

Livestock input supply and service provision in Ethiopia: Challenges and opportunities for market-oriented development



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Abstract

Livestock production in Ethiopia has, for long, remained subsistence with limited market-orientation and poor institutional support. Producing for the market requires re-orientation of the production system and development of a knowledge based and responsive institutional support services. Institutional support services of extension, research, input supply, rural finance and marketing are key areas of intervention that can play a central role in the transformation of subsistence production into market orientation. Livestock production systems in Ethiopia can be broadly categorized into mixed crop–livestock system, pastoral and agropastoral system, and urban and peri-urban production systems.

The demand for institutional support services for livestock development in these production systems can vary significantly. The way extension system is oriented in Ethiopia may not be in the best interest of livestock keepers and lacks the responsive capacity to the demands for livestock services. In fact, most often livestock development issues are left to development projects and NGOs that have limited scope, coverage and duration. The major inputs for livestock development include animal genetic resources, feeds and forages, veterinary drugs, vaccines, machinery equipment and utensils as well as knowledge. Most of these inputs have been supplied only by the government or government sponsored projects. Limited credit facilities to support livestock development have been provided by microfinance institutions, food security projects, small-scale micro enterprises and NGOs.

The contribution of the private sector in livestock input has been limited to supplies of veterinary drugs and services, roughage and concentrate feeds, and processing equipment and utensils. Recent trends show that there is an encouraging move to involve the private sector in input supplies such as production of beehives, despite the fact that the major direct buyer is still the Office of Agriculture and Rural Development (OoARD). Due to the recent increase in demand for live animals and animal products in the domestic and export markets, there has been a renewed interest to promote market-oriented livestock production in the country. As a result, there are some encouraging, but isolated, development interventions emerging to engage farmers and pastoralists in a more market-oriented livestock production in areas where the resources offer the opportunities. For example, there are some activities in apiculture production, small ruminants breeding and fattening, cattle fattening, poultry and dairy production.

At the *woreda* level, institutions such as microfinance, small-scale and micro enterprises, NGOs, women's affairs office are involved in these livestock development activities.

However, there is lack of coordination with the *woreda* Offices of Agriculture and Rural Development. The demand for input supply, particularly for improved animal genetic resources has increased substantially with poor response from the supply side. There is a gap in coordination of efforts and in basing livestock development interventions on scientific knowledge with the value chain in mind. The extension system has to be re-oriented to be able to respond to the increasing demand for improved and market-oriented livestock development if farmers, pastoralists and the private commercial producers are to benefit and contribute to the development of the national economy.

1 Introduction

Ethiopia has a land area of about 1.1 million km² and an estimated human population of over 77 million, growing at a rate close to 3% per annum. About 85% of the population lives in rural areas on subsistence crop and livestock production. The country, with its wide variations in agro-climatic conditions, possesses one of the largest and the most diverse plant and animal genetic resources in the world. Estimates of the contribution of the livestock sector to the total GDP and agricultural GDP in Ethiopia vary. Halderman (2004) reported that livestock contributes 12–16% of the total GDP and 30–35% of the agricultural GDP. FAO (2004) estimated the contributions of livestock to total GDP at 18.84% and the agricultural GDP at 44.54%. On the other hand, MoARD (2007) reported that the livestock sector accounts for 16% of the national and 27–30% of the agricultural GDPs, and 13% of the country's export earning. The country's annual livestock and meat export potential is currently estimated to be USD 136 million; however, the realized export earning over the past 15 years to 2003 averaged only to USD 2.5 million, which is incomparably low (MoARD 2007). As an integral component of the overall farming systems, livestock serve as a source of draught power for crop production in the rural farming population, supply farm families with milk, meat, manure, and serve as source of cash income. Livestock also play significant role in the social and cultural values of the society. In pastoral areas, the livelihood of the population depends mostly on livestock. Despite the importance of livestock to the farming and pastoral populations and to the national economy at large, the sector has remained underdeveloped and underutilized.

