves to produce good quality hay. The lease price of a unit of land is usually 50% less than if the hay would be bought *in situ* at harvest.

## 4.5 Seasons and time of sale

### 4.5.1 Crop residues

#### Teff straw

Generally, the demand for teff straw is usually higher during May–August because of mud house construction and the need to feed oxen for traction purposes. However, the peak demand periods vary slightly across the study areas. For example, in Adama and Mojo areas, the demand for teff straw is higher during October–May for it is the period of fattening, while demand for teff straw during June–September is very low because fattening is not practised during this time.

In Bishoftu area, the demand for teff straw is very high immediately after harvest (around December) because exporters want to buy as much as possible during this time. Teff straw is baled and transported to Djibouti and the Middle East and to inland towns like Addis Ababa and Adama. The city of Addis Ababa appears to show stable demand throughout the year because of the existence of dairy producers and livestock trade. Dairy producers use teff straw when hay is not available.

There are differences in the days of sale across the study sites. In some areas, the major sale days are week days (e.g. Alaba), while in others teff straw sale is done mainly during weekends (e.g. Tigray and Amhara). Higher volume of teff straw is offered for sale during market days. In some areas, teff straw is sold every day in the open market (e.g. Mojo), although the major sales are made during market days.<sup>9</sup> There are also differences in the

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8. In Alaba area, a human load of hay weighs about 12 kgs.

9. In Mojo, there are many sellers as well as buyers during a market day. On these days the price of straw is usually higher by about Ethiopian birr 4–5 per donkey load relative to the non-market days (ETB 12.4571 =

time of the day straw sale is made across the study sites. In some of the study sites (e.g. Woreta) straw marketing is undertaken early in the morning.

### Barley/wheat straw

The demand for barley/wheat straw in most of the study sites is higher during the harvest period since dairy producers prefer to buy and store enough for a year when it is available in large amount. The highest volume of barley/wheat straw is sold during market days across the study areas, followed by weekends and religious holidays. Barley or wheat straw sale was not encountered in Addis Ababa during the study.

### Sorghum stover

The demand for sorghum stover, especially in Mieso and Alamata, is higher during harvest period because fatteners around the area prefer to buy stover when it is available in adequate amount. Demand for stover also becomes high during late dry season when the availability of natural pasture declines significantly. In Metema Yohannes the demand for sorghum stover is related with the supply of cattle to the export market in Sudan.

### Maize stover

The major maize growing areas among the study sites are Zeway, Alaba, Shashemene and Awassa. Since maize stover is sold mostly green in these areas, there seems to be demand whenever it is available. Especially in the Zeway area, people queue up to buy green maize stover during the dry season when irrigated maize is harvested. Most of these buyers are dairy producers.

## 4.5.2 Natural pasture

### Hay

In most cases, hay is produced in waterlogged areas. These areas remain under water until about October–November each year. Hay will only be available after this period. Hence, livestock producers usually buy most of their hay requirements during November–December, when it is usually available in large amount. Since, hay is widely used for dairy animals, demand for hay appears to be relatively stable throughout the year in areas where dairy production is important.

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USD 1.00 at July 21, 2009). It was reported that retailers earn net profit of about ETB 4–5 per donkey load of teff straw.

## 4.6 Uses and preferences

There are competing uses of crop residues and hay in Ethiopia. Teff and barley/wheat straws are used as animal feed, for construction of mud houses and mattress making, although the most important use of these crop residues is feed. Spoiled teff straw is used mostly to build soil organic matter. The importance of these uses differ from place to place. In some areas such as Shashemene, wheat straw is preferred to teff straw for mattress making. In some areas, such as Debre Tabor, because of its scarcity and higher price, teff straw is used for the final finishing of the mud house, and the major phases of the construction is done with wheat or barley straws. In areas where teff straw is used for construction purposes, teff straw prices rise sharply in the rainy season due to the increase in mud house construction.

In Bishoftu, Mojo and Adama areas teff straw is also exported to Djibouti for use in the quarantine stations. Wheat and barley straws are not commonly used in the Djibouti quarantine stations, because of the difficulty to bale them and less preference for fattening. However, the Djibouti market demand for teff straw is seasonal. Baled hay is also used in the Djibouti stations.<sup>10</sup>

Sorghum stover is used as feed, for construction and for fuel. Most of the sorghum stover is used as feed, but construction and fuel also consume significant amount. Millet straw is used as animal feed and for construction. In Bahir Dar area, millet straw is one of the important crop residues supplied to the open market. Rice straw, supplied only in the Woreta area, is also used as feed and for construction purposes.<sup>11</sup> Hay is used mainly as animal feed, but also for mattress making and roofing.

Generally teff straw is used more for fattening than for dairy, while barley/wheat straw is used more for dairy than fattening. Farmers have different preferences for teff straw derived from cattle threshing and from combine harvesting. For example, in Mojo area, it was reported that teff straw from threshing by cattle was preferred to teff straw from combine machine harvester. The reason given was that the straw from machine thresher would be longer and so less convenient for cattle to consume, while the straw from threshing by cattle is shorter, more crushed and finer. Farmers reported that the very fine part of the straw is blown away by wind in the case of combine threshing, while it settles

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10. While hay is harvested in September–October, teff straw is produced upon teff threshing in December or later.

11. The misconception that rice straw reduces milk yield and might cause infertility has faded away and farmers now use rice straw as feed widely. The IPMS project has been promoting the use of urea treatment of rice straw to improve the nutritive value of rice straw in Fogera. Despite that fertilizer prices have dramatically increased some farmers are continuing to use this urea treatment on rice straw.

on the ground during threshing by cattle. In Shashemene, the same situation applies to wheat straw.<sup>12</sup>

Users generally have different preferences between barley and wheat straws. In all of the study areas but Shashemene, dairy farmers tend to prefer barley straw to wheat straw. In Shashemene area, dairy producers prefer wheat straw to teff and barley straws. One of the reasons, as reported by respondents, is that wheat straw mixes more easily with other feed types than barley straw. Teff straw is, however, preferred for oxen, small calves and construction in Shashemene area. Similarly, in Mojo area, dairy farmers prefer barley to other types of straws,<sup>13</sup> while fatteners prefer teff straw for they believe that animals fed on teff straw put on weight more quickly. In Mekelle area, while barley straw is more preferred for dairy, wheat straw tends to be preferred for fattening. Generally, however, barley straw is preferred to wheat straw in Mekelle area. Generally, among straw types, it looks like while dairy farmers prefer barley or wheat straw, fatteners tend to prefer teff straw. Some farmers perceive that teff straw reduces milk yield.

Farmer preferences for hay as feed differ between dairy and fattening. For example, in Bishoftu, Mojo, Adama, Sululta, Gondar, and Addis Ababa areas, hay is used mainly for dairy as opposed to fattening.<sup>14</sup> Hay is also more preferred for dairy than teff straw. In Sululta area, farmers reported that four hay grass species, locally known as ‘Balemi’, ‘Kumute’, ‘Sendafa’ and ‘Fura’ are produced. While Balemi, Kumute and Sendafa are preferred for dairy, Fura is preferred for fattening. Respondents also indicated that Balemi is generally more preferred compared to Sendafa. In Debre Tabor area, different types of hay are supplied and hay grass species locally known as ‘Serdo’ is the most preferred.

## 4.7 Feed storage

Teff straw is stored in heaps of conical or pyramidal forms either at homesteads or in the fields. The heaps are stored usually on open areas, and rarely under shades. The heaps are made in such a way that they do not let rain water percolate the heaps. The heaps in the field are fenced with thorny bushes to protect them from animals. As reported by farmers, a properly made heap (compact and tilted slope from the top to the foot) can stay for several years with minimum quality deterioration. Large traders and commercial livestock producers store baled straw under shades.

Like teff straw, hay is stored in heaps. Users usually store for up to a year. Hay is stored under shade and in the open air. Commercial hay producers usually store hay for less

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12. Combine harvesters are used widely for wheat in Shashemene area.

13. Dairying is not common in Mojo area; fattening is more widespread.

14. Farmers perceive that animals that fed on hay will not be able to take concentrates in required amount.

than five months. But, as reported by the producers, hay can be stored for several years if it is protected from moisture and rodents.

Stovers are usually first stored in heaps in the fields for a short time, after which they are transported to homesteads and stored in heaps again. The duration of field storage varies from area to area. In Metema, farmers store sorghum stover in the fields while it is greenish in colour in order to dry it and preserve the feed quality. The stover is then transported to homesteads within a month's time, and stored horizontally on a raised 'bed', locally known as Arkuba. The stover is thinly spread over the 'bed' so that rain drops would easily pass through without staying on the stover. Moreover, the raised bed is needed to protect the stover from termites. In Miesso farmers usually store stover in the fields in heaps. The stover is stored in a slant standing position in heaps in order to protect it from termites.

