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Improving Productivity and Market Success of Ethiopian Farmers

Working Paper No. 23

Sheep and goat production and marketing systems in Ethiopia: Characteristics and strategies for improvement

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This working paper series has been established to share knowledge generated through Improving Productivity and Market Success (IPMS) of Ethiopian Farmers project with members of the research and development community in Ethiopia and beyond.

IPMS is a five-year project funded by the Canadian International Development Agency (CIDA) and implemented by the International Livestock Research Institute (ILRI) on behalf of the Ethiopian Ministry of Agriculture and Rural Development (MoARD).

Following the Government of Ethiopia's rural development and food security strategy, the IPMS project aims at contributing to market-oriented agricultural progress, as a means for achieving improved and sustainable livelihoods for the rural population. The project will contribute to this long-term goal by strengthening the effectiveness of the Government's efforts to transform agricultural production and productivity, and rural development in Ethiopia.

IPMS employs an innovation system approach (ISA) as a guiding principle in its research and development activities. Within the context of a market-oriented agricultural development, this means bringing together the various public and private actors in the agricultural sector including producers, research, extension, education, agri-businesses, and service providers such as input suppliers and credit institutions. The objective is to increase access to relevant knowledge from multiple sources and use it for socio-economic progress. To enable this, the project is building innovative capacity of public and private partners in the process of planning, implementing and monitoring commodity-based research and development programs.

Most of the project's activities are taking place in selected Pilot Learning *Woredas* (PLWs). The smallholder farmers and pastoralists in the PLWs are expected to increase market-oriented production and productivity through the project's interventions during the project life. The project staff and partners will study this process through action research and learning. Some complementary focused studies are also undertaken by the project and its partners, which help to understand the context and determine key factors influencing the adoption and impact of the interventions. The results of all these studies and some important concepts, tools, methods and approaches developed will be published in the working paper series and will also be disseminated through other appropriate channels.

Intended users of the research outputs are government, non-governmental and private sector and donor organizations that are involved in market-oriented development. They may use these learnings in their efforts to scale out this development process to other *woredas* in the country. Some lessons learned are also expected to be relevant for possible use in market-orientated agricultural development efforts in similar contexts outside Ethiopia.

Sheep and goat production and marketing systems in Ethiopia: Characteristics and strategies for improvement

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Abbreviations

ATVET	Agricultural, Technical and Vocational Education and Training
DVM	Doctor of Veterinary Medicine
EARS	Ethiopian agricultural research system
EIAR	Ethiopian Institute of Agricultural Research
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success of Ethiopian farmers project
MSc	Masters of Science
NGOs	Non-governmental organizartions
PLW	Pilot Learning *Woreda*
RARIs	Regional Agricultural Research Institutions
RDAs	Research and Development Assistants
RDOs	Research and Development Officers

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Executive summary

Ethiopia is home for a large and diverse livestock resources and favourable production environments. The vast majority of the rural population's livelihood is partly based on livestock production. However, livestock production and productivity and producers' benefits from livestock production are far below expectations. Understanding the livestock production and marketing characteristics and producers' needs and perceptions, identifying constraints and opportunities, and designing workable production strategies are required in order to improve livestock productivity and market success of producers. Based on a series of IPMS studies, this paper synthesises and analyses the characteristics, constraints and opportunities of sheep and goat production and marketing in Ethiopia. The paper also puts forward strategic interventions for improving sheep and goat productivity and producers market success.

Livestock production systems in Ethiopia have evolved largely as a result of the influence of the natural production environments and socio-economic circumstances of farmers/pastoralists, rather than market forces. Livestock production is of subsistence nature. Like all other livestock species, sheep and goat in Ethiopia are kept under traditional extensive systems with no or minimal inputs and improved technologies, which results in characteristically low productivity. They are virtually kept as scavengers, particularly in the mixed crop–livestock systems. Sheep and goat are largely produced in mixed crop–livestock, specialized pastoral and agropastoral systems. Market-oriented or commercial production is almost non-existent. Small flock sizes predominate in the highland mixed crop–livestock systems because of land and capital limitations. Relatively larger flocks are maintained in the lowland (agro) pastoral systems. The major feed resources for sheep and goats include grazing on communal natural pasture, crop stubble, fallow grazing, road side grazing, crop residues, browses, and non-conventional feeds (household food leftovers, weeds, crop tillers and fillers). Production of improved forages, improvement of low quality feed sources such as crop residues and supplementary feeding (except fattening) is almost non-existent.

A multitude of technical, institutional and socio-economic problems constrain sheep and goat productivity, as reported by producers. Prevalence of diseases and parasites and the resulting high mortality and morbidity rates are the major problems. High mortality is the major factor for the observed low sheep and goat off-take rates in Ethiopia. Other technical constraints include shortage, seasonal unavailability and low nutritive value

of feeds. Lack and low adoption rate of improved technologies, unavailability and/or inaccessibility of inputs, inappropriate delivery methods of extension messages are further problems constraining livestock production. Marketing constraints include inaccessibility, lack of market information, lack of market orientation, low prices, and unfair share of profit margins. There is also minimal institutional and regulatory support for farmers to reap their share of the market benefits.

Despite all the constraints there are quite favourable opportunities to increase sheep and goat productivity in Ethiopia. The country owns large and diverse livestock resources which are genetically diverse and this genetic potential is not yet adequately exploited. Some of the breeds have special merits that meet the requirements of certain incentive markets and fetch premium prices. For instance, lowland breeds are in high demand in the Middle East; Menz sheep produce delectable meat; long-fat-tailed sheep breeds are highly prolific; and Central Highland goats produce branded 'Bati Genuine' leather. There is also a large domestic market expected to grow with increasing population size, urbanization, and per capita income. Besides, emerging export market, existing livestock support institutions, improved livestock technologies, diverse and favourable production systems and production environment need to be exploited to increase productivity.

Strategic options to improve productivity and market success need to be assessed and designed. Reorienting livestock extension service delivery based on farmers/pastoralists needs and perceptions will increase adoption of technologies. Technical interventions include control and prevention of the major diseases which are the major causes of mortality and morbidity affecting off-take rates. This entails assessing alternative health service delivery systems. Interventions to improve fertility and reproductive rates which also affect off-take rates need to be assessed. Development of feed resources and improved feeding practices are the key to increasing per capita animal output.

Support for evolving alternative production systems is another strategic option. The current improvement strategy is largely based on the small-scale mode of production. Besides improving the small-scale system, emphasis and support should be provided to the development of large-scale specialized sheep/goat production systems. Large-scale specialized production systems are more conducive to introduce improved production technologies that require high inputs, which has been a limiting challenge to increase productivity and off-take rates under smallholder production systems. Furthermore, the strategy could focus on developing small-scale market-oriented intensive production

systems depending on the characteristics of the existing production systems and agro-ecologies. Innovative production systems include specialized ranching, commercial feedlot operations, and market-oriented intensive small-scale sheep/goat production under mixed crop–livestock systems.

Stratification of production systems and delineation of production zones for the different production systems depending on the existing production systems and ecologies is also required to design workable production strategies. Extensive livestock-based production systems are more suited in the extensive lowlands in western, eastern and southern parts of the country and subalpine sheep-based regions. Intensive market-oriented systems with fattening activities are suited in the wet highlands with intensive cropping areas (land shortage for extensive breeding activities and feed availability) particularly in perennial crop–livestock systems with tethering practices.

Development of improved production systems also requires consideration of technical interventions, particularly development of breeding strategies. Breed choice is a major component of the breeding strategy. Under extensive systems with large breeding flocks (pastoral, lowland agropastoral, and subalpine sheep-based systems) conservation-based selective breeding using local breeds and well-designed and targeted crossbreeding with the objective of producing breeding stock (terminal sires) and fatteners/finishers for the intensive systems could be considered. Under such breeding strategy, farmers in the intensive system could cross the few available ewes with terminal sires to produce fatteners, or alternatively buy fatteners from the extensive system. Economically efficient intensive systems could also be designed based on improved exotic or local meat breeds.

Institutional, policy and regulatory supports are fundamental and the basis for all other strategic interventions. Institutions that deal with livestock education, research, development and credit may need to be re-oriented for a targeted and appropriate technology generation and dissemination. Marketing supports including development of infrastructures, provision of market information, organizing marketing groups or cooperatives, and regulations could entitle farmers/pastoralists to their fair share of the market profit margins.

1 Introduction

Ethiopia is home for diverse indigenous sheep and goat populations, numbering 25,017,218 and 21,884,222 heads (CSA 2009), respectively, parallel to its diverse ecology, production systems and ethnic communities. According to FAO (2004), the total annual meat production comes from cattle (63%), sheep (25%) and goats (12%). At the national level, sheep and goat account for about 90% of the live animal/meat and 92% of skin and hide (FAO 2004) export trade value. In the lowlands, sheep with other livestock are the mainstay of the pastoral livelihoods.

The current levels of contributions of the livestock sector in Ethiopia, at either the macro or micro level is below potential. The levels of foreign exchange earnings from livestock and livestock products are also much lower than would be expected, given the size of the livestock population (Berhanu et al. 2007). In order to alleviate the multi-faceted problems that limit productivity and off-take rates and improve marketing success of farmers and pastoralists, characterization of the production and marketing systems is essential.

The Improving Productivity and Market Success (IPMS) of Ethiopian farmers project, which is implemented by ILRI on behalf of the Ethiopian Ministry of Agriculture and Rural Development, has initiated a series of studies on characterization of sheep and goat production and marketing systems. The current paper synthesises and analyses these studies in order to provide organized information on the characteristics, constraints and opportunities of sheep and goat production and marketing in Ethiopia. The paper concludes by putting forward some possible strategic intervention areas for improving sheep and goat production and productivity and market success of farmers and pastoralists.

2 Method of the study

The sources of data and information for this study are progress reports of the IPMS project, data collected from the Pilot Learning *Woredas*, Masters of Science (MSc) and Doctor of Veterinary Medicine (DVM) theses research and other relevant literature. The MSc and DVM studies were sponsored by IPMS project. Information and data from eight MSc theses on sheep and goat production and marketing and eight DVM theses on major animal health problems in Ethiopia were utilized. The methods employed in the theses research were diagnostic surveys and flock monitoring studies. The objectives of the studies were to generate baseline information on sheep and goat production and marketing for designing sheep and goat production and improvement strategies. The studies were conducted in eight IPMS Pilot Learning *Woredas* (PLWs) (www.ipms-ethiopia.org).

The approach in the current study was synthesising the data and information generated from these theses studies. The data from the PLWs were organized into defined agro-ecologies and production systems. Thus characteristics of the production and marketing characteristics of the PLWs were described in the context of agro-ecologies and production systems, rather than geographic locations such as w*oredas* (districts). Such a presentation is believed to provide organized baseline information for designing country-wide production strategies based on similarities in production environments and production systems. Constraints to sheep and goats production and marketing and opportunities for improvement were analysed based on empirical data on the characteristics of the production environments and production/marketing systems. Finally, based on theoretical analysis of constraints and opportunities, strategic intervention areas for improving sheep and goat productivity and farmers/pastoralists' market success are outlined.

3 Classification of livestock production systems

Farmers/pastoralists choice of agricultural enterprises in Ethiopia depends on the production environment (availability of resources, particularly land, water and climate), long-standing tradition of agricultural production in the community, socio-economic circumstances (awareness and skill, access to inputs and markets), and government support (inputs and services) which stems from agricultural policies. Livestock production systems are identified on the basis of contribution of the livestock sector to the total household revenue (income and food), type and level of crop agriculture practised, types of livestock species kept, and mobility and duration of movement.

