

# Small ruminant value chain development in Ethiopia: Situation analysis and trends



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# Small ruminant value chain development in Ethiopia: Situation analysis and trends

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# Acronyms and abbreviations

ACSI	Amhara Credit and Saving Institution
AEZ	Agro-ecological zone
AI	Artificial insemination
AISD	Agricultural Investment Support Directorate
AP	Advance payment
APHRD	Animal and Plant Health Regulatory Department
CAHWS	Community Animal Health Workers
CAP	Cash against Commodity
CBE	Commercial Bank of Ethiopia
CBPP	Contagious bovine pleuropneumonia
CCPP	Contagious caprine pleuropneumonia
CRP	CGIAR research program
CSA	Central Statistical Agency
DBE	Development Bank of Ethiopia
DCSI	Debit Credit and Saving Institution
ECRA	Ethiopia Customs and Revenue Agency
EIA	Ethiopia Investment Agency
EIAR	Ethiopian Institute of Agricultural Research
ELIA	Ethiopia Leather Industry Association
EQSA	Ethiopian Quality and Standard Authority
ETB	Ethiopian birr
FAO	Food and Agriculture Organization
FMD	Foot and mouth disease
FOB	Freight on board
FTC	Farmers Training Centre
GDP	Gross domestic product
GO	Government organization
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
HABP	Household Asset Building Program

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ICBLT	Informal cross border livestock trade
IDE	International development enterprises
IGAD	Intergovernmental Authority for Development in Eastern African countries
ILRI	International Livestock Research Institute
Kg	Kilogram
KSA	Kingdom of Saudi Arabia
LC	Letter of credit
LSD	Lumpy skin disease
Masl	Meters above sea level
MENA	Middle East and North Africa
MFI	Micro finance Institutions
MoA	Ministry of Agriculture
Mol	Ministry of Industry
MoT	Ministry of Trade
NAIC	National Artificial Insemination Centre
NBE	National Bank of Ethiopia
NGO	Non-governmental organizations
NVI	National Veterinary Institute
OCSI	Oromia Credit and Saving Institution
OIE	World Organization of Animal Health
PPR	Pest des petits ruminants
PRA	Participatory rural appraisal
RVF	Rift Valley fever
SD	Standard deviation
SN	Safety net
SNNPR	Southern Nations, Nationalities and People's Region
SPS	Sanitary phytosanitary standards
UAE	United Arab Emirates
USAID	United States Agency for International development
USD	United States dollar
VC	Value chain
VCA	Value chain analysis

# Introduction

Ethiopia covers 1.13 million square km with relatively good climatic conditions for crop and livestock production. Agriculture provides sustenance for more than 80% of the population and accounts for 41% of GDP and 83% of total exports (NBE 2011). The socio-economic significance of livestock in the highland mixed crop–livestock and lowland pastoral systems is widely recognized. The livestock sector is a source of draught power, nutritionally rich foods, fertilizer, industrial raw materials and foreign currency, to name a few. It also plays several other important social, cultural and economic roles difficult to quantify monetarily. In fact, livestock rearing is one of the few viable economic activities in pastoral areas, while highland crop cultivation would be nearly impossible without draught power. Hence, livestock play a significant role in household and government strategies to alleviate poverty. Overall, based on 2008/09 data, the livestock sector contributes up to 25% of agricultural GDP (45% if the value of ploughing services is accounted for) and 11% (23% if cross border trade is fully accounted) of total Ethiopian foreign exchange earnings (Behnke and Fitaweke 2011).

The total livestock population in Ethiopia in 2012 was estimated at 54 million cattle, 25.5 million sheep and 24.1 million goats (CSA 2013), which places Ethiopia first in Africa and ninth in the world in terms of total stock. The high stock number, however, is not leading to higher exports or export earnings for live animals or meat. Ethiopia's annual exports of cattle and sheep meat were valued at USD 79.13 million in 2012 (ECRA 2012), while Botswana with a much lower stock number was able to reach USD 150 million export earnings from beef alone (FAO 2012).

In Ethiopia, cattle are reared primarily for draught power and milk production. The low maintenance cost of livestock in the prevailing production systems and the secondary importance of meat in smallholder production strategies, to a lesser extent, explain the low off-take rate. In the absence of climate shock, pastoralists' long-term herd building objectives and short-term consumption needs are the primary factors influencing the decision to destock. The determination of what and how much to sell should balance these two seemingly contradictory objectives (Barrett et al. 2004). About 64% of the cattle herd is between three and 10 years and 36% are females (CSA 2013). Small ruminants, however, are raised and sold for income and occasionally for household consumption. Short- and long-term financial obligations are the primary factors that shape evolution of livestock production systems (Solomon et al. 2010) and markets play a minimal role in this paradigm. Sheep and goat production in Ethiopia is mainly carried out by smallholder farmers and pastoralists. The population of sheep and goats has steadily increased over the years.

Despite its economic significance, investments in modern animal husbandry are limited, especially in the pastoral areas that are the sources of most animals destined for export markets (Belachew and Jemberu 2003). Some noticeable gains were made following liberalization of the Ethiopian economy and increased presence of the private sector in the meat processing industry with construction of export abattoirs. Performance in livestock and livestock products had been poor, however, compared to countries such as Kenya for dairy or Botswana for meat. Value addition in the livestock sector is limited and exports remain dominated by live animals, thus hampering the sector's potential to ease high unemployment in rural and urban areas.

Inadequate veterinary services, feed shortages, poor infrastructure, insufficient financial services and low levels of technical inputs are well documented in the Ethiopian livestock sector (Solomon et al. 2010; Aklilu 2008). Some of the few achievements noted in the export markets are primarily the result of institutional support such as the Meat

Development Enterprise and Livestock Marketing Authority. There is evidence that livestock exports tend to rise and fall as these institutions are created and phased out. It has been difficult to sustain any gains without them. Aklilu (2008) attributed these tendencies to the delayed take over by the private sector following phasing out of these projects.

Biomass availability relative to current stock is becoming a major constraint for livestock development. It is estimated that 99% of smallholders rely on natural pasture to feed their stock (CSA 2009). Alemayehu (2006) estimated that, depending on production systems and regions, between 80 and 90% of the feed utilized by livestock come from pastures and 10–15% from crop residues. This implies that the livestock population would in general remain undernourished unless adequate targeted intervention strategies capable of reversing this trend were found.

The Ethiopian economy has achieved a 10.5% average growth rate over the last five years (IMF 2013). The economy has also exhibited some resiliency in these times of slow recovery noted in the world economy, managing 8% between 2010 and 2011, especially for one that relies on foreign investments and remittances to finance its development. The rise in income, combined with rapid growth of Addis Ababa and other major cities, are the primary factors driving domestic demand for meat and dairy products, which is expected to continue to grow. Expected changes in the demand for livestock products in general and small ruminant meat in particular would also be qualitative, with an increased demand for quality as well as value-added products such as special meat cuts, hence inducing further changes in livestock product procurement systems.

Factors such as suitable agro-ecology for livestock production, genetically well-adapted livestock resources, a growing domestic market and geographic proximity to growing export markets illustrate the possibility for a thriving livestock sector in Ethiopia. It would require identifying constraints and applying remedies along the entire value chain, however, for the livestock sector to fully play its role as a pathway for development. This study addresses the current situation of the Ethiopian livestock sector. It is based on desk reviews, secondary data and primary data collected through key informant interviews. The study also applies a simulation model to generate a medium-term outlook of the small ruminant sector if everything stays the same. A detailed description of the model is presented in Appendix I.



## Small ruminants in Ethiopia

The Ethiopian small ruminant population is almost entirely indigenous breeds. A very small portion of the sheep population is represented by exotic breeds (Table 1). The genetic characteristics of the Ethiopian sheep and goat populations are the results of interactions between historical patterns of migration and geographic isolation and interbreeding, while their phenotypic traits are primarily determined by ecological patterns (Solomon et al. 2010). Solomon et al. (2007) regrouped sheep breeds into six categories—short-fat-tailed, Washera; thin-tailed, long-fat-tailed, Bonga; and fat-rumped breeds, encompassing nine subbreeds, Simien and Sekota for the short-fat-tailed group; Washera, Gumuz for the thin-tailed; Horro and Arsi for the long-fat-tailed; and Bonga for the Bonga group. For goats, Tesfaye (2004) identified eight separate genetic entities for goats associated to their genetic dispersion—Arsi-Bale, Gumuz, Keffa, Woyto-Guji, Abergale, Afar, highland goats and Hararghe goats. A recent study by Hassen et al. (2012) identified two major groups—the first with the Abergale goat and the second regrouping the Agew, Gumuz, Bati, Begja-Medir and central Abergale goats. The study confirms a close relationship between these breeds and suggests uncontrolled breeding, which is favoured by free movements of animals as the main facilitating factor. All these breeds may well be classified into fat- and thin-tailed groups.

Table 1. Breed composition of sheep and goat populations (2002/03–2012/13)

Breed	Sheep		Goats	
	Number	%	Number	%
Indigenous	22,78485	89.70	19,620,762	99.97
Hybrid	2,605,129	10.25	4885.2	0.02
Exotic	10,728	0.04	210	0.001
Total	25,405,342	100	19,625,857	100

Source: Computed from CSA (2002/03–2012/13) data.

Small ruminants are produced under two major production systems—the sedentary mixed crop–livestock production system and the nomadic pastoral or agropastoral production system (Alemayehu 2006). The former is based on limited communal and/or private grazing areas, industrial by-products, crop residues, cultivated forage and naturally grown bushes and shrubs. The pastoral production system is based on extensive communal grazing, while agropastoralists are characterized by a combination of pastoral and mixed crop–livestock systems. According to the traditional classification of livestock production systems, there are two distinct areas in the Ethiopian livestock production system. Highland areas more than 1500 metres above sea level (masl) cover 40% of the country, primarily the regions of Tigray, Amhara and parts of Oromia and SNNPRS.

Though the exact number is not known for various reasons, 40% of goats, 40% of sheep, 20% of cattle and 100% of the camel population are concentrated in the lowland pastoral and agropastoral areas (Asfaw and Jabbar 2008). Cattle and sheep are the major livestock in highland areas, while camels and goats are the prominent domestic animals in the pastoral lowlands (Ayele et al. 2003). The major pastoral lowland areas are located in four regional states—Somali, part of Oromia, Afar and part of SNNPRS. The pastoral areas are the major sources of livestock for the export market.

Forty-seven percent of sheep and 56% of goats are below two years of age, 53% of the sheep and 45% of the goats are more than two years old, 27% of sheep and 25% of goats are under six months and 10% of sheep and 12% of goats are aged between six months and one year (Table 2). The preference for any specific breed is normally dictated by the specific attributes buyers seek. For instance, some lowland breeds may be preferred because of carcass yield, but other breeds may be sought by consumers because of their specific taste, skin quality, milk yield (for goats), or quantity and quality of their wool. Fifty-one percent of sheep and 43% of goats are kept for breeding. Around 3% of the sheep and goats are utilized for meat.

Table 2. Herd structure of sheep and goats (2002/03–2012/13)

Ruminant and sex	Under 6 months		6 months–1 year		1–2 years		2 years and older		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
Male and female	6,085,838	27	2,289,334	10	2,425,088	11	12,018,763	53	22,819,024	100
Sheep Male	2,965,423	49	968,796	16	784,374	13	1,275,405	21	5,993,998	100
Female	3,120,415	19	1,320,538	8	1,640,714	10	10,743,359	64	16,825,026	100
Male and female	4,899,855	25	2,418,513	12	2,509,903	13	9,801,908	50	19,630,180	100
Goats Male	2,342,573	40	1,034,864	18	889,861	15	1,576,994	27	5,844,291	100
Female	2,557,282	19	1,383,650	10	1,620,043	12	8,224,915	60	13,785,889	100

Source: Calculated from CSA data(2002/03–2012/13).

While the reproduction parameters of Ethiopian sheep and goat breeds are similar to those of other breeds in sub-Saharan Africa, 17.5–16.4 months for age at first parturition, 230–437 days for lambing and kidding intervals and 1.0–1.5 for litter size (Otte and Chilunda 2002), the production parameters are quite different. They range from a daily growth rate of 100 grams before weaning to less than 50 grams afterwards, with an average slaughter weight at about 18–20 kg for sheep and 16–18 kg for goats, yielding a carcass dressing of about 10 kg (Belete 2009). More than 90% of meat from sheep and goats is from the male herd. This meat is destined for consumption in Addis Ababa and other large urban centres or for export following complex, intricate and long marketing channels. Many Ethiopian households also procure live small ruminants for slaughter during festivals or for family consumption as well.





# Production

The sheep and goat herd build-up depends on factors that contribute to the inflow of animals such as births, purchases and gifts and outflows such as sales and deaths (due to diseases and other reasons). As indicated in Table 3, producers obtain most of their animals through births on their farms. A small portion of the herd comes from purchases and gifts. Sheep are more often purchased than goats.

Table 3. Sheep and goat herd dynamics (2004/05–2012/13)

Change in herd	Sheep			Goats		
	Number (million)	Share in flow (%)	Share in total population (%)	Number (million)	Share in flow (%)	Share in total (population %)
<b>Inflows</b>						
Births	10.71	57	47	8.83	81	45
Purchases	7.73	41	34	1.76	16	9
Acquired by other means	0.43	2	2	0.25	2	1
Total inflows	18.87	100	83	10.85	100	55
<b>Outflows</b>						
			0			
Sales	5.61	40	25	3.69	37	19
Slaughters	2.88	21	13	1.61	16	8
Deaths	5.26	38	23	4.50	45	23
Offerings	0.27	2	1	0.21	2	1
Total outflows	14.02	100	61	10.00	100	51
Total population	22.82			19.63		

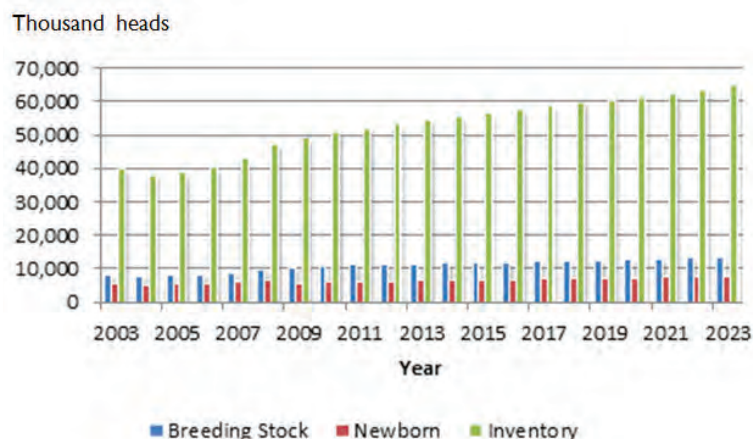
Source: CSA (2004/05–2012/13).

There are four outlets for sheep and goat outflow—sales, slaughter, death and offerings. Sales and deaths are the two most important for sheep and goat producers. It is estimated that producers lose up to 23% of their herds by deaths through diseases, predation and other sources (CSA 2004 to 2013). The number of animals lost through death almost equals the number sold by producers, calling for proper attention to animal health issues.

## Population trends

Ethiopia's cattle stock reached 51 million in 2010 and likely reached 54 million in 2013 based on our projection. It is expected to grow at an average of 1.74% per year over the next 10 years, reaching 57 million by the end of 2016, 61 million by 2020 and 65 million by the end of 2023 (Figure 1). The projected number of new-born calves is based on the number of mature females. The projected new-born calves is relatively stable, hovering around 7 million/year, with an estimated average growth rate of 1.95% per year over the next 10 years.

Figure 1. Trends in cattle numbers between 2003 and 2023 ('000 head).

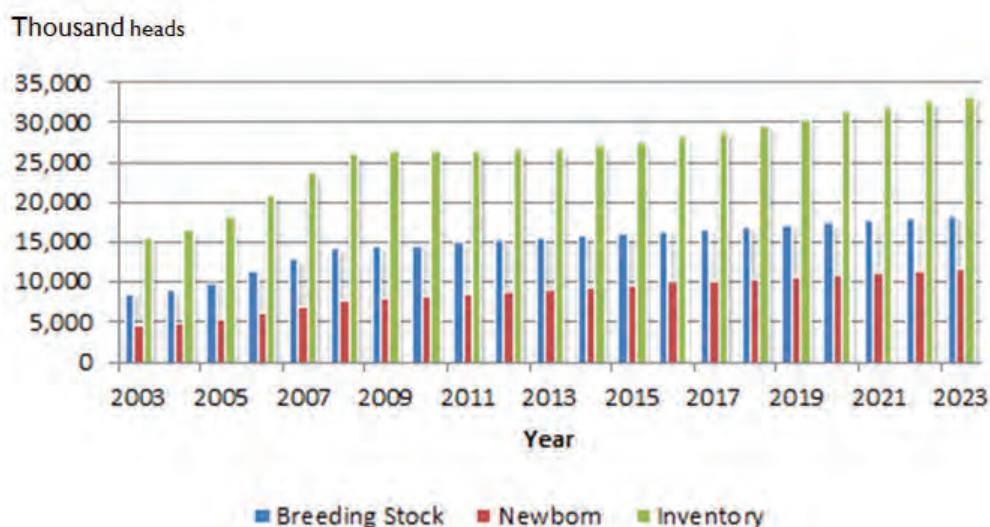


Source: Historical data from CSA and FAO and projected data from simulation.

There was a sharp increase in the number of both sheep and goats between 2003 and 2012 (Figures 2 and 3), which could be attributed to increased demand by both domestic and export markets. This period also coincides with increased export earnings from live animals and meat. The internal demand for meat also increased during this period mainly because of population growth and increased income of the population in general. Historically, there was a decline in the number of sheep and goats during the 1970–1979 decade by 0.39 and 0.23%, respectively, which was followed by a slight increase (0.36 and 0.40%, respectively) during the 1980–1989 decade. As a result, total sheep and goat stock remained unchanged during these two decades. A sharp decline followed in the 1990–1999 decade (7.1% for sheep and 7.5% for goats), which was recovered in the 2000–2009 decade with an increase of 12.5% for sheep and 17.3% for goats, which more than compensated for the decline during the preceding decade.

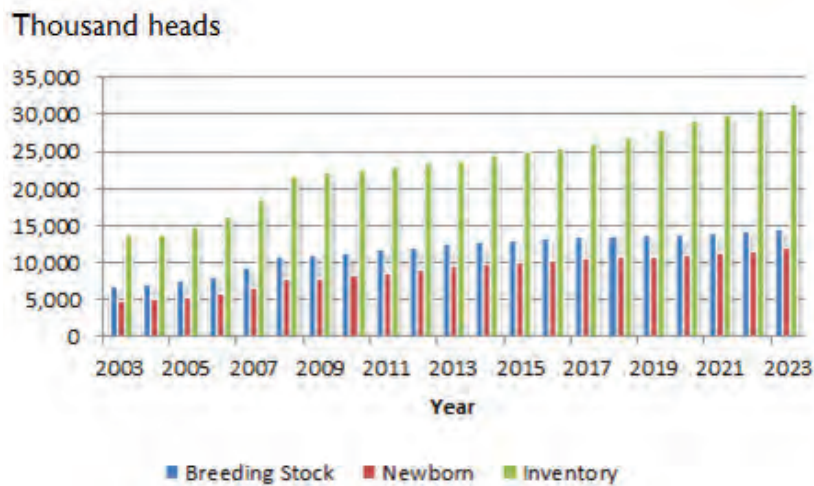
The sheep population is expected to grow at an estimated average annual rate of 2.17%, reaching 26.6 million by the end of 2013, 28 million by the end of 2016, 31 million by the end of 2020 and 33 million by the end of 2023. The number of new-born lambs is expected to hover around 9.8 million over the next 10 years, averaging 2.57% at an annual growth rate between 2013 and 2023 (Figure 2). The evolution of the goat population is similar to that of cattle more so than that of sheep, with an expected average annual growth rate of 2.79% between 2013 and 2023. It is projected to reach 23 million by the end of 2013, 25.5 million by end of 2016, 29 million by the end of 2020 and 31 million by the end of 2023. The projected number of new-born kids is expected to grow at 2.34%/year between 2003 and 2023, hovering around 10.2 million per year (Figure 3).

Figure 2. Trends in sheep numbers between 2003 and 2023 ('000 head).



Source: Historical data from CSA and FAO and projected data from simulation.

Figure 3. Trends in goat numbers between 2003 and 2023 ('000 head).



Sources: Historical data from CSA and FAO and projected data from simulation.

## Regional distribution, herd size and ownership

The regional distribution of livestock provides insights about where efforts may be needed for livestock value chain development. The main sheep- and goat-producing regions are Amhara (35% sheep and 21% goats), Oromia (34% sheep and 31% goats), SNNPRS (16.2% sheep and 16.3% goats) and Tigray (5.42% sheep and 13.26% goats). This is based on a CSA 2012/2013 livestock sample survey, which does not include the major pastoral areas in Afar (three of five zones) and Somali (six of nine zones) regional states. These two regions (Afar and Somali) and the Borena zone of Oromia regional state are the major pastoral areas of the country that supply sheep, goats, cattle and camels to the export market.