## 4.8 Demand for fodder

The demand for fodder appears to be increasing in Ethiopia because of the increase in market-oriented livestock production activity. In areas where dairy is important, there seems to be a year round demand for fodder. However, demand for fodder for fattening is seasonal.

In general, the demand for straw, stover and hay is higher than the available supply at given prices. The demand for hay in Ethiopia looks to be higher than for other straw and stover types. In some areas such as Bishoftu, the demand for straw has shown significant increase due to the expansion of dairy farming. In Metema area, sales volume of sorghum stover has increased considerably due to the expansion of livestock export.<sup>15</sup>

In Sululta area, hay export to Djibouti and the Middle East as feed for the exported animals was reported to be an important reason for the increase in price. Similarly, in Alaba, as reported by the farmers, the supply of hay to the open market is declining from year to year due to expansion of crop land into grazing areas. In Gondar area, demand for hay is increasing, perhaps because of the increasing live animal export trade to Sudan. In Debre Tabor area, the demand for hay is very high due to the increase in market-oriented dairy farms.

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15. It was reported that one hectare of land can yield about 40 donkey cart loads of stover in the Metema area. Considering average price of ETB 85 per donkey cart load, ETB 3400 revenue is obtained from stover sale from one hectare.

## 5 Agro-industrial by-products supply and demand

Agro-industrial by-products from flour and edible oil mills, grind mills and local brewery are sold in all of the study areas. There are several flour mills in the towns of Addis Ababa, Adama, Mekelle, and Gondar. The number of edible oil mills is lower than that of the flour mills in all the study areas except Gondar.

### 5.1 Types of agro-industrial by-products supplied

#### Wheat bran

Three types of wheat bran are supplied in the study areas, viz., fine, coarse and mixed. Mixed bran is produced by some factories that do not sieve out the coarse bran. Wheat bran is also differentiated based on the type of wheat. For example, it was reported that wheat bran from durum wheat is of higher quality than from the bread wheat, because it has more flour content.

#### Seed cakes

The seed cakes supplied in the study areas are from noug, cotton, linseed, and sesame. The importance of the particular seed cakes vary from place to place. Below, we give descriptions of the supply situation of the seed cakes in the study areas.

Different types of seed cakes are important in different places. For example, in Adigrat area, the seed cakes traded are noug, linseed, and sesame seed cakes, in that order of importance. In Shashemene, linseed cake is the most traded. In Adama town, linseed, cotton and noug seed cakes are most supplied. In Zeway, linseed cake is most traded, followed by noug and cotton seed cakes.

In Gondar, the seed cakes produced in the town are sesame, noug, cotton, safflower, mixed sesame–noug, and mixed safflower–sesame seed cakes. There is no linseed cake production in Gondar. In Debre Tabor area, only noug cake is produced and traded in the town, very occasionally mixed with safflower. The area is an important grower of noug.

### 5.2 Quality of agro-industrial by-products supplied

Below we present buyer and seller perceptions of the quality of agro-industrial by-products as animal feed. Buyers and sellers use different methods to assess the quality of wheat bran and seed cakes. Quality of wheat bran is assessed by visual observation and smelling. Quality of seed cakes is assessed by visual observation, smelling and soaking

in water. Seed cakes that easily absorb water are considered of better quality. There is no standardized quality control method for wheat bran and oilseed cakes. But users crudely classify these by-products into poor and good quality.

## Wheat bran

Mixed wheat bran is considered of better quality than pure fine or pure coarse because of its good proportion of flour and husks. Reportedly, coarse wheat bran has poor nutritional value while fine bran may cause bloating to animals. According to respondents, good quality wheat bran is the one which has good proportion of flour and husks, has not developed mould, is not solidified, is whitish in colour, is not adulterated with foreign materials and does not have bad odour. Respondents also indicated that density is a good indicator of quality for grind mill by-products. Reportedly, the higher the density, the better the quality, because weight is an indication of the proportion of flour inside the by-product. Respondents in Mekelle and Awassa indicated that quality of wheat bran also vary by the mill that produces them.

## Seed cakes

The quality of seed cakes is affected by extraction method, number of extractions and adulteration. Noug or linseed cakes can be adulterated with rape seed, mustard or safflower during extraction. Farmers reported that the noug and linseed cakes which are adulterated with rape seed and mustard have low intake and also may create health problem on animals. According to farmers, the noug and linseed cakes adulterated with safflower do not create health problem on animals but do not easily mix with water and thus are less palatable.

The type of extraction method also creates quality differences. Modern and big edible oil mills use organic solvent extraction method which squeezes most of the oil and the resultant seed cakes are considered poorer in quality. The other extraction method is mechanical pressing method, which is not efficient in oil extraction. The cake produced from this method is considered of better quality. Seed cakes should contain some oil lest they become very tough for the animals to feed on.

Number of extractions also affects quality of cakes. For example, cotton seed cake obtained from second round extraction is reportedly preferred to the cake obtained from the first round extraction since the latter has too high oil content. Cakes can also be produced in fine and coarse form by varying machine adjustments. Livestock producers prefer fine seed cakes to the coarse ones.

## 5.3 Units of sale

Wheat bran is sold in different amounts. Wheat bran is packed in 25 and 50 kg sacks. However, some shops retail bran in as small amounts as one kg. In Zeway area, traders sell bran in buckets of 20 litres.<sup>16</sup> In general, about 70% of bran is used by urban farmers, and the remaining proportion is used by rural farmers. Seed cakes are sold in sacks of different size and are retailed in kgs.

## 5.4 Season and time of sale

In general, the demand for agro-industrial by-products is lower during the wet season and during crop harvest because of the availability of grass/hay and crop residues. Fattening activity in major towns like Adama in the wet season is also low which contributes to the low demand for agro-industrial by-products during the season. Agro-industrial by-products are usually sold in stores throughout the day, or in the open market during market days.

## 5.5 Uses and preferences

### Wheat bran

Wheat bran is used to feed different types of animals. In general, users prefer mixed bran to fine or coarse. According to farmers, fine bran creates health problem on livestock, and thus farmers feed animals by mixing it with other feeds. Fine bran is usually used for poultry. Users across the study sites buy wheat bran in small amounts. In some areas, fine and coarse bran are fed to different animals. For example, in Wukro area, users feed fine wheat bran to dairy animals and horses, and coarse bran to oxen and sheep. In Awassa, fine bran is preferred for fattening while coarse bran is preferred for dairy animals.<sup>17</sup> Similarly, in Bishoftu area, fatteners prefer fine wheat bran.

### Seed cakes

Seed cakes are used to feed different animals and for export. Farmer preferences for the types of seed cakes differ by the purpose of feeding. For example, in Adama, linseed and cotton seed cakes are preferred to noug seed cake for fattening. However, fatteners in this area feed fattening animals with small amounts of noug cake at the last cycle of fattening because they believe that noug cake gives the fattened animal smooth and shiny hair, and results in red meat.

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16. One bucket weighs 4–4.5 kg.

17. Farmers in this area perceive that dairy animals fed with fine bran become fat and yield less milk.

Dairy producers prefer noug seed cake to linseed cake, because they believe that dairy cows fed with linseed cake become fat and milk yield decreases. Farmers in the surrounding rural area of Adama town also buy cakes to feed oxen specially during ploughing. According to users, sesame–noug mixed seed cake is the most widely used in Gondar area, perhaps due to availability. In the Adama area, cotton seed cake is exported more than other seed cakes.<sup>18</sup>

Unlike in other areas, rural people are the major buyers of the cakes in Mojo because of the prevalence of fattening activity in rural areas. In Zeway, users feed cakes to cattle, donkeys, horses and sheep. In Bahir Dar, it was reported that rape seed cake was not used as feed since it is toxic. Rape seed is rather used as fertilizer.

## 5.6 Storage

### Wheat bran

Like other agro-industrial by-products wheat bran is sensitive to humidity. The shelf life of bran is lower than that of seed cakes. Traders reported that bran can be stored for two months in the dry season while it can be stored only for one month in the wet season. Bran cannot be stored for long because it solidifies. Thus producers, traders and users reported that they do not keep wheat bran for a period of more than two months. Users usually buy wheat bran enough for 1 to 2 weeks because of its short shelf life. The shelf life of bran is also affected by type of storage. Bran stored in ventilated stores can have longer shelf life than bran stored in non-ventilated stores, according to traders.

### Oilseed cakes

Seed cakes need care while stored. The cakes should be aerated, lest they would be heated and become too dry, which shortens their shelf life. The cakes should also be protected from moisture while being transported or stored. According to traders, linseed, cotton and noug seed cakes have shelf life of about 5–6, 2–3, and 3 months, respectively. Noug cake stored in piles over one another may be heated and its shelf life reduced. On the contrary, linseed and cotton seed cakes stored in piles do not easily get heated up.