Mode of livestock production in Ethiopia is broadly classified into pastoral, agropastoral and mixed crop–livestock, peri-urban and urban production systems. In pastoral systems, extensive livestock production is mostly the sole source of livelihood with little or no cropping. In the submoist/moist lowlands, agropastoralism is the main mode of production. Crop and livestock production are both important activities. The system is either transhumant or sedentary. The pastoral production system in some areas has been evolving into agropastoral system. Livestock production is a secondary enterprise in the highland mixed crop–livestock systems, although livestock assumes a major importance in areas (e.g. subalpine areas) where crop production is unreliable. The less dominant and underdeveloped systems include urban/peri-urban dairying and sheep/goat fattening and large-scale commercial livestock production.

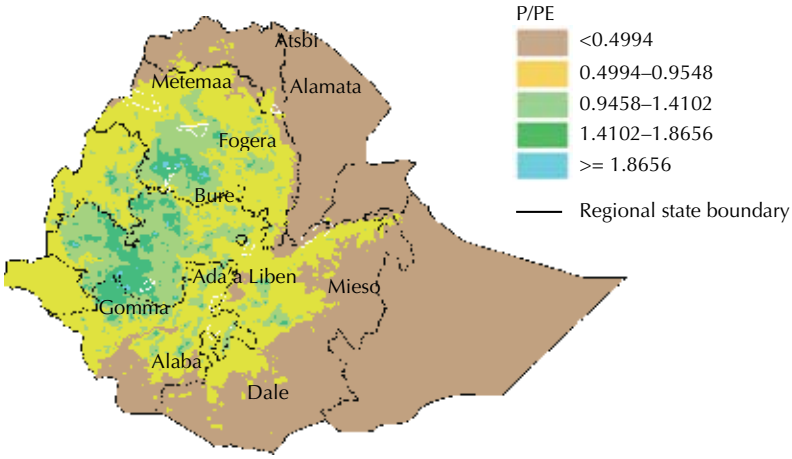
Various classification of agricultural/livestock production systems are suggested depending on the purpose of classification. Based on prevalence of agricultural activity, Getahun (2008) classified traditional small ruminant production systems into four subsystems: small ruminant in annual crop-based system located in northern, northwestern, and central highlands; small ruminant in perennial crop-based, mostly found in southern and southwestern highlands; small ruminants in cattle based systems, these systems usually exist in agropastoral and semi-arid areas; small ruminant dominated systems found in pastoral and arid areas of eastern and northeastern Ethiopia, where sheep and goats are the dominant livestock species. On the other hand, Solomon et al. (2008) classified sheep production systems in Ethiopia into five subsystems (Table 1).

Table 1. *Major sheep production systems in Ethiopia*

Production systems	Environment	Geographic regions	Characteristic features of production systems	
			Main products	Scale of production and management†
Subalpine sheep–cereal system	Subalpine (>3000 m)	Menz area, Wag Himra, parts of North Gondar (Debark, Dabat, Janamora, Wegera), South Gondar, North and South Wollo zones of Amhara State, and Tigray State	Meat, fibre, manure, skin; unreliable, long-season barley	Medium scale sheep production; semi-intensive/extensive, low-input
Highland cereal–livestock system	Highlands (2000–3000 m)	Most of Oromia; West and East Gojam and Agew Awi zones of Amhara State; Central Tigray	Mainly cereal cropping; meat, manure, skin	Small-scale sheep production; semi-intensive, low-input
Highland perennial crop system	Highlands (1500–2000 m)	Coffee, inset and fruit growing areas of Southern and Oromia	Mainly perennial cash crops (coffee, inset, khat); meat, skin	Minor sheep production; semi-intensive, low-input; some practice tethering
Lowland crop–livestock system (agropastoral)	Submoist/moist lowland (≤1000 m)	Benishangul-Gumz, lowlands of Amhara, Tigray, Oromia	Cereals, sesame, cotton; meat, skin	High level of livestock keeping; extensive/semi-intensive, low-input
Pastoral system	Semi-arid/arid (≤1000 m)	Pastoral regions in Somali, Afar, Oromia and Southern states	Meat, milk, skin; minimal or no cropping	Rangeland-based large-scale sheep production; extensive, low-input

† Based on feeding, veterinary care, housing practices.
Source: Solomon et al. (2008).

The IPMS Pilot Learning *Woredas* (PLWs) represent the various agro-ecological zones (Figure 1) and livestock production activities in Ethiopia. A range of agricultural production systems in each PLW have been defined by IPMS studies (www.ipms-ethiopia.org). These production systems can be described as subsystems constituting a major crop–livestock or livestock–crop or livestock system depending on the predominant agricultural activity. In the context of the later overall classification, five livestock production systems can be defined based on the type and dominance of agricultural activities and the production environments in the PLWs (Table 2).



P/PE = ratio of precipitation to evapotranspiration.

Figure 1. *IPMS Pilot Learning* Woredas *and their agro-ecologies.*[1]

Table 2. *Production systems based on characteristics of IPMS Pilot Learning* Woredas *(PLWs)*

Region	PLW	Subproduction systems†	Agro-ecology		Production system††
			Rainfall (mm)	Altitude (m)	
SNNPR	Alaba	Teff/haricot bean–livestock Pepper/wheat/goat/apiculture–livestock	857–1085	1554–2149	Submoist highland crop–livestock
	Dale	Coffee/inset–livestock Cereals/inset/haricot beans/coffee–livestock	1314	1170–3200	Wet highland perennial crop–livestock
Oromia	Gomma	Coffee–livestock Cereal/livestock	1524	1387–2870	Wet highland perennial crop–livestock
	Mieso	Sorghum/pulse/oil crops/livestock Pastoral system	635–945	1700	Dry lowland Agro) pastoral
Amhara	Fogera	Rice/fish/horticulture–livestock Cereals/oil crops/horticulture/livestock/apiculture	1216	1700–2400	Moist highland crop–livestock
	Bure	Cereal/pepper/livestock Cereal/potato/livestock	1386–1757	713–2604	Moist highland crop–livestock
	Metema	Cotton/rice–livestock Sesame/cotton/sorghum–livestock	850–1100	550–1608	Sub-moist lowland crop–livestock
Tigray	Atsbi-Womberta	Barley/wheat/pulses–small ruminants Teff/wheat/barley–livestock and apiculture	642	918–3069	Submoist highland crop–livestock
	Alamata	Barley/wheat/pulse–livestock Teff/sorghum/maize–livestock	498–1429	< 1500	Submoist lowland crop–livestock

Source: www.ipms-ethiopia.org. †† Classification of production systems is based on the dominant agricultural practices and the dominant ecological conditions (rainfall pattern and altitude range) in the PLW.

1. For detailed description of farming systems of each PLW, refer to www.ipms-ethiopia.org.

The basis of classification of subproduction systems is the type and dominance of agricultural activities. For example, the types of crops and livestock species differ in different parts of Alaba woreda and this feature was used to distinguish two subfarming systems: teff/haricot bean/livestock subsystem producing teff, haricot bean, sheep and cattle and the pepper/livestock subsystem producing pepper, wheat, goats, honey and cattle. Some subsystems can be solely based on the type of dominant crops rather than livestock species (example sesame- or cotton-based subsystems in Metema PLW) and the cereal/pepper/livestock and cereal/potato/livestock subsystem in Bure PLW. Furthermore, there could be variation in production systems (type and level of the different crops produced and livestock species maintained) within a given geographic location (such as the PLW). The reasons for such variations could be due to differences in socio-economic conditions (e.g. large- and small-scale farmers/investors in Metama PLW), and the high and continuous variability in agro-ecological conditions, which is a typical characteristic of the topographic and climatic conditions in Ethiopia.

4 Characteristics of sheep and goat production systems

4.1 General characteristics

The livestock production systems in Ethiopia have evolved largely as a result of the influence of the natural production environments and socio-economic circumstances of farmers/pastoralists rather than market forces. Sheep and goat in Ethiopia and most developing regions are kept under traditional extensive systems. Sheep and goats are largely produced in mixed crop–livestock, specialized pastoral and agropastoral systems. Livestock production is of subsistence nature. Market-oriented or commercial production is almost non-existent. Smallholder livestock production predominates in the highland mixed crop–livestock systems because of land and capital limitations. As shown in Figure 2, large flocks are maintained in the extensive lowland (agro) pastoral systems (Mieso and Metema PLWs), while small flocks and tethering is practised in densely populated areas (Alaba PLW; Figure 3).

Figure 2. *Ownership of large flocks of sheep and goats in extensive management system of Metema (left) and Mieso (right).*

Figure 3. *Tethering system of goats in Alaba.*

Generally, livestock are reared in extensive systems with no or minimal purchased inputs. Livestock are virtually kept as scavengers, particularly in the mixed crop–livestock systems. Traditionally extensive systems of production share common characteristics such

as limited number of animals per unit area, low productivity per animal, relatively limited use of improved technology and use of on-farm by-products rather than purchased inputs.

4.2 Land and livestock holdings and production objectives

Data on land use pattern and proportion of livestock species kept in each PLW are presented in Table 3. Land devoted to livestock production (which includes grazing lands and uncultivated arable land) is high in the lowlands (Metema and Mieso PLWs). Grazing land make up a very small proportion of the total area in perennial crop–livestock and cereal–livestock systems.

Table 3. *Land use pattern and livestock populations*

PLW	Land use ('000)			Populations of livestock species ('000)								
	Total (ha)	Grazing (%)	Cultivated (%)	Cattle	Sheep	Goat	Donkey	Mule	Horse	Poultry	Camel	Bee
Alaba	64.1	6.7	68.7	161.7	30.7	36.5	20.9	1.7	1.9	62.9		10.0
Dale	144.0	16.9	39.7	225.7	30.2	31.4	16.3	0.4	2.5	218.9		10.9
Gomma	96.4	8.1	52.4	113.2	21.3	14.1				209.1		52.7
Mieso	196.0	8.9	11.5	110.5	24.5	40.9	7.9			53.5	20.2	
Fogera	117.4	23.0	43.8	157.2	7.6	27.9	13.2	0.3	0.008	246.5		21.9
Bure	72.7	5.9	47.6	71.9	15.2	8.8	6.0	0.08	0.6	47.2		4.8
Metema	440.1	70.9	23.6	124.0	8.7	25.9	7.0			64.8	0.6	23.8
Alamata				74.8	12.7	12.3	5.3	0.09	0.075	45.7	1.2	2.7
Atsbi-Womb-erta	146.3	5.9	8.9	48.9	72.5	10.4	10.0†			44.0		0.5

† For Atsbi-Womberta number of donkeys includes all equines (donkeys, horses and mules).
Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

Sheep are more important livestock in Alaba, Bure, Gomma, Dale, Mieso and Atsbi-Womberta, while goats are more important in Alaba, Dale, Fogera, Metema, and Mieso PLWs. Generally, the type and the proportion of the different livestock species kept by farmers and (agro-) pastoralists depend on the production environment. These decisions are rarely market-oriented.

Flock sizes of sheep and goat vary with the production system and the production environment (Table 4). The specific factors determining flock size include availability of land and feed, role of livestock as major source of livelihood, and reliability of crop production. Flock sizes are large in the lowlands (e.g. Mieso PLW) where grazing land is

more available. Larger flocks are kept in moist highlands (Fogera and Bure PLWs) where crop residues and stubble grazing are more available than in the submoist highlands (Alaba PLW). Flock sizes are small in highly populated w*oredas* of the southern region. Despite the shortage of grazing land and crop residues, large flocks of sheep are maintained in subalpine areas (e.g. Menz area in Amhara region) as sheep are the main source of livelihood and crop production is unreliable.