Over the years, lack of market-orientation of the livestock sector has over-shadowed and undermined the role it can play in contributing to the national economy. The comparative advantages of the unique genetic resources, the agro-ecology they live in and the associated production systems have not been exploited appropriately and adequately. The share of government investment in livestock research, education and extension services and other development activities has been relatively low. Large extensive areas of pastoral and agropastoral production systems have been largely ignored and marginalized with regard to livestock resources development. The visibility of these areas has been reduced through replacement with crop production and expansion of large-scale commercial crop farms with little or no consideration to the livestock sector.

Major livestock producing areas in the arid and semi-arid regions of the country have been viewed through the lens of cereal crops production and have most often been labelled as 'food insecure', 'marginal', 'moisture stressed' or 'low potential' areas, despite the huge, yet unexploited, livestock, crops and other natural resources they possess.

As a result, most livestock development efforts have been left to projects that are either location specific, species specific or breed specific and have failed to be sustainable as most activities have focused on specific objectives (rangeland, construction of physical structures, exotic breed introduction etc.) rather than on holistic and sustainable livelihoods development of the people who live in these areas and own the livestock resources.

Recent trends, (especially since 2003/04) however, indicate that there is better government recognition of the huge and yet untapped potential of the sector, accompanied by renewed efforts to develop and elevate its contributions to both the domestic and export markets. Encouraging changes in approaches and methods to develop the sector are taking place. However, the performance of the sector has been limited due to lack of adequate experience and knowledge, poor input supply system, inefficient input/output marketing system, limited support services and other technical and socio-economic considerations. The major technical constraints are shortage and fluctuation in quality and quantity of feed, poor genetic resource base for production traits, poor management practices, diseases, poor market infrastructure and institutional arrangements. Most inputs have been supplied by the government and there is a tendency to continue to do so. This paper presents the resource base, development efforts so far and examines the processes and problems encountered in livestock input supply and service system. Information collected from various secondary sources, and from a baseline data survey and a participatory rural appraisal (PRA) of seven *woredas* (Fogera and Metema in Amhara; Ada'a Liben in Oromia; Dale and Alaba in the SNNPR and Atsbi-Wemberta and Alamata in Tigray) are used. These *woredas* are Pilot Learning *Woredas* (PLWs) of the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project.

2 Overview of the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project and methodology of the study

2.1 Brief description of the project

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

- Introduction of a participatory market-oriented agricultural development approach to facilitate adoption of appropriate technologies, innovative input supply and output marketing schemes and innovative financial services
- Development of an agricultural knowledge management system to improve the availability, access, sharing and use of relevant knowledge and information on Ethiopian agriculture
- Strengthening the innovative capacity of farmers, pastoralists, and public and private sector agricultural organizations to respond to development challenges and opportunities
- Promote evidence-based alternatives on agricultural development approaches, including policies technologies and institutional arrangements.

Gender, HIV/AIDS and the environment are cross-cutting issues in all the project objectives and activities.

In consultation with the Federal and Regional authorities and other stakeholders, the project selected 10 Pilot Learning *Woredas* (PLWs) for developing a community based market oriented agricultural program. These *woredas* are: Atsbi-Wemberta and Alamata districts in Tigray; Fogera, Metema and Bure in Amhara; Mieso, Ada'a Liben and Goma in Oromia; and Dale and Alaba in SNNPR (Figure 1).¹ Research and development programs based on market-oriented priority commodities within farming systems were developed for each of the PLWs in a participatory manner with the main stakeholders. The selection of the commodities was based on the development priorities expressed by communities as well as MoARD. The livestock commodities selected are cattle (milk, butter, live animals, beef and hides), sheep and goats (live animals, skin), poultry (meat and eggs), apicultural products (honey and wax) and fish (Table 1). The livestock population in these PLWs is presented in Table 2.