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18. Adama edible oil factory exported 8000 quintals of cotton seed cake to Saudi Arabia in 2005/06. Cotton seed cake is also exported to Sudan from Gondar.

## 5.7 Demand

### Wheat bran

Generally, there appears to be year round demand for wheat bran in most of the study areas, except in areas where commercial livestock production is very weak. The volume of wheat bran sale is increasing over time. For example, in the Adigrat area, in 1994, the monthly per trader sale was estimated to be about 50 quintals, while in 2006/07 it was about 225 quintals. Moreover, the demand as estimated by the trader was about threefold of the existing supply. Similarly, in Awassa, the demand for wheat bran is increasing significantly. In some areas, demand for bran seems to vary by season. For example, in Bishoftu area, demand for bran is very high during February–June, the fattening season.

Apparently, wheat bran is transported long distances for sale. For example, it was reported that previously, the town of Adigrat used to receive wheat bran supply from the mills in Bahir Dar (about 700 km away), Gondar (about 550 km away), Dessie (about 550 km away) and Shire Endaselassie (about 250 km away). Now, the sources of bran for Adigrat are the towns of Mekelle (about 130 km away), Shire Endaselassie, Axum (about 160 km), and Adigrat itself. Similarly, the town of Soddo gets its supply of bran from as far as 350 km away.

### Seed cakes

As is generally true with wheat bran, the supply of seed cakes is lower than the demand in most of the study areas at prevailing prices. For example, as reported by traders in Shashemene area, there is an increase in volume of sale for all types of cakes. Since 2005/06, rural people in Shashemene area are increasing their purchases of seed cakes possibly because of increasing feed shortage, market orientation and increasing awareness of the importance of seed cakes as feed. Similarly, in Adama, the demand for cakes is increasing because of the increase in the number of fatteners in the town. It was estimated that the volume of sale in 2006/07 in Adama area was fivefold that of 2003/04.

## 6 Manufactured feed supply and demand

### 6.1 Manufactured feed

There are about 15 feed mixers and millers in the country as observed during the study period (see Annex 2 for names and other information). However, only five of them are manufacturing purely for sale. The rest produce primarily for own consumption, with occasional sales when there is excess production over their own demand. The mixers and millers produce feed mixes for poultry, dairy and beef, in that order of importance based on volume. Small ruminant feed mixes are also produced. However, there is variation from plant to plant in the type of feed being focused on.

The five big commercial feed mixers and millers are located in the towns of Adama, Mojo, Bishoftu, and the Addis Ababa suburb of Akaki and Kality. The mixers and millers sell mixes directly to users; no traders are involved in the sale of feed mixes. Prices of manufactured feed are increasing over time. Mixers and millers reported that they face increasing supply shortage of the agro-industrial by-products used in feed formulation. Below we give brief description of the operation of three of the mixers and millers.

#### Mojo Animal Feed Mixer and Miller PLC

The Mojo Animal Feed Mixer and Miller PLC., located in the town of Mojo, manufactures feed for beef, dairy, poultry, sheep, and goats on order basis. The factory has standard formulae for all feed types. The factory also formulates feed based on formulae provided by the feed buyers. The company has only one year of experience in mixing and milling feed after it was transferred to the current owner. Prior to the transfer, it had operated for five years. The plant has a capacity to produce 40 quintals per hour. The manufactured feeds are sold to urban and rural farmers in beef and dairy production, including fatteners residing in Adama town. The plant caters mainly for fatteners followed by dairy and poultry farmers. The plant also exports feeds to Djibouti.

There is reportedly irregularity in the production of the formulated feeds. The production depends on the amount of orders the plant receives. When the plant wins auction, it can produce for 24 hours. In such occasions the plant can produce from 5000–6000 quintals of feed per month. The average monthly production as reported by the management is about 3000 quintals. The demand for the feed fluctuates with the fattening activity in the surrounding areas.

The plant uses corn, wheat screening, fine and coarse wheat bran, linseed cake, noug seed cake, limestone, salt and premixes (vitamins and minerals) as input for formulating

the feeds. These inputs are bought from Addis Ababa. Wheat screening is also bought from the towns of Adama, Bishoftu, Kibre Mengist and Awassa. Similarly, cotton seed cake and limestone are purchased from Adama and the Muger Cement Factory, respectively.

During the study time, beef and dairy feed mixes are sold for about Ethiopian ETB (ETB) 165/quintal<sup>19</sup> (ETB 12.4571 = USD 1.00 at July 21, 2009). It appears that beef feed mix has higher demand than dairy feed mix. There are different categories of feed mixes produced for dairy and poultry. For dairy, they are calf, heifer, bull and milking cow feeds, while for poultry they are starter, grower, layer and broiler feeds. Only one type of feed mix is formulated for beef, sheep and goats. The factory also produces pellet, by using molasses and other ingredients. Pellet can be used to feed all types of animals. Pellets are also produced on order basis.

## Bora Animal and Poultry Feed Processing PLC

This factory, located at Bishoftu town, manufactures poultry, dairy, fattening, shoat and pig feeds, on order basis. About 90% of the feed mix produced by the plant is poultry feed mix. The plant uses the international standard feed formulation formulae in manufacturing different feed types.

The factory sells the feeds mostly to governmental poultry farms (e.g. Bonga and Soddo poultry production centres). It also sells to associations and the National Disaster Prevention and Preparedness Commission (DPPC) and others. In 2001/02 the factory exported about 900 quintals of shoats feed mix to Djibouti. However, the export did not continue after that.

In producing poultry feed the factory targets different agro-ecologies: lowland, mid-highland and highland areas. The factory adds more fatty feed ingredients to feeds meant for cooler areas in the highlands. Poultry feed is made of corn, noug and linseed cakes, fine wheat bran, wheat screenings, soybean, fish meal, molasses,<sup>20</sup> lime<sup>21</sup> and broken biscuits. The factory uses different corn types for poultry and cattle feed formulations. It was reported that the factory uses high and low protein maize for poultry and for cattle feed formulations, respectively. The price of formulated poultry feed rose from ETB 80 per quintal in 2005/06 to ETB 180 in 2006/07.

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19. One quintal is equivalent to 100 kg.

20. The price of molasses was ETB 0.4 per litre in 2006/07, and ETB 0.25 per litre in 2005/06.

21. The price of lime was ETB 35/quintal in 2006/07 and ETB 30/quintal in 2005/06, and ETB 25/quintal in 2004/05.

The factory buys corn, noug cake, linseed cake, fine wheat bran and soybeans from Addis Ababa, and wheat screenings from Bishoftu and Addis Ababa. Broken biscuits are also bought from food factories. Molasses are purchased from Metehara Sugar Factory, and limestone from the Derba area. The factory produces fish meal for use as an input in the feed formulation.

## Kality Feed Mixer and Miller PLC

The Kality Feed Mixer and Miller PLC was established in 1976 by the Ethiopian Government. It manufactures poultry, dairy, beef, sheep, goat and swine feed mixes. Most of its produce is poultry and dairy feed mixes. The types of poultry feeds produced are starter, layer, grower and broiler feed mixes, while the cattle feeds formulated are dairy, heifer, calves, bulls and beef feed mixes. For sheep, goat and swine the factory manufactures mother, kid, and fattener feeds.

About 50% of dairy and poultry feed mixes are sold to government institutions. Small farms also buy feed from the plant. Although intermittent, the plant exports feed mixes to Djibouti. The factory sells 2000–3000 quintals of feed mix per month. In value terms this amounts to ETB 0.6 to 0.7 million. There seems to be stable demand for dairy and poultry feed throughout the year. However, the factory formulates pig, sheep, goat and broilers feed on order. It was reported that input prices are driving up the prices of feed mixes. Moreover, the plant faces shortage of wheat bran, and oilseed cakes.

## 7 Feed prices

The spatial variability of feed prices was analysed for all types of feed in at least some of the study sites. However, the seasonal variability of feed prices for 2006/07 was analysed for loose and baled teff and wheat straws, barley/wheat mix straw for the study sites where secondary price data were available. It was possible to collect price data mostly for areas where a particular feed is important.

### 7.1 Teff straw

#### Spatial variability of teff straw prices

Teff straw prices appear to show significant variations across the study sites (Table 3). Available data on teff straw price showed that prices could vary from ETB 0.65/kg to ETB 2.00/kg. In general, the price of teff straw also varies from year to year depending on the rainfall pattern.