Table 4. *Average flock size per household and flock structure*

PLW	Flock size (number)		Flock composition (%)							
			Breeding females		Breeding males		Castrate/finishing		Young	
	Sheep	Goat	Sheep	Goat	Sheep	Goat	Sheep	Goat	Sheep	Goat
Alaba	5.0	6.5	39.4	39.3	5.8	5.9	3.6	3.1	51.2	57.6
Fogera	10.9	12.17	25.9	37.4	19.1	5.6	17.9	8.1	37.1	48.9
Bure	11.3	10.2	52.4	49.2	2.9	4.9	5.6	6.6	39.3	38.4
Metema		9.7		39.4		6.9		3.8		49.8
Gomma	3.6	2.1	33.9	35.1	13.1	9.8	10.7	5.0	42.6	50.1
Mieso		127		31		15				42
Atsbi-Womberta	20.0	21.1	28.7	40.4	37.6†	31.4†	–	–	41.6	28.0
Alamata	14.8	15.7	45.0	46.0	7.5	11.5	5.8	1.1	41.7	41.4
Somali Region	54.4		50.3		15.6				34.1	
Amhara	23.3		59.8		5.2				25.3	

† Breeding males in Atsbi-Womberta include all males (breeding males, castrates/finishing); †† Sample for Amhara is average of North Shoa, South Wollo, North Wollo and North Gondar (Solomon et al. 2008).
Sources: Tsedeke (2007), Endeshaw (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

Sheep and goat flocks are composed of different classes of animals based on age and sex. The proportion of the different classes of animals reflects the management decision of the producers which in turn is determined by their production objectives. The data presented in Table 4 on flock structure indicates that sheep and goat farmers tend to maintain self-replacing breeding flocks. Generally breeding ewes/does constitute the major proportion of the flocks in all systems.

Farmers and pastoralists objectives of keeping sheep and goat are shown in Table 5. The most important objectives are cash income, savings and meat for household consumption.

Table 5. *Farmers/pastoralists sheep and goat production objectives and their relative importance* ‡

Production objectives	Alaba	Dale	Fogera	Bure	Metema	Mieso	Gomma	Alamata
Sale/cash income	30.5	29.2	100.0	30.2	0.70	90.9	0.44	50.0
Meat (home consumption)	20.2	11.6	48.1	40.7	0.20	90.9	0.13	22.2
Goat milk	16.3	13.3				87.0		15.8
Manure	4.9	2.5					0.12	27.6
Skin			37.0	24.4		15.6		08.9
Social capital/prestige	4.3	0.8					0.02	
Ceremony					0.01		0.01	
Risk/benefit distribution							0.10	
Saving	23.7	38.3			0.08		0.19	

‡ Relative importance of objectives is expressed in percentage of respondents for Alaba, Dale, Alamata, Mieso, Bure and Fogera PLW. For Metema and Gomma, rank indexes were calculated based on farmers rankings of objectives as Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for a particular objective divided by sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all objectives.
Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

4.3 Feed resources and feeding systems

4.3.1 Feed resources and their importance

The major feed resources for sheep and goats include grazing on communal natural pasture, private pastures, crop stubble, fallow grazing, road side grazing, crop residues, browses, grains, improved forages, and non-conventional feeds including household food leftovers, weeds from crop fields, tillers from dense crop fields, fillers (crops intentionally planted on part of crop lands or around homestead to be used as feed) and traditional brewers grains (locally known as atella; Figure 4). Importance of the different feed resources varies depending on the production system, farmers' livestock management practice and the production environment (e.g. availability of grazing land, climate). For example, based on farmers responses in Dale PLW, it was found that the major feed for goats is crop by-products from parts of inset (*Enset ventricosum*), banana, chat, sweet potato, haricot bean, weeds and thinning of annual crop in moist mid-highlands (66% of respondents); tree leaves from acacia species and *Olea africana* in the lowland areas (86.7% of the respondents); and shrubs, bushes and tree branches in moist highlands, particularly for goats (86.7% of participants). Whereas, availability of communal pastures is declining in perennial cash crop producing midland areas, in the lowland extensive systems (Metema PLW), the main feed resource for goats is natural pasture and browse species both during the dry and wet seasons. Table 6 synthesises the relative importance of the different feed resources as expressed by respondent farmers in the PLWs.

Figure 4. *Brewers grains from traditional local alcoholic drinks (locally known as atella) fed to sheep and goats.*

Table 6. *Feed resources and their importance in IPMS PLWs*

Feed resources	Gomma, Dale	Bure, Fogera	Alaba, Ada'a Liben	Metama, Alamata	Mieso
	Wet highland perennial crop–livestock	Moist highland crop–livestock	Submoist highland crop–livestock	Submoist lowland crop–livestock	Dry lowland agropastoral
Natural pasture grazing	****	****	***	*****	*****
Crop stubble	**	***	****	**	**
Fallow grazing				***	
Crop residues	**	**	**	**	*
Non-conventional	****	**	***		
Browse Spp.	**		***		****
Improved forages			*		

Number of asterisks relate to the degree of importance of a feed resource. Importance is derived based on percentage of farmers who identified the feed resources as important in IPMS PLWs.
Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

4.3.2 Seasonal availability of feeds and water

Figure 5 presents seasonal availability and importance of the major feed resources in different agro-ecologies/production systems represented by Gomma, Metema, Mieso and Fogera PLWs. Most farmers responded that natural pasture is the most important source

of feed during the wet season in all systems. Its availability is insignificant during the dry season, except in the wet highlands. Crop residue and crop stubble grazing are important sources of feed during the dry season.

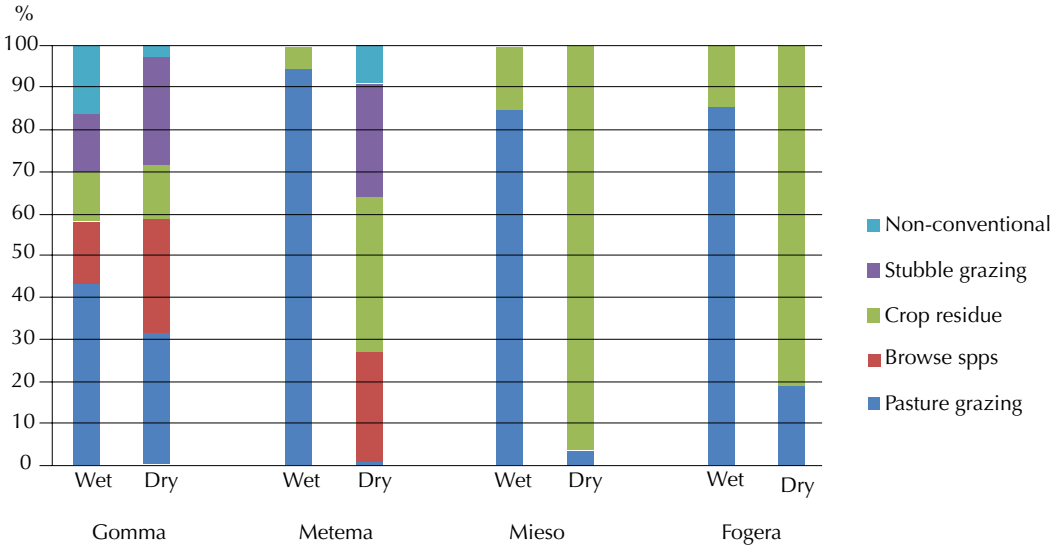


Figure 5. *Seasonal availability of the major feed resources as expressed by surveyed farmers in Gomma, Metema, Mieso and Fogera PLWs representing wet highland, submoist highland, dry lowland and moist highlands.*

Water sources for livestock include rivers, streams, ponds, deep well, pipe water and rain water harvest as well as springs. Rivers are the major water sources for livestock. The majority of surveyed farmers in IPMS PLWs (96.3% in Bure, 84% in Atsbi-Womberta, 85.6% in Metema, 56.9% in Gomma, 51.3% in Fogera, 55.2% in Alaba, 44.7% in Alamata, and 66.7% in Dale) responded that rivers are the major source of water for the most part of the year. The other water sources are less important. For instance, in Gomma PLW, ponds, wells, pipe water and rain water account for 6.8, 5.6, 4.4 and 6.9%, respectively. However, the relative importance of water sources depends on the season and agro-ecology. For instance, 80% of the farmers in moist lowland *kebeles* in Dale and 75% in Mieso PLWs use pond water, while importance of rivers in Dale decline from 66.7% in the highland to 13.3% in the lowland *kebeles*. Similarly, importance of ponds and wells increase from 0% and 6.7% in the wet season to 13.3 and 17.8% in the dry season in Metema PLW.

Livestock watering frequency varies with season and agro-ecology. Sheep are commonly watered every three days and goats every 3–5 days during the dry season as nearby

water sources dry-up (Alaba PLW). In Dale PLW, animal are watered once in two days in moist lowlands and once a day in moist highlands. Time taken to watering points range from 7.7–9 minutes in Gomma to 0.33–5 hours in Alaba, and distance ranges from 1.0 km (wet season) to 2–5 km (dry season) in Metema to 1.0–10 km in Dale PLWs. Critical periods of livestock water shortage are shown in Figure 6. No water shortage is reported in the wet highlands.