1. Detailed description of these PLWs is available on the IPMS website at www.ipms-ethiopia.org.

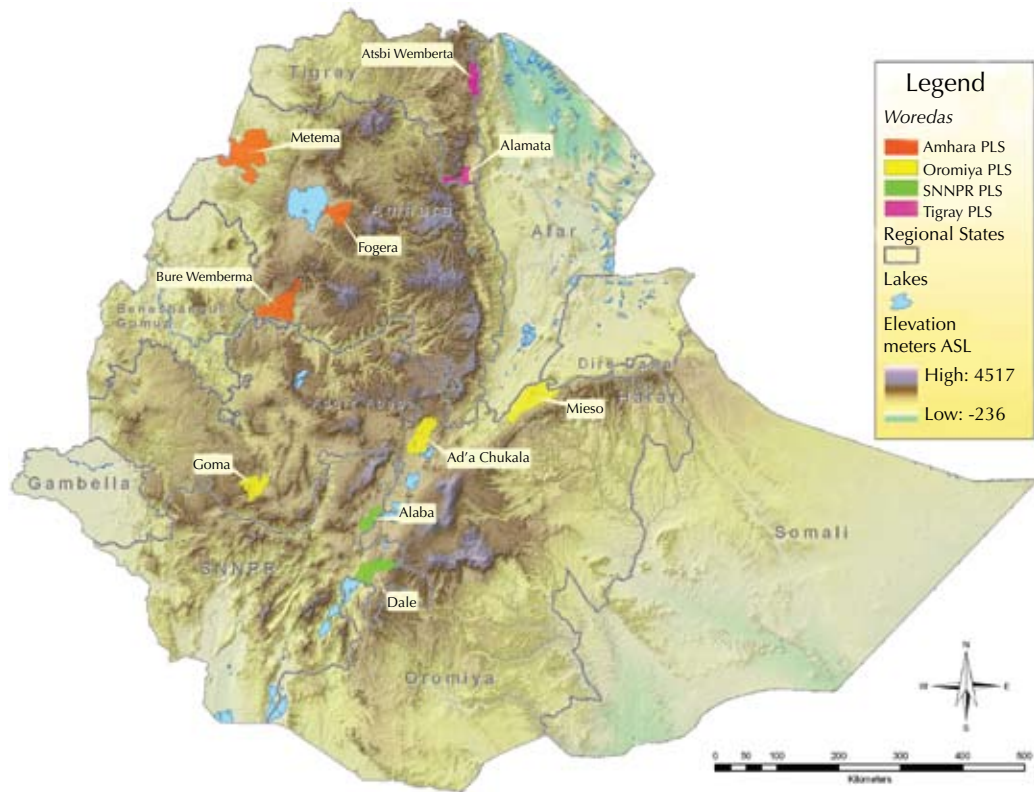


Figure 1. Location of Pilot Learning Woredas of the IPMS project.

2.2 Sampling and data collection methods

The general situation of input supply and services for livestock at national level is assessed based on secondary information and the current situation at *woreda* level using information collected through Participatory Rural Appraisal (PRA) techniques and a baseline survey data in eight *woredas* in the four regional states of Oromia, Amhara, Tigray and SNNPR.

PRA information was collected by multidisciplinary teams using key informants interviews, focus group discussions, transects and stakeholder workshops. The baseline data were collected by enumerators, guided and supervised by the project’s Monitoring and Evaluation (M&E) specialists. Data were collected through individual household interviews, focus group interviews, key informants interviews and secondary data from peasant association (PA) and *woreda* level statistics. Household level data were collected from each of the farming systems identified in the selected *woredas*. An overview of the number of PAs and sample size used for this paper is provided in Table 3.