**Table 3.** *Teff straw prices*

Study site	Date of data	Price (ETB/kg)	Market place
Alamata	April 2007	0.75	Farm gate
Alamata	May 2006–April 2007 (average)	1.50	Open market
Alamata	May–July 2006 (average)	1.00	Open market
Alaba	March 2007	0.65	Open market
Alaba	May–July 2006 (average)	1.00	Open market
Shashemene	April–May 2007 (average)	1.30	Open market
Adama	April 2007	2.00	Roaming in town
Adama	April 2007	0.50	Farm gate (baled)
Adama	September 2006–April 2007 (average)	1.70	Roaming in town
Bishoftu	April 2007	1.33	Open market
Metema Yohannes	May 2007	2.00	Open market
Gondar	May 2007	2.00	Open market
Woreta	May 2007	0.50	Open market
Bahir Dar	May 2007	2.00	Open market
Mojo	Average of April 2006–March 2007	0.70	Open market
Addis Ababa	Average of April 2006–March 2007	1.25	Open market

There also seems to be significant differences in prices between farm gates and retail markets. For example, in Alamata the farm gate price of teff straw was about ETB 0.75/kg in April 2007, while the average retail price for the year from May 2006 to April 2007

was ETB 1.5/kg. Farm gate price of teff straw was reported to be about half as much as the open market retail price in Woreta. The price of teff straw in Alaba was about ETB 0.65/kg in March 2007, but respondents indicated that prices would increase to about ETB 1/kg in the wet season when there is construction of mud houses in the town. In Bahir Dar, teff straw was sold for ETB 2/kg in May 2000.<sup>22</sup>

In Adama, teff straw was sold for ETB 2/kg in April 2007, while the yearly average price was estimated at about ETB 1.70/kg. However, farm gate prices are much lower at about ETB 7–8/bale (or ETB 0.50/kg). It was reported that teff straw price has risen sharply during the last 10 years in Adama, perhaps because of increased mud house construction and increased urban and peri-urban animal agriculture in the area.

In Bishoftu, teff straw<sup>23</sup> was sold for about ETB 1.33/kg in April 2007, compared with wheat and barley straw price of about ETB 1/kg. Similarly, it was reported that price of teff straw could be twice as much as the price of wheat or barley straw in Gondar.

## Seasonality of teff straw prices

Seasonality of loose teff straw retail prices was analysed for Mojo, Adama, Shashemene, Woreta, Alamata and Addis Ababa, while seasonality of baled teff straw prices was analysed for Bishoftu and Mojo (Figures 2–5). The seasonality of the loose teff straw retail prices and the farm gate baled teff straw prices indicate that, generally prices rise during the wet and dry seasons, and fall during harvesting period because of higher supply. However, there are slight variations in this pattern across the study sites. Particularly, retail prices of loose teff straw in Shashemene appear to be lowest in the wet season (Figure 3).

## 7.2 Barley/wheat straw

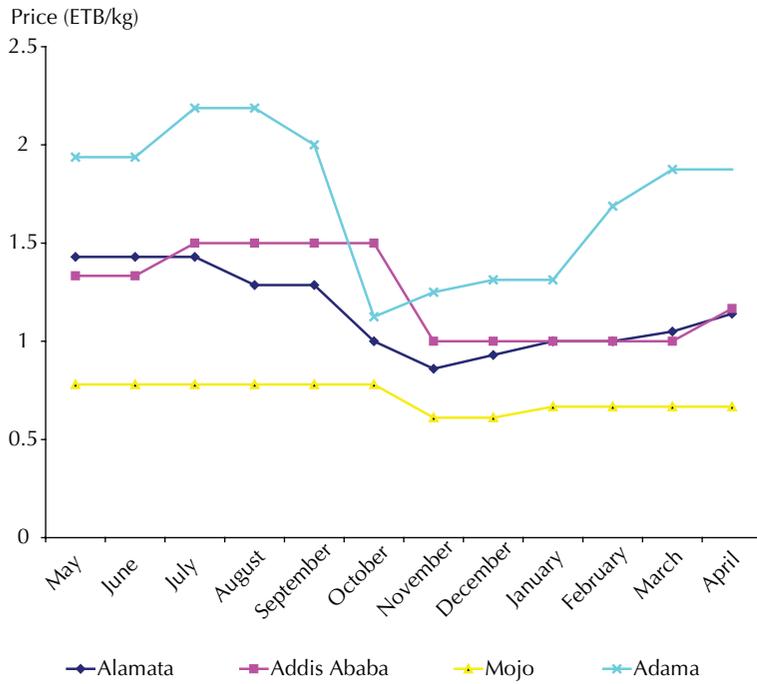
### Spatial variability of prices

In general, there is no large difference between the prices of pure wheat and barley straws. Available data indicate that price of barley/wheat straw (either pure or mixed) ranges from ETB 0.60/kg to ETB 1.00/kg (Table 4). Generally, as with teff straw prices, the average price of barley/wheat straw rise during the dry and rainy seasons but fall during the harvest period (Figures 6 and 7). Available data also indicate that barley/straw prices are usually higher during market days than during non-market days. For example, in Mojo area, straw prices are usually higher by about ETB 4–5 per donkey load during the market days, when the number of buyers and sellers is high.

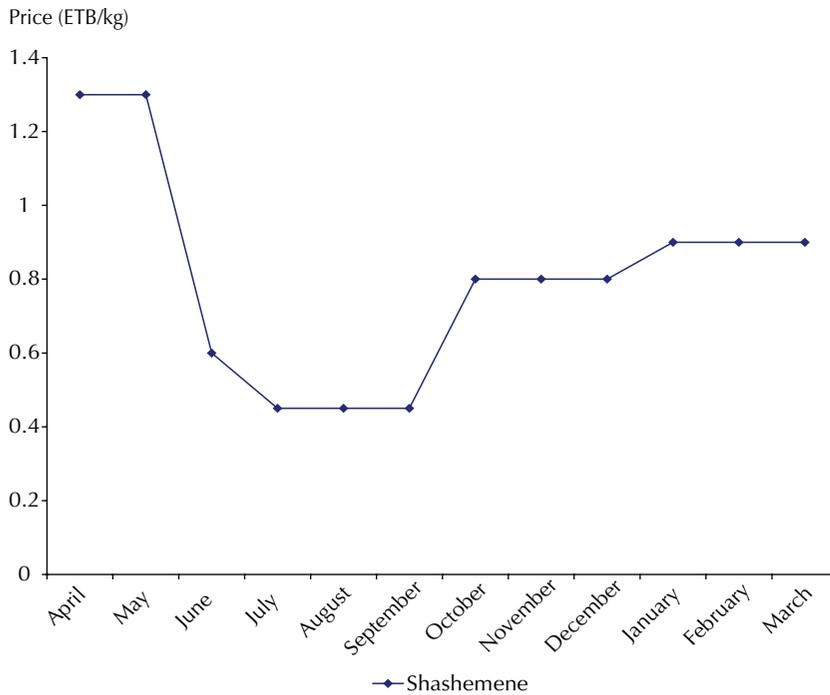
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22. Interestingly, millet straw was sold for ETB 2.4/kg in Bahir Dar in May 2007.

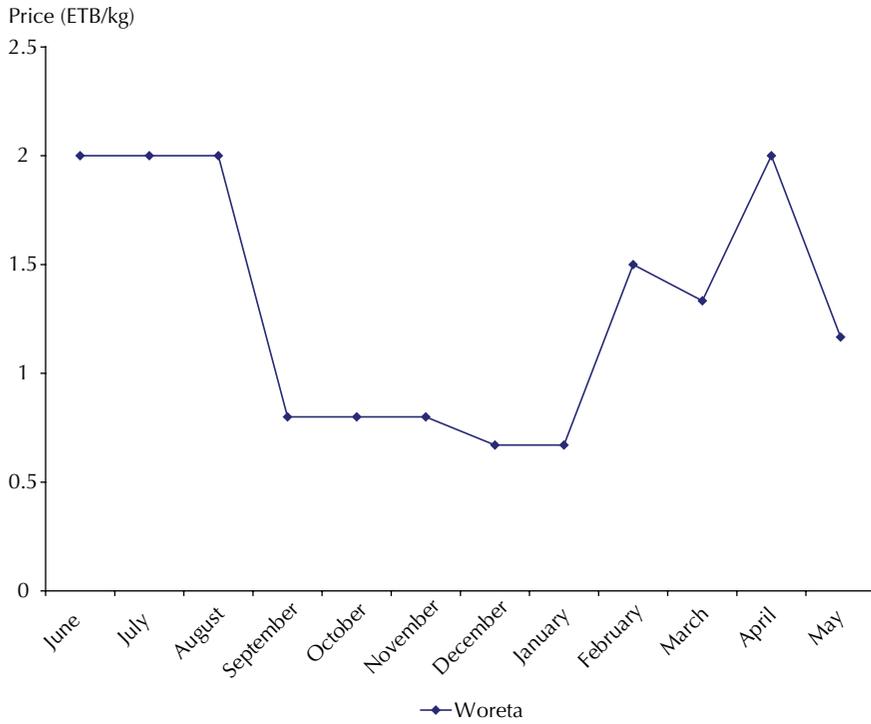
23. In Bishoftu wheat or barley straws are locally called 'geleba' while teff straw is called 'chid'. Sometimes geleba may be bought/sold mixed with pulse residues.