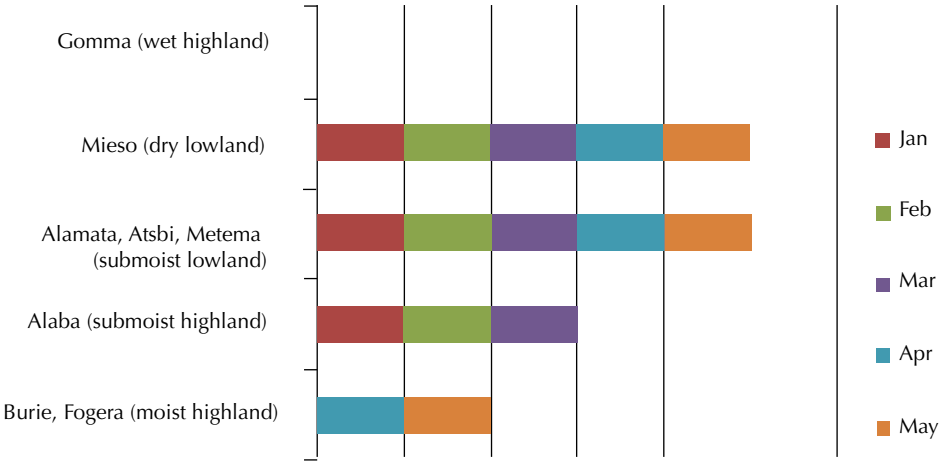


Figure 6. *Critical months of water shortages for livestock.*

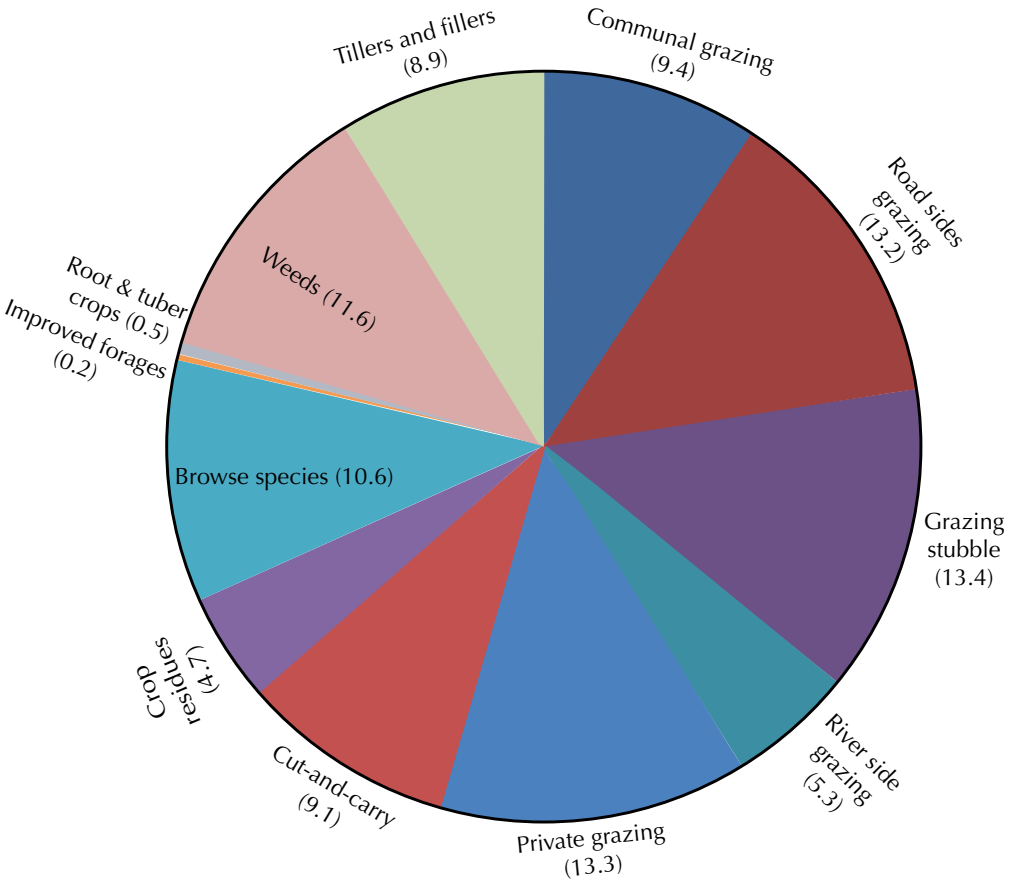
4.3.3 Feeding systems

In most production systems, agro-ecologies and geographic regions, extensive free grazing in communal grazing lands and stubble grazing are the most common practices of feeding sheep, while browses are used for goat flocks by almost all farmers and pastoralists (Figures 7 and 8). It is estimated that natural pasture provides from 80–90%, and crop residues 10–15% of the total livestock feed intake in Ethiopia (Alemayehu 2003). A relatively more intensive controlled feeding is practised in the perennial crop–livestock systems (e.g. Gomma and Dale PLWs) and submoist crop–livestock system (e.g. Alaba PLW). The form of controlled feeding includes tethered grazing on private lands and marginal lands, cut-and-carry feeding of grass, tillers, fillers and weeds. Tethering is practised by 79, 57.5 and 54.4% of interviewed households in Alaba, Dale and Gomma PLWs, respectively. The reasons for such practice include unavailability of communal grazing lands in highly populated areas and damage by free roaming animals on perennial coffee and fruit plantations (42.6–93.4% of respondents), saving herding labour (19.5–50%), protection of animals from predators (27.8–53.6%), utilizing marginal lands (7.6–1.45%) and avoiding unwanted breeding (2.5%) (Endeshaw 2007; Tsedeke

2007; Belete 2009). The relative contributions of the different feeding practices and feed resources are shown in Figure 9.

Figure 7. *Sheep grazing in Bure (left) and Atsbi-Womberta (right) PLWs.*

Figure 8. *Goats browsing on acacia species in Alaba PLW.*

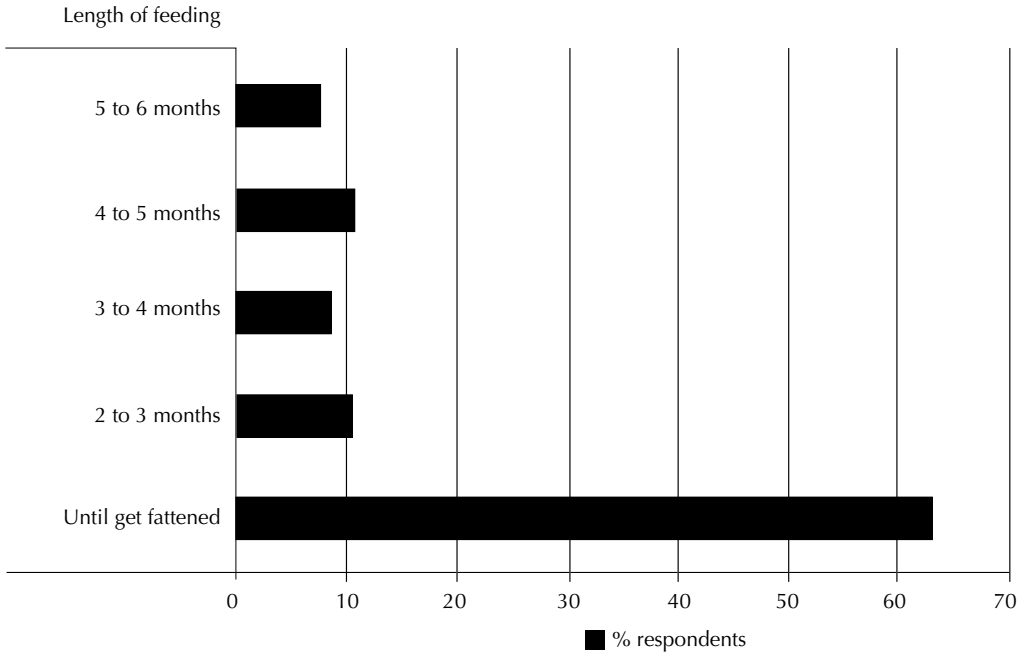


Source: Tsedeke (2007).

Figure 9. *Relative contributions of feeding practices to sheep and goat production in Alaba IPMS PLW.*

Supplementary feeding of sheep and goat in most extensive production systems where large breeding flocks are kept is limited mainly to fattening/finishing castrates. Occasional crop residue supplementary feeding of certain classes of sheep is practised during the dry seasons. In contrast, in areas with small flock sizes, tethering and supplementary feeding is a common practice. In wet highland perennial crop system, 92% and 33% of the households supplement all breeding females and castrates during the dry and wet seasons, respectively. Supplemental feeds include household food leftovers, attela from local areke and tella, grains, enset from tuber-pseudo stem to tip part of leaves, banana leaves and stem, sweet potato vine, haricot been residue, maize from early stage to post-harvest, wheat bran (20% households), fruit leaves mainly avocado and banana (*Musa paradisiaca*), and Chat (*Catha edulis*) leftovers. Different supplementary feeding period is followed by different groups of farmers (Figure 10). Most farmers (63.2% of respondents) feed animals for an extended period of time until they are satisfied that the animal is well

fattened. Such practice is the most common traditional fattening practice among farmers in many parts of Ethiopia. In more extensive production systems (Alaba and Mieso PLWs), goats are supplemented with tree pods and mineral soil during the dry season (Figure 11).



Source: Based on Belete (2009).

Figure 10. *Supplementary feeding practices for fattening castrates.*

Figure 11. *Acacia tree beating for feeding pods to goats in Alaba (left) and goats liking mineral soil in Mieso (right).*

4.4 Major diseases and parasites

Tables 7 and 8 list the major diseases of sheep and goat in different ecological regions of Ethiopia. The diseases were identified and described by farmers using local names. Veterinary names of the diseases were established based on farmers' description of the symptoms. The diseases were ranked based on the proportion of interviewed farmers that mentioned the disease as important in each PLW.

Table 7. *Major sheep diseases in IPMS PLWs representing different agro-ecologies in Ethiopia in ranking order of importance as expressed by farmers*

Veterinary name	Local name	Alaba	Fogera	Bure	Mieso	Atsbi-Womberta	Alamata
Pasteurellosis	Inqit/Mieta/Gororsa/Dingetegna/Miemieta	3		1	2	1	2
Fasciolosis	Berer/yegubet til/Effel/Losha/Lugo/Yegubet-til	1	2	2		3	3
Sheep pox	Fentata/Infirir/Kurkussa/Humimeta/Baga/Fintita/gudedo	4		3		4	7
Dermatophylosis	Afemaz			4			
Coenerosis	Azurit/Zarity/Osa			5	1	2	7
Respiratory problem	Sal/Quufa		1		6	6	
Orf	Afegumed/Afemendid/Hancharoo		3		3		5
Anthrax	Qurba/Taffia/Tereje/Arae Tizenat	2	3			5	
Black leg	Wekie/Habussa					3	
Endoparasitosis	Tilatil					7	2
GIT disorder	Yehod metawek						4
Ectoparasitosis/tick/lice	Kuridid/Tigegna/Engira				1	9	3
Mange mites/skin diseases	Ekeke/chito				5	10	1
Enzootic ataxia		5					
Lameness	Mojale						6
Eye problem							7
Enteritis	Albaati				4		

Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

The most important diseases of sheep in the moist highland zones (represented by Fogera and Bure PLWs) are pasteurellosis, fasciolosis, coenerosis, orf, anthrax and sheep pox. In submoist highlands (Atsbi-Womberta and Alaba PLWs) pasteurellosis, fasciolosis,

coenerosis, anthrax and black leg are high ranking diseases. In the lowlands (Mieso and Alamata PLWs), ectoparasites including mange mites, ticks, lice, or in general skin diseases like orf, coenerosis, pasterellosis, endoparasites, and fasciolosis are economically important parasites and diseases.

Table 8. *Major diseases of goats in IPMS PLWs in ranking order of importance as expressed by farmers*

Scientific name	Local name	Alaba	Dale	Fogera	Bure	Metema	Mieso	Atsbi-Womberta	Alamata
Trypanosomiasis	Shillo		1						
Heart water	Harisho		2						
Pasteurellosis	Inqit/gororsa/ankelikil	3			1	3	4		2
Goat pox	Fintita/enfirir/kurkussa/humi-meta/baga/gudedo/fusso	4	3		2			1	9
Orf	Afemaz/afemen-did/hancharoo/afemaze/yefyeolch hiwot				3	1	2		3
Ectoparasitosis/tick/lice	Meziger/kuridid/tigegna/engira/bijajo		5		4	4	5	4	6
Respiratory problem	Sal/buhe/quufa			1		2	8	3	7
PPR like disease	–			2					8
Mange/skin diseases	Kukini/ekeke/chito			3		4	6	2	1
Fasciolosis	Losha/lugo	1							
Anthrax	Tereje/arae tizenat	2							
Pneumonia		5							
GIT disorder	Yehod metawek								5
Endoparasitosis	Tilatil/deisha		4						4
Abortion	Mechengef								8
Coenerosis	Azurit/osa						1		8
Enteritis	Albaati/masmat					5	3		
Lameness	Okolo						7		

Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

The major goat diseases in the wet (Dale PLW), moist (Fogera, Bure) and submoist highlands (Atsbi-Womberta, Alaba PLWs) include trypanosomiasis, pasturelosis or general respiratory problems, goat pox, and fasciolosis. Diseases of secondary importance are heart water, *peste de petit ruminants* (PPR), mange or generally skin diseases and anthrax while orf is of tertiary importance in the highlands. In the lowlands (Mieso, Alamata and

Metema PLWs), skin diseases like mange, orf and coenerosis are of primary importance. Other important diseases in the lowlands include pasteurellosis or general respiratory problems and enteritis.

4.5 Breeds, breeding management, productivity

Livestock productivity is influenced by a complex interaction of the genetic potential of the livestock breed kept, the production system and the production environment. Sheep and goat breeds reared in Ethiopia are almost exclusively indigenous breeds. Most of the these breeds have not been systematically improved and have evolved in marginal environments (for instance the Menz sheep in afro-alpine ecologies) with adaptation to the natural environment and are thus less 'productive' in certain production traits such as growth traits when compared to other breeds. However, productivity of livestock breeds should be evaluated within the context of the production environment (the climatic conditions, availability of feeding, disease load etc.). In addition, the mode of production determines the level of productivity and production through the farmers' production objective, such as choice of crop or livestock production. The production objectives in turn determine the farmers' management skills and the level of input used to meet these objectives. Comparative data on small ruminant breeds maintained in the different production systems, production environments and their level of productivity in Ethiopia are presented in Table 9.