Table 1. Priority market-oriented livestock commodities by PLW

Produce	Pilot Learning Woredas									
	Amhara			Oromia			SNNPR		Tigray	
	Metema	Fogera	Bure	Ada'a Liben	Mieso	Goma	Alaba	Dale	Alamata	Atsbi-Wemberta
Milk	√	√	√	√	√	√	√	√	√	√
Butter	√	√	√	√	√	√	√	√	√	√
Beef	√	√	√	√	√		√		√	
Hides/skins							√	√		√
Shoats	√		√	√	√	√	√	√	√	√
Poultry	√	√	√	√	√	√	√	√	√	√
Honey	√	√	√	√		√	√			√
Fish		√								

Table 2. Livestock population in the 10 PLWs

Region/PLW	Cattle	Sheep	Goats	Poultry	Beehives
Amhara					
Metema	103,765	4956	29,863	92,068	4096
Fogera	157,128	7607	27,867	246,496	21,883
Bure	71,924	15,225	8794	45,371	4801
Subtotal	332,817	27,788	66,524	383,935	30,780
Oromia					
Ada'a Liben	160,697	22,181	37,510	191,380	3274
Mieso	92,411	7325	41,869	64,496	3445
Gomma	113,180	21,285	14,076	209,096	52,662
Subtotal	366,288	50,791	93,455	464,972	59,381
SNNPR					
Alaba	161,566	34,760	43,141	221,342	14,690
Dale	225,698	30,152	31,443	218,923	10,949
Subtotal	387,264	64,912	74,584	440,265	25,639
Tigray					
Alamata	83,589	3822	14,398	114,449	1751
Atsbi-Wemberta	48,870	72,471	10,427	44,000	6729
Subtotal	132,459	76,293	24,825	158,449	8480
Total	1,218,828	219,784	259,388	1,447,621	124,280

Table 3. *Sample size baseline data of household survey IPMS**

Pilot Learning <i>Woreda</i>	Farming system	No. of peasant associations	No. of sample households
Metema	Cotton/rice/livestock	4	43
	Sesame/cotton/sorghum/livestock	12	43
Fogera	Rice/livestock	7	38
	Cereal/livestock	18	73
Atsbi-Wemberta	Pulse/livestock	12	76
	Apiculture/livestock	7	43
Alamata**	Teff/sorghum/maize/livestock	8	80
Ada'a Liben	Teff/dairy	13	40
	Teff/livestock	32	60
Alaba	Teff/haricot beans/livestock	43	70
	Pepper/livestock	30	41
Dale	Coffee/livestock	41	89
	Beans/livestock	23	51

* No baseline data survey was conducted in Mieso at the start of the project.

** There is only one farming system in Alamata.

3 The Ethiopian livestock resource base

Throughout this paper, the term 'livestock' is used broadly to include large and small ruminants, camels, poultry, apiculture and fish resources. Ethiopia has the largest livestock population in Africa. According to CSA (2008) the estimated livestock population kept by farmers in rural areas was about 43.1 million cattle, 23.6 million sheep, 18.6 million goats, 616,500 camels, 34.2 million chicken, 4.8 million beehives, 6.5 million equine and 40,000 t of annually harvestable fish. Cattle play the most important role in the farming economy followed by sheep and goats. The livestock population is primarily indigenous types and have not adequately characterized and documented.

Cattle found in Ethiopia are mostly zebu. The main cattle breeds/populations identified and characterized so far include the Boran, Fogera, Horro, Sheko and the Afar. These main cattle breeds/populations are indigenous to specific regions of Ethiopia. The Fogera and Horro, well known for their milk production, are reared around Lake Tana and Eastern Wellega regions, respectively. The Boran, a renowned beef breed/population, is found in the southern and eastern parts of the country, while the Sheko breeds/populations, which are considered to have tolerance to high tsetse challenge, are found in the southwest. European breeds, especially Friesian and Jersey, have been imported for many years and crossed with the indigenous cattle breeds.

Some 7 sheep and about 12 goat breeds/populations have been identified so far in Ethiopia. However, only few of these have been studied and characterized to some extent. The sheep breeds/types include the Horro, Menz, Afar, Arsi, Bonga, Washera and Black-Head Ogaden. The goat breeds/types identified include the Afar, Arsi-Bale, Long and Short eared Somali and the Hararghe Highland goats. Few exotic breeds of sheep and goats have been introduced into the country for crossbreeding. Among these, the Awassi, Dorper, Hampshire and Corriedale sheep have been used for meat and wool in the highlands, while the Anglo-Nubian, Sanan, Toggonburg, are preferred for milk and meat production in the lower altitude of the mixed farming systems. Recently, the Boar goat and the Dorper sheep breeds have been imported by the Ethiopian Sheep and Goat Productivity Improvement Project (ESGPIP) and are being tested for their meat production under different agro-ecological conditions. With regard to poultry, the indigenous birds comprise over 99%, while the remaining 1% are exotic commercial chicken breeds such as the White leghorn, Rhode Island Red, Fayomi and Bovan that have been imported by various bodies. Some have been crossbred with the indigenous chicken.