Understanding holding size at the household level could help develop targeted interventions on behalf of smallholder farmers and pastoralists. Holding size also determines household responsiveness to price incentives. There is a variation in size of holding of small ruminants between production systems, with larger herd size for pastoralists relative to highland farmers. As reported by Asfaw et al. (2011), more than 60% of smallholder sedentary farmers do not own sheep and more than 70% do not own goats. They also reported that more than 80% of Borana pastoralists do not own sheep and more than 58% of them do not own goats. Holding size at the household level is very small despite Ethiopia's large stock numbers. More than 62% of households own fewer than six sheep and more than 72% of households own fewer than six goats. The common holding is two sheep or two goats. Households may own both sheep and goats (Table 4).

Gender matters with respect to land and livestock ownership and the position of men and women in decision making related to livestock. Livestock production systems are undergoing profound changes. Some of these changes are exogenously induced and include a changing policy environment with the rise of a market economy and government emphasis on exports. These changes also have endogenous origins. The transition from livestock keepers to crop producers, the increased prevalence of female-headed households and access to better technology and support systems are leading to changes in livelihoods (van Hove and van Koppen 2006). The realignment of livelihood costs are affecting asset ownership structure, asset management and the intra-household decision making process.

In central and northern highlands such as Amhara, Tigray and parts of Oromia and SNNPRS, both the husband and the wife own livestock such as cattle, sheep, goats, equines and honey bees (MoA 2007a). In the event of divorce, the wife is entitled to half of the stock. Within the household, poultry is owned by women and children. Women are involved in small economic activities such as petty trade and weaving and can use the money to buy livestock that will belong to them. In pastoral areas, men own cattle, camels, donkeys and small ruminants, but women do not, except those who are household heads. The sale of cattle, sheep, goats and equines by households is carried out by husbands. In some cases women/wives sell these animals. Women are mostly involved in selling sheep and goats and attending the home herds.

Table 4. Levels of sheep and goat ownership among smallholder sedentary farmers (percent of holders)

Size of holding (head)	Sheep(% of holders)	Goats(% of holders)
1	12	15
2	18	22
3	13	15
4	11	12
5	8	8
≥ 6	38	28
Mean	5.40	7.29
Standard deviation	7.53	11.04
Maximum	130	200

Source: Computed from CSA 2012/13 data.

Average holding size of sheep and goats varies by region and production systems (Table 5). House holding size for sheep is higher in Somali region, followed by Afar and Gambella regions. For goats, holding size is higher in Afar, followed by Somali and Dire Dawa regions. The highland regions such as Amhara, SNNPRS and Oromia have smaller average herd size per household relative to the pastoral areas.

Table 5. Average number of sheep and goats per household (2012/13)

Region	Sheep	Goats
Tigray	6.22	8.51
Afar	14.5	21.02
Amhara	5.65	5.34
Oromia	4.45	5.11
Somali	15.06	16.04
Benishangul-Gumuz	3.82	5.36
SNNPRS	3.55	5.40
Gambella	6.94	7.02
Harari	2.33	3.49
DireDawa	4.78	9.08
Total	5.40	7.2

Source: CSA raw data (2012/13).

## Herd structure

Herd structure by age group is a good indicator that can guide the use of targeted intervention options along the value chain. As indicated in Table 2 above, about 53% of sheep and 44% of the goat population in Ethiopia is two years and older, but about 27% of sheep and 25% of the goat population are under six months. About 22% are found in the age group six months to one year and one–two years (11% each). This has been consistent over the last decade.

Table 6 illustrates how sheep and goats over two years of age are utilized. More than 82% of sheep and 87% of goats in this age category are kept for breeding purposes, while a small proportion of these animals is used for mutton/ goat meat production, or milk and wool (for sheep) production. While CSA does not document the use of sheep as a source of milk, pastoralists and farmers do use sheep for milk, especially during droughts because sheep can survive better and remain productive under harsher conditions than cattle.

Table 6. Purposes of keeping sheep and goats aged two years and above (2002/03–2012/13)

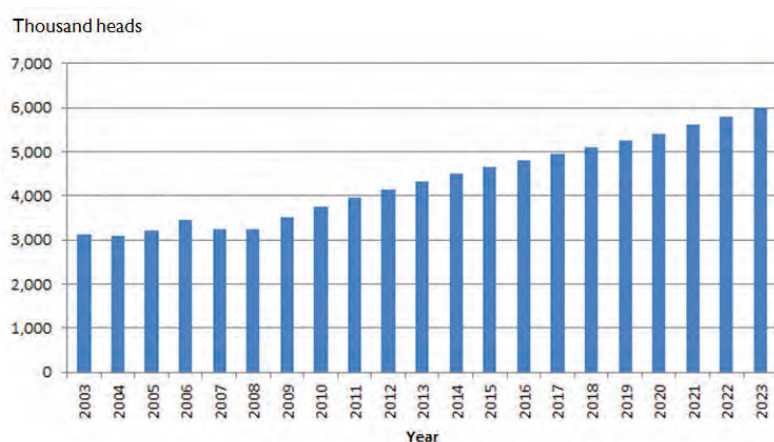
Purpose of rearing	Sheep		Goats	
	Number	%	Number	%
Mutton/meat	553,512	4.59	550,259	5.64
Milk			636,458	6.53
Wool	70,172	0.58		
Breeding	9,905,929	82.21	8,481,157	87.00
Other purposes	1,519,657	12.61	80,499	0.83

Source: CSA Various years.

Only 10% of sheep and goats aged two years and above are slaughtered. This could be the category of animals that issued especially for domestic markets. It includes barren and aged ewes and castrated/uncastrated, fattened, matured male sheep/goats that are usually used for domestic markets. Sheep and goats between six months and two years are an important source of meat for both domestic and export markets. The export market targets young male sheep and goats within these categories.

Live animals are utilized in two different commercial activities—slaughter and export of live animals. The demand for slaughter determines the quantity of meat produced for both domestic consumption and exports. The total number of slaughtered cattle reached 4 million in 2012 and is expected to grow on average at 3.28% per year and likely reached 4.3 million by the end of 2013. It is expected to grow to 4.8 million in 2016, 5.4 million in 2020 and 6 million by 2023 (Figure 4). The number of sheep and goats slaughtered is expected to follow their historical trends over the next 10 years, averaging 2.13 and 2.35%, respectively (Figures 5 and 6). In absolute terms, total slaughter for sheep, which was around 9 million in 2011, is expected to reach 10.3 million in 2016, 11 million in 2020 and 11.85 million in 2023. Slaughter for goats was estimated at 8.7 in 2011 and is expected to reach 11.2 million by 2016 and 13 million by 2023.

Figure 4. Trends in cattle slaughtered (2003–2023) ('000 head).



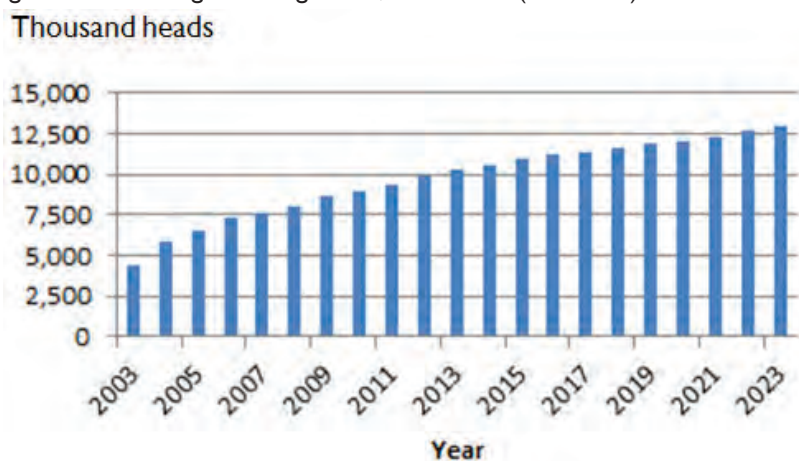
Source: Historical data from CSA and projected data from simulation.

Figure 5. Trends in sheep slaughtered (2003–2023) ('000 head).



Sources: Historical data from CSA and FAO and projected data from simulation.

Figure 6. Trends in goats slaughtered, 2003–2023 ('000 head).



Sources: Historical data from CSA and FAO and projected data from simulation.

## Meat production

Slaughter volume and carcass yield determine meat production. Carcass yield has been historically flat for cattle, sheep and goats and is projected to remain so in the future. Hence, the expected growth in meat production will come from growth in slaughter volume. One of the major challenges of Ethiopian sheep and goat production systems is low carcass yield. Table 7 compares the carcass weight of Ethiopian sheep and goats with that of neighbouring countries in East Africa and other less-developed countries. The average carcass weight of Ethiopian sheep and goats is the lowest relative to all countries and the world average, which could be because of poor genetic performance, poor animal husbandry practices, or a combination.

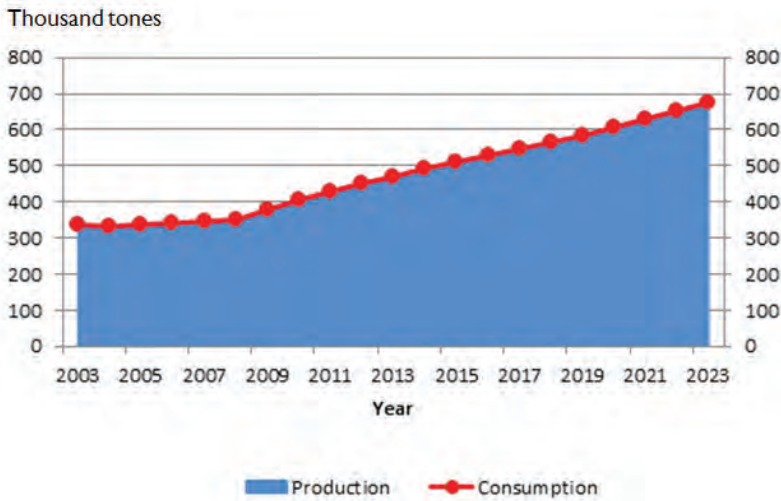
For cattle meat (Figure 7), the historical production high was in 2002 at 352,000 t. This was followed by a drop in production in 2003 to 338,000 t but has been trending up; reaching 404,000 t in 2010. It is expected to be at 471,000 t by the end of 2013. Production is expected to continue its upward trend with an average growth rate of 3.6% per year, reaching 528,000 t in 2016, 604,000 t in 2020 and 676,000 t by 2023. Slaughter volume is expected to increase for production to increase and total consumption is expected to mimic total production in its evolution as long as beef exports stay relatively insignificant as they have over the last five years.

Table 7. Small ruminant carcass yield (kg) by country (1999–2008)

Country or region	Mutton	Goat meat
Ethiopia	10	8
Kenya	12	11
Malawi	14	12
Rwanda	12	11
Sudan	16	13
Tanzania	12	12
Uganda	14	12
Eastern Africa	11	11
Least developed countries	13	10
World	16	12

Sources: FAO Statistical Database <http://faostat.fao.org>; FAO calculated data.

Figure 7. Evolution of cattle meat production and consumption (2003–2023) ('000 t).

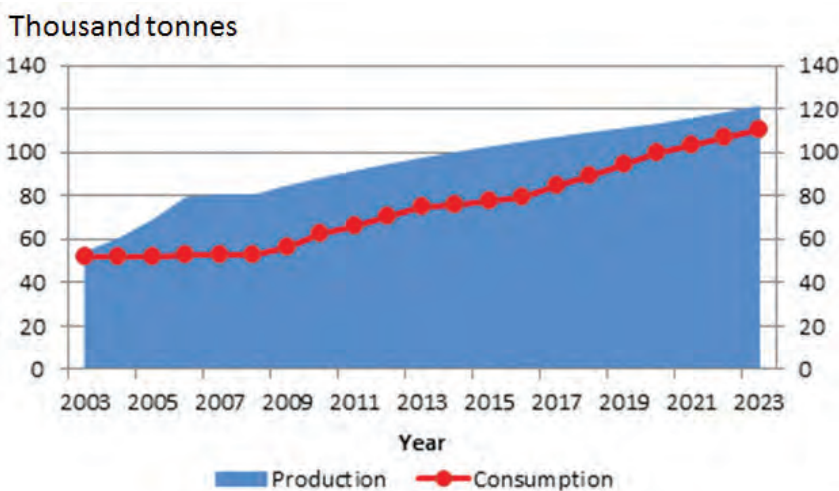


Sources: Historical data from CSA and FAO and projected data from simulation.

Sheep meat production grew by 2% on average between 2005 and 2011, but has been relatively unstable. From 68,000t in 2005, production reached 85,000 t in 2011, except in 2008 when it decreased by 4.2% compared to 2007. It recovered in 2009 and has been growing since. The average growth rate is expected to be at 6% between 2013 and 2016 to keep up with a rise in sheep meat consumption and exports. For goat meat, low carcass yield in 2007 and 2008 led to a low production level.

Goat meat production grew by an average of 2%/year between 2005 and 2011, reaching 51,000 t in 2011 (Figure 9). Carcass yield is expected to revert to its historical levels, hovering around 8.4 kg/animal. Thus, goat meat production is expected to grow annually by 4% on average for the 2012–2016 period, reaching 61,000 t in 2016 as a result of strong demand for goat meat in the domestic and export markets.

Figure 8. Evolution of sheep meat production and consumption (2003–2023) ('000 t).

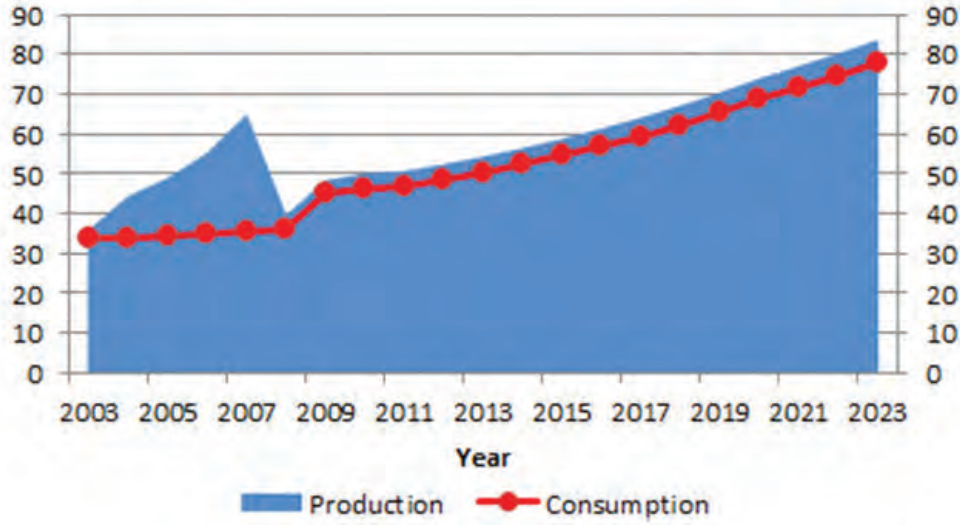


Source: Historical data from CSA and FAO and projected data from simulation.

Carcass yield is usually determined by genetics, feed and health (more on these later). The historical low carcass yield per animal for sheep and goats in Ethiopia could be attributed to poor selection practices to improve the genetic performance of local breeds, as well as poor feeding, healthcare and other management practices. Efforts to improve selection of breeding stock, feeding, animal health services and management practices to improve the feed conversion ratio and carcass weight at slaughter age could be one intervention option.

Figure 9. Evolution of goat meat production and consumption, 2003–2023 ('000 t).

Thousand tonnes



Source: Historical data from CSA and FAO and projected data from simulation.





## Consumption and expenditures

Smallholder farmers produce sheep and goats mainly as sources of income to meet urgent cash needs. They also raise small ruminants for meat, manure and occasionally milk. Households sometimes slaughter sheep and goats for their own consumption, depending on their wealth status (Legese et al. 2008; Legese and Hordofa 2011; Duguma et al. 2012). This means that consumption of small ruminant meat by households is not a common practice because they usually sell their sheep and goats. Table 8 presents the daily per capita calorie intake by food groups in Ethiopia during 1995 and 1999. The major sources of calories during these periods are cereals followed by potatoes, stems and other tubers and pulses. Meat as a whole constituted only 0.8% of the per capita daily calorie intake in 1999–2000. However, this varies between urban (0.6%) and rural (2.3%) consumers. It is important to point out that the contribution of meat to the overall diet has increased by 29% between the two periods from 14 calories to 18 calories. It has significantly increased (by 60%) for rural consumers and slightly decreased by (–3.4%) for urban consumers.

Annual per capita meat consumption (Table 9) in 1999 was 3.3 kg. This is a lower figure than historic accounts such as FAO, which estimates per capita beef consumption at 4.6 kg. This may be due to consumption sourced from group slaughters not fully unaccounted for in the FAO statistics or for other reasons, but in any case it is substantially higher for urban consumers than for their rural counterparts. It has increased by 20% at the national level and by 37% for rural consumers and has declined by 2% for urban consumers (CSA 1996 and 2000). Beef constitutes 63% of the total annual meat consumption followed by mutton (17.5%) and goat meat (11.7%). The evolution of beef, mutton and goat meat in the domestic market provides some insights for the growth potential of the domestic market and competitiveness of the export market relative to the domestic market. The competitiveness of these commodities in the export market is also related to level of domestic demand because the latter affects the price of live animals in domestic markets. There was a dramatic increase in the per capita consumption of mutton between 1995 and 1999/2000 by 138% while beef and goat meat consumption increased by 21% and 7%, respectively. Further analysis of the difference between rural and urban consumers reveals that the per capita consumption of beef, mutton and goat meat has increased by 39%, 201% and 137%, respectively.

Table 8. Daily per capita calorie intake and share (%) by food group and location

Food group	Calories per person per day								
	National		Rural				Urban		
	Calories	Share	Calories	Share	Calories	Share	Calories	Share	
	1995		1999	1995	1999	1995	1999		
Cereals, un-milled	369	271	12.3	408	302	13.2	154	91	5.2
Cereals milled	944	1141	51.6	941	1184	51.7	961	887	51
Pulses, un-milled	106	87	3.9	114	97	4.2	60	28	1.6
Pulses, milled	119	91	4.1	115	89	3.9	144	100	5.7
Oil seeds	11	7	0.3	12	7	0.3	4	2	0.1
Cereal preparations (pasta products)	3	3	0.1	1	1	0	12	17	1
Bread and others	31		1.6	10		0.4	148		10.8
Meat	14		0.8	9		0.6	41		2.3
Fish	0	0	0	0	0	0	0	1	0
Milk, cheese and eggs	24		1.1	25		1.1	16		0.9
Oils and fats	50	37	1.7	34	23	1	142	119	6.8

Food group	Calories per person per day								
	National		Rural			Urban			
	Calories	Share	Calories	Share	Calories	Share	Calories	Share	Calories
Spices	43	25	1.1	42	24	1.1	47	27	1.6
Potatoes, other tubers and stems	113	370	16.7	123	421	18.3	60	71	4.1
Coffee, tea and buck thorn leaves	36	26	1.2	39	29	1.2	18	11	0.7
Other food items	35	29	1.3	29	22	0.9	71	73	4.2
Foods taken away from home	–	7	0.3	–	4	0.2	–	23	1.3
Non-alcoholic beverages	0	0	0	0.1	0.2	0	1	1	0
Alcoholic beverages	5	6	0.3	4.4	5.5	0.2	6	11	0.6
Total	1939	2211	100	1941.7	2291.8	100	1922	1,738	100

Source: Household income, consumption and expenditure surveys of CSA (1998 and 2001).

Table 9. Annual per capita meat consumption (grams) by type of meat and location of consumers (1995–1999)

Meat type	National (gram/person/year)			Rural (gram/person/year)			Urban (gram/person/year)		
	1995	1999	%	1995	1999	%	1995	1999	%
	Beef	1725	2088	62.7	1157	1608	61	4539	4915
Mutton	244	582	17.5	145	436	16.5	750	1444	19
Chicken	310	232	7	183	186	7.1	963	504	6.6
Pork	1	3	0.1	1	4	0.2	1	1	0
Canned meat	1	0	0	0	0	0	2	0	0
Goat meat	366	391	11.7	159	377	14.3	1465	478	6.3
Camel meat	18	14	0.4	14	6	0.2	36	62	0.8
Others	3	21	0.6	0	21	0.8	20	214	2.8
Total (meat)	2668	3331	100	1659	2638	100	7776	7618	100

Source: Reports on household income, consumption and expenditure surveys of CSA (1998 and 2001).

Household meat consumption is sourced from informal slaughter in the backyard and through formal avenues such as abattoirs and official slaughter houses. The Ministry of Agriculture estimates that close to 80% of beef and 90% of mutton and goat meat is sourced from backyard slaughter. Ahmed (2000) indicated that 50–60% of all slaughter is conducted informally. These estimates were based on the collection of hides and skins. Hence, the FAO and CSA data used for simulation studies likely include consumption from both formal and informal slaughter.

Ethiopia's per capita beef consumption is expected to hover around 5 kg/year, higher than its historical average. Beef consumption is expected to grow to 465,000 t in 2015. Per capita consumption of mutton is anticipated to hover around 0.78 kg/year but would probably be around 1.15 kg/year if all consumption sourced from backyard slaughtering were accounted for. The projections indicate that total sheep meat consumption is expected to reach 971,000 t by the end of 2013 and grow at an average annual rate of 2%, reaching 104,600 t by 2016, 112,900 t by 2020 and 121,100 t by 2023. Based on these figures, it is expected that on average close to 11 million sheep will be slaughtered annually for consumption in Ethiopia over the next 10 years, with backyard slaughtering accounting for a significant share of total slaughter. Similar findings are obtained for goat meat consumption, where per capita consumption from formal and informal slaughtering is expected to be around 1.07 kg/year, with a significant portion from informal sources. Goat meat consumption is expected to grow on average by 4.3%/year, leading to 568,000 t in 2016, 687,000 t in 2020 and 778,000 t by 2023, with a significant contribution from informal slaughter.