Farmers breeding management decision is determined by the merits of livestock species and breeds, farmers breeding objectives and the production environment. For instance, farmers in Metema PLW prefer to keep goats rather than sheep and cattle since goats are believed to serve as immediate source of income, have short generation interval, require low initial capital, and are highly prolific, fast growing, and adapted to the environment. Farmers in Metema keep a mix of the local Habesha and Gumuz goat breeds. Few farmers like to keep the exotic Rutana goats because of their faster growth rates than the other local breeds, but are sensitive to disease and environmental stresses.

Table 9. *Sheep breeds by production system and ecology and their productivity in Ethiopia*

Production system	Sheep–cereal					Cereal–livestock	(Agro) pastoral		Perennials/cereal–livestock				Cereal–livestock
Ecology	Subalpine					Wet highland	Dry lowland		Wet and submoist highland				Submoist lowland
Breed groups	Short-fat-tailed sheep						Fat-rumped sheep		Long-fat-tailed sheep				Thin-tailed
Types	Menz	Wollo	Farta	Tikur	Sekota	Semien Washera	Afar	BHS*	Adilo	Arsi	Horro	Bonga†	Gumz
Mature weight	20.1	21.7	28.3	25.4	26.6	26.9 32.8	31.0	27.9	28.1	28.6	35.4	34.2	31.0
Birth weight	2.2					2.7	2.97	2.9			2.72		2.79
Yearling weight	16.9					23.6	25.5	24.1			23.7		
Age at 1st lambing	512					464			438	354	360	420	410
Lambing interval	315					271	315			234		291	199.2
Litter size	1.02	1.0	1.09	1.08	1.0	1.11	1.03	1.0	1.53	1.37	1.43	1.31	1.17

*Black Head Somali; †Bonga is a long-fat-tailed sheep but genetically distinct from the group.
Sources: Wilson (1982); Niftalem (1990); Solomon et al. (1995); Tsedeke (2007); Getahun (2008); Mengistie (2008); Solomon Abegaz (2008); Solomon et al. (2008).

Uncontrolled breeding is the common practice and rams/bucks and ewes/does run together throughout the year. For instance, in Metema PLW, 97% of respondent farmers use uncontrolled breeding. However, controlled or hand mating (Figure 12) is usually practised in systems where tethering is practised (Gomma and Dale PLWs). Although male and female animals run together throughout the year and mating/breeding is uncontrolled, mating and thus lambing/kidding seasons are concentrated in seasons when feed is most available (e.g. November–January and April–June in Metema PLW, and September–October and March–April in Dale PLW).

The practice of selection and maintenance of own breeding males vary with production systems. Only 37.3, 49, 20.2–29.9, and 30.5% of surveyed farmers owned breeding rams and bucks in Alaba, Dale, Gomma, and Bure PLWs, respectively. However, in the extensive lowlands a higher proportion of (agro)pastoralists own breeding males (72% in Metema and almost 100% in Mieso PLWs). Retention of young male for breeding is seldom practised and there seems to be a negative selection of breeding males as farmers tend to select and castrate faster growing males at younger age for the market.

Where selection is practised, the selection criteria include body confirmation (94.5%), performance history (20.9%) and colour (14.7%) in some areas (Gomma PLW) while colour, body size, tail type, horn and other appearance characters are given higher weights in others (e.g. Bure PLW and Menz area).

Figure 12. *Hand mating sheep in Atsbi-Womberta (note the udder cover to force wean the lamb).*

Reproductive and growth performance are important measures of productivity in meat animals. Sheep and goat productivity in Ethiopia, and in general in Africa, is considered low as compared to productivity levels in developed livestock industries of the world. Reproduction levels in sub-Saharan African breeds are 17.5–16.4 months for age at first parturition (Otte and Chilonda 2002), 230–437 day for lambing intervals (Wilson 1989), and 1.0–1.5 for litter size (Ibrahim 1998). Growth rate of sheep and goats in Ethiopia is slow ranging from 100 g/day at early age to less than 50 g/day after weaning, resulting in small carcass weights (10 kg) and annual meat production (3–3.5 kg/year per animal) (EARO 2000). Flock monitoring studies showed that there is a loss of body weight in most classes of animals in sheep and goat flocks (Belete 2009) resulting in smaller animals at slaughter age (18–20 kg for sheep and 16–18 kg for goats) and thus low meat yield.

Sheep breeds in the subalpine region are lighter in weight at birth, yearling, and at maturity compared to breeds in the wet highlands and lowlands. They also have less

reproductive capacity, especially in litter size. The goat breeds identified in Ethiopia (Tesfaye 2004) include Afar, Abergelle, Arsi, Harerghe highland, Short-eared Somali, Long-eared Somali, Western highland, Western lowland, Central highland, and Keffa. Goats in general have high reproductive capacity; percentage multiple births being 1.4, 1.3, 18.0, 15.0, 2.5, 3.0, 38.0, 44.0, 17.0, and 22.0, respectively for the above listed breeds. Adult body weight ranges from 25–40 kg (Peacock 1996).

4.6 Labour utilization and gender roles

Family labour is the main source of livestock farm labour. Use of hired labour for flock management is minimal and uncommon (e.g. 5.9% in Alaba), except in cash crop areas (e.g. Metema). Thus the amount of household labour available and the manner of labour allocation are critical to effectively carry out farm operation and influence livestock management techniques and adoption of improved technologies. Availability of labour for flock management is adequate in most cases (e.g. 75.7% and 61.3% of the households in Alaba and Gomma PLWs). Children and women provide the bulk of labour in sheep and goat management (Figure 13). Typical division of labour in sheep and goat management is shown in Table 10 for Alaba PLW.

Figure 13. *Children (boys and girls) are responsible for herding sheep in Bure.*

Access to resources, ownership and decision-making roles vary with gender. For instance in Alaba, husbands, spouses and children own 68.2, 29.0, and 2.8% of the animals. However, women and children may have the property right over the flocks but are not decision-makers and husbands decide on the income from livestock.

Table 10. *Percentage response of farmers in division of labour in sheep and goat management in Alaba PLW*

Tasks	Responsibility				
	Men	Women	Boys	Girls	Hired labour
Flock herding	32.1	12.3	45.8	8.3	1.4
Cut-and-carry grasses/browses	29.5	33.8	25.9	9.5	1.3
Watering flock	40.3	12.4	45.6	1.3	0.4
Clean flock barn	–	66.0	2.9	31.1	–
Cares for young flock	20.6	44.9	26.6	7.9	–
Fattening managements	43.1	34.8	17.2	4.5	0.4
Treat sick flock	85.0	1.8	13.2	–	–
Milk goats	–	80.4	–	19.6	–
Process goat milk	–	67.1	–	32.9	–
Sale sheep and goats at markets	82.2	5.2	12.6	–	–
Decide on use of proceeds	73.7	20.2	6.1	–	–
Owner of the flocks	68.2	29.0	2.8	–	–

5 Characteristics of sheep and goat marketing systems

Animals are often trekked or transported on carts to market places (Figure 14). A mix of cattle, sheep and goats are presented at a typical livestock market place (Figure 15). Sheep and goats purchased by traders and consumers are also shown in Figure 16.

Figure 14. *Trekking and transporting goats to market in Mieso (left) and Alaba (right) PLWs.*

Figure 15. *A typical livestock market in Tigray and a terminal market in Addis Ababa.*

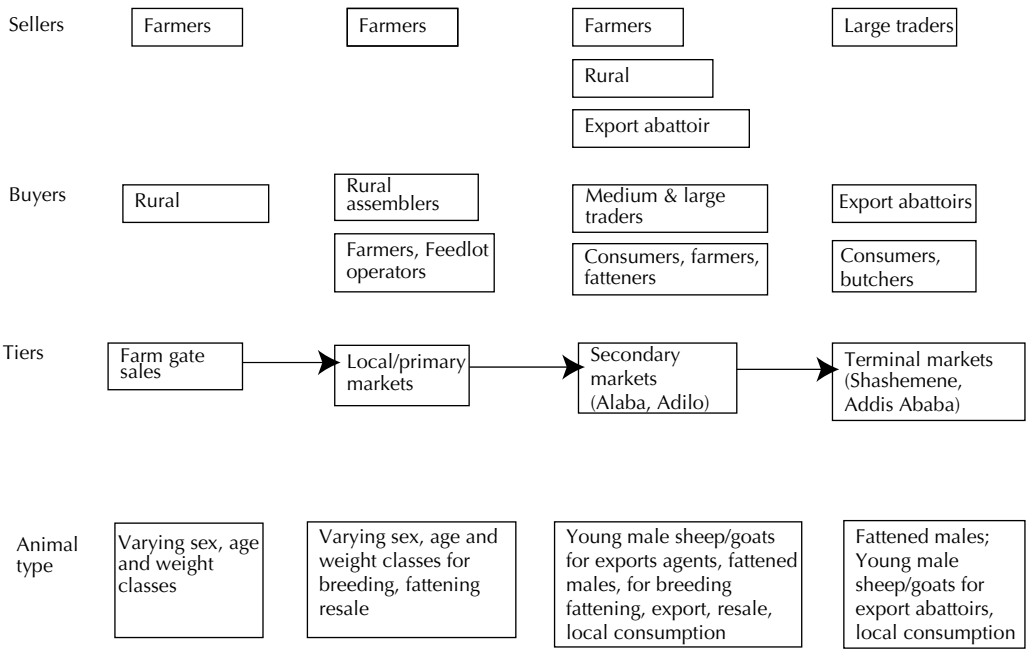
Figure 16. *Goat marketing in Mieso (left) and sheep marketing in Alaba (right) PLWs.*

The age and sex structures of the type of animals typically supplied to markets as described by Tesfaye (2009) are presented in Table 11. Yearlings are the first class of animals to be sold to cover immediate cash needs. Similarly, bucks including buck kids and young intact males constitute the largest percentage of marketed goats in Dale (53.3%) and Alaba PLW (32.0%).

Table 11. *Percentage of different age classes of goats supplied to markets in Metema PLW*

Age classes	Male	Female	Castrate
≤1 year	66.0	58.8	0
1–2 years	19.0	13.4	9.8
2–3 years	6.0	3.4	7.9
3–4 years	5.3	4.5	31.5
>4 years	3.6	19.9	50.8

Figure 17 describes a typical sheep and goat marketing structure/chain based on a typical livestock market structure identified by Ayele et al. (2003) and sheep and goat marketing structure in Alaba PLW (Tsedeke 2007). Livestock marketing structure of Ethiopia follows a four-tier system (Ayele et al. 2003).



Sources: Based on Ayele et al. (2003) and Tsedeke (2007).

Figure 17. *A typical sheep and goat marketing structure in Ethiopia.*

The main actors of the 1st tier are local farmers and rural traders/rural assemblers who transact at farm level. Those small traders from different corners bring their animals to the local market (2nd tier). Traders/wholesalers purchase a few large animals or a fairly large number of small animals for selling to the secondary markets. In the secondary market (3rd tier), both smaller and larger traders operate and traders (wholesalers or retailers) and butchers from terminal markets come to buy animals. In the terminal markets (4th tier), big traders and butchers (wholesalers or retailers) transact larger number of mainly slaughter type animals. Consumers get meat through direct purchase of live animals or from butchers.