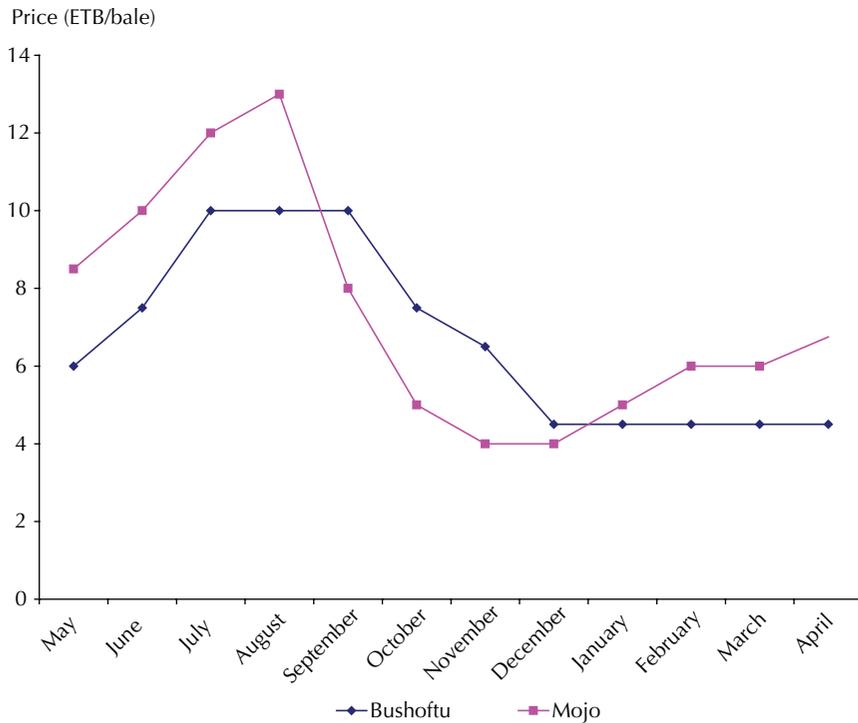
**Figure 2.** Seasonality of loose retail teff straw in Alamata, Addis Ababa, Mojo and Adama, 2006/07.



**Figure 3.** Seasonality of loose teff straw retail price in Shashemene, 2006/07.



**Figure 4.** Seasonality of loose teff straw retail prices in Woreta, 2006/07.



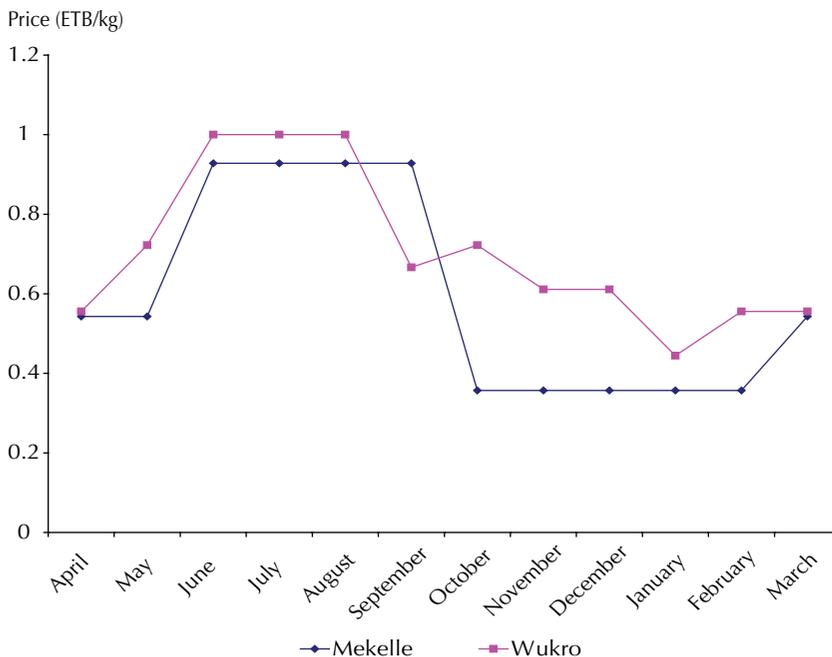
**Figure 5.** Seasonality of baled teff straw farm gate price in Bishoftu and Mojo, 2006/07.

**Table 4.** Barley/wheat straw prices

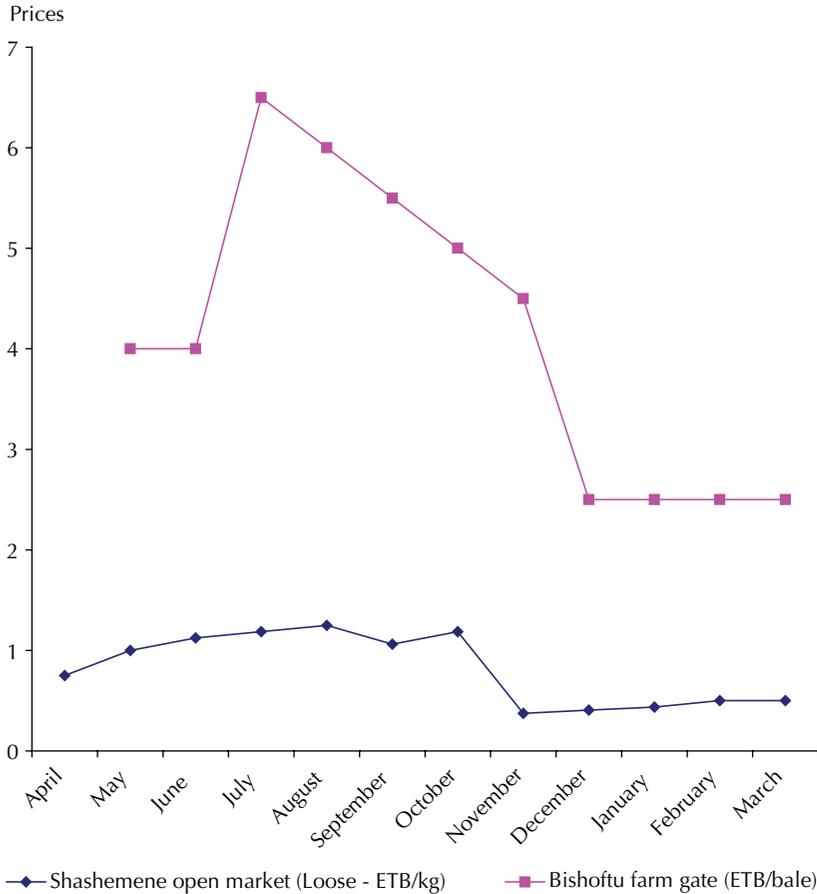
Study site	Date of data	Type of straw	Price (ETB/kg)	Market place
Mekelle	April 2006–May 2007 (average)	Barley/wheat mix	0.60	Open market
Wukro	May 2006–April 2007 (average)	Barley/wheat mix	0.70	Open market
Wukro	April 2007	Barley/wheat mix	1.00	Open market
Shashemene	May 2006–April 2007 (average)	Wheat	0.80	Open market
Shashemene	May 2006–April 2007 (average)	Wheat	0.25	Farm gate

## Seasonality of barley/wheat straw prices

The seasonality of barley/wheat mixed straw prices was analysed for the Mekelle and Wukro markets in Tigray. Available data indicate similar pattern in seasonal variability as that of teff straw. Prices of barley/wheat mixed straw tend to be highest during the wet season, lowest during the harvest season, with a rising trend during the dry season (Figure 6). Analysis of retail loose and baled wheat straw prices also show similar pattern.



**Figure 6.** Seasonality of mixed wheat/barley straw retail price in Mekelle and Wukro, 2006/07.



**Figure 7.** Seasonality of wheat straw retail price in Shashemene and Bishoftu, 2006/07.

## 7.3 Sorghum stover

### Spatial variability of price

Secondary data on sorghum stover prices were available for Mieso, Alamata and Metema. The prices of sorghum stover differed by the type of sorghum in the Mieso area (Table 5). The sweet sorghum stover had higher price in Mieso at ETB 0.70/kg compared with ETB 0.50/kg for the non-sweet sorghum stover. The farm gate prices of sorghum stover in Mieso were about one-third of the open retail market prices.