Annual per capita expenditures for food and non-food items in 1999 are presented in Table 10. Expenditures for food items were 63% of the total per capita annual expenditures, which is similar for rural and urban households. Expenditures for cereals have the highest share (21%) of annual per capita food expenditures, followed by restaurants, cafés and hotels (17%) and meat (10%). Expenditures for meat are higher for urban consumers (10%) relative to that of the rural consumers (5%). The share of restaurants, cafés and hotels seems to be high by developing country standards.



# Exports

## Meat and live animal export performance

Ethiopia has seven export abattoirs that are currently exporting meat to the Middle East and African countries such as Angola, Comoros Islands and Togo. However, except for the two recently opened abattoirs, Abergale and Ashraf, already-existing abattoirs are exporting only chilled small ruminant carcasses. This is because they do not have the capacity to debone and export frozen beef. Moreover, they could not become competitive in exporting beef carcasses given a very high demand for meat in domestic markets that raises the price of slaughter animals.

Looking into the capacity of already-existing export abattoirs and their actual performance during the last six years provides insights about the nature of the supply of slaughter animals (sheep and goats) to the export market. Most of the export abattoirs are operating at less than 40% of their capacity (Table 11). They attribute this to a shortage of animals ready for slaughter and explain that animals of export quality are not available in the market. However, past studies (Legese et al. 2008) reveal that other factors such as the purchasing system of export abattoirs to be the main causes of the supply shortage. Most export abattoirs buy animals at the factory gate and their price is not attractive enough to get animals of the required quality.

Table 10. Per capita expenditures for meat and selected other items (2010 prices)

Food and non-food expenditure items	Per capita annual expenditure by location					
	Urban		Rural		Total	
	ETB	%	ETB	%	ETB	%
Food items	3155.71	63.35	2058.78	65.68	2240.62	65.12
Cereals	670.34	21.24	658.37	31.98	660.36	29.47
Pulses	226.34	7.17	189.41	9.20	195.53	8.73
Oil seed	2.45	0.08	3.83	0.19	3.6	0.16
Bread and other prepared foods	195.51	6.20	22.83	1.11	51.46	2.30
Meat	325.53	10.32	101.22	4.92	138.41	6.18
Milk, cheese and egg	78.83	2.50	91.62	4.45	89.5	3.99
Oils and fats	287.95	9.12	126.31	6.14	153.1	6.83
Vegetables	244.23	7.74	121.84	5.92	142.13	6.34
Fruits	19.4	0.61	5.82	0.28	8.07	0.36
Spices	179.31	5.68	125.56	6.10	134.47	6.00
Potatoes, other tubers and stems	62.2	1.97	147.91	7.18	133.7	5.97
Coffee, tea, chat, and buck thorn leaves	208.26	6.60	212.53	10.32	211.82	9.45
Other food items	131.93	4.18	70.09	3.40	80.34	3.59
Expenditures on restaurants, cafes and hotels	523.43	16.59	181.44	8.81	238.13	10.63
Total expenditures on food items	3155.71	100	2058.78	100	2240.62	100
Non-food items	1826.02	36.65	1075.76	34.32	1200.12	34.88
Alcohol	23.32	1.28	59.41	5.52	53.43	4.45

Food and non-food expenditure items	Per capita annual expenditure by location					
	Urban		Rural		Total	
	ETB	%	ETB	%	ETB	%
Fuel and power	530.41	29.05	518.95	48.24	520.85	43.40
Household operation	167.59	9.18	61.5	5.72	79.08	6.59
Rent	1020.29	55.88	360.52	33.51	469.89	39.15
Total expenditure on non-food items	1826.02	100	1075.76	100	1200.12	100
Total household expenditures	4981.73		3134.54		3440.74	

Source: CSA (2001).

Note: These are the most recent data on consumer expenditures that were available to us. A recent survey was conducted but the data were not available to the public when the study was being implemented.

However, some abattoirs such as Luna provide premium prices for traders that collect thousands of animals per week. Luna also provides trucks for transportation of animals at cost. The performance of this abattoir relative to the others indicates that the supply of animals could be increased by attractive prices and other incentives for producers and traders. An assessment made by the Ministry of Agriculture in 2009 also attributed the supply shortage to the low price that export abattoirs are paying for slaughter animals. In some places, farmers/pastoralists are not willing to sell to traders that are collecting animals for export abattoirs because they depress the price. This has been observed in the Abergale area where cooperatives and traders who signed supply contracts with the Abergale export abattoir could not supply animals as specified in the contract, mainly because the low prices paid by the abattoir were not acceptable to producers. This observation certainly contradicts the existence of a supply gap that could be beneficial to smallholder farmers.

Table 11. Annual capacity of abattoirs to export sheep and goat carcasses (t)

Name of abattoir	Annual slaughtering capacity (tonnes of sheep and goats carcasses)	Average capacity used (2005–2010)	Average capacity use/year (%)
Luna	3616	2851	79
Modjo Modern	7689	2757	36
Elfora	6656	2327	35
Helmex	5653	1625	29
Organic	5600	1068	19
Total	29,214	10,628	36

Source: SPS-LMM (2011).

Recently established abattoirs are built with better capacity for beef slaughter, deboning, cutting, vacuum packing and exporting frozen beef. These export abattoirs, however, are too far from pastoral areas to obtain a sustainable supply of price-competitive slaughter animals. The cost of transportation from pastoral areas to these locations (Bahir Dar and Mekele) erodes the competitiveness of products processed through these abattoirs. As a result, Abergale export abattoir that started exporting frozen beef in 2009 to Angola and Comoros could not sustain its operations because of competitiveness issues and stopped its activities in early 2012. Ashraf did not start operation, except some test slaughters. Additional bigger slaughterhouse projects are expected to be implemented in the near future to meet expectations of the Ethiopian Government for its Growth and Transformation Plan to export 111,000 t of meat in 2015 valued at USD 400 million, which seems overly ambitious judging by the current performance of existing export abattoirs and the reluctance of the new companies to actively engage exports.

Earnings from animal exports (meat and live animals) during the period 2000 to 2012 increased from USD 2 million in 2000 to more than USD 200 million each year from 2010 (Table 12). Earnings from live cattle exports have been the highest over the last six years. Although sheep numbers were second, their value was lower than that of camels in most of years. Goat exports yielded the lowest earnings.

Table 12. Trends in live animal and meat exports(2000–2012)

Year	Meat		Live Animals	
	Volume (t)	Value ('000 USD)	Head	Value ('000 USD)
2000	870	1725	4919	181
2001	663	1103	2383	343
2002	1700	2400	10,372	480
2003	3317	6335	41,966	2377
2004	7754	15,598	103,905	13,081
2005	7917	18,448	163,375	27,259
2006	5875	15,471	233,925	36,507
2007	6486	20,887	297,644	40,865
2008	7468	26,581	214,683	52,691
2009	10,183	34,002	333,752	90,708
2010	16,877	63,226	472,041	147,877
2011	17,666	79,130	785,078	207,051
2012	15,441	74,130	671,937	135,940

Source: ECRA (2000–2012).

The largest number of animals is exported to KSA, followed by UAE (Table 13). KSA is importing live sheep from Ethiopia mainly for sacrifices during the Hajj, a one-time event during the year and may involve highland sheep if air transport is possible. Egypt is also a major market for live camels and cattle, but has been a volatile market for Ethiopia over the years. Sudan, Somalia, Djibouti and Yemen are also formally importing substantial number of animals from Ethiopia, mainly for re-export to other Middle East countries. Significant yet informal cross border trade with Somalia and Kenya is often not adequately accounted for.

Table 13. Number of live animals exported(2005–2012)

Importing country	2005	2006	2007	2008	2009	2010	2011	2012	2005–2012	
									Number	%
KSA	831	20,042	144,055	78,666	17,950	89,699	146,730	119,770	77,218	18.5
UAE	5007	11,266	16,329	69,745	161,852	36,294	91,941	123,332	64,471	15.4
Somalia	23,917	19,980	17,375	15,566	39,029	100,278	149,308	135,164	62,577	15.0
Sudan	12,972	62,853	16,178	12,214	39,948	107,656	153,175	53,872	57,359	13.7
Djibouti	5447	17,672	50,287	5640	3017	18,573	116,689	146,128	45,432	10.9
Egypt	51,536	5287	7720	5568	51,175	73,040	70,430	50,513	39,409	9.43
Yemen	57,144	80,229	43,384	25,644	10,082	22,007	6622	12,266	32,172	7.70
Libya							12,537	8114	10,326	2.47
Jordan	2686	11,473	995			12,255	13,826		8247	1.97
Kuwait					4440	4720	7253	10,677	6773	1.62
Lebanon						1700	10,133	3650	5161	1.23
Oman					3941	2006	4313	3948	3552	0.85
Bahrain		2714.00				3449			3082	0.74
Togo						9			9	0.00
Others	3835	1759.00	1321	1640	2318	355	2121	4503	2232	0.53
Total	120,648	119,134	103,707	38,492	74,973	138,114	243,924	239,799	418,017	100

Somalia pays the most money for live animals, followed by Egypt, UAE and Sudan, while KSA is seventh (Table 14). Somalia, Sudan and others are mainly importing cattle, while KSA is importing sheep and there is a considerable price difference.

Similar to live animal exports, the value of exported meat that was less than USD 2 million in 2000 exceeded USD 63 million in 2010. The value of exported meat increased over the period under review, except in 2007 (Table 15). The decline in volume and value of exported meat is mainly attributable to an import ban imposed by UAE for nine months

in 2007 in association with Rift Valley Fever in some parts of the East African countries, but without any grounds for its occurrence in Ethiopia. Not all importing countries imposed a ban on Ethiopian meat during that period. The export volume revived and grew by 11.8% during 2007, mainly because the import ban imposed by UAE was lifted after a series of negotiations. Since 2007, meat exports continuously increased, reaching a record level of 17,700 t in 2011, but both the volume and value of meat exported in 2012 declined by 13.3% and 6.3%, respectively. One reason for the decline was closure of the Abergale export abattoir, mainly because it was not competitive given a very high demand for highland cattle that are needed both for traction and meat. Another important reason was the overvalued domestic currency relative to the U.S. dollar. At the current rate, export abattoirs are not competitive in the beef export market because the domestic price of meat is higher than what the export market is paying. The share of beef in total meat production is about 77%; whereas that of small ruminants is 20%, yet 77% of the meat exported during 2005 to 2011 was chilled small ruminant carcasses, while beef exports during this period were only 14% of total meat exports. Small ruminants contributed 86% of the total value of meat exports (Table 15).

Table 14. Value of live animals exports (2005–2012)(million USD)

Importing country	2005	2006	2007	2008	2009	2010	2011	2012	2005–2012	
									Value	%
Somalia	3.40	4.03	2.90	4.13	16.31	35.71	49.60	46.76	20.35	21.31
Egypt	12.46	2.02	3.63	3.36	24.38	37.20	37.40	35.51	19.49	20.41
UAE	0.95	1.98	4.91	18.92	24.66	11.36	60.90	9.58	16.66	17.44
Sudan	1.68	10.86	3.99	5.02	17.99	44.86	0.00	22.36	13.35	13.97
Djibouti	1.07	1.87	7.95	1.50	0.81	1.96	22.30	23.21	7.58	7.94
Yemen	5.84	11.72	10.66	11.82	2.34	6.96	2.70	5.53	7.20	7.53
KSA	0.08	1.61	6.80	7.93	3.51	5.02	13.80	12.26	6.38	6.68
Libya	0.00	0.00	0.00	0.00	0.00	0.00	6.70	5.74	1.56	1.63
Jordan	0.75	1.09	0.03	0.00	0.00	2.15	2.40		0.92	0.96
Lebanon	0.00	0.00	0.00	0.00	0.00	0.97	2.90	1.52	0.67	0.71
Oman	0.00	0.00	0.00	0.00	0.55	0.93	1.50	2.14	0.64	0.67
Kuwait	0.00	0.00	0.00	0.00	0.16	0.49	0.90	1.12	0.33	0.35
Bahrain	0.00	0.27	0.00	0.00	0.00	0.26	0.00		0.08	0.08
Togo	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
Others	1.02	1.07	0.00	0.01	0.01	0.00	0.10	0.27	0.31	0.32
Total	21.14	18.03	22.27	16.69	28.24	50.93	76.90	75.04	96	100

Table 15. Export of meat by meat type and year

Year	Unit	Meat type					Total
		Frozen beef	Chilled sheep and goats carcasses	Chilled beef carcasses	Offal	Camel meat	
2010	Volume (t)		13,603	1480	1788	6	16,877
	Value (million USD)		56.90	4.09	2.24	0.02	63.25
2011	Volume (t)	2166	14,000		1500		17,666
	Value (million USD)	7.17	69.00		2.63		78.80
2012	Volume (t)	128	13,827		1486		15,441
	Value (million USD)	0.265	70.16		3.7		74.125
2010 to 2012 (average)	Volume (t)	1147	13,810	1480	1591	6	18,034
	% contribution	6.36	76.58	8.21	8.82	0.03	100
	Value (million USD)	3.72	65.35	4.09	2.86	0.02	76.04
	% contribution	4.89	85.95	5.38	3.76	0.02	100



It is important to note that Ethiopia is exporting small ruminant carcasses with no further processing or cutting that would add value to the products (Table 15). Lack of motivation from exporters is viewed as the major impediment to developing new products and an effective strategy to develop markets for new products. Table 16 summarizes observations from trade missions by the Ministry of Agriculture and Ethiopian SPS Standards and Meat and Marketing Program (2005–2010). Most major importing countries import frozen and chilled small ruminant carcasses and cuts. However, Ethiopian meat exporters have never attempted to export small ruminant meat cuts, although the demand exists.

Table 16. Types of meat and live animals imported by Middle East and African countries

Country	Imported products	Sources of imports
Egypt	Frozen beef, offal, camels, cattle	Brazil, Argentina, others
KSA	Chilled sheep and goats carcasses, frozen beef cuts, frozen goat meat and sheep, goats, camels and cattle	Syria, Sudan, Lebanon, Australia, New Zealand, Australia, Brazil, India, Ethiopia, Romania, Argentina, Pakistan, Somalia
UAE	Chilled and frozen sheep and goats carcasses and cuts, offal, frozen beef and veal and beef cuts, offal and sheep, goats, camels and cattle	Ethiopia, Somalia, India, Pakistan, Australia, Argentina, Iran, New Zealand, Brazil
Yemen	Mainly cattle	Ethiopia, Somalia
Kuwait	Chilled and frozen sheep and goat carcasses, beef, sheep, goats and cattle	Australia, New Zealand, Brazil, Uruguay and Paraguay
Bahrain	Sheep and goats and cattle and frozen beef	Australia
Oman	Sheep and goats, cattle, frozen beef and sheep and goats carcasses	
Qatar	Sheep and goats, cattle	
Ghana	Frozen beef and sheep and goats, cattle offal	New Zealand, Argentina, Brazil, Europe
Cote d'Ivoire	Chilled and frozen beef and sheep and goat meat, variety of meats, offal (cattle, sheep)	Mali, Burkina Faso, Guinea, Niger, France, Spain, Netherlands, USA, Canada, France

Source: Dugasa and Belachew (2010).

## Sources of animals for export market

The lowland areas are the primary source of animals destined for exports, for two important reasons—the rate of weight gain in feedlots and the high competition due to high meat demand in the highlands (Legese et al. 2008). The controversial issue of meat darkening that used to be associated with highland sheep and goats is now overcome by the export abattoirs. Export abattoirs were associating meat darkening with origin of the animal; however, the reason behind fast darkening of meat is lack of body fat cover rather than origin of the animal or other reasons (Duguma et al. 2012). Carcasses of emaciated and skinny animals darken more quickly than those of well-conditioned animals. Thus export abattoirs are managing meat colour through proper chilling and selection of animals with good body condition and are buying small ruminants from both the highlands and lowlands. The major problem with the highland animals is the degree of competition between domestic consumers and export market operators. The demand for highland small ruminants by highlanders is very high. The competition between domestic consumers and traders buying for export markets raises prices, leading export abattoirs to cede highland markets during religious festivals such as Christmas, Easter and Ramadan, when the domestic demand is very high.

## Trends in live animal exports

Formal live cattle exports remain vibrant and reached 156,000 in 2006, although exports weakened in 2008 at 84,000, before beginning an upswing from 103,000 in 2009 to 321,000 in 2011 (Table 17). Exports have since weakened, dropping 37% in 2012 and are expected to follow historical trends, hovering around 200,000 per year between 2013 and 2023 (Table 17).

Sheep export volume reached an historic high at about 140,000 in 2007, but sharply fell to 80,000 in 2008. The decline in 2008 could be attributed to depressed demand of live animals in major importing countries such as KSA and UAE as a result of the world financial crisis in 2008, but exports recovered in 2010 to 132,000, 350,000 in 2011 and 396,000 in 2012. These surges were not due to any particular policies, except perhaps some trade missions and participation of Ethiopian exporters at the Gulfood fairs organized under various projects such as the SPS-LMM program, which was phased out in 2011. The Gulfood fair has created an opportunity for Ethiopian exporters to promote their products and create market links with importers in different countries. Hence, future exports are expected to follow their historical trend, hovering around 250,000 between 2013 and 2023. Live goat exports have always been below those of sheep. From a historic high just above 31,000 in 2007, exports fell to 5100 in 2008. A recovery that started in 2009 reached 11,300 in 2010 and 14,500 in 2010. Goat exports are expected to follow the historic trend, reaching 17,000 in 2020 and 21,000 in 2023. The other important export is camels and its export volume has been continuously increasing, except in 2008 and 2012, when volume decreased by 37% and 44%, respectively. Projections based a two-year moving average indicate that camel exports will hover around 70,000 per year over the next 10 years (Table 17).

Table 17. Number and share (%) of live animal exports

Year	Cattle		Camels		Sheep		Goats	
	Number	Share	Number	Share	Number	Share	Number	Share
2005	143,499	87.9	3882	2.4	12,857	7.9	3105	1.9
2006	156,247	70.8	19,410	8.8	33,553	15.2	11,363	5.2
2007	83,356	28.3	39,926	13.5	140,290	47.6	31,197	10.6
2008	84,275	39.7	25,179	11.9	97,527	46.0	5182	2.4
2009	103,010	31.1	79,439	24.0	126,263	41.5	11,319	3.4
2010	230,605	48.9	79,908	16.9	132,148	31.1	14,507	3.1
2011	320,761	40.3	99,857	12.5	350,783	44.0	12,487	1.6
2012	202,706	29.6	56,126	8.2	396,528	57.9	14,869	2.2
Average	165,557	42.1	50,466	12.8	164,471	41.8	13,004	3.3
2020	162,104	32.8	70,699a	14.3	243,526	49.3	17,383	3.5
2023	199,803	36.9	70,731a	13.1	249,478	46.1	21,089	3.9

a. Projections are based on a two-year moving average forecast

Note: Percentages may not add to 100 because other animals are exported in limited numbers

Source: Derived by the authors from historical and projected data

## Informal trade

A significant number of livestock are exported from Ethiopia through informal channels. Ministry of Agriculture (MoA) data (2002 and 2008) show that about 1.7 million live animals are informally exported each year (Table 18). These animals are sourced from different regional states and cross borders informally to different neighbouring countries. By the MoA accounts, 66% of these animals are informally exported to Somalia, 22% to Djibouti and 12% to Sudan (MoA 2008). The animals exported to Djibouti and Somalia are re-exported to different Middle East countries and are considered exports from those countries. Between 1993 and 2000, the total value of the unofficial crossborder livestock trade from Ethiopia has been estimated at USD 105 million per year, 100 times greater than the average annual official livestock export trade (Pavanello 2010). Through efforts to boost formal exports, however, formal live animal exports have dramatically increased since 2006 and the gap has been significantly reduced. For example, Desta et al. (2011) estimated informal crossborder livestock exports through Berbera and Bosaso ports at USD 144 million per year, while formal live exports were more than USD 207 million. The formal channel is growing over time.

During the seven years up to 2012, the volume of the informal crossborder livestock trade was four times that of formal exports; however, this varies with animal species. Goats are the major species informally exported at 49% of the total, followed by cattle with 27%. The largest difference between formal and informal exports is goats (informal goat exports are more than 63 times formal exports), followed by cattle and sheep. About 74% of goats cross the border through Somali region, 24% through Afar region, 1% through Oromia and 1% through Southern Nations, Nationalities and People's Region (SNNPRS).

Table 18. Informal live animal exports, by major outlets

Species	Major outlets						Total
	Afar	Somali	Oromia		SNNPRS	Amhara (Metema)	
			Borena	East Hararghe			
Cattle	73,000	109,500	70,000	66,000	7300	169,000	494,800
Sheep	36,500	219,000	4000				259,500
Goats	219,000	657,000	10,000		5500		891,500
Camel	7000	6000	3000			2071	18,071
Total	335,500	991,500	87,000	66,000	12,800	171,071	1,663,871

Note: Numbers may not add to total.