In Alaba PLW, farmers market sheep and goats at farm gates or the nearest local/primary markets. Farmers use all markets in their localities regardless of political boundaries and ethnic and cultural differences. Farmers and rural assemblers from different local markets supply animals of varying sex, age and weight to Alaba Kulito and Adilo secondary markets. There are two possible exit market routes through which animals from Alaba area reach to the final consumers. The first route is through agents of export abattoirs who collect young male sheep and goats from the local markets. The second and most important route is through medium and large traders who collect animals from Alaba areas and supply through large traders to terminal domestic markets in Shashemene and Addis Ababa. Animals that exit through the later routes are often exceptionally fattened male animals usually supplied during holidays. In the second and third tiers (primary and secondary markets), animals are bought for breeding and fattening purposes.

6 Constraints to improve productivity and market success

Sheep and goat production and productivity in Ethiopia are generally low. This is mainly a result of low per capita production (i.e. productivity). Low per capita production is in turn a result of a combination of low reproduction rate, high mortality rate and slow growth rate (see section 4.5). Low productivity levels are reflected in total production volume. Flock dynamics and off-take rates can be taken as proxy indicators to production volume. There are indications that average annual growth rate in the livestock population is slow, stagnant or negative. Off-take rates due to sale are low, being exceeded by mortality rates in some cases indicating low flock productivity. ILRI/IFPRI data (Asfaw and Jabbar 2008) show that flock inventory changes over a period of one year were negative for sheep and goats. In Dale PLW, sheep and goat holdings per household declined over a two-year period monitoring study in selected households in highland areas from 2.27 to 1.13 for sheep and from 4.93 to 2.67 for goats, while there was an increase in the lowlands from 0.44 to 0.56 for sheep and from 7.63 to 12.47 for goats (Endeshaw 2007). Data on off-take and mortality rates in selected IPMS PLWs and average of different production systems (Asfaw and Jabbar 2008) are presented in Table 12.

Table 12. *Commercial off-take rates (%) and mortality rates (%) based on surveys in IPMS PLWs and ILRI/IFPRI data*

Species	Off-take and mortality rates	ILRI/IFPRI	IPMS PLWs		
			Alaba	Gomma	Dale
Sheep	Commercial off-take rate	40.0	31.1	27.5	
	Mortality	29.0	45.5	26.0	
Goat	Commercial off-take rate	49.0	29.4	19.7	23.3
	Mortality	23.0	49.2	17.0	13.3

Sources: Endeshaw (2007), Tsedeke (2007), Belete (2009), Tesfaye (2009), Yenesew (2009).

Sheep and goat productivity is constrained by complex and interlinked technical, institutional and socioeconomic factors. Constraints to improved productivity identified by farmers in IPMS PLWs are listed in ranking order in Table 13.

Table 13. *Production constraints by production system/agro-ecologies in ranking order based on farmers responses*

Production systems/agro-ecologies	Submoist highland crop–livestock	Submoist lowland crop–livestock	Wet highland perennial crop–livestock		Moist highland crop–livestock
IPMS PLWs	Alaba	Metema	Gomma	Dale	Bure
Diseases/parasites	1	1	5	2	1
Feed shortage	2	6	1	1	3
Water	5	–	9	–	5
Labour shortage	9	3	7	3	6
Drought	8	–	8	–	–
Predators	4	5	3	–	2
Lack of technologies/inputs	6	–	2	–	–
Inadequate extension support	3	–	–	–	–
Inadequate vet service	–	–	–	–	2
Lack of capital	7	–	4	4	7
Theft	–	2	–	–	8
Market	–	4	6	5	4

6.1 Diseases and parasites

Diseases and parasites are the major constraints to improved small ruminant production and productivity in most production systems/agro-ecological zones. Health problems cause high mortality and reduced reproductive and growth performances resulting in reduced output per animal and flock off-take rates. Flock monitoring studies showed that mortality rates attributable to diseases and parasites are 21.7% (goat) and 25.3% (sheep) in Alaba, 14.2% (goat) and 14.6% (sheep) in Gomma, and 10.9% (goat) in Dale PLWs. The effect of morbidity on productive and reproductive performances of the flocks is also apparently higher.

There is an institutional dimension to the health problem, which is inadequate veterinary service delivery. Problems related to service giving include absence of preventive veterinary services such as vaccination and accessible and adequate veterinary clinics resulting in unethical and inappropriate use of drugs from illegal sources. Constraints in animal health delivery as reported by farmers are presented in Table 14. Although the magnitude of animal health service problems is immense in many parts of the country, it also varies with geographic/ecological locations. For instance, absence of veterinary drugs and services is a major problem in the remote lowland areas of Metema and Mieso PLWs. Under such

circumstances, it is a common practice to see farmers and pastoralists purchase (often from illegal sources) and apply various drugs without any regulation and training.

Table 14. *Constraints in animal health delivery in Dale PLW*

Constraints	Percentage of respondents			
	Moist Dega	Moist Woina Dega	Moist Kola	Overall
Absence of veterinary clinics	33.3	31.1	66.7	35.8
Shortage of veterinary personnel	13.3	25.6	0.0	20.5
Inaccessibility	6.7	20.0	33.3	20.0
High drug price	33.3	6.7	0.0	14.2
Shortage of drugs	13.3	1.1	0.0	2.5
No problem	0	8.9	0.0	6.7

Source: Endeshaw (2007).

6.2 Feeds and feeding

Feed shortage is one of the limiting factors for increasing production and productivity of small ruminant in most of the agro-ecological zones in Ethiopia. In the extensive lowland crop–livestock system (e.g. Metema PLW), feed availability in terms of quantity as perceived by farmers is better than in other ecologies. This could be due to the vast grazing land available, low stocking rate and the availability of stubble grazing and crop residues from extensive cropping. The gravity of feed shortage in quantity can be seen from the feed balance in the highland and lowland ecologies (Table 15). A deficit of 8.6, and 56.1% in moist and submoist highlands respectively, and an excess of 71.7% in lowland crop–livestock system have been estimated.

Table 15. *Available and required feed supply (tonne DM per year)*

Production system/ecology (PLWs)	Available feed supply	Feed required	Balance
Moist highland crop–livestock (Bure PLW)	7.7	8.4	Negative
Submoist highland crop–livestock (Alaba PLW)	524.7	1196.2	Negative
Submoist lowland crop–livestock (Metema PLW)	833,531.2	235,273.2	Positive

Data for Bure is per household.
Source: Tsedeke (2007), Tesfaye (2009), Yenesew (2009).

Reasons for shortage of feed vary depending on the agro-ecology and production system. In densely populated areas where land resources are limited like Alaba PLW, reasons given by farmers (percentage of farmers in parentheses) includes declining yields of

grazing land (28.8), increase in livestock population (11.1), cultivation of grazing lands (31.9), drought (17.7) and increase in human population (10.4).

Besides to feed deficit, feed shortage is expressed in terms of seasonality of feed availability, quality of the available feed and feeding practices. The feed deficit is further aggravated by seasonality of forage availability and crop residues in the highlands and by erratic rainfall in the lowlands. The common feeds in Ethiopia such as crop residues and matured natural pasture are inherently low in CP, digestibility, and minerals. Poor nutritive values of feeds lower the production capacity and fertility potential of animals. There is also inefficient collection, conservation and utilization of available feeds which is mainly expressed in the lack of adopting feeding technologies to improve the nutritive value and palatability of crop residues and grazing lands which are the major feed resources in most production systems and agro-ecologies.

6.3 Lack of improved technologies and inputs

Availability of improved technologies and inputs are critical to transform the traditional subsistent production systems into market-oriented profitable enterprises. Both generation of technologies and devising efficient delivery systems are essential in this endeavour. Quite a number of improved livestock technologies and inputs (improved breeds, forage seeds, feeding practices including fattening packages, veterinary inputs) have been generated and/or adopted from elsewhere. However, because of inefficient delivery of these services, improved technologies and inputs remained unavailable or inaccessible to the producers.

Demand for improved livestock technologies is likely to be observed among market-oriented elite farmers. In Alaba PLW, only 9.3% of respondents reported lack of improved technologies and inputs. On the other hand, 71% of respondents in Gomma PLW and 73.5% in Mieso PLW showed interest for inputs and services. However, actual use of inputs is apparently negligible. A survey (Zelalem 2007) showed that only 14.3% and 3.8% of livestock technology adopters and non-adopters, respectively use purchased feeds like cowpea, hay, MUB, and grain, while 85.7% and 96.2% of adopters and non-adopters, respectively do not use any kind of input.

6.4 Inadequate and inappropriate information and knowledge delivery

Dissemination of information and knowledge on agricultural technologies through mainly government agencies is currently the strategy adopted to enhance agricultural productivity. However, such services are not up to expectations. The majority of farmers in Alaba PLW (75.2%) believe that the existing extension system is not providing any assistance in sheep and goat development. Besides, those who received improved technology did not apply to their flocks because either it was not relevant to their problems, affordable, accessible or easy to apply.

Results of a survey in Mieso PLW (Zelalem 2007) convey agropastoralists' perception of livestock extension services (Table 16).

Table 16. *Pastoralists and agropastoralists' perception of livestock extension services in Mieso PLW*

Agropastoralists opinions	Percentage of respondents	
	Adopters	Non-adopters
Awareness of small ruminant extension services	61.2	22.6
Mismatch between extension message and needs regarding:		
Feeding technologies	75.5	83.0
Animal health technologies and services	80.6	83.0
Improved breeds	42.9	39.6
Building shelter and shed	45.9	41.5
Facing communication problem with extension agents	27.6	28.3
Unwilling to comment on extension services	17.3	34.0
Opinion on attributes and application of fattening package:		
Increases body weight	71.4	54.7
Difficult due to unavailability of input	28.6	40.0
Difficult due to shortage of veterinary services	33.7	45.3
Difficult due to unavailability of improved feed	17.3	13.2
Difficult due to capital limitations	29.6	
Difficult due to unavailability of improved breed	16.3	
Positive attitude towards fattening (out of a potential score of 40)	28.6	28.9
Knowledgeable of fattening technologies (out of a potential score of 30)	7.7	6.2

Source: Extracted from Zelalem (2007).

It was found that 38.8% of extension packages adopters were not aware of small ruminant extension services in their *woreda*. Producers also believe that there is a mismatch between extension messages and their needs. Extension messages are prepared by experts as part of routine tasks without consideration of the need and

interest of agropastoralists. Extension messages are prepared by *woreda* experts to fulfil the quarterly plans which are transferred to extension agents in a top–down manner. The messages are general in their contents and most often delivered late.

6.5 Marketing constraints

Improving marketing success of livestock producers provides incentives to adopt technological interventions that improve livestock productivity, which in turn improves marketing success. Access to local market is the most important economic determinant to adopt technologies (Zelalem 2007) and choice of production enterprises. Market locations in primary and secondary markets are usually not fenced; there are no permanent animal routes and no feed and watering infrastructures. Yet, buyers and sellers are subjected to various service charges by the local authorities as well as other bodies (Ayele et al. 2003). Nearly in all parts of the country, there is no regular market information on prices and supplies, nor formalized grades and standards of sheep and goats and other livestock (Kebede and Ray 1992; Ayele et al. 2003). As a result, there is excess supply of animals beyond demands in some seasons. The more mobile trader is better informed on market prices which combined with excess supply places the trader in a better position during price negotiation. Table 17 presents constraints to improved market access as perceived by producers. Illegal market in Metema area is identified as a constraint to producers and traders (Tesfaye 2009).

Traders and exporters are also faced with marketing problems. A survey in IPMS PLWs (Berhanu et al. 2007) identified lack of adequate supply of good condition animals, inadequate market places, lack of holding (concentration) places, feed supply, lack of market information, and multiple taxation at checkpoints (especially when animals are trekked or trucked through towns) and lack of efficient vaccination services for export animals as the major problems. Problems identified by exporters include lack of adequate supply of appropriate and good quality animals, poor marketing infrastructure, livestock diseases, lack of adequate sanitary and phytosanitary services to support exports, long market channels (usually 3–5 stages between producer and the abattoirs), and problems with airfreight transport services.