**Table 5.** *Sorghum stover prices in Mieso and Alamata*

Study site	Date of data	Type of straw	Price (ETB/kg) or as indicated	Market place
Mieso	April 2007	'Ala' variety (sweet sorghum)	0.65	Open market
Mieso	April 2007	'Kera' variety (non-sweet sorghum)	0.50	Open market
Mieso	April 2007	Ala variety (sweet sorghum)	0.20	Farm gate
Mieso	April 2007	Kera variety (non-sweet variety)	0.125	Farm gate
Alamata	May 2006–April 2007 (average)	Unknown	800–1000/ha	Farm gate
Metema	April 2006–May 2007 (average)	Unknown	0.45/kg	Farm gate

There has been sharp increase in the price of stover in Alamata area recently. Stover users reported that in 2005/06 the price of sorghum stover was very low, sold in exchange for labour for harvesting sorghum plus ETB 30 cash payment per hectare. In 2006/07 the price of one hectare of stover heaped on the farm was reported to be ETB 800–1000. In Metema, one donkey cart load (locally called 'karo'), which is equivalent to about 200 kg, was sold for an average of ETB 90 in 2006/07.

## 7.4 Hay

### Spatial variability of prices

Available price data indicated that there is significant price differences between farm gate and wholesale prices of hay (Table 6). Farm gate prices are about half of wholesale prices. Interestingly, significant price differences also occur when buyers lease in plots of land for hay production at the beginning of the rainy season than when they buy during harvest. For example, in Woreta, there was a price difference of about ETB 250/ha. Available price data indicated that hay prices are higher in Sululta than in Sendafa area, perhaps because of the quality differences (Table 6).

It was reported that hay prices have increased significantly in recent years. For example, in Sululta area a bale of hay was sold for ETB 1.66/kg in May 2007, while the average price in 2005/06 was ETB 0.65/kg. Similarly, in Alaba area, hay price was ETB 0.50/kg in March 2007, while the average price during the previous year was about ETB 0.30/kg. In Gondar, it was reported that one Isuzu truck load of hay in Tseda village (a village where commercial hay production on cultivable land is common) sold for ETB 700 in May 2007, while the price was about ETB 550 in 2005/06. The rise in the price was mainly

due to the increase in demand. The prices of hay do not seem to exhibit the pattern of seasonal variability observed for the other feed types. There seems to be much less intra-year variability in hay prices.

**Table 6.** *Prices of hay in different study sites*

Study site	Date of data	Loose or baled	Price (ETB/kg or as indicated)	Market place
Sululta	May 2007	Baled	1.66	Wholesale market
Sendafa	Average of November 2006–April 2007	Baled	0.50	Farm gate
Sendafa	Average of November 2006–April 2007	Baled	1.00	Wholesale market
Alaba	March 2007	Loose	0.50	Open market
Alaba	March 2006	Loose	0.30	Open market
Woreta	June 2007	–	400/ha lease	Farm gate
Woreta	November 2007	–	650/ha lease	Farm gate
Bahir Dar	May 2007	Loose	270/donkey cart load	Open market
Debre Tabor	Average of 2007	Loose	1.00	Open market

## 7.5 Wheat bran

### Spatial price variability

Available price data showed that wheat bran price ranged from ETB 0.80/kg to ETB 1.25/kg in 2007 (Table 7). However, there appears to be significant rise in wheat bran prices over time, because of rising wheat prices and increasing demand for the bran. Generally, prices of fine and coarse bran are not significantly different, although the supply of coarse bran is much higher than that of fine bran.

## 7.6 Oilseed cakes

### Spatial price variability

Available price data showed that generally, among linseed, cotton and noug seed cakes, linseed cake is most expensive, followed by cotton seed cake (Table 8). For example, in Zeway the price of linseed seed cake was as high as ETB 2.50/kg in May 2007. Generally, the prices of seed cakes fall during the wet season and rise during dry season due to demand and supply variability. As with other feed types, there is a sharp increase in seed cake prices recently due to increase in the fattening activities.

**Table 7.** Retail (shop) prices of wheat bran in different study sites

Study site	Type of bran	Date of data	Price (ETB/kg)
Endasselassie	Fine or coarse	March 2007	1.20
Soddo	Fine or coarse	March 2007	1.00
Alaba	Coarse bran	March 2007	0.80
Alaba	Fine bran	March 2007	0.90
Yirgalem	Mixed bran	March 2007	1.25
Awassa	Fine or coarse	May 2007	1.00
Adama	Fine or coarse	April 2007	1.10*
Adama	Fine or coarse	Average of 2006	0.50*
Addis Ababa	Fine or coarse	Average of 2007	1.20
Addis Ababa	Fine or coarse	Average of 2006	0.60
Bahir Dar	Fine or coarse	Average of 2007	1.25
Gondar	Fine or coarse	Average of 2007	1.00

\* Factory gate prices.

**Table 8.** Oilseed cake prices

Study site	Type of seed cake	Date of data	Price (ETB/kg)	Market place
Woreta	Noug	Average of 2007	0.70	Factory gate
Debre Tabor	Noug	Average of 2007	1.00	Factory gate
Debre Tabor	Noug	May 2007	1.80	Retail shops
Zeway	Noug	May 2007	1.70	Retail shops
Adama	Linseed	April 2007	1.45	Wholesale
Zeway	Linseed	May 2007	2.50	Retail shops
Debre Tabor	Linseed	May 2007	2.00	Retail shops
Zeway	Cotton	May 2007	1.70	Retail shops
Gondar	Cotton	May 2007	1.70	Retail shops
Gondar	Cotton	Average of 2006	0.80	Retail shops

## 8 Market places, actors and institutions

### 8.1 Market places

#### Teff straw

Teff straw is sold at farm gates and open markets. However, open market sale is more common across the study areas. In areas where teff straw is very scarce (e.g. Soddo and Awassa), teff straw is sold only at farm gates, perhaps because of the high demand for construction purposes. Some traders who buy teff straw at farm gate bale the straw in the fields. Some of the study sites do not have open market places for straw. In such cases, farmers roam around towns with donkey loads for sale.

Interestingly, in the Adama area, we observed that the places where teff straw is sold depend on the amount of sale: farmers with high and very low volume usually sell straw at farm gate, while those who have medium volume usually sell in town. Those who produce small amount are usually poor households and sell the straw after harvest when prices are relatively low; they sell early due to their limited alternative source of cash income. Large producers sell generally when prices are higher. Households with medium volume of straw usually distribute their sale over several months. The richer households prefer to sell straw at farm gate since the amount of straw is so high that retailing in towns using donkeys becomes difficult, or perhaps buyers have the incentive to travel to farm gates to buy large amount.

#### Barley/wheat straw

While open market places are widely used to sell barley/wheat straws, farm gate sales are used in a limited way. Some of the study sites have more than one straw market places, while others do not have open market place at all. For example, there are two big open straw market places in Mekelle town.<sup>24</sup> Most of the barley/wheat straw in Mekelle is sold in the open market directly by farmers, with limited involvement of straw traders. It was reported that straw sale has long tradition in Mekelle. In Bishoftu, there is no straw market place; producers usually roam around the town to sell their straw.

#### Sorghum and maize stovers

Sorghum and maize stovers are mostly sold *in situ* after harvest, perhaps because of the difficulty to transport to homesteads. In some cases, such as Zeway, farmers sell the green

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24. In terms of size of barley and wheat straw supplied to the open market, Mekelle stands first, followed by Shashemene and Woreta.

stover *in situ* to traders and the traders harvest and transport the stover for retail in the town. In Mieso, some farmers retail sorghum stover in the town. Millet straw is also sold both at the open market and at farm gate.

## Hay

The supply of hay to the open markets in most of the study sites is limited, since most of it is sold *in situ*. Grass for hay is mostly sold while standing or by heaps after harvesting, but traders sell hay mostly baled.

In Awassa, hay is not sold in the open market but sheep fatteners and some land owners lease grass fields for hay production. The fatteners reported that the price of one hectare of grass land was ETB 1350 in 2006/07. The grass land is harvested twice in a year (in July and December). In Woreta open market, hay sale is limited but commercial livestock producers in the town pay for the grass fields in July and harvest in November.

## Agro-industrial by-products

Traders sell bran in consumer or grain shops, alongside other items. There is very limited open market sales of brans. Open market sale for brans was observed only in Shashemene. Seed cakes are mostly sold in food grain shops, where other feed types might also be sold. Open market sale of seed cakes is very limited, perhaps because of difficulty in handling. Users, especially rural users, prefer to buy directly from the processors, because of higher certainty of quality.

## 8.2 Market actors

Animal feeds are purchased by different types of users who deal with livestock and poultry activities. These are subsistent and market-oriented rural farmers, urban dairy producers and fatteners, commercial poultry producers, livestock and poultry traders, feed processors, abattoirs, live animal exporters, feed exporters and house builders. Feed is sold by different types of sellers. Below we give a brief account of the buyers and sellers.