Sources: Data for Metema from MoA (2008), others from Belachew and Jemberu (2003) and MOA (2002) and may not add up.

Formal live camel exports are far larger than informal exports. Live camels are transported from the Kenyan border all the way to Adama and then to Port Metema, mainly because of the attractive price in the formal channel. Experience with camel formal exports demonstrates the possibility of diverting the huge number of goats, cattle and sheep absorbed by informal channels to the formal export system through price incentives. Pastoralists and other actors in the value chain use the informal system primarily for access to better markets (prices and less harassment in the market). Excessive taxation on animals informal livestock markets in the country also contributes to an increased flow of animals to the informal channel (Solomon et al. 2003). A recent study by the Ethiopian Meat and Dairy Technology Institute (unpublished document) shows that the treatment of recipient neighbouring countries has also contributed to the growth of informal crossborder livestock exports. For example, Sudanese customs charges ETB 400 per animal exported through the formal channel, but only ETB 20 exported through the informal channel. This clearly encourages the informal channel.

Ethiopia's informal crossborder livestock exports are now directed to Somalia, Djibouti and more recently, to Sudan. While crossborder exports from Ethiopia into Kenya and Sudan are destined mainly for the domestic markets in those countries, Ethiopian exports to Djibouti and Somali (Somaliland and Puntland) are mostly re-exported to the Middle East (Aklilu 2010). Desta et al. (2011) reported that live animal exports from Berbera and Bosaso have often reached a peak of 3 to 3.5 million per year. About 65% of this volume is believed to originate in Ethiopia.

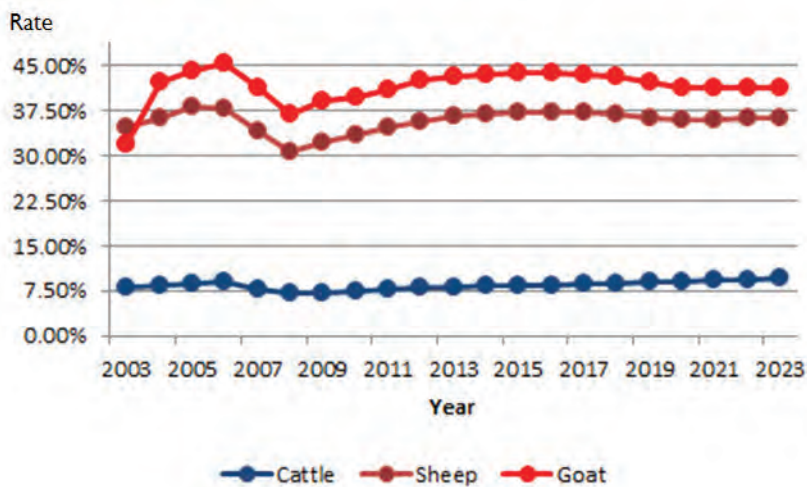
Informal crossborder livestock exports contribute to price escalation in domestic markets and erode competitiveness of formal live animal and meat exports. The Ethiopian treasury loses revenue and although informal markets positively affect the livelihood and food security of market agents, the lost revenue adversely affects long-term development goals of the government through its impact on the tax base (Lesser and Moisé-Leeman 2009). For these reasons, the Ethiopian Government has tried various initiatives in lowland pastoral areas to curb the informal crossborder livestock trade. These include schemes such as a hard currency deposit Cash against Commodity/Advance Payment arrangements, small-scale border trade directives and Franco Valuta basic commodity import permits in the Somali regional state (Desta et al. 2011). However, all three arrangements have their own limitations and did not succeed in reducing the flow of animals to informal export channels, rendering any growth in the formal trade not sustainable.



## Live animal off-take

Studies on off-take rates indicate that they vary based on production systems, species and ecological conditions; for example, they tend to be higher during drought and disease outbreak years (Bekele et al. 2006). On average, off-take rates were estimated at 10% for cattle, 35% for sheep and 38% for goats (Belachew and Jemberu 2003). Simulation studies on off-take rates calculated as a ratio of animals that exited through slaughter and export to total stock indicated that the off-take rate has historically been high for both sheep and goats. Sheep off-take was about 38% in 2005 but has been decreasing since, reaching an historic low at about 30% in 2008. It recovered in 2010 at 34% and is expected to reach 37.3% in 2016 and hover around 36% from that point forward. The goat off-take rate reached 45.5%, an historic high, in 2006. As with sheep, it fell to 38.5% in 2009, but rose in 2010 to 40% and is projected to reach 43.9% in 2016 and stabilize at 41.3% from 2020 forward. The upward trend is explained by an expected recovery in the live animal and goat meat export market, although there may be other factors in play (Figure 10).

Figure 10. Evolution of off-take rates for cattle, sheep and goats (2003–2023).



Source: Derived by the authors from historical and projected data.



## Inputs and services—Animal species and breeds

Evaluation of Ethiopian indigenous cattle breeds and their crosses with exotic breeds dates back to the establishment of agricultural colleges in the early and mid-1940s. Over the three decades that followed, discrete but useful attempts were made in different parts of the country to generate and deliver livestock technologies to support development efforts. Studies by the then Alemaya College of Agriculture, Wolayita Agricultural Development Unit and Chilalo Awuraja Development Unit were among these earlier studies. The latter two focused mainly on integrated rural livestock development efforts with components in other agricultural activities as well.

A more systematic breed improvement study over a long duration was conducted between 1974 and 2000 by the then Institute of Agricultural Research (IAR), now named the Ethiopian Institute of Agricultural Research (EIAR), in four agro-ecological zones. This long-term crossbreeding program largely focused on improvement of cattle for milk, meat and draught. The program evaluated Boran and Horro breeds and their crosses with Friesian, Jersey and Simmental exotic breeds at Holeta (highland area) and Bako (humid mid-altitude) research centres. In this program, evaluation of a third breed, Barka/Begait and its crosses with the above mentioned three exotic breeds at Adami-Tulu (dry mid-altitude) and MelkaWerer (lowland pastoral area) was also included. Over the same period, IAR also made an evaluation of Horro, Blackhead Somali and Adal sheep breeds at Bako and Melka Werer research centres, respectively. Evaluation of Menz sheep breed and its crosses with Awassi and Corriedale exotic breeds at Sheno Research Centre was ongoing at the same time. Bako and Werer evaluation objectives were to improve meat, while the work at Sheno focused on both meat and wool. Unlike sheep, a goat breed evaluation study failed to draw equal national attention in this early research, although there were some attempts at the Werer centre. Adami Tulu Research Centre is now involved in the evaluation of goats. These centres that evaluated livestock species and breeds have also been generating different management technologies, all of which form the basis for livestock extension inputs.

Currently the federal and regional research institutes and agricultural faculties at universities are providing inputs for breed improvement and multiplication of technologies. However, the capacity for multiplication of these technologies is limited because these institutions are not mandated to multiply technologies for extension, apart from the component relating to their on-farm activities and they are limited because they often operate on a small farm. Thus, multiplication of livestock species has remained in the hands of public and private breeding and multiplication centres/ranches established in different parts of the country at different periods.

For cattle, multiplication and improvement farms/ranches currently exist in Oromia (Did Tiyura ranch for Boran), Amhara (Metekel and Andassa ranches for Fogera) and SNNPRS (Sodo and Tatessa farm for Jersey and Friesian crosses). Some of the farms in Oromia region have been privatized (Abornosa for Boran breed improvement) and transferred to universities (Horro Guduru farm for Horro breed improvement and Assela farm for Arsi breed improvement) and may not actively support extension activities due to a change in their mandate.

Sheep improvement farms are located in Amhara (DebreBerhan and Ahmed Guya), while no centre is designated for goat improvement and multiplication activities apart from research works at Adami Tulu. Extension activities for small ruminants currently rely more on breeds from research and university farms than multiplication centres. A collaborative project among the federal Ministry of Agriculture, USAID, regional states and institutions of higher learning to improve and market small ruminant meat has also started bearing fruit. It utilizes Boer goat and Doper sheep breeds imported from South Africa to improve meat production; however, these sheep and goat breeds have yet to be multiplied on a larger scale or disseminated, except those given for demonstration to a limited number of farmers/pastoralists. Thus, sheep and goat production in Ethiopia relies on indigenous breeds and more than 99% of both sheep and goats are indigenous breeds (Table 19). There are more hybrid and exotic sheep breeds than goats.

In principle, the federal and regional extension packages for breed delivery generally include crossbred heifers and bulls, selected indigenous cattle heifers and bulls, crossbred bucks and rams (mainly indigenous breeds) and exotic three month-old pullets/cockerels, day-old chicks and fertile eggs. In addition, AI service, mainly to improve milk production through use of exotic semen for indigenous breeds and liquid nitrogen as a component of breeding support, are part of the package. Bull service for natural mating is also promoted on a limited basis.

Table 19. Breed composition of sheep and goats ('000 head) (2006–2012)

Year	Sheep			Goats		
	Indigenous	Hybrid	Exotic	Indigenous	Hybrid	Exotic
2006	23,616	10,995	5145	18,557	1905	
2007	26,089	25,337		21,707		
2008	24,990	10,771		21,881	2778	
2010	25,488	17,288	2981	22,783	3228	
2011	24,141	26,112		22,561	2707	
2012	25,439	39,691	10,072	24,058		

Source: CSA report of different years (2006–2012).





## Inputs and services—Feed

Animal nutrition is among the top challenges to improve livestock productivity because availability of affordable quality feed is a challenge. Crop expansion into pasture land, overgrazing of marginal land, seasonal variation in productivity and quality of pasture land, underdeveloped feed preservation practices and limited use of improved fodder production explain feed shortages in the highland mixed crop–livestock system. In pastoral and agro-pastoral areas, the constraints include bush encroachment, rangeland deterioration due to overgrazing and frequent drought cycles and a critical shortage of water. In most cases, use of scarce water and rangeland resources is a leading cause for social conflicts among pastoral communities.

The federal and regional research centres and agricultural faculties at universities operate feed improvement programs. This list includes federal and regional research centres such as Kulumsa that generate feed technologies without having a livestock research branch. International research centres like ILRI are also involved in the evaluation and generation of feed technology inputs ready to be used by the national extension services. A number of improved varieties of grasses, leguminous fodder and multipurpose shrubs/browse have been evaluated and recommended for the different agro-ecological zones (AEZ) of the country. NGOs and smallholder farmers and farmer training centres (FTCs) are engaged in multiplication and sourcing of forage seeds used in extension activities. These forage seeds typically include Napier grass, Rhodes grass, cowpea, pigeon pea, alfalfa, *Dolichos lablab*, *Desmodium*, oats, *Leucaenaleucocephala* and *Sesbaniasesban*. These sources produce a limited amount of seed relative to national demand. Currently there is no effective mechanism for uptake.

Extension work in feed development is largely geared toward introduction and use of improved fodder crops in the highlands and improving rangeland management and use in the lowlands. Improved conservation and use of crop residues and by-products have not attracted equal attention as introduction of improved forages. Resource-poor farmers in the mixed crop–livestock production system have ready access to ample straw and stalks/stovers that are used wastefully during the harvest period. Most of these feed resources are either not conserved at all or conserved inappropriately.

Farmers obtain forage seeds from Bureaus of Agriculture. Woreda offices place their annual request for seeds to the regional/zonal bureaus that purchase the requested seeds and deliver the amount available. Seeds complemented with what can be obtained from different sources within/outside the Woreda through its efforts are distributed to farmers. Grazing was the most common feeding practice reported by livestock producers (40%), followed by crop residues and hay. Less than one percent of livestock producers were reported to use improved forage and the proportion of those using crop residues did not exceed four percent over years (Table 20).

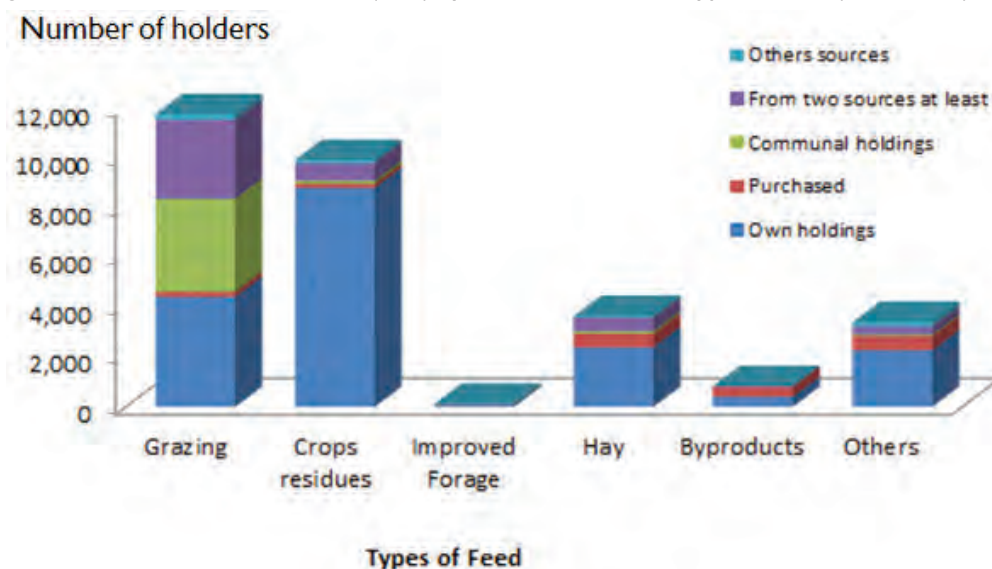
Table 20. Number (millions) and share (%) of smallholder producers reported to use different feeding practices

Years	Units	Number of users of different feeds (millions)						Total
		Grazing	Crop residue	Improved forage	Hay	By-products	Others	
2007	Number	10.84	9.06	0.06	3.04	1.00	3.04	27.04
	Share	40.08	33.51	0.23	11.26	3.69	11.23	100
2008	Number	12.25	10.31	0.10	3.93	0.73	3.26	30.58
	Share	40.05	33.72	0.33	12.86	2.39	10.66	100
2010	Number	13.16	11.07	0.18	4.37	0.81	3.63	33.22
	Share	39.61	33.33	0.54	13.16	2.43	10.93	100
2011	Number	13.01	11.12	0.20	4.05	1.05	4.19	33.62
	Share	38.71	33.09	0.6	12.03	3.11	12.46	100
2012	Number	13.34	11.47	0.19	4.35	1.04	4.60	34.98
	Share	38.13	32.78	0.54	12.44	2.97	13.15	100

Source: CSA reports (2007–2012).

Figure 11 illustrates the primary sources of feed types in Ethiopia between 2005 and 2012. Farmers own holdings are major sources for grazing, crop residues and hay, which may be because producers in the highland mixed crop–livestock systems usually use their own holdings for grazing, especially during the rainy cropping seasons when fields are covered with annual crops. They use either their own holdings or land rented for crop production that yields crop residues. Communal lands are another important source of grazing, especially in pastoral areas. In the highlands, communal grazing is practised after harvest. Industrial by-products are usually purchased for feed; however, their use is limited because they are expensive. Local brewery/distillery by-products can be either obtained from traditional beer makers or purchased from surrounding distillers.

Figure 11. Number of smallholders ('000) by sources of different types of feed (2005–2012).





# Inputs and services—Animal health inputs and services

## Organization, function and structure of veterinary services

### Federal veterinary services

Ethiopia established the Livestock State Ministry under the Ministry of Agriculture in March 2013. The Federal Veterinary Services operate under the Animal Health Directorate, one of three directorates organized under the state ministry. The regional veterinary services work in concert with their federal counterparts and are obligated to support implementation of activities related to disease control and prevention that are planned and budgeted by the federal government via the Animal Health Directorate.

About nine case teams are organized under the Animal Health Directorate. These case teams perform different functions such as regulatory, disease control, public health, epidemiology, quarantine, abattoir inspection, traceability and identification. There are six functional quarantine stations in the country, staffed by one veterinarian, one animal health assistant, one animal health technician and one laboratory technician. In addition to the quarantine stations, three border check posts also provide quarantine service in different parts of the country, including Bole International Airport in Addis Ababa with three veterinarians and three animal health assistants, Moyale with one animal health assistant and Lafa'essa with one animal health assistant rendering border inspection services. Meat inspection in export abattoirs is conducted by two veterinarians, three meat inspectors, one meat technologist and one laboratory technician.

### Regional veterinary services

Public veterinary service delivery relies on district veterinary clinics located in district towns supported by animal health posts located in the vicinity or villages of farmers/pastoralists. There is one animal health post for each three Kebeles. As in the Federal Veterinary Services, the Regional Veterinary Services are responsible for both animal health and public health activities. According to assessments made by Dugasa and Belachew (2009) and the Ministry of Agriculture (2009, unpublished report), there were 949 veterinarians, 2743 animal health assistants, 216 laboratory technicians, 345 meat inspectors, 1983 animal health technicians and 102 artificial insemination technicians operating at various animal health institutions in the country. More than 1641 district veterinary clinics, 570 subdistrict clinics, 872 animal health posts, 205 local slaughter houses, seven export abattoirs, one National Animal Health Disease Investigation Centre, one National Veterinary Institute for vaccine production and 15 regional laboratories currently render veterinary services throughout Ethiopia. Moreover, about 823 community animal health workers (CAHW) selected from livestock herders themselves and trained in basic animal health care are involved in control of animal diseases, especially in remote and low-potential areas where access to public and private veterinary services is difficult.

## Private veterinary delivery system

There is a small number of privately-owned animal health service providers conducting clinical services for fees, selling drugs and extending advisory services. According to the Ministry of Agriculture and an assessment made by Dugasa and Belachew(2009), there are 64 clinics, 239 rural drug shops, 149 pharmacies and 30 drug importer businesses owned and run by private operators. The development of private veterinary services is largely hampered by a highly subsidized public veterinary system that provides services inexpensively to the detriment of private operators. Public veterinary service providers charge very low fees, making it very difficult for private sector operators to compete with the public sector.

## Major animal diseases and control

Many livestock diseases and parasites infest Ethiopia. The following list of diseases is based on occasional, unpublished reports that the Ministry of Agriculture prepares for OIE (2010).

### Infectious diseases

#### Rinderpest

Rinderpest was eradicated through the long-term efforts of the Pan African Rinderpest Campaign (PARC). The Pan African Program for the Control of Epizootics (PACE) program concentrated on verifying absence of the disease in the country and after 17 years of concerted efforts, Ethiopia was officially declared free of Rinderpest by the OIE in May 2008.

#### Contagious Bovine Pleuropneumonia (CBPP)

CBPP is one of the most important cattle diseases in Ethiopia. It predominantly occurs in a few pastoral and agropastoral areas, particularly in the southern Rift Valley and occasionally in other parts of the country. Mass annual vaccination measures have been and are still being undertaken to control the disease. APHRD has developed a national CBPP control and eradication strategy. The proposed policy is eradication by mass prophylactic vaccination, control of cattle movement and slaughter of infected, chronic and latent carrier animals once a high level of control is achieved. To tackle the CBPP problem, the policy proposes identifying short-term and long-term strategies that divide the country into epidemiological zones as the basis for a phased eradication program.

#### Lumpy skin disease (LSD)

LSD is one of the newly emerging cattle diseases in Ethiopia. It is sporadically encountered mainly in the highlands and its spread is controlled by systematic vaccination.

#### Foot andmouth disease (FMD)

FMD is endemic in Ethiopia, with significant variable prevalence across farming systems and agro-ecological zones. Five serotypes of FMD virus (A, O, C, SAT 1 and SAT2) prevail according to the national epidemiological survey. Local herds exhibit mild symptoms for the disease, hence, only exotic improved breeds and their crosses are vaccinated. Recently, Ethiopia has developed a national short- and long-term strategy to control FMD. The short-term strategy envisages enhanced FMD vaccination, surveillance, diagnosis, animal movement control and development of export compartments to promote safer trade of livestock and livestock products.

The export zone concept involves quarantine, inspection, testing, vaccination and certifying animals as appropriate at different times in different places as they move from their origin to export abattoirs and port of embarkation.

Compartmentalization of the animals destined for export at an early stage in pre-quarantine holding areas and appropriate mitigation of the risk of disease transmission through livestock and meat destined for export are the major features of the system. The totality of risk reduction measures would reduce the risk of exporting dangerous pathogens potentially present to a low or negligible level.

### Rift Valley fever (RVF)

RVF has been cyclically occurring in Kenya, Sudan and recently in Somalia. Areas of Kenya and Somalia bordering Ethiopia were affected with the disease in 1997. Active disease search, GIS monitoring and banning livestock exports from risky areas were instituted to restrict disease introduction and dissemination. There is a significant degree of awareness by the veterinary services and a contingency plan exists for screening herds when and if necessary.

### Brucellosis

In Ethiopia, Brucellosis is endemic in many AEZ. However, it causes problems mainly in intensive dairy farms around urban centres. Serological screening is practised in cattle and small ruminants destined for (external trade) export, as well as for brucellosis control on dairy farms.

### Peste des petits ruminants (PPR)

PPR was confirmed in Ethiopia for the first time in 1989 in the southern Omo River Valley before moving to other parts of the country. The disease is endemic in most pastoral areas of Ethiopia. The recent use of a homologous vaccine has significantly reduced its incidence. A national strategy was developed based on a serological survey conducted in 1999. A total of 13,849 sera samples were collected from 72 districts of seven regional states. As expected, the prevalence was higher in lowland pastoral systems compared to highland sedentary systems. This was expected of a disease that is transmitted by direct contact. The strategy is to vaccinate all small ruminants in those districts considered endemic for the disease including their neighbours, based on the results of the 1999 serological survey and outbreak disease reports.