Table 17. *Live sheep, goat and skin marketing constraints in ranking order of importance*

Constraints/PLWs	Alaba	Gomma	Bure
Live sheep and goat			
Excessive tax	4	4	–
Brokers/dealers	1	2	–
Seasonality of markets	5	1	–
Lack of access to incentive markets	3	5	3
Lack of market and price information	2	3	
Low market prices	–	–	1
Counterfeit Birr	–	–	4
No problem	–	–	2
Skins	–	–	–
Lack of price and market information	2	–	–
Lack of extension support on skin handling and marketing	1	–	–
Poor skin quality of local animals	3	–	–

Sources: Tsedeke (2007), Belete (2009), Yenesew (2009).

6.6 Institutional, regulatory and policy support

Improvements in productivity and farmers' income depend largely on adoption of improved technologies and marketing support. There is growing evidence that the major factor explaining low adoption of technology in Africa is lack of appropriate institutional and policy support (Kedir 1998). Adoption of improved technologies is strongly affected by the policy environment like input supply, market, credit, and price policies. A value chain approach is required for development efforts to succeed.

Institutional support in sheep and goat production in Ethiopia is largely limited to health services. However, there are still farmers who obtain alternative veterinary services from illegal sources (e.g. 19.3% of respondents in Alaba PLW). There are no private or governmental enterprises or cooperative associations working on livestock marketing and input supply. The informal livestock input provision, such as through retail traders, is not accessible in most parts of the country. This is in contrast to the emerging crop marketing cooperatives which help to overcome the production and marketing problems. Access to credit services (only 6.7% in Alaba PLW) is limited in some areas. Lack of regulations such as absence of licensing requirements for involvement in livestock trading in some regions (Berhanu et al. 2007) is also a hindrance to market success of producers and consumers.

Institutions involved in generation and dissemination of improved livestock technologies have so far limited impact on livestock development. The main features of research and development support are poor linkage between research and extension, inappropriateness of technologies, and low return from technologies.

7 Opportunities and strategic options for improvement

7.1 Institutional support for livestock research and development

Institutions generating improved livestock technologies, disseminating improved livestock technologies, and providing credit and health care are already in place. Furthermore, agricultural universities and colleges are turning out large trained force that can advice farmers and be future livestock producers themselves.

In Oromia Regional State, livestock development department has recently been reorganized as a separate livestock development and marketing agency detached from the Bureau of Agriculture. This may facilitate its effective functioning. Effective linkage of the now independent agency and the livestock research system in EARS could facilitate targeting research projects and enhancing adoption of livestock technologies by producers. The Federal Ministry of Agriculture and Rural Development and Bureaus of other Regional States are also reviewing the existing system of service delivery and are considering a different and innovative institutional arrangement to enhance livestock production for economic development. The livestock resource base and the prospects and contribution of livestock development to the national economy and livelihoods of millions of farmers and pastoralists could rightly justify moving away from past failed attempts and setting-up a new dynamic and innovative institutional arrangement in Ethiopia.

Livestock research in Ethiopia is structured under federal and regional systems. The federal research institute (EIAR) is organized to undertake research and coordinate the Ethiopian agricultural research system (EARS). These include research undertaken by the Regional Agricultural Research Institutions (RARIs), universities, ATVETs, private sector, NGOs etc. Although various research activities have been undertaken to improve livestock resources over the last decades, these efforts have not been adequate to make any significant contribution to improvement of the sector given the limited resources availed to the sector *vis-à-vis* the large size of the country, the diversity of agro-ecologies and production systems and the huge livestock resources it owns. In addition, most often the research focused on production oriented technological interventions with very little or no attention to organizational and institutional issues and commodity value chain

development. The critical aspects of input supply, credit, marketing and consumer taste and preference have been given little or no attention. A strong national agricultural research system that promotes complementarities and avoid competitions and duplication could help improve the efficiency and effectiveness of the agricultural research system as a whole. First and foremost, EIAR has to strengthen its capacity and calibre in undertaking livestock research that is strategic and broadly relevant to the nation at large. Its coordinating role has to be enhanced to ensure relevant, demand driven and problem solving research is undertaken by the EARS. A number of universities now run graduate programs and theses research undertaken by graduate students (MSc/PhD) should be relevant and part and parcel of the national research agenda.

Harmonizing and ensuring that research centres, subcentres and testing sites are strategically located (irrespective of organizational affiliation and/or administrative boundaries) and their agro-ecological mandate and research agenda are clearly defined in a participatory manner could enhance effective and efficient utilization of available financial, human and material resources in the country. EIAR also needs to realize the large untapped livestock resources in the country that could be mobilized for economic development (beyond providing oxen power for crop production) and should allocate adequate resources (human, financial and material). The livestock research system could also be reorganized into limited commodity centres/institutes (e.g. small ruminant, dairy etc.) and address the value chain development of these commodities by pooling its own critical research staff and from EARS. To address the shortage of qualified staff in the research institutions and advance innovations, a workable and flexible arrangement has to be developed to ensure a regulated movement of qualified staff between research institutions and universities, and other relevant organizations.

7.2 Sustainable utilization of animal genetic resources

Ethiopia is home for large and diverse livestock populations. This genetic potential is not yet adequately exploited. The genetic variation among and within breeds provides the raw material for genetic improvement. Besides, some of the sheep and goat breeds have special merits that meet certain incentive markets and fetch premium prices. The sheep and goat breeds in the lowlands of the country are in good demand in the Middle East markets. The Menz sheep and other subalpine sheep produce delectable meat and are in high demand in terminal domestic markets including Addis Ababa. The long-fat-tailed sheep breeds such as Horro sheep are highly prolific breeds. The central highland goats in

the northern Rift Valley of Ethiopia are branded and produce leather known in European markets as 'Bati Genuine'. All these traits could be utilized to enhance productivity and market success of producers, traders and exporters.

Population of livestock species in Ethiopia show increasing trends, although there is stagnation or declining trend in per capita ownership (Berhanu et al. 2007). This indicates that there is a potential to increase livestock production even under the existing unimproved production environment and the environment is supporting the growing livestock population. However, this could be detrimental to the environment and needs designing rational production strategy. Rational production strategies may include stratification of production environments, developing production strategies, and designing suitable and sustainable conservation-based breeding strategies.

7.3 Developing alternative production systems

The diverse production systems and production environments in the country provide immense opportunities for improvement. Extensive rangelands in pastoral areas and communal grazing lands, though shrinking due to human population growth, in highland mixed crop–livestock systems are favourable opportunities for extensive commercial livestock production. Land resources in the vast pastoral areas are predominantly devoted to livestock production. Pastoral communities are fully engaged in livestock production and can thus easily adopt livestock technologies provided appropriate technologies are supplied. Pastoral communities constitute 12–15% of the total population (PPE 2006) and own 40% of the livestock in Ethiopia. Similarly, subalpine environments where crop production is unreliable and livestock (particularly sheep), constitute the main source of livelihood are favourable for livestock production. The mixed crop–livestock production system in the highlands provides ample crop residues which is one of the major feed resources. Ample feed resources in the wet highlands can be exploited for intensive livestock production.

At present, sheep and goat are produced in Ethiopia under subsistence-oriented and low-input extensive mode of production. The current improvement strategy is largely based on this small-scale mode of production. Besides improving the small-scale system, the sheep and goat production strategy should also give adequate emphasis and support to the development of large-scale specialized sheep/goat production

systems. Large-scale specialized production systems are more conducive to introduce improved production technologies, which has been a limiting challenge to increase productivity and off-take rates under smallholder production systems. Furthermore, the strategy could focus on developing small-scale market-oriented intensive production systems depending on the characteristics of the existing production systems and agro-ecologies. Innovative production systems include specialized commercial breeding, commercial feedlot operations, and market-oriented intensive small-scale sheep/goat production under mixed crop–livestock and (agro)pastoral systems.

Stratification of production systems and delineation of production zones for the different production systems depending on the existing production systems and ecologies is required to design workable production strategies. Commercial and extensive livestock-based production systems are more suited in the extensive lowlands in western, eastern and southern parts of the country and subalpine sheep-based regions. Intensive market-oriented systems with fattening activities are suited in the wet highlands with intensive cropping areas (land shortage for extensive breeding activities and feed availability) particularly in perennial crop–livestock systems with tethering practices.

Sheep and goat production practice in Ethiopia is virtually organic agriculture as animals are maintained as scavengers with no or minimal chemical inputs. It would have been a great opportunity to improve market success of producers if market outlets to regions of the world where organic products fetch premium price are created. However, this requires meeting global sanitary and phytosanitary regulations. The strategy adopted in Ethiopia to meet these standards is creating disease free zones.

Development of improved production systems also requires consideration of technical interventions, particularly development of breeding strategies. Breed choice is a major component of the breeding strategy. Under extensive systems with large breeding flocks (pastoral, lowland agropastoral, and subalpine sheep-based systems) conservation-based selective breeding of local breeds and well-designed and targeted crossbreeding with the objective of producing breeding stock (terminal sires) and fatteners/finishers for the intensive systems could be considered. Economically efficient intensive systems could also be designed based on improved exotic or local meat breeds.

7.4 Technical interventions

Improved livestock technologies that can increase livestock productivity are widely available in research, development and education centres. These include improved sheep and goat breeds, forage crops, and management practices that are generated or adopted from elsewhere. Livestock technology (breeds and forage crops) multiplication centres are in place. These are immense opportunities to support livestock development.

Technical interventions to improve productivity should be designed targeting specific agro-ecologies and production systems as constraints (disease problems, feed shortage) are situation specific. The major constraint limiting commercial off-take rates are low reproductive rates, high preweaning mortality rates and slow growth rates. Solomon et al. (in press) estimated higher marginal relative economic values for twinning rate and pre-weaning lamb survival compared to other production traits. Supplementary feeding could promote more frequent and early lambing (Mukasa-Mugerwa et al. 2002; Solomon et al. 1995). Diseases such as enteritis are the major causes of young mortality. Disease control in young stock requires utmost attention in order to increase off-take rates.

Per capita meat yield of sheep and goats is low. The reasons are the inherent slow growth rate of the adapted indigenous breeds and traditional management practices. Simple genetic improvement practices at village level (such as culling inferior males and avoiding negative selection), introducing improved meat breeds under intensive systems as well as proper feeding and watering could increase carcass yield. Management interventions may focus on improving efficiency of traditional finishing/fattening practices.

Improvement of grazing lands and crop residue utilization seems to be the most feasible feed resource improvement option in highland crop–livestock systems, particularly in subalpine regions. High yielding improved forage crop varieties adapted to subalpine regions are limited. Feed production in this area is mainly limited to forage development along conservation structures since forage entry point is highly limited in intensive cropping areas. Furthermore, in subalpine areas flock management is extensive with large breeding flocks which limit the value of forage produced in small backyards. Intensive backyard forage production is suited to intensive systems in the wet highlands, particularly in perennial crop areas with small flocks and tethering practices. The

extensive pastoral areas are exclusively dependent on grazing, and improvement of rangelands is critical.

7.5 Improving livestock extension service delivery

There has been a remarkable effort in providing extension services. Impact of the extension service could be increased if farmers' needs and aspirations and their feedback on technologies and extension approaches are obtained. There are indications that reorienting the extension service is required. Table 18 gives an indication of what agropastoralists want extension service giving institutions to provide. The table also provides how agropastoralists receive the extension method/approach followed by extension institutions. Such studies need to be conducted in other production systems to assess farmers' attitudes and effectiveness of extension messages delivered. The information could be utilized for reorienting the livestock extension service.