### 8.2.1 Type of buyers

#### Subsistent farmers

Some subsistent farmers purchase agro-industrial by-products especially wheat bran and seed cakes for their oxen and other preferred animals. These farmers usually buy

feed in the dry season and during ploughing period. This is the time when availability of natural pasture and crop residues become very low. Some farmers reported that they purchase agro-industrial by-products with the revenue earned from the sale of crop residues. Subsistent farmers who do not produce enough own crop residues also buy crop residues, although in limited amount. In Metema area, farmers buy locally produced sesame seed cake (locally known as 'Embaz'<sup>25</sup>) for sick and drought-affected animals.

### Market-oriented rural farmers

These farmers are involved in fattening and dairy production. For instance, fattening is extensively exercised by farmers residing in rural areas around Adama, Mojo and Mieso while dairying is also undertaken in rural peasant associations around Bishoftu, Mojo, Alamata and Mekelle.

The preference of the market-oriented rural farmers for the type of feed depends on the type of livestock business. Farmers involved in fattening activities prefer linseed cake the most, followed by cotton seed cake, wheat bran and noug cake in that order. On the other hand, farmers involved in dairy production prefer wheat bran the most, followed by noug cake, cotton seed cake, and linseed cake in that order. In areas where teff straw, wheat straw and barley straw are available, fatteners prefer teff straw the most, followed by barley straw, while dairy producers prefer barley straw the most, followed by wheat straw and teff straw in that order.

### Urban commercial farmers

Urban dairy is practised in almost all study towns in different degrees. Urban fattening is practised mostly in the towns of Adama, Mieso, Mojo, Bahir Dar, Woreta, Debre Tabor, Metema and Gondar. The fatteners mostly purchase linseed cake, cotton seed cake, wheat bran and teff straw. However, there are differences from town to town. Dairy farmers purchase mostly wheat bran, hay, noug cake, barley/wheat straw and pulse husk.

### Livestock traders

Livestock traders buy feed for their animals during trekking or until they sell the animals. The feeds bought by livestock traders are usually hay and teff straw.

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25. Embaz is sesame seed cake, a by-product of sesame oil extracted by the use of camel power using a local equipment called 'Ansara'.

## Feed mixers and millers

There are about 15 feed mixers and millers in the country. All of them use agro-industrial by-products such as fine wheat bran, noug seed cake, linseed cake, rape seed cake, wheat screening and broken biscuits to produce different types of formulated feed.

## Abattoirs/meat processors

Export abattoirs quarantine animals for more than 15 days before slaughtering. During this time, the abattoirs feed the animals roughage feeds, especially hay.

## Live animal exporters

Live animal exporters buy feed to feed animals during holding time and quarantine period and also transport feed with the animals from origin to destination. These exporters buy mostly hay and teff straw.

## Feed exporters

Feed is exported to Djibouti and the Middle East. Secondary sources indicate that during August 2006 to March 2007, about 400 t of alfalfa, 680 t of wheat bran and cotton seed cake, and 3765 t of hay and teff straw were exported through the Adama customs authority.<sup>26</sup>

## House builders and other users

Teff, barley and wheat straws are used for mud house wall construction and mattress making. Teff straw is especially preferred for house construction. In the wet season the demand for teff straw is very high because of high number of mud house construction due to the availability of rain water. In some study areas wheat or barley straw is used for first and second level mud application, while teff straw is used for finishing. House builders also use grass hay for roofing. Mattress makers buy teff, hay, and barley/wheat straws.

### 8.2.2 Feed sellers

#### Teff straw

In general, teff straw is sold by women, young boys and men. However, there are differences in the type of sellers of teff straw from area to area. For example, in Alaba, the

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26. In terms of value, revenue of about ETB 400,000 from alfalfa, ETB 1.3 million from wheat bran and cotton seed cake, and ETB 5.7 million from hay and teff straw was obtained from the export.

sellers are mostly women, while in Tigray teff straw is sold mostly by men. In Woreta area, teff straw is sold mostly by young men below 20 years of age.

### Barley/wheat straw

Barley/wheat straw is mostly sold by men. For example, in the Tigray study areas where barley/wheat straw is very important, marketing is done almost exclusively by men. In Shashemene, women are involved in wheat straw retail.

### Sorghum stover

Both men and women are involved in the sale of sorghum stover, although there are differences across the study areas. For example, in the Mieso area, it was reported that only women are involved in sorghum stover retail sale, and usually from the poorest of the poor families. In Metema, it is men who are involved in sorghum stover sale.

### Hay

Both men and women are involved in hay sale. Since most of the hay is sold *in situ* from community or public compounds auction committees are usually involved in conducting bids auctions.

### Agro-industrial by-products

Bran and seed cakes are sold by mills directly to users or to traders. Traders then retail the bran and seed cakes to users. Seed cakes apparently are transported long distances, as far as up to 700 km.

## 8.3 Market institutions

Most of the feed trading is informal and so conducted without licenses. There seems to be little barriers to entry and exit. Several of the feed traders exit and new traders get into the business. However, the licensed businesses, which are usually large, stay for relatively longer period in the business.

In a few of the study areas, we observed the emergence of dairy cooperative who are involved in feed supply to members and non-members. For example, there were dairy cooperatives in Mekelle and Atsbi (Tigray), which used to supply feed to members, although currently the feed supply role has been terminated. In Bishoftu and Shashemene there are dairy cooperatives who supply feed to members and non-members.

We also observed the emergence of feed traders' cooperative in Mojo. The cooperative, known as Lalisa Feed Traders Cooperative, was formed about a year ago. The cooperative is involved in teff, barley and wheat straw trade. Some of the cooperative members are also straw producers. The cooperative buys from farmers, bale the straw and sell to other traders. We have not come across a feed mixers and millers association.

In few cases brokers are involved in straw sale, especially in teff and hay sale. For example, in Awassa area, where teff straw sale in the open market is limited, farm gate sales usually involve brokers. It was reported that the brokers are involved because teff straw supply is limited. On the other side, brokers are also involved in teff straw sale in Bishoftu area, where teff straw supply is high.

Institutions of grading and quality control do not exist in the feed market. There is no organization which controls the quality of formulated feeds. There is no formal market information services for feeds in any of the study areas.

In some of the study areas, such as Gondar and Zeway, farmers come in group to purchase hay on auction. Land leases for hay production is practised in a number of the study areas. In Adama area, some feed traders sell bran and seed cakes to fatteners on credit. The fatteners pay upon selling the fattened animals. Use of credit for feed trading is limited, although some traders reported using credit for the business. Payment is mostly effected in cash.

## 9 Conclusion and implications

Various studies have identified feed shortage as the most important constraint of livestock production in general and market-oriented livestock production in particular (Berhanu et al. 2007). Feed is scarce in Ethiopia both in quantity and quality. Although several studies have been conducted on feed production and use in Ethiopia, studies on feed marketing are scarce. This study uses rapid market appraisal methodology to generate a general understanding of the feed marketing in Ethiopia in an effort to contribute to a better understanding of the feed market operations, based on data collected from 24 study towns and their environs in 4 regional states.

Feed marketing is not a recent phenomenon in Ethiopia. In the past, farmers used to lease in land for *in situ* grazing for their preferred animals. In a few of the study sites, crop residue marketing started only about a decade ago, prompted by declining size of grazing lands, drought and emergence of market-oriented livestock production. In such areas, prices of crop residues rose sharply since sales started. Roughage feed sales is done mainly during market days or religious holidays and weekends. Prices are usually higher during market days, where many buyers and sellers meet. Across the study sites and for most of the crop residues and hay, it was reported that supply usually falls short of demand at prevailing prices.

Crop residues and hay are the major marketable roughage feeds in the study areas. The type of crop residue marketed in a particular area is mainly determined by the type of crop grown as influenced by the agro-ecology. Among crop residues, teff, barley, wheat, and millet straws, and sorghum stover are the most marketed in the study areas. Among these crop residues, teff straw is the most marketed, perhaps because of its quality, as perceived by farmers. While sorghum stover is marketed mainly in the low land sorghum growing areas, teff, wheat, barley and millet straws are marketed mainly in the highland and intermediate highlands.

The crop residues of teff, wheat and barley straws are used as feed, and for house construction and mattress making. In some areas, mud house construction during the wet season raises the price of teff straw significantly. Hay is used as feed and for roofing while sorghum stover is used mainly as feed, but also for fuel and construction.

In the study areas in general, teff straw is preferred for draught oxen and fattening, while barley and wheat straws and hay are preferred for dairy. Users also reported that teff, barley and wheat straws derived from threshing by cattle is preferred to that derived from machine threshing, reportedly because the former is more crushed and contains higher

finer particles. Specialized commercial hay production is observed in three of our study sites.

The most commonly marketed agro-industrial by products are wheat bran, and linseed, cotton and noug seed cakes. Wheat bran comes in fine or coarse or mixed. Users in general prefer mixed bran, followed by coarse bran. Most of the users of agro-industrial by-products buy from retailers. Bran is sold in shops together with other consumer products or in grain shops.