### Contagious caprine pleuropneumonia (CCPP)

CCPP is a very important disease of goats. It is concentrated in north and south Omo, Borana, Asosa and eastern Tigray. Control of the disease relies on prophylactic and therapeutic measures.

### Sheep and Goat Pox

The occurrence of sheep and goat pox has been reported mainly in the central highlands. There is no report from sheep and goat breeding areas in the Somali and Afar regions. Control is based on prophylactic vaccinations.

### Other infectious diseases

Sporadic diseases such as anthrax, black leg and haemorrhagic septicaemia have been diagnosed in the country and are effectively controlled through prophylactic vaccination.

### Parasitic diseases

Different trade-limiting diseases and parasites that cause damage of economic importance are found in Ethiopia. Four species of mites cause a condition called mange in sheep and goats—Sarcoptes, Psoroptes, Demodex and Chorioptes. These external parasites cause rejection of more than 35% of sheep skins and 56% of goat skins collected by tanneries. This problem is unnoticeable until the skins enter the processing stage and thus causes very high economic losses to tanneries and the country at large. A report indicated that six tanneries in Addis Ababa rejected 2,037,745 skins in

1996/97 which caused a loss of USD 6.3 million (MoA 2007b). Apart from economic losses caused by rejection of skins, mites cause the animal to lose weight and it takes a long time until the treated animal regains a normal condition after clinical recovery. It is thus difficult to produce good quality animals for the market in areas where mites are prevalent. Mites also have a zoonotic dimension affecting humans.

Internal parasites such as liver fluke and roundworms are the major impediments to sheep production in marshy areas. This problem is growing with expansion of irrigated agriculture. Haemonchosis and round worms are also serious parasites. These parasites cause heavy weight losses and poor growth in kids and lambs (MoA 2007b).

## Vaccine production and achievements of vaccination programs

The National Veterinary Institute (NVI) in Debre Zeit was established in 1963 with the help of the French Government. It produces and supplies most of the vaccines needed in the country as well as occasional surplus for export. The NVI is managed as a government enterprise and operates on a cost recovery basis. Its current vaccine production capacity is shown in Table 21.

### Number of vaccinated animals

The number of animals that have been vaccinated against different diseases in the last seven years is summarized in Figure 12. The number of vaccinated animals has increased over the last seven years. Ethiopia stopped vaccinating against Rinderpest since the country was declared free of the disease.

Apart from disease prevention, the animal health system takes control measures through diagnosis and treatment of animals afflicted by different diseases. Table 22 shows animals afflicted by different diseases and treated over the last seven years.

Table 21. Current vaccine production capacity of the National Veterinary Institute (NVI)

Type of vaccine	Production capacity (number of doses)
<b>Bacterial vaccines</b>	
CBPP (T1 SR)	12,000,000
CBPP (T1 44)	6,000,000
Anthrax	25,139,928
Blackleg	12,014,914
Ovine pasteurellosis	10,832,432
Bovine pasteurellosis	10,646,125
CCPP	2,500,000
Fowl typhoid	2,000,000
Subtotal	81,133,399
<b>Viral vaccines</b>	
LSD	24,550,000
Sheep pox	18,000,000
PPR	31,320,000
FMD	175,000
AHS	6,048,000
Newcastle Lasota	6,780,000
Newcastle HBI	2,640,000



Type of vaccine	Production capacity (number of doses)
Newcastle Thermostable	8,800,000
Newcastle Inactivated	500,000
Fowl pox	1,680,000
Gumboro	6,000,000
Rabies	50,000
Camel Pox	2,000,000
Subtotal	108,543,000
Total	189,676,399

Source: NVI (2013), personal communication.

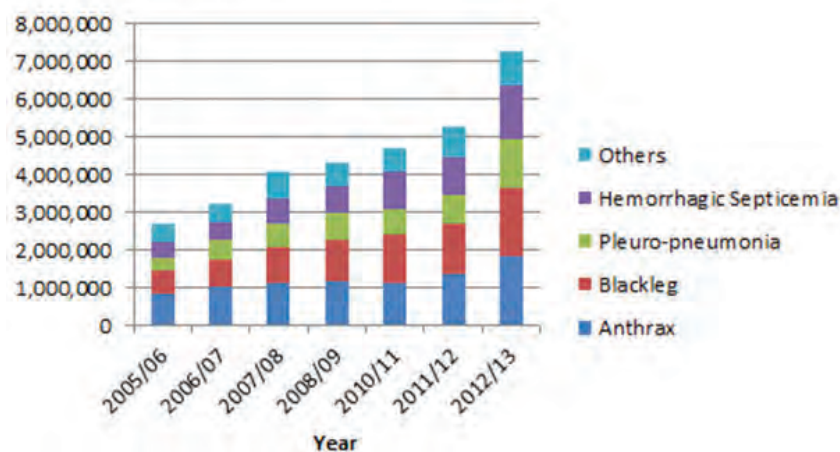
Table 22. Number of animals afflicted by different diseases and proportion treated (%), 2003–2012

Animal	Afflicted	Treated (%)
Cattle	7,286,463	46
Sheep	4,996,616	25
Goats	4,052,056	20
Horses, donkeys and mules	859,663	38
Camels	73,272	24
Poultry	13,093,874	8

Source: CSA (2003–2012).

Figure 12. Number of animals vaccinated, 2005–2012.

#### Doses of vaccines



Source: CSA (2003–2012).

## Livestock health and quality regulatory framework

Clear policy guidance for specific components of livestock development, including disease control, veterinary laboratory services, privatization of veterinary service delivery and breeding policy is lacking (MoA 2010). Broad economic policies tend to influence the way the livestock sector operates. A variety of laws, regulations and decrees related to livestock have existed since the late 1940s and most were found specific to animal diseases and others for meat inspection. Between 1949 and 1971 there were at least four proclamations and amendments issued to control animal diseases, with two meat inspection proclamations and regulations in the early 1970s. The recent proclamations are Animal Disease Prevention and Control issued in 2002 and Veterinary Drug and Feed Administration and Control in 2011.

The major proclamations and regulations enacted and enforced for regulatory veterinary services and meat inspection have helped Ethiopia for many years to fulfil its obligations for food safety and animal disease management; however, discussion with animal experts reveals that they mostly fail to meet required standards for international trade of animals and animal products and have not always been implemented as intended. Strict enforcement of the laws has always been a problem. MoA distributed the Sanitary and Phytosanitary (SPS) guidelines to meat and livestock exporters and the Ministry's field inspectors. The materials have not been strictly applied because they were voluntary and not part of the regulatory framework. Their strict use and implementation in the future requires making them mandatory and part of animal health laws.

Veterinary professionals believe that the need for legal support to implement animal health and food safety standards cannot be overemphasized. Control of animal diseases is only achievable by establishing a sound regulatory framework and strong enforcement mechanisms. Ethiopian laws related to animal health and meat safety are outdated and do not conform to OIE standards, SPS Agreements and Codex Alimentarius and need to be updated to address emerging challenges.



## Inputs and services—Access to finance and credit

The National Bank of Ethiopia (NBE) requires that all commercial banks (other than the Commercial Bank of Ethiopia) purchase a bond for 27% of each loan. The bond has a maturity period of five years and an interest rate of 3%. As a consequence, repeated complaints are heard about liquidity constraints, thus, when private banks finance new projects, they prefer more promising and less risky projects such as industries, retail and construction rather than livestock projects. The NBE recently reduced reserve and liquidity requirements for commercial banks from 15% and 25% to 10% and 20%, respectively, which is expected to at least temporarily improve available loans. The business and finance community, however, widely acknowledges that this measure alone will not improve the situation in any significant manner.

The other constraint for the livestock value chain is a requirement for a Letter of Credit (LC) to export live animals or meat. The National Bank requires exporters to trade through an LC or an advance mode of payment for exporting live animals to any destination. An LC is a commitment by a bank on behalf of the buyer that payment will be made to the beneficiary (exporter), provided that the terms and conditions have been met, as verified through presentation of all required documents. An LC is useful when reliable credit information about a foreign buyer is difficult to obtain, but the exporter is satisfied with the credit-worthiness of the buyer's foreign bank. The buyer pays service and confirmation charges and deposits a minimum of 30% of the value of the consignment at its bank. This system is not commonly preferred by importers because it is time consuming with relatively expensive transaction costs. The reliability of an LC system also depends on the reliability of the foreign (issuing) bank. Thus, live animal exporters face challenges, especially when dealing with new customers.

Meat exporters do not have such problems because they commonly use a telegraphic mode of payment, which is actually an advance payment. In this system, five parties are involved—the importer, importer's bank, intermediary bank, the exporter and exporter's bank. The importer deposits the value of the consignment at his bank, which in turn orders the intermediary bank to transfer the amount to the exporter's bank, which in return informs the client and issues an export permit. The consignment will then be shipped. The NBE controls and ensures transfer of the foreign currency.

Live animal exporters can get short-term loans by submitting export licenses, an LC and contractual agreements as collateral. The amount of the loan depends on the value of the LC; however, some exporters have at times withdrawn the shipment after collecting loans from banks. Because there are no fixed assets or securities as collateral, it is difficult for lending banks to recover disbursed loans through an LC holding mechanism. Such untrustworthiness increases transaction costs and in some cases bars trustworthy exporters from access to credit.

## Role of private and public banks

There are 21 banks in Ethiopia, including the three state-owned banks—Commercial Bank of Ethiopia (CBE), Development Bank of Ethiopia (DBE) and Business and Construction Bank (BCB), as well as 18 private commercial banks. The CBE is the largest bank in the country, three times larger than the capacity of all the private banks together.

The private commercial banks are also potential sources of financing for the meat and live animal business. The governing issue is that all the banks need security (physical assets) for the loan, but it is difficult for most new business operators engaged in the livestock business and smallholder livestock producers to provide such security. Land in Ethiopia belongs to the government, so land lease certificates cannot be used as collateral for bank loan unless 30% of the investment on that land is developed. If the stated proportion of the project on the land is developed, banks can consider a land lease certificate as collateral for loans to new projects or expansion of existing businesses.

The DBE is another source of credit for livestock businesses (investments). It finances projects that are proven to be feasible by its own project appraisal team. Unlike other banks, DBE considers new projects as collateral provided borrowers submit a viable project feasibility study, the land to be used for the new project and 30% of the proposed project capital in cash as equity contributions. The bank considers refinancing requests for projects already financed by other financial institutions, but DBE does not consider retroactive financing of projects already financed by owners. This is prohibitive for most business people because the terms and conditions of DBE are different than other lenders and not known by many people. Most business people tend to use bank loans for completion of their projects rather than entering into bank loan arrangements from the very beginning.

## Role of microfinance institutions and credit and savings associations

Apart from the commercial banks, other formal sources of finance such as credit and savings associations, microfinance institutions and informal saving arrangements such as Ekub play a vital role in supporting access of livestock and meat businesses in general—and smallholder livestock producers in particular—to financing. Credit and savings associations are organized in urban and rural areas by different groups. These associations mobilize savings from their members and provide credit to members depending on the amount of their savings. The interest rate of these cooperatives is lower than that of other lenders. Members repay their loans while they continue their regular savings. The interest collected on credit is distributed annually to members. The problem with credit and savings associations is their poor management and limited financial capacity to reach a large number of borrowers simultaneously. Some organizations provide them with seed money to raise their lending capacity. Credit and savings associations are managed by a committee selected from its members. It is rare for trained personnel to serve as committee members, so these cooperatives have a gap in the technical capacity of their management.

Microfinance institutions are the other important sources of financing for agribusinesses, including the livestock sector. The microfinance institutions need group collateral to extend loans to small business operators and farmers/pastoralists. In addition to their demand for group collateral, the amount of money these institutions make available for lending to individual borrowers is too small to run livestock businesses. A high interest rate is also prohibitive for the target users. They charge as high as 18% per year and although they serve both urban and rural dwellers, the interest rate is higher for rural borrowers because follow-up costs are higher. The short gestation period of microfinance credits does not take into account the nature of livestock production. Farmers and pastoralists are required to start repayment of the credit before the animals start to give birth or achieve better condition (by fattening) and to be sold at higher prices. This means rural youth who are keen to start livestock businesses lack credit. Some initiatives such as Household Asset Building Program (HABP) arrange special credit programs for their target groups. These are still administered by MFIs, but with a lower interest rate (10–15%), better repayment modalities and more follow-up to ensure best use of the loan. Some NGOs such as International Development Enterprises (IDE) and SOS Sahel have succeeded in similar arrangements for small ruminant rearing and fattening activities.

Some microfinance institutions are learning from the experience of rural credit and savings cooperatives to overcome problems related to group lending (group collateral) and have started establishing rural banks in some areas. Rural banks are similar to credit and savings associations (cooperatives) in that they are established by a group of farmers/pastoralists and depend on the savings of members. However, they make use of hired, full-time technicians rather than

a committee to run the day-to-day activity of the bank. These banks use a steering committee selected from members to screen the credit worthiness of borrowers. The steering committee is selected from the community (members of the bank). Overall activity of the rural banks is monitored by the National Bank of Ethiopia.

The Ethiopian microfinance market is dominated by a few large MFIs, all of which are linked to regional state government ownership (Ebisa et al. 2013). The four largest institutions account for 71% of market share in terms of borrowing clients and 82% by loan provision. The total number of active borrowing clients of the microfinance institutions in Ethiopia reached more than 2.4 million in 2011 (Table 23). The total credit extended by all microfinance institutions was ETB 6.9 billion in 2011 and reached ETB 12.79 billion in 2013. Of the total credit granted in 2011, the share of the four largest microfinance institutions was ETB 5.6 billion.

Table 23. Performance of microfinance institutions in Ethiopia, 2011

Microfinance institution	Number of clients		Loan size	
	Number	%	Amount (million ETB)	%
Amhara Credit and Saving Institution (ACSI)	694,993	28.13	1,940.83	28.2
Dedebit Credit and Saving Institution (DECSI)	396,648	16.05	1,849.94	26.88
Oromia Credit and Savings Sh.Co (OCSCO)	503,000	20.36	1,280.00	18.6
Addis Credit and Savings Institution (ADSCI)	156,148	6.32	566.83	8.23
Africa Village Financial Services (AVFS)	17,359	0.7	14.97	0.22
Aggar microfinance	5854	0.24	19.13	0.28
Benishangul-Gumuz Microfinance	28,874	1.17	51.76	0.75
BuusaaGonofa Microfinance	48,908	1.98	76.55	1.11
Digaf Microfinance	1270	0.05	1.33	0.02
Diredawa Microfinance	5923	0.24	16.29	0.24
Dynamic Microfinance Institute	261	0.01	2.22	0.03
Eshet Microfinance	24,116	0.98	40.59	0.59
Gambella Microfinance	880	0.04	1.17	0.02
Gasha Microfinance	6991	0.28	14.74	0.21
Ghion Microfinance	233	0.01	0.29	0
Harar Microfinance	2706	0.11	7.10	0.1
Harbu Microfinance	17,984	0.73	23.81	0.35
Lefayedu Credit and Savings	303	0.01	0.62	0.01
Letta Microfinance	925	0.04	4.79	0.07
Meket Microfinance	2959	0.12	2.33	0.03
Meklit Microfinance	14,224	0.58	23.03	0.33
Metemamen Microfinance	10,218	0.41	8.72	0.13
Omo Microfinance	327,888	13.27	585.10	8.5
PEACE Microfinance Institution	17,206	0.7	45.51	0.66
ShashemeneEddirYelimat Agar (SEYAMFI)	4144	0.17	10.96	0.16
Sidama Microfinance	47,810	1.94	28.33	0.41
Specialized Financial and Promotional Institution (SFPI)	33,342	1.35	50.81	0.74
Tesfa Microfinance	162	0.01	0.20	0
Wasasa Microfinance	53,981	2.18	113.97	1.66
Wisdom Microfinance	45,331	1.83	101.21	1.47
Somali Microfinance			0.00	
Total	2,470,641	100	6883.14	100

Source: NBE as presented in Ebisa et al. (2013).



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## Inputs and services—Knowledge systems

Federal and regional research centres and higher learning institutions generate livestock technologies for extension inputs in Ethiopia. They also generate information and knowledge that serve the various disciplines of livestock extension. Available inputs include technologies on breeds, feed and nutrition and livestock health. Federal research centres, operating under the Ethiopian Institute of Agricultural Research, that deal mainly with generation of livestock technologies are Holeta, DebreZeit and Melka Werer research centres. But among the federal research centres, Melkassa, Kulumsa and Assosa centres have research program components on feed and nutrition without species/breeds and health components of livestock research.

Oromia regional state runs livestock research centres at Bako, Adami Tulu and Holeta under the auspices of the Oromia Agricultural Research Institute. Yabello's Pastoral and Dryland Agriculture Research Centre is also located in Oromia and focuses on livestock research. Similarly, Amhara Agricultural, Tigray Agricultural and Southern Agricultural Research Institutes do operate livestock research programs in the various centres established in their respective regions. Somali and Afar pastoral and agropastoral research institutes were established recently and have been instrumental in generating pastoral/agropastoral focused livestock technologies.

The International Livestock Research Institute is actively involved in generation and supply of livestock technologies and capacity building of the national agricultural research system through staff training support. The Ministry of Agriculture, in collaboration with some NGOs (e.g. Farm Africa) and bilateral organizations (e.g. USAID) imported sheep and goat breeds that were directly used for extension activities. In the animal health area, Sebeta Animal Disease Investigation Laboratory generated useful results and is currently providing diagnostic services. Adami Tulu Pesticide Processing S.C produces acaricides.

The National Artificial Insemination Centre (NAIC) in Kaliti is responsible for the generation, import and delivery of improved cattle semen. In cooperation with regional bureaus, the ministry also generates and delivers liquid nitrogen to support cattle breed improvement activities. Institutions that multiply livestock technologies are limited to public research or improvement farms which are few and inefficient due to small farm sizes, budgetary restrictions, constraints with facilities and understaffing. With the probable exception of poultry and beehives, the multiplication of other livestock technologies has so far largely remained unattractive to the private sector despite lucrative markets in the country.





## Access to land for livestock-related activities

There is strong commitment from the government to make the country's fertile land available for agricultural investment. Availability of investment land varies with agro-ecological zones and it is relatively easier to get land in the lowlands where there is lower population pressure. Population pressure in the highlands makes it difficult to get large plots of land for livestock breeding activities. However, because of the nature of the business, land used for export abattoirs is in close proximity to major urban centres such as Addis Ababa, Bishoftu, Mojo, Bahir Dar, Mekelle and Jijiga to facilitate easy access to airport cargo terminals. Access to a sustainable supply of slaughter animals is also considered in demarcating land for slaughter houses.

The government created an Agricultural Investment Support Directorate (AISD) under the MoA to facilitate acquisition of large tracks of land (greater than 3000 ha) for foreign and local investors. For this purpose, the government has about 3.7 million ha that was allocated by four regional governments (SNNPRS, Oromia, Benishangul-Gumuz and Gambella), which is earmarked for large-scale agricultural investments. There are some additional incentives to encourage investment in large farms in remote areas of the country. For example, a 30% tax deduction for three consecutive years after expiration of the income tax exemption period set for the investments is offered by the Council of Ministers in regulations on investment incentives and investment areas reserved for domestic investors. This includes the states of Gambella, Benishangul/Gumuz, Afar (except in areas within 15 km left and right of Awash River); Somali, Guji and Borena zones of the state of Oromia and South Omo zone; Segen, Maji, Sheka, Dawro, Keffa zones; and Konta and Basketo special Woredas of SNNPRS. The MoA has the responsibility of providing technical support for private investments in agriculture. The support includes, among other things, providing areas larger than 5000 ha, information, technical support and facilitation of relationships with other public services. The Agricultural Investment Support Directorate (AISD) was established under the MoA to serve as a focal point to support crop and livestock investments. The AISD prioritizes foreign investment proposals in different areas and also assists investors with services such as work permits, connects them with agricultural research centres, liaises with the MoT to facilitate export of their products and collaborates with regional governments to mediate any conflicts between investors and local residents.

The Ethiopian Investment Agency (EIA) has a mandate to facilitate allocation of land for Foreign Direct Investment projects throughout the country. Both the Ethiopian Investment Agency and the Agricultural Investment Support Directorate are providing a one-window service for agricultural investors. Prior to an investment proclamation, AISD was the entity providing these services to agricultural investors, but the proclamation has given EIA power to administer and allocate land to investors.

The Regional Land Administration and Environmental Protection Bureaus and Regional Investment Offices have the mandate to allocate and administer investment lands that are not under the jurisdiction of the federal government. Investment land allocation is recommended by investment offices and approved by an investment board chaired by regional presidents. City councils and municipalities are the main government administrative bodies to offer or allocate land to investors. However, discussion with some value chain actors and their sectoral associations such as ELTA, EMPEA and ELIA as well as supporting government institutions such as EMDTI and LIDI reveals that getting land in cities, particularly around Addis Ababa, is difficult due to cumbersome bureaucratic procedures and civil

servant attitudes. In these areas, land lease rates are relatively high. Available information indicates that the federal and regional states have developed industrial zones with necessary infrastructure, but the use of compartments is low probably because of competing interests from multiple sources, including sectoral associations that are looking after the interests of their members, the federal government, state government and investors.