Table 18. *Agropastoralists demand for sheep/goat services and opinions on extension methods, Mieso PLW*

Demand/opinion	Percentage of respondents	
	Adopters	Non-adopters
Agropastoralists demands for services		
Supply of inputs (vet drugs, supplementary feeds etc.)	22.4	24.5
Credit service, input suppliers at village level	37.8	18.9
Improved production techniques	3.1	7.5
Agropastoralists opinions on extension methods/approaches		
Training is important in changing attitude	8.2	4.0
Training is important in social development‡	9.0	17.0
Field day is important in changing attitude	2.0	6.0
Field day is important in social development	4.0	3.8
Demonstration is important in changing attitude	2.0	6.0
Demonstration is important in social development	3.0	0
Visit is important in changing attitude	0	2.0
Visit is important in social development	3.0	1.9
Public meeting is important in changing attitude	9.2	2.0
Public meeting is important in social development	23.0	9.4

‡ Social development: means of information transfer and improving social interaction.
Source: Extracted from Zelalem (2007).

7.6 Developing domestic market

Sheep and goat meat is a favourite in Ethiopia. There is already a large market for sheep and goat in the country. However, per capita meat consumption in Ethiopia is low,

particularly in rural areas where the majority of the population resides. Per capita beef, mutton and goat meat consumption is estimated to be 33.0, 22.4, 9.1 kg/capita per year, respectively in urban areas, while these values drop substantially to 6.6, 3.4, 3.0 kg/capita per year in rural areas (Asfaw and Jabbar 2008).

The domestic market for sheep and goat is expected to grow with increasing population size, urbanization and changing life style, and per capita income. Population censuses in Ethiopia show increasing human population. Asfaw and Jabbar (2008) estimated a growing trend in total live animal equivalents consumed from 1.3, 4.0 and 2.3 in 2001/02 to 1.5, 4.5 and 2.6 million heads in 2005/06 for cattle, sheep and goat, respectively. Such a high and increasing domestic demand for sheep and goat is expected to adversely affect the export supply unless livestock productivity and production is improved.

7.7 Expanding emerging export market

There is an unmet demand for live animal and meat export market opportunity, particularly for sheep and goat and an expanding skin export market. This opportunity enhances the market successes of producers, traders and export abattoirs and increases foreign currency earnings. Skin and hides export is already one of the major foreign exchange earning commodities for Ethiopia.

Currently the major source of sheep and goat for the export market are the remote lowland pastoral areas. The price margins for sheep and goat in these areas are fairly low and the competition with domestic market for local consumption is less stiff. The situation in the highly populated central parts of the country, which currently contributes insignificantly to the export market, differs with respect to domestic market demands and prices. There is a need to assess the factors affecting the supply and demand for sheep and goat from these regions considering the domestic *vis-à-vis* export market. The export market will have to compete with the growing domestic demand for sheep and goat meat, particularly in the central parts of the country. Expanding sheep and goat production through encouraging large-scale production and increasing productivity in smallholder systems (see section 7.4) is required. Furthermore, there is a need to meet the diverse export market demand regarding carcass classes in terms of age, carcass weight and quality (particularly lean to fat ratio). Technical solution could include targeting potential local and exotic breeds and developing feeding packages to meet export requirements. A long-term option with regard to expanding the export opportunity is

accessing into European meat markets, especially with organic meat products. Supporting regulations, however, need to be devised if producers are to reap a fair share of this opportunity.

7.8 Strengthening services

Restructuring and strengthening of livestock technology generating and disseminating institutions (see sections 7.1 and 7.5) is required to enhance technology adoption by producers. However, technology adoption is also limited by access to inputs and financial constraints. Thus, strengthening existing and developing innovative service provision approaches need to be considered. For instance, farmer/village-based health service provision (as demonstrated in Mieso, Alaba PLWs) and community based insurance schemes (Gomma PLW) are examples of good practices. Finally, the bottlenecks in livestock marketing which slash farmers' equitable income, which in turn act as disincentive for farmers to adopt technologies, need to be addressed in all its dimensions.

References

Aklilu Feleke. 2008. Major animal health problems of market oriented livestock development in Bure woreda. DVM thesis, Addis Ababa University, Debre Zeit, Ethiopia.

Alemayehu M. 2003. Country pasture/forage resources profiles: Ethiopia. FAO (Food and Agriculture Organization of the United Nations), Rome, Italy. (Available from http://www.fao.org/ag/agp/agpc/doc/counprof/ethiopia/ethiopia.htm) (Accessed on January 2010).

Asfaw N and Jabbar M. 2008. *Livestock ownership, commercial off-take rates and their determinants in Ethiopia*. Research Report 9. ILRI (International Livestock Research Institute), Nairobi, Kenya. 52 pp.

Ayele S, Assegid W, Jabbar MA, Ahmed MM and Belachew H. 2003. *Livestock marketing in Ethiopia: A review of structure, performance and development initiatives*. Socio-economics and Policy Research Working Paper 52. ILRI (International Livestock Research Institute), Nairobi, Kenya.

Belete Shenkute Gemeda. 2009. Production and marketing systems of small ruminants in Gomma district of Jimma zone, western Ethiopia. MSc thesis. Hawassa University, Hawassa, Ethiopia.

Berhanu Bedassa. 2002. Analysis of factors affecting the adoption of crossbred dairy cows in the central highlands of Ethiopia. MSc thesis. School of Graduate Studies, Haramaya University, Ethiopia.

Berhanu Gebremedhin, Hoekstra D and Samson Jemaneh. 2007. *Heading towards commercialization? The case of live animal marketing in Ethiopia*. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project Working Paper 5. ILRI (International Livestock Research Institute), Nairobi, Kenya. 73 pp.

CSA (Central Statistical Authority). 2006. *Ethiopian agricultural sample survey.* Vol II. Report on livestock and livestock characteristics. Statistical Bulletin 388. CSA, Addis Ababa, Ethiopia.

EARO (Ethiopian Agricultural Research Organization). 2000. National small ruminants research strategy document. EARO, Addis Ababa, Ethiopia.

Endeshaw Assefa. 2007. Assessment of production and marketing system of goats in Dale district, Sidama zone. MSc thesis, Hawassa University, Awassa, Ethiopia.

FAO (Food and Agriculture Organization of the United Nations). 1994. *Production yearbook*. Volume 48. FAO, Rome, Italy.

FAO (Food and Agriculture Organization of the United Nations). 2004. Livestock sector brief: Ethiopia. Livestock information, sector analysis and policy branch (AGAL), FAO, Rome, Italy.

Gebremedhin Abraha. 2007. Major animal health problems of market oriented livestock development in Atsbi-Womberta woreda. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Getahun Assebe. 2007. Major animal health problems of market oriented livestock development in Mieso woreda, western Harerghe, Ethiopia. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Getahun L. 2008. Productive and economic performance of small ruminant production in production system of the highlands of Ethiopia. PhD dissertation. University of Hohenheim, Stuttgart, Hoheinheim, Germany.

Gizachew Bayleyegn. 2007. Major animal health problems of market oriented livestock development in Metema woreda, north Gondar zone, Ethiopia. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Ibrahim H. 1998. *Small ruminant production techniques*. ILRI training manual. ILRI (International Livestock Research Institute), Nairobi, Kenya. 192 pp.

ILRI (International Livestock Research Institute). 1995. *Livestock policy analysis*. ILRI Training Manual 2. ILRI, Nairobi, Kenya. 264 pp.

Kassaw Amsalu. 2007. Major animal health problems of market oriented livestock development in Fogera woreda. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Kebede Andargachew and Ray B. 1992. Intra-annual sheep price patterns and factors underlying price variations in the central highlands of Ethiopia. In: Rey B, Lebbie SHB and Reynolds L (eds), *Small ruminant research and development in Africa. Proceedings of the first biennial conference of the African small ruminant research network, ILRAD, Nairobi, Kenya, 10–14 December 1990*.

Kedir Bati. 1998. The role of SG2000 project credit system in the adoption of wheat technologies by smallholder farmers in Ethiopia. The case of Hetosa district. MSc thesis. Sokoine Agricultural University, Morongono, Tanzania.

Kuastros Mekonnen. 2007. Major animal health problems of market oriented livestock development in Alaba woreda, Southern Nations Nationalities and Peoples Region. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Mengiste Taye Tereffe. 2008. On-farm performances of Washera sheep at Yilmanadensa and Quarit districts of the Amhara National regional state. MSc thesis. Hawassa University, Awassa, Ethiopia.

Mukasa-Mugerwa E, Anindo D, Sovani S, Lahlou-Kassi A, Tebely S, Rege JEO and Baker RL. 2002. Reproductive performance and productivity of Menz and Horro sheep lambing in the wet and dry seasons in the highlands of Ethiopia. *Small Ruminant Research* 45:261–271.

Niftalem Dibessa. 1990. On-farm study of the reproduction and growth performance of Menz sheep around Debre Berhan area. MSc thesis. Alemaya University of Agriculture, Dire Dawa, Ethiopia.

Otte MJ and Chilonda P. (eds). 2002. *Cattle and small ruminant production systems in sub-Saharan Africa–A systematic review*. Livestock information sector analysis and policy branch, FAO (Food and Agriculture Organization of the United Nations), Rome, Italy.

Peacock C. 1996. *Improving goat production in the tropics. A manual for development workers*. FARM-Africa and Oxfam (UK and Ireland), Oxfam, UK. 87 pp.

Solomon Abegaz Guangul. 2007. *In-situ* characterization of Gumuz sheep under farmers' management in north-western lowlands of Amhara region. MSc thesis. Haramaya University, Ethiopia.

Solomon Gizaw, Yohannes Gojam and Solomon Abegaz. 1995. Lifetime reproduction and growth in Horro ewe lambs bred either at 7 or 18 months of age. Third ESAP conference, 27–29 April 1995, ESAP proceedings, pp. 209–213.

Solomon Gizaw, Komen H, Hanotte O and van Arendonk JAM. 2008. Indigenous sheep resources of Ethiopia: Types, production systems and farmers preferences. *Animal Genetic Resources Information* 43:25–40.

Tesfaye Alemu Tucho. 2004. Genetic characterization of indigenous goat populations of Ethiopia using microsatellite DNA markers. PhD thesis, NDRI, India.

Tesfaye Tsegaye. 2009. Characterization of goat production systems and on-farm evaluation of the growth performance of grazing goats supplemented with different protein sources in Metema woreda, Amhara region, Ethiopia. MSc thesis. Haramaya University, Haramaya, Ethiopia.

Tsedeke Kocho Ketema. 2007. Production and marketing systems of sheep and goats in Alaba, southern Ethiopia. MSc thesis. Hawassa University, Awassa, Ethiopia.

Wilson RT. 1982. Husbandry, nutrition and productivity of goat and sheep in tropical Africa. In: Gatenby RM and Trail JCM (eds), *Small ruminants breed productivity in Africa*. ILCA (International Livestock Center for Africa), Addis Ababa, Ethiopia. pp. 67–75.

Wilson RT. 1989. Reproductive performance of African indigenous small ruminants under various management systems: A review. *Animal Reproduction Science* 20:265–286.

Yenesew Abebe. 2009. Characterization of small ruminant production system and on-farm evaluation of urea treated wheat straw and concentrate feeding on sheep body weight change in Bure woreda, west Gojjam zone. MSc thesis. Haramaya University, Haramaya, Ethiopia.

Yohannes Tekle. 2007. Major animal health problems of market oriented livestock development in Alamata woreda. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Zelalem Tamrat. 2007. Adoption of small ruminant fattening package in agropastoral areas, Meiso wereda, Eastern Oromia. MSc thesis. Haramaya University, Haramaya, Ethiopia.

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