Among the seed cakes, users prefer linseed and cotton seed cake for fattening, while they prefer noug seed cake for dairy. Noug seed cake is perceived to have less effect on body weight increase as compared with the other seed cakes. Sesame seed cake is not widely marketed, because of the high sesame seed price in the export market.

There are about 15 mixers and millers in Ethiopia, of which only 5 of them produce purely for sale. The remaining produce primarily for own consumption and sell surpluses. Most of the millers and mixers produce on order basis only. Most of the millers and mixers are also located around Addis Ababa. Poultry, dairy, beef, shoats and swine feed mixes are produced. However, poultry feed mix is the most produced in terms of volume.

Feed prices have risen sharply in recent years. Feed prices tend to be higher during the dry and wet seasons and lower during the harvest season. Farm gate prices are less by about half of the open market retail prices. There are also significant price differences between the study sites for most of the feed types. Teff straw is generally the most expensive straw among the straws. Among the seed cakes, linseed cake is most expensive, followed by cotton seed cake.

Most of the feed trading is informal and there seems to be little barrier to entry and exit. Several of the feed traders exit and new traders get into the business. Brokers are rarely involved in the hay market. However, if brokers are involved, it appears that the reason for their involvement is the high scarcity of the feed (relative to demand) or high volume of transaction. In a few of the study areas, dairy cooperatives supply feed to members. We also observed the emergence of feed traders cooperative. Formal institutions of grading and quality control, contractual enforcement and price regulations do not exist in the feed market.

We draw the following implications based on our analysis of the rapid feed market appraisal data. However, it must be noted that such recommendations could be refined based on a follow-up quantitative analysis, although we do not expect the following implications to be fundamentally inappropriate.

- Supply of fodder is below demand at prevailing prices. This gap between supply and demand is likely to increase with the expansion of market-oriented livestock production. The gap also results in rising feed costs to farmers. Hence, interventions to increase the production of fodder are urgently needed. The type of interventions should be based on the resources of the communities and the specific conditions of an intervention area. One-size-fits-all strategy will not be effective.
- Storage problems generally cause deteriorations in the quality of crop residues and hay. Crop residues are usually stored on open air exposed to sun, rain, rodents and animals. Some farmers report that they could not sell feed or feed their animals because of spoilage at storage. Hence, interventions to promote proper storage mechanisms could contribute to the alleviation of feed shortage.
- Most grass varieties marketed in the study areas are local varieties with low productivity, and low feed quality. Hence, interventions to promote improved grass species that have higher productivity and higher feed quality could contribute to the alleviation of feed shortage. Moreover, there is no proper management of grass lands, such as weeding, over sowing and land preparation. In most of the study sites, hay is harvested too late, perhaps reducing the feed quality of hay. Hence, promotion of proper management of grasslands and optimal time of harvest is recommended.
- Generally, the awareness of farmers of the importance of agro-industrial by-products and manufactured feed is low, resulting in low use of the products as feed. The feed mixers and millers produce mostly on order basis, because of low and uncertain demand. Hence, interventions to improve farmer awareness and use of agro-industrial by-products and manufactured feed are required.
- The feed types demanded depend very much on the type of livestock enterprise. Hence, feed development interventions should consider the type of market-oriented livestock enterprises in an intervention area.
- Although feed supplying cooperative are emerging, some of them have not sustained their feed supply service for various reasons. A closer look at why farmer cooperatives are not sustaining their feed supply services is required in order to devise interventions to strengthen the service.
- In some areas, there are no designated feed market places. Sellers roam around the towns to sell their feed. The lack of designated market places clearly contributes to inefficiency in the feed marketing system. Hence, development of market places for feeds is an important step in improving the operation of the feed market.
- The feed market is basically informal. Formal market institutions are rare, indicating the low attention paid to the feed marketing system. Hence, better attention from decision-makers to the feed market is required.
- Various uses of crop residues and hay compete with the use of the resources as feed, contributing to the gap between feed demand and supply. Improving the supply of the raw materials for the competing uses, although a long-term option, needs to be considered.
- Feed marketing studies are scarce in Ethiopia. This study is basically a qualitative analysis aimed at generating a general understanding of the operation of the feed

market. Feed marketing is also likely to be more important in the future with the development of market-oriented livestock production. Further studies based on quantitative analysis could enrich, refine and update the conclusions of this study.

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## Annex 1 List of organizations from which information was collected

### Adigrat

1. *Woreda* Office of Agriculture and Rural Development

### Atsibi

2. *Woreda* Office of Agriculture and Rural Development
3. IPMS project office

### Wukro

4. *Woreda* Office of Agriculture and Rural Development
5. Wukro Office of Urban Agriculture Bureau
6. Wukro St. Mary Technical College

### Mekelle

7. Mekelle Office of Urban Agriculture
8. Mekelle and its surrounding Milk and Feed Distributors Association
9. Tigray Region Bureau of Agriculture and Rural Development
10. Tigray Land O'lakes Office

### Alamata

11. IPMS project office
12. Abergelle International Livestock Development PLC, Alamata holding center
13. *Woreda* Office of Agriculture and Rural Development
14. Alamata Dairy Cooperative

### Metema

15. IPMS project office

### Gondar

16. Integrated Livestock Development Project (ILDLP)
17. *Woreda* Office of Agriculture and Rural Development
18. Gondar Office of Urban Agriculture Bureau
19. Yebleje Michael Fattening Association

### Debre Tabor

20. *Woreda* Office of Agricultural and Rural Development
21. Office of Urban Agriculture

Woreta

22. IPMS project office
23. *Woreda* Office of Agriculture and Rural Development

Bahir Dar

24. Office of Urban Agriculture
25. Bahir Dar Dairy Association
26. Jerusalem Children and Community Development

Addis Ababa

27. Ministry of Agriculture and Rural Development
28. Ethiopian Dairy Development Enterprise (EDDE)
29. City Urban Agriculture Development Bureau

Bishoftu

30. *Woreda* Office of Agriculture and Rural Development
31. IPMS project office
32. Debre Zeit Agricultural Research Center
33. Office of Urban Agriculture
34. Ada'a Dairy Cooperative

Mojo

35. *Woreda* Office of Agriculture and Rural Development
36. Mojo Modern Export Abattoir

Adama

37. *Woreda* Office of Agriculture and Rural Development
38. Zonal Bureau of Agriculture and Rural Development
39. Eastern Ethiopia Customs Branch Office

Mieso

40. IPMS project office
41. *Woreda* Office of Agriculture and Rural Development

Zeway

42. Adami Tulu Agricultural Research Center
43. *Woreda* Office of Agriculture and Rural Development
44. Zeway State Farm
45. Batu Fatteners Association

Shashemene

46. Office of Urban Agriculture
47. Biftu Dairy Cooperative
48. *Woreda* Office of Agriculture and Rural Development

Alaba

49. *Woreda* Office of Agriculture and Rural Development
50. IPMS project office

Soddo

51. *Woreda* Office of Agriculture and Rural Development
52. Office of Urban Agriculture

Awassa

53. Awassa College of Agriculture
54. *Woreda* Office of Agriculture and Rural Development
55. ALTURISM Animal Fattening Association

Yirgalem

56. *Woreda* Office of Agriculture and Rural Development
57. Yichalal Behibret Dairy Cooperative
58. IPMS project office

## Annex 2: List of agro-industrial by-products producers, and feed mixers and millers contacted

### Adigrat

1. Mesaal Industry and Business Flour Mill PLC

### Mekelle

2. Diplomacy Flour Mill PLC
3. Tigray Flour Mill PLC
4. St. George Flour Mill PLC

### Alamata

5. Alamata Flour Mill PLC

### Gondar

6. Gondar Edible Oil Mill PLC
7. Koke Amba Flour Mill PLC

### Debre Tabor

8. Ashagre Edible Oil Mill
9. Agegnehu Edible Oil Mill

### Woreta

10. Addis Umer Rice Processor
11. Asefa Hude Edible Oil Mill

### Bahir Dar

12. Guder Agro-industry PLC
13. Bahir Dar Edible Oil Mill

### Addis Ababa

14. DH Geda Flour Mill PLC
15. Kality Feed Mixer and Miller PLC
16. Aman Ebrahim Edible Oil Mill

### Bishoftu

17. Ada'a Flour Mill PLC
18. Bora Animal and Poultry Feed Processing PLC
19. Ananas Flour Mill PLC

Mojo

20. Mojo Animal Feed Mixer and Miller PLC

Adama

21. Brothers Flour Mill PLC

22. Nazareth Edible Oil Mill

Zeway

23. Abdela Edible Oil Mill PLC

Shashemene

24. Ali Flour Mill PLC

25. Husen Edible Oil Mill PLC

Awassa

26. Shamsan Flour Mill PLC

Yirgalem

27. Aposto Flour Mill

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MINISTRY OF AGRICULTURE AND  
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