The state owns all the land in Ethiopia, hence it can't be purchased or sold, but it can be leased. Farmers do have user rights over their plots of land, which can be inherited. The highlands concentrate most of the human and livestock population in Ethiopia and access to investment land in these areas comes at the expense of smallholder farmers. It is common that farmers can be evicted from their land with little compensation (a value of 10 years' crop production). Without any experience or training in handling such an amount of money, most of these farmers spend the compensation money in a very short time and find it difficult to feed their household. In the pastoral areas, land is more communal and pastoralists use seasonal mobility in search of pasture and water for their animals. Access to investment land in these areas should also not threaten the livelihood of the pastoral community.

Recently, 40 million parcels were registered in the highlands under the land registration and certification program (FDRE 2010). Ghebru and Holden (2012) found that land registration policy contributed to enhanced livelihood through increased food availability and stronger tenure security when first initiated. The initiative also enhances women's participation in land markets by renting out their rights to richer households and using the proceeds to buy food or finance other economic activities, including purchasing livestock. Recently, there have been some amendments in Tigray stipulating that not more than 50% of the land can be rented out. The amendment is perceived as weakening tenure security because holders who may not be able to fully exploit the land run the risk of having the rights withdrawn. This could disproportionately affect women, especially women heads of households.

Under Ethiopian family law, both husband and wife are entitled to an equal share of land ownership, and in case of divorce, the wife is entitled to half of the land. In the pastoral lowlands, there is a territorial unit for exclusive use by the respective clans, which have the right to utilize the resources available on the land. In south Omo, farmland mostly belongs to women and they decide on crops to be grown (Ayele 1998 and 2006).



# Value addition and marketing

## Market participation

Improved market participation is a key avenue to improve the livelihood of smallholder sheep and goat producers. Analysis of CSA data for the 2005 to 2013 period reveals that more than 48% of cattle producers, 41% of sheep producers and 45% of goat producers did not buy or sell their animals. Twenty-four percent of surveyed producers sold cattle, 24.1% sold sheep and 25.5% sold goats (Table 24).

Table 24. Market participation by livestock producers (%) (2005–2013)

Market participation regimes	Cattle (%)	Sheep (%)	Goats (%)
Sales only	24.1	24.3	25.5
Purchases only	15.4	21.7	17.5
Sales and purchases	12.5	8.2	5.7
No sales and no purchases	48.1	41.4	45.4

Source: Computed from CSA raw data (2005–2013).

The other important dimension of smallholder market participation is the quantity of animals sold through markets. More than 70% of sheep, goat and cattle producers did not buy any of these animals and more than 62% did not sell during the 2010–2013 period (Table 25). The transactions involved a very small number of animals. The proportion of farmers who sold three animals a year is highest for goats and lowest for cattle (Table 25). The reasons for no or low participation are generally attributed to small herd and flock sizes, low fertility and high mortality, all of which lead to a relatively slow herd growth rate (Asfaw and Jabbar 2008). In general, large numbers of smallholder farmers and pastoralists do not participate in the livestock market and those who did participate sold or bought very few animals in a year.

Table 25. Smallholder producers who purchased and sold animals (%) (2010–2013)

Number of animals	Buyers (%)			Sellers (%)		
	Cattle	Sheep	Goats	Cattle	Sheep	Goats
0	71.47	70.01	76.47	62.69	62.90	62.59
1	20.58	17.20	14.51	26.23	14.55	12.49
2	5.89	7.65	5.48	7.46	10.80	10.30
3	1.24	2.44	1.74	2.02	4.68	5.30
≥4	0.83	2.70	1.81	1.60	7.06	9.32
Mean (SD)	1.4(.84)	1.76(1.29)	1.68(1.22)	1.47(0.96)	2.32(1.72)	2.62(1.95)

Source: Computed from CSA raw data (2010–2013).

## Market participants

### Producers

Producers are smallholder farmers, pastoralists and agropastoralists who raise sheep and goats and other animals. There is no commercial sheep or goat producer in Ethiopia and herd size for smallholder producers varies depending on agro-ecological setting and wealth of the producer. Larger herd sizes are usually observed among pastoralists, but herds are very small in highland mixed crop–livestock systems. There are, however, variations within agro-ecologies, depending on household wealth. Small ruminant producers tend to sell for cash and their animals are important sources of milk and meat for the household. It is important to note the marketing behaviour of smallholder sheep and goat producers in Ethiopia. Although every producer intends to sell his/her sheep and/or goats, the sale decision is not guided by market demand, but rather most producers (especially those who have very small herds) sell their animals when cash is needed to meet obligations. Thus supply of sheep and goats to the market is governed by factors apart from market price incentives. In general, supply is very high during dry seasons, at planting time in the highlands and agropastoral areas because farmers need to buy fertilizer and improved seed, at the beginning of the school year to pay school expenses for children and religious festivals such as Easter, Christmas and Ramadan. Supply is usually low during major Christian fasting seasons in the highlands, during the rainy seasons (especially in pastoral areas), harvesting seasons in the highlands because producers are too busy with harvesting activities to take animals to market and during months after crop harvest (because farmers are in a good financial position and are buying animals to make use of the available crop aftermath).

Smallholder producers usually sell their animals in primary markets: however, there are cases when they sell at the farm gate, bush markets (for pastoralists), or on their way to the market. Farmers/pastoralists perceive that collectors waiting at the farm gate on the way to market are depressing the price of animals, so they want to sell their animals to traders, individual consumers, or other farmers in the market. However, those who want sell their animals early to meet urgent cash needs tend do so either at the farm gate or on the way to the market. Bush markets in pastoral areas are very far from primary markets. These markets could be around water points and other common gathering places where collectors buy animals to sell in primary markets.

### Collectors

Collectors could be smallholder farmers or pastoralists who trade livestock as a part-time business. They usually make use of their knowledge of local conditions and relationships. The sources of capital for collectors vary depending on relationships they have with their buyers and the level of trust they have developed with traders. Those collectors who have developed trust with traders usually get advance payment from these traders so that they will collect animals satisfying the trader's quality requirements. They hand over the animals either based on market prices or receive a commission on the number of animals that were collected (Legese et al. 2008). Those collectors that have not developed trust among traders usually depend on their own capital or borrow money either from money lenders or microfinance institutions. Collectors buy animals by going to remote areas at farm gates, village markets (smaller than the primary markets) and bush markets in pastoral areas. Those collectors operating in pastoral areas usually cross into the neighbouring regional states to collect animals from nearby markets when there is better price in domestic markets. This happens especially during the months prior to the Hajj pilgrimage season when there is very high demand for live sheep in lowland markets for live export to KSA. They also play a key role during restocking operations following drought seasons in pastoral areas. They usually supply breeding stock by collecting from remote markets because they have the knowledge to select animals of the required quality.

## Large-scale traders

As used in this document, large-scale traders refers [**Even though ‘traders’ is plural, the noun phrase ‘large-scale traders’ is singular and therefore takes the singular verb**] to those sheep and goat traders who supply thousands of animals a week to export abattoirs or live-animal exporters. They do not have a written supply contract either with their buyers or suppliers, but they have permanent buyers that will absorb all the animals they have collected as long as the purchases display the agreed animal attributes. Large-scale traders have a network of small traders and collectors that will collect animals from different corners of the country. The level of involvement of these traders depends on the nature of their agreement with buyers. Some export abattoirs provide premium prices to traders that can supply thousands of animals a week. Suppliers to such buyers establish their collection networks and try to supply as many animals as they can. They share the premium prices with small traders who otherwise would have sold the animals directly to the abattoirs and try to maximize their supply to export abattoirs.

Such traders do not go to markets to buy animals; rather they coordinate collection of animals in all possible markets using mobile telephones. They send advance payments to their suppliers through bank transfers and receive animals at their rented holding grounds around the export abattoir. Such animals rest for three days to let them regain weight lost during transportation before they are handed over to the abattoirs. Some traders operating this way supply up to 70% of the total demand of abattoirs (Legese and Hordofa 2011). Traders that operate at non-premium-paying abattoirs also use a networking strategy to collect a large number of animals in a given time and maximize their profit. The difference between such traders and those supplying to premium-price-paying abattoirs is the involvement of the former in transportation of animals from secondary markets to holding grounds around the abattoir site. The number of small-scale traders supplying animals to such traders is also very small. Because there is no premium price advantage in this case, small-scale traders using their own capital want to sell directly to export abattoirs and get the price that large-scale traders are getting.

## Small-scale traders

Small-scale shoat trader in this document refers to those livestock traders who supply more than a truckload (100 head) of sheep or goats per month to the market. The basic difference between collectors and small-scale traders is the scale of their operation and where they buy animals. While collectors usually buy up to five animals each week, small-scale traders buy up to 40 animals a week and they are usually full-time operators. Such traders supply to both domestic (local) markets and export abattoirs or live animal exporters. They usually make use of their own capital; however, those small-scale traders who supply animals to large-scale traders may take advance payments from large-scale traders to be able to buy a large number of animals at one time. Small-scale traders sell to large-scale traders either to make use of their capital without paying any interest or to benefit from premium prices as indicated above. At times when they fail to buy a truckload of animals, small-scale traders join to rent trucks and benefit from economies of scale. Small-scale traders also supply to hotels, restaurants, supermarkets and also consumer markets in bigger cities, especially during holidays. In addition to the number of animals collected through the network of their suppliers, small-scale traders also buy shoats on their own from primary markets. If they are not providing advance payments for collectors, they buy from their customers (collectors) at prevailing market prices. In order to benefit from such transactions, collectors tend to depress prices when they buy from producers.

## Cooperatives

Cooperatives that are involved in sheep and goat trading are either multi-purpose or marketing. Such cooperatives are available mainly in pastoral areas. They are established to create forward and backward links to livestock producers; however, they mainly focus on the forward links by collecting live animals from their members and non-members (Legese et al. 2008). Different NGOs and projects have tried to strengthen these cooperatives and link them to export abattoirs. Several cooperatives have also signed supply contracts to export abattoirs, however, none of them have honoured the supply contract because they could not compete with individual traders and be profitable. The day-

to-day activity of cooperatives is decided by the committee and lacks flexibility to make on-the-spot decisions such as changing the price of a sheep or goat when the market changes. Such committee-based activity is also costly because the committee members need to be paid for their time. Cooperatives are organized by farmers or pastoralists, so they usually lack entrepreneurship skills.

## Brokers

Brokers are those market actors that mediate transactions between buyers and sellers in livestock markets. The influence of brokers varies from place to place: for example, they are playing a key role in Somali markets where it is impossible to buy or sell in the absence of brokers. Brokerage in Somali livestock markets is based on clan structure of the society whereby different clans sell their animals through brokers from their clan. In some markets, brokers are needed because they take responsibility for genuine ownership of animals by the seller (Ayele et al. 2003), which avoids sale of stolen animals that usually creates conflict in livestock markets. The role of brokers is not as strong in most highland sheep and goat markets and they are replaced by those actors that do on-the-spot buying and selling of these animals. They buy two or three animals in the morning (usually before the animals enter the marketing yards) and sell them in the same market (Legese and Hordofa 2011). The number of animals handled by such actors varies depending on the time of the year. They can buy and sell up to 10 animals a day during peak supply seasons and obtain ETB 30–50 per animal.

## Export abattoirs and live animal exporters

There are seven export abattoirs buying sheep and goats to export chilled carcasses to Middle East and North African countries. They buy animals at the factory gate from large- and small-scale traders that can supply at least one truckload at a time. As indicated above, some export abattoirs provide premium prices for those traders that can supply thousands of animals in a week. Most are operating at less than 50% of their installed capacity, mainly because of a shortage of export quality animals. In addition to premium prices, some abattoirs deploy their trucks at cost to collect animals that are already procured by their suppliers. Unlike other buyers, export abattoirs buy animals on a live weight basis and the animal is weighed after it has rested for 24 hours in the holding area at the factory gate. This is to avoid filling animals with water which is usually done by feeding salt to add extra weight when selling on a live weight basis. Export abattoirs compete with each other, which raises the per kg live weight price, especially during the peak Ramadan fasting seasons. Most of the export abattoirs are located in Bishoftu and Modjo areas. Transporting animals from the Somali pastoral areas beyond Babile is becoming less feasible and there are projects to establish export abattoirs in these areas.

Live animal exporters are those traders that export live sheep and goats to Middle East markets. They usually collect seasonally and export live animals during the Hajj season. They use collection networks similar to the large-scale traders that buy animals for export abattoirs. The difference between the two is in the quality of animals. While export abattoirs need male, intact sheep or goats within a weight range of 14–27 kg, live animal exporters need animals that weigh more than 25 kg live. The origin of animals is also an important criterion for live animal exporters. Because animals from the highlands cannot tolerate the high temperature in Djibouti, low-land animals are needed for this channel. Unlike that of export abattoirs, the number of live animal exporters varies every year because it does not involve any major investment and there is no restriction on entry and exit to this market.

## Sheep and goat butchers and supermarkets

Sheep and goat butchers slaughter for domestic markets. They are available in big and small towns and their number is increasing. In terms of animal quality, they can slaughter male intact or castrated, sterile fattened females or young animals. However, they usually focus on fattened males of 40–50 kg (Legese and Hordofa 2011). They sell either fried meat or raw meat that could be consumed either at their premises or as take away. Butchers buy slaughter animals from small-scale traders.



Supermarkets in Addis sell mutton and beef at retail. Some new supermarkets such as Fresh Corner and others that are opening in Addis Ababa focus mainly on meat and dairy products, fruit and vegetables. These supermarkets sell raw meat to individual consumers as take away. They also supply sheep carcasses to hotels and restaurants on a contractual basis. According to information obtained from owners of supermarkets through key informant interviews, they buy animals from small traders. Some of them like Fresh Corner and Hadiya supermarkets slaughter animals in the Luna export abattoir, which sources slaughter animals through large- and small-scale traders. Supermarkets usually focus on sheep and beef rather than goats due to consumer preferences. Unlike the export abattoirs, supermarkets debone and cut mutton and beef and pack meat in bundles attractive to consumers.

## Hotels and individual consumers

Hotels are the major outlets for live sheep and goats. They slaughter sheep and goats and process them into different dishes. Slaughter is usually carried out for most hotels except some big ones in Addis and other urban centres. According to information obtained from hotels and managers through key informant interviews, they usually slaughter fattened sterile ewes. These animals have a better meat yield compared to other animals (Legese et al. 2008). Prices for such animals are relatively cheaper relative to yearlings and fattened male sheep or goats. Most hotels have permanent suppliers (usually small-scale traders). Some hotels also buy from producers or collect in markets.

Individual consumers usually buy sheep or goats during religious festivals. The type of animals demanded by individual consumers varies with the wealth of the consumer. Wealthy households buy fattened sheep and goats while others buy male yearlings.

## Marketing costs and margins along the sheep and goat value chains

To demonstrate value added along the value chain, data were collected from markets using Participatory Rural Appraisal techniques. Primary and secondary data were used to build the cost and margins tables in this document. Primary data were collected through key informant interviews with collectors, traders, managers of export abattoirs, supermarket owners and butchers. The original data were collected in October 2011 (Legese and Hordofa 2011) and updated in October 2013. Secondary data were obtained from the Central Statistical Agency, Revenue and Customs Authority and Ministry of Agriculture. Net marketing margin of a particular marketing agent, as an indicator of the efficiency of the channel, is defined as the residual of the gross marketing margin after paying marketing costs. Marketing costs include total marketing costs of each agent (Table 26).

Table 26. Sheep marketing costs (ETB) and share of total cost (%) for different market participants

Marketing expense	Export abattoirs		Formal live exporters		Informal live exporters		Large-scale traders	
	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)
Reception			20.5	9.7				
Feed	2	6.2	70	33	5	3	1	2
Veterinary treatment while feeding			5	2	2	1	0.13	0.3
Barn	0.4	1.2	2.5	1	2	1.0	0.2	0.4
Water and electricity	1	2.5	2	1	1	0.5		
Labour (hired)	0.1	0.3	1	0.5	1	0.5		
Telephone	0.4	1.2	0.5	0.2	1	0.5		
Transport to port	2	6.2	55	26	20	10.4		
Veterinary/hazards certificate	0.04	0.1	0.03					
Quarantine charges			10	5				

	Export abattoirs		Formal live exporters		Informal live exporters		Large-scale traders	
	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)
Marketing expense								
Certificate of origin	0.8	2.5						
Trekking							2.14	4
Trucking to centre							25	50
Total Tax payment	15	46	15	7	10	5	10	20
Combiner							1.26	3
Loading/unloading	1	3.1					0.41	1
Payment to buying agent					50	26	3	6
Payment to selling agent					50	26	3	6
Marking ink					0.45	0.2	0.5	1
Fuel and lubricant	2.2	7					2.5	5
Other			30	14	50	26.0		
Total marketing	32	100	211	100	192	100	50	100
Reception								
Feed	1	2	1	6	5	1.9	2.0	2.0
Veterinary treatment while feeding	0.34	1					0.1	0.1
Barn	0.2	0.4			2.5		2.5	2.5
Water and electricity					30	11.1	30	29.5
Labour (hired)					35	13.0	30	29.5
Telephone					5	0.7	5	4.9
Transport to port								
Veterinary/hazards certificate								
Quarantine charges								
Processing, packaging and labelling								
Certificate of origin					145	53.7		
Trekking	3.34	7	3	16	30	11.1	15	14.8
Trucking to centre	25	54.5	5	28				
Total Tax payment	10	22	5	28	5	3.7	5	4.9
Combiner	1	1						
Loading/unloading	1	1			2	0.7	2	2.0
Payment to buying agent	3	7	2	10	10	3.7	10	3.7
Payment to selling agent								
Payment to guard/grazing			1	6				
Marking ink	0.5	1.0						
Fuel and lubricant	1	3	1	8				
Other								
Total marketing	46	100	18	100	270	100	101.6	100

Source: Computed from PRA data (2013).

Reception costs are incurred when animals collected from different sources arrive at the holding ground. These include vaccination and treatment against diseases and ear tags for identification and are usually incurred by formal live animal exporters and are necessary to receive export permits. Feed is the major cost for live animal exporters because they are required to keep animals at the holding area (in quarantine) for three weeks in order to receive an export permit. Other actors also incur feed costs for only a couple of days, but it is only 3–5% of the total marketing cost. Feed cost per animal is derived by determining the total amount of feed that traders/export abattoirs buy during harvest seasons for an entire year's consumption and the average number of animals slaughtered by the abattoir in a year.

Labour is calculated based on the firm's total labour cost for a month and the number of animals slaughtered or sold by the firm. Telephone calls are search costs used to communicate with suppliers. Two types of transport costs are included in the table (transport to the centre and to the port), which shows cost of transportation from production areas to the centre (for processing, consumption, or holding area in case of live exports), from the export abattoir to the port and from the waiting area to the seaport for live exports. Trucking (transportation) cost to the centre is the major marketing cost for large-and small-scale traders, while trekking costs from bush markets and production areas to primary markets are the major cost for collectors. There are additional costs such as combiner's cost. 'Combiner' is the name given to the individual at the back of the truck whose primary function is to make sure that animals do not fall in the truck and get trampled and do not jump from the truck. Combiners are paid about ETB 300 per trip. Transportation to the airport is the major cost for export abattoirs, which use refrigerated trucks. All these costs, including labour, fuel (electricity), water and other supplies are considered in the calculation. Processing, packing and labelling costs are incurred by export abattoirs, butchers, supermarkets and hotels.

Export abattoirs slaughter sheep and goats, chill the full carcass and wrap it with cotton linen when shipping them. They also freeze offal in plastic bags and pack them in labelled cartons for shipment. Supermarkets also prepare shooat meat in different cuts, pack it in plastic and make the product ready for distribution from their retail outlets. Butchers roll cuts of carcasses as per the order of the buyer for take away. Hotels process shooat meat into different dishes to serve on site: however, take away and the associated packing are not common from hotels. Tax payments included in the two tables are taxes at market gates and profit taxes that firms or individuals are required to pay.

Table 27. Goat marketing costs (ETB) and share of total cost (%) for different market participants

Marketing cost	Export abattoirs		Formal live exporters		Informal live exporters		Large-scale traders	
	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)	Amount (ETB)	Share (%)
Reception			21	8.5				
Feed	2	6.3	70	28.3	5	3.5	1	1.7
Veterinary treatment			5	2.0	2	1.4	0.1	0.2
Barn	0.4	1.3	2.5	1.0	2	1.4	0.2	0.4
Water and electricity	0.8	2.5	2	0.8	1	0.7	2	3.8
Labour (hired)	0.07	0.2	1	0.4	1	0.7		0.0
Telephone	0.4	1.3	0.5	0.2	1	0.7	1	1.9
Trekking		0.0		0.0			2.1	4.0
Trucking to centre		0.0	25	10.1			25	47.2
Transport to port	2	6.3	54.6	22.1	20	14		
Veterinary/hazards certificate	0.04	0.1	0.03	0.0				
Quarantine charges			10	4.0				
Processing, packaging and labelling	7.76	24.3						
Certificate of origin (ETB/head)	0.8	2.5	0.8	0.3				
Total Tax payment	15	46.9	15	6.1	10	7.0	10	18.9
Combiner		0.0	1.54	0.6			1.3	2.5
Loading/unloading	1	3.1	1	0.4			0.4	0.8
Payment to buying agent			20	8.1	50	35	3.1	5.8
Payment to selling agent			15	6.1	50	35	3.1	5.8
Payment to guard/grazing			2.5	1.0			0.4	0.8
Marking ink			0.5	0.2	0.5	0.3	0.5	0.9
Fuel and lubricant	2.2	6.9					2.5	4.7
Other			21	8.5	50	35		
<b>Total</b>	<b>32</b>	<b>100</b>	<b>247</b>	<b>100</b>	<b>143</b>	<b>100</b>	<b>53</b>	<b>100</b>

Source: Computed from PRA data(2013).

## Marketing channels

Based on analysis of secondary data from the Central Statistical Agency, Customs Authority, Ministry of Agriculture and past studies on the small ruminant value chain (Legese et al. 2008; Legese and Hordofa 2011; Duguma et al. 2012), we have identified five major channels each for sheep and goat marketing in Ethiopia. Using CSA data, we computed the share of each marketing channel (Tables 28 and 29 for sheep and goats, respectively). For sheep, 67% of the transacted animals are sold to consumers via traders and 24% are sold to hotels, butchers and supermarkets. Overall, the domestic market accounts for 92% of total transactions for sheep. Live sheep exported formally and informally account for 3% each, while the remaining 2% is exported as mutton.

Table 28. Major marketing channels in sheep value chain

Channel type	Volume of animals flowing through the channel (%)
Channel 1: Sheep sold to domestic individual consumers through traders	67
Channel 2: Sheep sold to hotels, butchers and supermarkets	24
Channel 3: Live sheep exported through formal channel	3
Channel 4: Live sheep exported through informal channel	3
Channel 5: Mutton exported to different counties	2

Source: Computed from CSA (2012/13) and MoA (2002, 2007, 2008, 2010).

Table 29. Major marketing channels in goat value chain

Channel type	Volume of animals flowing through the channel (%)
Channel 1: Goats sold to domestic individual consumers through traders	75
Channel 2: Goat meat exported from pastoral areas	12
Channel 3: Live goats exported through informal channel	9
Channel 4: Goats sold to hotels	3
Channel 5: Live goats exported through formal channel	1

Source: Computed from CSA (2012/13) and MoA (2002, 2007, 2008, 2010).

For goats, the domestic market channel is also important, accounting for 78% of the total goats transacted, with 75% sold live to consumers and 3% to hotels as goat meat. The second most important channel in the goat value chain is meat exported to Middle East countries. About 12% of goats in the value chain are sold to export abattoirs. These animals are mainly sourced from pastoral lowlands and are primarily intact male yearlings. The other important channel is the informal live goat export channel. About 9% of the total goats in the value chain are informally exported to neighbouring countries, while formal live goat exports are less than 1% of total animals in the value chain. The number of animals informally crossing Ethiopia's borders to neighbouring countries has different implications. This channel is competing with domestic consumers and export abattoirs, which leads to higher domestic prices for live animals. This in turn threatens the competitiveness of export abattoirs and the resulting supply shortage compels these abattoirs to operate under their installed capacity. There is significant loss of hard currency as a result of the informal crossborder trade.

Another important aspect is the flow of benefits among actors that highlights efficiency of the different marketing channels identified in the Ethiopian small ruminant value chain. We computed gross margin (marketing margin), net marketing margin and producer share of the final price of sheep and goats. Accordingly, producers receive 69% of the final price when individual consumers buy the animal live through traders (Table 30). They receive 59% of final price if export abattoirs are the buyers and 51% if the buyers are hotels. There are multiple reasons explaining the hotel price—hotels incur higher marketing and processing costs compared to live sheep traders and export abattoirs, 16% of the final sheep price when the animal is sold to hotels compared to 4% when sold to consumers by traders, 3% for export abattoirs and 11% for informal exporters. Although informal live animal exports are discouraged by the government, the share of the final sheep price that reaches producers (47%) was higher when animals are sold to this channel rather than the formal channel (44%). Informal live animal exports benefit individual producers, but suppress national revenue and the resulting long-term development activities that could be financed by the government.

Table 30. Sheep sold to domestic individual consumers through traders

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Consumers	Total
Selling price (ETB)	900	950	1100	1300		
Marketing costs per head (ETB)		18	46	50		114
Distribution of marketing costs (%)		16	40	44		100
Marketing margin		50	150	200		400
Net margin (value added)		32	104	150		286
Distribution of net margin (%)		11	36	52		100
Proportion of final product price that reaches the producer				69		

Source: Computed from PRA data (2013).

Large-scale traders achieve the highest net margin in the channel when sheep are sold to individual consumers. These are primarily castrated fattened males and sterile ewes. Large-scale traders also have the highest share of total marketing costs incurred in this channel, perhaps justifying their net margin.

The 'hotel channel' is the most lucrative in the entire sheep value chain with the highest marketing net margins and marketing costs as well. Seventy-three percent of the net margin realized in this channel goes to hotel operators. The hotels usually buy mature ewes (Table 31).

Table 31. Sheep sold to hotels

Parameter	Producer	Collectors	Small-scale traders	Hotels	Consumers	Total
Selling price (ETB)	820	900	1050	1600		
Marketing costs per head (ETB)		18	46	270		334
Distribution of marketing costs		5	14	81		100
Marketing margin		80	150	550		780
Net margin (value added)		62	104	280		446
Distribution of net margins		14	23	63		100
Proportion of final product price that reaches the producer				51		

Source: Computed from PRA data (2013).

The 'export' channel whereby animals are sold to formal live animal exporters ranked third in terms of transaction volume. The primary targets are intact, well-conditioned, male sheep. Exporters buy animals with a live weight of between 25 and 40 kg, with the majority exported to Saudi Arabia for sacrifice during the Hajj. This is a seasonal demand, at its prime during that time of the year. As a result, turnover is high because opportunistic market agents, primarily exporters, tend to exit after the season. These agents are more interested in short-run market opportunities than building durable relationship with suppliers for long-term business. Net marketing margin for exporters is higher than that of final sellers in the other channels (Table 32).

Table 32. Live sheep exported through formal channels

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Formal live exporters	Foreign importers	Total
Selling price (ETB)	800	900	1100	1350	1800		
Marketing costs per head (ETB)		18	46	50	211		325
Distribution of marketing costs (%)		6	14	15	65		100
Marketing margin		100	200	250	450		1000
Net margin (value added)		82	154	200	239		675
Distribution of net margin (%)		12	23	30	35		100
Proportion of final product price that reaches the producer					44		

Source: Computed from PRA data (2013).

Sheep producers in lowland pastoral areas take advantage of their geographical proximity to ports in neighbouring countries. As a result, they have the option to sell their stock in domestic markets or in nearby markets in these neighbouring countries, depending on prices. The marketing environment in the lowland areas plays a significant role in this decision and at times more so than price (Table 33). Traders contacted for this study indicated that their main reason was an attempt to escape bureaucratic hassles. About 50% of the total net margin created in this channel is obtained by exporters. Other actors also benefit proportionally to their cost.

Table 33. Live sheep exported through informal channels

Parameter	Producer	Small-scale traders	Large-scale traders	Informal exporters	Foreign importers	Total
Selling price(ETB)	850	1000	1300	1,		
Marketing costs per head(ETB)		46	102	192		340
Distribution of marketing costs (%)		14	30	56		100
Marketing margin		150	300	500		950
Net Margin (value added)		104	198	308		610
Distribution of Net margin (%)		17	32	50		100
Proportion of final product price that reaches the producer				47		

Source: Computed from PRA data (2013).

The 'meat export' channel has the lowest volume of animals entering the sheep value chain (Table 34). Export abattoirs have been functioning below capacity for a long time and sheep are only 10–20% of the slaughter volume of export abattoirs. Meat export volume is still very low and has never surpassed 18,000 t. The maximum net margin (49%) is obtained by export abattoirs and the least goes to large-scale traders. In this channel, large-scale traders primarily benefit from the animal volume sent to export abattoirs because they usually collect animals through a network of small-scale traders and collectors at premium prices. Hence, their net margin per animal may be small but their overall weekly gain is high considering the large number of animals they supply to export abattoirs. Similar cost calculations for the goat value chain are indicated in Annex 3.

Table 34. Mutton exports

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Export abattoirs	Foreign importers	Total
Selling price(ETB)	600	660	780	850	1015		
Marketing costs per head(ETB)		18	46	50	32		146
Distribution of marketing costs (%)		12	32	34	22		100
Marketing margin		60	120	70	165		415
Net margin (value added)		42	74	20	133		269
Distribution of net margins (%)		16	28	7	49		100
Proportion of final product price that reaches the producer					59		

Source: Computed from PRA data (2013).

## Analysis of end markets for sheep and goat value chains

Analysis of end markets provides important information about the characteristics of final consumers of products, quality requirements, tests and preferences, times of high and low demand, volume of demand and other relevant information. This information provides good guidance for suppliers to maximize benefits from transactions with their buyers. Hence, end buyers are important sources of demand information, can transmit learning and in some cases are willing to invest in firms further down the chain (Campbell 2008). End markets for sheep and goats could be broadly classified as domestic and export markets.

## Domestic markets

Domestic markets serve individual consumers, hotels, butchers and institutional consumers (such as hospitals, universities and the army). These consumers need animals of different qualities and parameters vary with agro-ecology, season, wealth category and type of institution. Individual consumer preferences, for example, vary with location. Highland consumers usually consume mutton while lowlanders prefer goat meat to mutton. However, butchers in Addis and other urban centres in the highlands serve raw and fried goat meat. This is expected to change the attitude of highlanders for goat meat. Wealth category and timing are also important parameters for individual consumers. Well-off households usually go for castrated, fattened sheep or goats, while others go for male yearlings. The demand for sheep or goats by individual consumers is seasonal because of religious festivals, thus there is a high domestic demand for sheep and goats at the end of August to celebrate Ethiopian New Year, in December for Christmas and for Easter. There is also high demand during the celebration of Ramadan and Arafa.

Hotels usually slaughter fattened ewes, which is a continuous demand throughout the year, except during the major Orthodox Christian fasting seasons (mainly mid-February to beginning of April for 55 days) when livestock markets in most highland areas are closed. Most hotels serving Christians in the highland areas do not slaughter sheep or goats because demand for meat decreases by this time. This applies to butchers, too. Butchers need male intact/castrated goats and their demand is also continuous except those following Orthodox Christianity. Supermarkets are also emerging as important buyers of live sheep. They usually slaughter fattened, intact, or castrated sheep. The number of animals purchased by hotels, butchers and supermarkets varies on the degree of market penetration. Institutional consumers such as universities and the army follow a similar pattern. They are bulk consumers that buy thousands of animals mostly through their suppliers (on a contract basis).

## Export markets

Seven export abattoirs export live sheep and goats, mutton and goat meat to Middle East countries. Vietnam, Turkey, China and Hong Kong are also important destinations for offal. The most important markets for Ethiopian chilled sheep and goat carcasses are UAE and KSA. These markets have specific requirements, especially carcass weight. The UAE market needs sheep and goats carcasses of 5–10 kg, which requires slaughtering animals of 13–25 kg live weight. On the other hand, the KSA market needs larger sheep and goat carcasses of 7–12 kg for goats and 8–12 kg for sheep. This in turn requires slaughtering goats of 16–30 kg and sheep of 20–30 kg live weight. The new market that has opened an opportunity for highland sheep is the Bahrain market. This market accepts sheep carcasses of 9–12 kg. In general, although quality requirements vary, the sheep and goat export market generally requires animals with these characteristics—male, intact, young (1–2 years) and with a live weight of 12–30 kg. The export market needs non-castrated sheep and goats with good body fat cover (Legese et al. 2008).

Ethiopian meat is competing with meat from New Zealand, Brazil, India and Pakistan in the Gulf markets. The market in these countries is segmented according to income, with higher-income populations preferring freshly slaughtered meat, while lower-income populations (particularly low-income expatriates) opt for low-cost meat that is usually frozen. Ethiopian meat is geared toward the low end of the market. This is also the segment of the population that consumes chilled Ethiopian sheep and goat carcasses. Ethiopian meat is sold at lower prices in these markets.

Ethiopia is also exporting live sheep and goats to Middle East markets. The major importer of Ethiopian sheep and goats is KSA. This is a seasonal market targeting the Hajj pilgrimage season. As indicated above, intact male sheep and goats of over 25 kg are required for this channel.





## Value chain governance

Smallholder farmers and pastoralists/agropastoralists are the major producers and suppliers of sheep and goats to the market. According to information obtained through focus group discussions with producers and interviews with key informants on livestock trade in different parts of the country, these producers sell their animals to any buyer whenever they go to markets and do not have any long-standing customers (Fillip 2006; Teklewold et al. 2009; Legese and Hordofa 2011; Duguma et al. 2012). Long-term contracting relationships between market agents are almost non-existent. Traders usually buy animals from any producer by negotiating price to its minimum. There is no trust between producers and traders, which means there is no information and knowledge shared among producers and buyers. The power balance (bargaining power) varies with seasons depending on the nature of demand and supply. During planting seasons (June and July) and in times of drought, market supply is at its peak. These periods tend to coincide with times of low demand with many producers desperate to sell their animals. On the other hand, during high-demand seasons such as Easter, Christmas, New Year and Ramadan, producers set the market. The difference in this case is that the major buyers during such seasons are individual consumers, not traders. Traders do not have absolute market power to set prices in such seasons. To understand the real market movers, final buyers who are sourcing from large- and small-scale traders need to be considered.

As indicated earlier, large-scale sheep and goat traders are those selling animals to export abattoirs. These traders determine market prices depending on an agreed price. The agreed price, hence traders' procurement price, fluctuates mainly because of the competition between export abattoirs to buy a large number of animals, especially during Ramadan. Hence, export abattoirs have the leadership position in this market dynamic with the power to determine the price and flow of animals in markets supplying animals to them. Export abattoirs reduce their operations by the time domestic demand (during religious festivals) becomes higher. Horizontal links between producers that could be a source of strength by improved bargaining power are generally weak. There are ways to strengthen producer positions through collective action such as livestock marketing cooperatives linked to buyers, but these cooperatives were not successful mainly because of poor management.



## Food safety

Foods of livestock origin are highly perishable because they are the ideal media for the growth of bacteria, which can make the food unsuitable for consumption. Some bacteria produce toxins that are very dangerous and cause severe gastrointestinal problems. Food-borne diseases are caused not only by bacteria but also parasites that are ingested with food. Extensive consumption of raw meat in Ethiopia is the major cause for spread of tapeworms such as cattle tapeworm (cysticercosis in meat) and by cysts of the canine tapeworm (hydatidosis in meat). There are also other zoonotic diseases that could be transferred from animals to humans through ingestion of different animal products, such as brucellosis and tuberculosis. Consuming raw meat and milk are the major mechanisms for transfer of such bacteria.

Many cities in Ethiopia established municipal slaughterhouses mainly as a result of nationwide livestock projects in 1990s. These abattoirs incorporate line slaughter and processing systems in which carcasses are vertically suspended on rails, thereby allowing the different operations (bleeding, hide removal, evisceration, etc.) to be carried out at different locations (MoA 2007c). These slaughterhouses provide slaughter services to butchers and residents in the area. Slaughter in the backyard is normally forbidden and meat sourced from outside slaughterhouses may be discarded. However, slaughter of cattle by groups to celebrate festivals usually takes place in backyards in most places.

Small ruminants are not commonly slaughtered in the municipal abattoirs. By some accounts up to 80% of all slaughter is conducted in the backyard (Mahmud 2000). This poses significant health risks simply because procedures to limit cross-contamination are not followed and there is heightened environmental risk posed by a failure to manage slaughter waste, some of which is dumped in streams (Addisu et al. 2010). There have been some attempts to gauge consumer value of food quality and safety in Ethiopia. First, it is important to note that in a developing country context, including Ethiopia, there is no clear demarcation between quality and safety attributes, although studies such as Jabbar and Samuel (2010) for beef and dairy, Addisu et al. (2010) for beef and small ruminant meat and Aga (2011) for sheep meat in Addis were conducted for that purpose. The central hypothesis of these studies is that all attributes are not equally preferred by consumers. They are valued differently with a premium paid for the most preferred and discount for the least preferred.

The veterinary stamp, health certificate, neatness of the butchery, equipment such as availability of cold facilities and display chamber to avoid exposing meat to dust, flies and unnecessary contamination are indicators of food safety. With beef quality and safety, Jabbar and Samuel (2010) found that for consumers, freshness is the most important attribute, followed by hygiene of the sales outlet and personnel, abattoir stamp, fat content and price. There is a prevailing attitude among Ethiopian consumers that price is an indicator of quality and safety. For sheep meat, Aga (2011) derived the relative importance of each prevailing quality and safety attribute in shaping consumer purchasing decisions. Hygiene is the most important attribute contributing to 37.4% overall utility, followed by freshness at 18.5%, price at 16.0%, official stamp at 14.3% and fat content at 13.8%. How consumers value these attributes could provide useful insights to processors and other value chain actors about what to produce and how to produce, which could be helpful in terms of market innovation and value chain upgrading. Ethiopia is evidently far from making significant inroads in livestock product development as the predominance of uncontrolled backyard slaughter indicates.

Some supermarkets have meat retail sections and some are targeting meat as their main commodity, especially in Addis (MoA 2007c). These supermarkets are following international hygiene procedures and are equipped with cooling facilities to ensure safety. On the other hand, the vast majority of butchers in the country are selling fresh meat without cooling it. This is associated with the habit of eating raw meat, which requires freshness and will continue as long as the habit of raw meat consumption continues despite potentially serious public health implications.

Export abattoirs are required to follow strict international regulations and maintain cold chains that are regularly monitored by inspectors from meat importing countries. They are required to produce chilled sheep and goat carcasses having 10-day shelf-life in destination markets. However, domestic slaughterhouses are not required to fulfil these standards (MoA 2007c). Apart from adequate slaughter and meat handling facilities, adequate meat inspection is needed for good quality meat. Ethiopian meat inspection regulations provide relatively comprehensive technical guidelines on ante-mortem and post-mortem inspection procedures and on judging carcasses or carcass parts. All export abattoirs are privately owned and operated and meat inspection is carried out by MoA staff. The government assigns one veterinarian, two senior meat inspectors, two assistant meat inspectors and one laboratory technician at each export abattoir.



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## Grades and quality standards

Established grades and standards for slaughter animals and carcasses facilitate marketing of Ethiopian livestock and meat products. Grades and standards help to harmonize and organize market volume and price information. Grades for feeder stock indicate the potential for profitable weight gain, lean yield and carcass quality. Carcass grades, including effects of age and fat cover, specifically indicate the lean yield and quality of meat products (tenderness, colour). For export meat products, grades enable purchase of unseen products once buyers have built confidence that the product delivered will be of a specified quality and type.

Ethiopia's Quality and Standards Authority (EQSA) has developed grades and standards for live animals and carcasses; chilled and frozen mutton and goat specifications; codes of hygienic practices for processed meat products, fresh meat, mutton and goat meat, curried and canned specifications; and basic requirements for a livestock market. However, these codes remain unfamiliar to livestock traders and producers. To our knowledge, there isn't any livestock market in the country that is known to use this system. The application of these codes in the processing and grading of livestock products is minimal and no training was conducted for qualified graders to implement these quality standards and grades (Dugasa and Belachew 2009).

The drafted regulatory text on live animal marketing contains articles that seek to enforce sales of animals at auction points and the respect of quality standards. The existing live animal grades and standards are not popularized nor enforced and a quality base pricing system is not being executed because professional graders are lacking. There are other articles that seek to enforce animal movement, health certificate requirements and transporting animals using adapted trucks. However, the use of such trucks by transport service providers is rare. The reason often evoked is the prohibitive cost of these specialized vehicles, especially when they are subjected to import duties. Overall, it seems that there is a disconnect between the drafted regulatory framework and existing marketing practices. The draft proclamation requires some revision; otherwise it may have some unintended consequences by depressing formal market operations and encouraging informal cross border trade.



## Strengths, weaknesses, opportunities and threats (SWOT) to the development of the small ruminant value chain

The Ethiopian small ruminant sector is challenged by several factors, ranging from supply of essential inputs and services to produce quality animals to processing products. The SWOT analysis of the Ethiopian small ruminant value chain is presented in Table 35.

Table 35. Strengths, weaknesses, opportunities and threats (SWOT) analysis of the Ethiopian small ruminant sector

### Strengths

- Increased awareness of smallholder farmers/pastoralists about income diversification benefits of small ruminants.
- Use of small ruminates, especially goats, as risk mitigation mechanisms in pastoral areas. Since loss of pastoralist assets (that usually depend on large ruminants) because recurrent droughts are increasing, they are shifting towards goats and camels as a coping strategy for the effects of climate change.
- High number of trained livestock extension agents to support smallholder farmers in livestock production.
- New veterinary faculties in more than six universities are producing a tremendous number of veterinarians every year. These veterinarians could be better organized either in the private sector or public institutions to improve the veterinary health service and support the supply of better quality animals to markets.
- Federal and regional research centres and universities provide inputs for breed improvement and multiplication of technologies.
- Different NGOs and smallholder farmers engaged in multiplication of forage seeds.



## Weaknesses

- Multiplication of livestock technologies such as breeding stock and forage planting materials is limited because research centres and universities are not mandated to multiply technologies apart from their on-farm activities and they have limited capacity to do so.
- Most public breed multiplication farms and ranches are privatized and owners shifted them to other non-livestock farming activities. As a result, there is a large shortage of improved breeding stock.
- Forage seeds and other planting materials are not commercialized and markets are not developed for these commodities. Forage development is usually a project initiative that ceases with the lifetime of projects.
- Improved conservation and use of crop residues does not get enough attention and this resource is not efficiently utilized. Though huge amounts of crop residues are produced in the crop–livestock mixed farming systems, farmers are not trained in their proper conservation and use. Producers are not aware of different treatment mechanisms to increase the nutritional value of crop residues.
- There is no clear breeding policy. Emphasis is given to introduction of exotic breeds and crossing them with indigenous breeds rather than selection and improvement of indigenous breeds.
- Inefficiency of genotype multiplication farms. Most of the existing ranches/farms operate under capacity due mainly to understaffing, budget constraints and weak management systems.
- Lack of private sector participation in multiplication of genotypes and forage planting materials and shortage of improved breeds and forage planting materials.
- Feed shortages and absence of a well-established feed marketing system in most parts of the country.
- Shortage of veterinary drugs and clinical equipment in veterinary clinics and health posts, mainly because of inadequate budget allocations by regional governments. The problem of drug shortages is resolved by Oromia and Amhara regional states mainly through allocation of revolving funds at the Woreda level, however, this problem still exists in other regional states. Shortage of clinical equipment is a general problem in all regions because drug revolving funds are not used for this purpose.
- Shortage of veterinary personnel. The government has built at least one veterinary clinic in each district and one veterinary health post in three Kebeles. One veterinary technician is assigned to serve the community in each health post. This technician is expected to do both technical veterinary services and administrative issues, including financial management. Because the Kebeles cover large areas, one technician could not satisfy the service demand from the community.
- Shortage of transportation facilities for veterinary service providers. Farmers and pastoralists need emergency veterinary services at their places because it is difficult to transport sick animals or pregnant animals that have delivery problems. However, technicians in most places do not have transportation such as ordinary bicycles, motorcycles, cars, or horses to respond to such demands.
- Limited participation of private sector operators in provision of veterinary services and drug supply. This is mainly because of a highly subsidized public veterinary system that does not charge the real cost of services. Farmers/pastoralists are accustomed to very low service charges that are not attractive for private sector operators. This may need either withdrawal of the government from the veterinary clinical service or devising a level playing field for both public and private service providers.

### Opportunities

- An increasingly high demand for shoat meat in Middle East and North African countries. The demand for Ethiopian shoat meat has dramatically increased following market promotion activities and the general increase in demand for meat globally. This has created an opportunity for shoat producers to sell more goats and sheep at better prices. Meat exports have increased from 870 t in 1991 to about 18,000 t in 2011/12 and more than 90% is shoat meat (Legesse et al. 2008).
- Government commitment and support to increase export of meat. In its five-year growth and transformation plan, the government has decided to increase meat exports to 110,000 t by 2015. The government envisages earning USD 1 billion from the export of meat and live animals by this time. Thus, GoE is committed to support all actors involved in development of livestock value chains in the country. It is assessing constraints along the meat export value chain and is ready to take all the necessary measures to increase the supply of live shoats to export abattoirs and export of meat according to targets set in the GTP. This creates better market opportunities for shoat producers.
- Suitable agro-ecology to produce different livestock species.
- Availability of a significant livestock population.
- Increasing domestic and international demand for meat.
- Proximity to Middle East countries relative to other meat and live animal exporting countries.
- Attention of NGOs to small ruminants as a mechanism to diversify household income and create household assets.
- Efforts to introduce and disseminate improved forage species by GOs and NGOs

### Threats

- High competition in export markets. Ethiopian meat exports compete with meat exported from Australia, India and other countries that provide higher quality products.
- Recurrent droughts in pastoral areas. Pastoral areas are prone to recurrent droughts in which shortages of forage and water damages livestock herds and flocks.
- Huge informal trade absorbs the majority of animals and escalates domestic prices, reducing competitiveness of formal export markets.
- Frequent clan conflicts in pastoral areas result in supply shortages in major markets. The Ethiopian pastoral system includes different ethnic groups with their own clan subdivisions. Conflicts frequently arise between different ethnic groups as well as clans within specific ethnic groups. Conflicts are not predictable and can happen when the export market is at peak demand. Such conflicts result in supply shortages in livestock markets.
- Repeated bans on Ethiopian livestock and meat by importing countries. The Ethiopian livestock and meat export trade is jeopardized by repeated bans, in particular from countries on the Arabian Peninsula, because its products are perceived as carrying livestock diseases.
- Prevalence of different diseases and parasites reduces the productivity of small ruminants.
- Weeds/tree species invade grazing lands in the highlands and dominate the bushes in pastoral areas
- Informal veterinary drug trade and poor regulatory system to control it. Besides the formal public veterinary clinics and private veterinary drug shops, there is a huge informal livestock drug business in the country. These are contraband businesses with products of unknown source sold in the market without any sense of responsibility. The regulatory system is incapable of controlling such businesses, leading ordinary shops, human pharmacies and other traders operating in open air markets to get involved in selling livestock drugs.



## Conclusions and implications

Ethiopia is endowed with abundant livestock resources; however, overall productivity of the livestock sector is very low. The level of participation of smallholder farmers and pastoralists in sheep and goat markets is very low, mainly because of high mortality and low fertility rates that limit herd size per household. Improved fertility and reducing the mortality rate are required to increase flock size sufficiently to allow smallholders to sell more animals more often than they do now. This requires a number of actions, including:

- Increased investments in animal health services and making those services accessible to smallholders at the right time and at affordable prices.
- Improved content and quality of livestock extension services. Extension messages should be designed to advise producers to better utilize scarce feed resources to improve productivity and quality of marketed animals.
- Revision of the extension package to influence the marketing behaviour of producers.
- The Ethiopian small ruminant population is almost entirely indigenous breeds with a very small portion represented by exotic breeds. Breed improvement activities to select indigenous breeds or crossbreed with high quality exotic breeds are lacking. The low proportion of exotic and crossbred animals is because of reliance on multiplication of breeding stock at federal and regional research centres and higher education institutions that do not have a mandate for large-scale multiplication. These institutions also lack the capacity because they were established to undertake research and multiplication of a limited number of animals mainly for demonstration. Considering the need for huge investments to setup big multiplication centres within a short time, more economical and sustainable alternative strategies to this problem are needed. One of those strategies is promotion of community-based breeding programs whereby the community selects its best performing animals and uses collective action in their maintenance, multiplication and marketing. This does not involve much external investment and could be carried out by farmers/pastoralists once they are trained and closely supported by professionals. The other option is strengthening existing public livestock multiplication centres. Existing public farms perform under capacity. In order to satisfy the national needs for livestock extension inputs, the capacity of existing public multiplication centres needs to be enhanced for them to operate with the necessary competence to carry out their mission. This may need budgetary support so that they will fulfil their human resource requirements, facility maintenance and cover their running costs.
- Delivery of animal health services in Ethiopia is predominantly performed by the public sector and is far from satisfactory, leaving many areas without services. The presence of private veterinary practices on the ground is spotty and does not give an indication of active participation. This is mainly attributed to a subsidized service rendered by the public sector which is far below its actual cost. Competition with such a subsidized system may not be as such attractive for the private sector. Thus, creating a level playing field for the private sector to compete with the public service is mandatory to improve the animal health service delivery system. Three issues are of paramount importance for participation of the private sector in an animal health delivery system:
- Animal health practitioners with the necessary educational background need to be certified to deliver services both in the form of drugstore and/or clinical operations.

- New graduates from the different veterinary faculties are unemployed while there is shortage of personnel to properly address the required health services in the country. This calls for encouraging these young professions to be engaged in private services, which may involve providing credit (initial capital) and developing their business skills.
- In light of the shortage of skilled animal health personnel to render services with wider coverage than is currently available, utilization of paravets under the supervision of vets should be expanded. Recurrent monitoring and training to update their skills is also essential.
- The current focus on distribution of improved seeds and other plant materials for fodder crops to improve on farm feed resources is commendable. However, it is limited by a chronic shortage of seeds/cuttings. These plant materials are multiplied by some research centres and higher education institutions. Unlike crop seeds, there is no private or public institution dedicated to multiplication of these materials. Markets are not developed for fodder planting materials because they have been distributed for free. To attract participation of private sector operators or promote farmer-based multiplication of these materials, there is a need to develop markets for forage plant materials.
- Most extension interventions in feed development focus mainly on introduction and use of improved fodder in the highlands and rangeland management in the lowlands. However, farmers in the highlands and lowland agropastoral areas produce ample amounts of crop residues (straw and stover), but use them wastefully during the harvest period. In most places, farmers do not conserve them properly. Because these crop residues have low digestibility and high fibre content, there is a need to augment these nutrient-deficient feeds with cheap and easily available protein-rich supplementary browse forage crops or through urea and/or molasses. Training and demonstrations for farmers and extension agents are needed.

Currently, there is a huge demand for sheep and goat meat both in domestic and export markets. Though willingness to pay for different quality attributes varies, both domestic and export markets need well-conditioned animals at competitive prices. There is very high demand for fattened, non-castrated, young male sheep and goats in domestic and export markets, but farmers in most parts of Ethiopia follow a traditional fattening practice that demands feeding an animal for more than a year after it is castrated. There is a need for interventions targeted to change such practices into quick feeding of animals in a more cost effective way that allows producers more turnover and with better margins. Such interventions would enable producers to catch both the domestic and export markets with better quality products.

The major export markets for Ethiopian sheep and goat meat are the Middle East countries. These countries are importing cuts of meats in addition to chilled carcasses. Exporting meat cuts increases the value of meat and also creates more employment opportunities, but Ethiopia is currently exporting mainly chilled carcasses and offal. This implies a need to build the capacity of private sector operators and motivate them to broaden their product line.

Participation by smallholder farmers and pastoralists in livestock markets is low. Sales are often driven by need rather than being a node in the business continuum. Under such circumstances, investment in high-payoff inputs when available is limited, thus extension education about market incentives is necessary to improve productivity and sustain production gains. Such changes often occur slowly because smallholders and pastoralists tend to participate in markets only if compelled to by their specific circumstances.

An analysis of cost structure indicated that transportation accounts for the highest share of marketing costs. Animals are transported using various means, including ordinary trucks not suitable for livestock transportation. Besides direct monetary costs, the impact of such transportation on marketing is far reaching. It tends to induce stress and weight losses that affect meat quality at slaughter. The need to enforce the rules and regulations about animal transportation by means of designated livestock trucks is important.

Overall, the outlook for the Ethiopian livestock sector is expected to follow its long-run trend with no significant changes. For the sector to thrive, significant interventions are needed to improve its trajectory. These include actions on the input generation and delivery system, including genetic resources, feeds, animal health, credit and other relevant production factors, including land. It is only through these interventions that value chain development can be expected.

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# Appendices

## Appendix I. Structural Model of the Ethiopian livestock sector

The basic structure is a dynamic partial equilibrium multi-market model with an explicit crop–livestock integration used to simulate the medium- and long-term overviews of the Ethiopian livestock sector. The structure of the model is a series of behavioural supply, demand, prices and trade equations for crops and livestock. These endogenous variables are all linked in the model so that any changes in one sub sector will be felt throughout the entire agricultural sector through adjustments dictated by the relative elasticity of each explanatory variable with respect to the corresponding dependent variable. The crop component of the model includes teff, barley, wheat, maize, sorghum, pulses and oil seed crops. The livestock component encompasses cattle, sheep, goat, dairy (milk and butter) and feed (maize used as feed and oil cake). The third part of the model is comprised of price links that include dynamic producer price models that are dictated by supply, demand and inventory adjustments. Additional price links are contemporaneous relationships between retail and producer prices.

### Database

A database was developed from secondary sources that include the Ethiopian Central Statistical Agency (CSA), the Food and Agricultural Organization (FAO) of the United Nations, various reports and the authors' own calculations. The collected data can be divided into three groups—endogenous variables, exogenous variables and livestock demographic parameters based on the purpose of this study. The endogenous variables include supply-side variables (area, yield, production, beginning stock and imports), demand-side variables (consumption, exports and ending stock) and price variables (retail prices and producer prices). The exogenous variables involve macro-economic variables (consumer price index, producer price index and gross domestic product), population, rainfall and transportation costs. The livestock demographic parameters represent indicators of herd structure, mortality rate, fertility rate, share of lactating cows and share of milked cows. The livestock demographic parameters are relatively stable over the years and may only be altered in a significant manner by unanticipated shocks such as disease outbreaks.

The exogenous variables contain both historical data and projected data through the year 2020. Where projections were not readily available, we derived our own projections based on similar variables or our best estimates of their corresponding growth rates. In this study, Ethiopia is assumed to be a price taker with limited contribution to the world crop and livestock market. For this reason, world price of meat and live cattle are assumed to be exogenous. World meat price is proxied by the Australian export price of beef while that of sheep and goats are proxied by the New Zealand export prices of sheep and goats. Australian beef prices, including their projected values over the next 10 years, are collected from the Food and Agricultural Policy Research Institute (FAPRI) website. The New Zealand export prices of sheep and lamb meat were gathered from FAO statistics and their projected values were derived using the growth rate of world beef prices. Live cattle, sheep and goat exports are the Ethiopian border price adjusted to transportation cost, expressed in U.S. Dollars and projected to increase by 3% annually over the next 10 years.

Producer and consumer price indices are collected from the CSA. Producer price index is expected to revert to its long-run trend and appreciate by 4% annually for the next 10 years while consumer price index is expected to increase by 5% annually for the next 10 years. Ethiopia's GDP is also exogenous and was collected from the CSA. While we believe that the Ethiopian economy will continue to grow, we projected its annual growth rate to revert to its average between 2004/05 and 2008/09 at 7.5% per year. The population data, including projections over the next 10 years, are collected from the CSA. The same specification was used for cattle, sheep and goats for their biological and physiological similarities. The model specification for the livestock module is as follows:

## Specification

- Newborn = F (Lagged stock of mature females, Time trend)
- Slaughter = F (Lagged total stock, Retail price of animal)
- Live animal exports = F(Lagged of live animal exports, Retail price of animal, Export price of animal)
- Current stock of animals = Lagged stock of animals + Newborn + Imports of live animals – Exports of live animals – Slaughter
- Carcass yield = F(Lagged rainfall, Time trend)
- Meat production = Slaughter x Carcass yield
- Per capital meat consumption = F (Retail price of meat, Retail price of other meat, Per capita income)
- Meat consumption = Meat production – Meat exports

## Appendix 2. Number of animals vaccinated annually (2005–2012)

Livestock and year	Total vaccinated	Vaccinated against					
		Anthrax	Blackleg	Pleuro-pneumonia	Hemorrhagics	epitemicia	Rinderpest
<b>Cattle</b>							
2005	9,692,663	3,409,419	2,728,383	900,339	1,237,421		1,417,101
2006	11,026,887	4,182,805	3,013,728	1,186,863	1,609,463	275,335	758,693
2007	13,910,148	4,724,568	4,128,191	1,574,600	1,399,184	381,726	1,701,879
2008	15,034,195	5,049,523	4,506,192	1,782,918	1,800,083	340,245	1,555,234
2010	17,374,674	4,937,871	5,853,944	1,804,092	3,031,224		1,747,542
2011	18,800,744	5,854,098	5,991,196	1,862,571	3,165,970		1,926,909
2012	20,748,062	6,255,220	6,526,943	2,620,525	3,407,172		1,935,591
<b>Sheep</b>							
2005	1,585,941	247,237	162,964	444,116	224,852		506,772
2006	2,387,867	363,905	166,150	543,147	445,439	50,007	819,219
2007	4,025,712	485,529	365,777	887,002	937,550	41,371	1,308,483
2008	3,868,687	489,750	446,432	997,184	801,259	62,111	1,071,951
2010	3,023,407	344,489	304,057	809,948	851,347		713,565
2011	3,967,945	355,647	441,147	881,869	883,713		1,405,569
2012	4,281,540	585,305	359,702	1,100,393	1,140,884		1,046,789
<b>Goats</b>							
2005	1,582,110	228,020	139,684	335,798	489,004		389,604
2006	2,415,333	403,913	261,499	791,099	464,604	61,636	432,582
2007	2,867,956	380,425	254,789	677,711	818,727	42,854	693,450

Livestock and year	Total vaccinated	Vaccinated against					
		Anthrax	Blackleg	Pleuro-pneumonia	Hemorrhagics epticemia	Rinderpest	Others
2010	3,138,474	293,292	296,934	695,908	1,045,349		806,991
2011	3,359,767	376,151	474,202	977,854	910,605		620,955
2012	4,056,717	394,462	330,179	1,567,193	1,188,662		542,359
Camels							
2005	27,279	5332	0	19,851	0		2,096
2006	27,083	5272	0	14,582	0		0
2008	14,402	4338	4657	0	0		5407
2012	44,247	6798	4419	11,733	10,112		9665
Equines							
2005	614,106	152,876.00	86,561.00	62,685.00	58,914.00		253,070.00
2006	483,465	177,805.00	56,328.00	52,357.00	22,283.00	3277.00	171,415.00
2011	79,773	11,699.00	13,817.00	41,803.00	7585.00		4869.00

### Appendix 3. Number of animals afflicted by different diseases and proportion treated over time (2003–2012)

Year	Cattle		Sheep		Goats		Equines		Camels		Poultry	
	Number afflicted	% treated	Number afflicted	% treated	Number afflicted	% treated	Number afflicted	% treated	Number afflicted	% treated	Number afflicted	% treated
2012	9,052,653	57.34	4,946,543	36.58	4,454,657	29.92	1,252,784	50.25	54,639	32.44	25,791,507	7.24
2011	8,978,652	56.05	5,208,185	32.93	4,584,548	24.87	1,282,226	48.42	83,362	34.69	29,575,984	7.12
2010	8,960,286	56.98	6,647,823	31.75	5,411,326	22.20	1,132,386	45.11	76,567	19.06	23,999,966	5.43
2008	9,254,149	43.78	7,928,867	23.73	5,611,132	20.32	1,003,913	34.76	103,807	17.97	29,484	15.53
2007	7,084,627	46.48	6,388,707	29.28	4,881,643	21.89	721,081	38.96	111,977	21.62	842,697	4.57
2006	5,656,766	43.64	4,727,232	20.88	3,871,386	16.97	634,225	34.58	75,747	37.22	15,111,011	2.91
2005	5,982,429	43.30	3,588,059	20.51	3,044,692	20.61	678,276	33.57	54,876	26.65	13,247,901	3.10
2004	5,015,949	33.72	2,862,193	13.59	2,491,327	9.93	473,329	26.05	44,727	15.76	7,197	22.54
2003	5,592,656	36.02	2,671,938	12.06	2,117,792	15.53	558,748	26.25	53,748	15.00	9,239,119	1.94

### Appendix 4. Distribution of costs and margins in goat value chain

Channel I: Goats sold to domestic individual consumers through traders

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Individual consumers	Total
Selling price (ETB)	1120	1204	1350	1540		
Marketing costs per head (ETB)		18	46	53		117
Distribution of marketing costs		15	39	45		100
Marketing margin		84	146	190		420
Net Margin (value added)		66	100	137		303
Distribution of net margin (%)		22	33	45		100
Proportion of final product price that reaches the producer				73		

## Channel 2: Goat meat exported from pastoral areas (12%)

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Export abattoirs	Foreign importers	Total
Selling price (ETB)	650	680	780	850	1025		
Marketing costs per head (ETB)		18	46	53	32		149
Distribution of marketing costs (%)		12	31	36	21		100
Marketing margin		30	100	70	175		375
Net Margin (value added)		12	54	17	143		226
Distribution of net margin (%)		5	24	8	63		100
Proportion of final product price that reaches the producer (%)					63		

## Channel 3: Live goats exported through informal channels (9%)

Parameter	Producer	Bush traders	Large-scale traders	Informal exporters	Foreign importers	Total
Selling price (ETB)	850	1050	1300	1800		
Marketing costs per head (ETB)		46	53	143		242
Distribution of marketing costs (%)		19	22	59		100
Marketing margin		200	250	500		950
Net Margin (value added)		154	197	357		708
Distribution of Net margin (%)		22	28	50		100
Proportion of final product price that reaches the producer				47		

## Channel 4: Goats sold to hotels (3%)

Parameter	Producer	Collectors	Small-scale traders	Hotels	Individual consumers	Total
Selling price (ETB)	980	1050	1150	1700		
Marketing costs per head (ETB)		18	46	270		334
Distribution of marketing costs		5	14	81		100
Marketing margin		70	100	550		720
Net Margin (value added)		52	54	280		386
% of value added		13	14	73		100
Proportion of final product price that reaches the producer				57.6		

## Channel 5: Live goats exported through formal channels (1%)

Parameter	Producer	Collectors	Small-scale traders	Large-scale traders	Formal live animal exporters	Foreign Importers	Total
Selling price (ETB)	850	950	1100	1300	1800		
Marketing costs per head (ETB)		18	46	53	247		364
Distribution of marketing costs (%)		5	13	15	68		100
Marketing margin		100	150	200	500		950
Net Margin (value added)		82	104	147	253		586
Distribution of margin (%)		14	18	25	43		100
Proportion of final product price that reaches the producer					47		

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