4 Livestock development efforts to date

To overcome the development constraints and realize the benefits from the huge but untapped livestock resource, efforts have been made in various aspects to develop the livestock sector. We present a brief description of these efforts below.

4.1 National livestock development strategy

Cognizant of the major development constraints of the livestock subsector, a National Ruminant Livestock Development Strategy was prepared in 1997, within the overall policy objective of livestock subsector to develop and utilize the available resources and increase its contribution to the social and economic development of the country (MoA 1996, 1997). Components of the strategy included:

- a. feeds and nutrition: to increase supply and quality of feed and improve ruminant nutrition;
- b. animal health: to control and ultimately eradicate economically important ruminant livestock diseases; ensure only healthy and wholesome foods of animal origin reach the market and are placed in the hands of consumers; meet international animal health standards and requirements; and restrict tsetse fly advance into new areas and suppress the existing fly population in active fly dispersal areas and thereby reduce losses from trypanosomiasis;
- c. animal breeding: to improve milk and meat production through breeding with the view to achieve self-sufficiency in the short term and surplus for export in the long term; and
- d. livestock marketing: to improve the efficiency of the livestock and livestock products marketing.

Currently, a study to develop a National Livestock Development Master Plan is under way.

4.2 Livestock development packages

In line with the package approach of agricultural extension, four different livestock development packages have been prepared and used in the different agro-ecological zones of the country as applicable. These packages are: milk production improvement through introduction of exotic blood; meat production improvement using indigenous animals; egg production improvement through introduction of exotic blood; and honey production improvement using traditional and improved hives and improved management.

4.3 Livestock development projects

Over the last 50 years, various livestock development projects have been prepared and have been/are being carried out to minimize/overcome the development constraints of the sector. According to Getachew (2003) the First Livestock Development Project (F₁LDP), known as the Addis Ababa Dairy Development Project, was started in 1972 with loan from the World Bank. It was designed to set up small and medium sized individual dairy farms in potential *woredas* around Addis Ababa. Livestock as an integral part of the agricultural extension services began in 1960. F₁LDP put a major effort in introduction of improved dairy breeds and involvement of small-scale dairy farmers in the peri-urban and rural areas of Addis Ababa. This effort was followed by Swedish International Development Agency (SIDA) supported Chilalo Agricultural Development Unit (CADU), initiated in 1967, and the Wolaita Agricultural Development Unit (WADU). These two projects (CADU and WADU) had shown some promising results. Nevertheless, due to the high financial requirement and the number of skilled manpower per beneficiary, it was impossible to scale out and up these activities in other areas. Based on this experience, the Minimum Package Programme (MPP), which was regarded as a less expensive approach of reaching a larger segment of the peasant population in Ethiopia, was established in 1971. The MPP was implemented in two phases: MPPI and MPPII. The Extension and Project Implementation Department (EPID) of the MoA was mandated to implement the MPPs and offer farmers an integrated minimum agricultural services and inputs. The Livestock Extension service was included in the second phase of the project (MPP II) and was operated by the then Animal Resources Development Department (ARDD) of the MoA.

Projects geared to dairy development programs were then carried out with the implementation of Dairy Rehabilitation and Development Project (DRDP) followed by the FINNIDA assisted projects of the Selale Peasant Dairy Development Pilot Project (SPDDPP), National Artificial Insemination Center (NAIC) and the Smallholder Dairy Development Project (SDDP). Other projects included the Fourth Livestock Development Project (F₄LDP), the Pan African Rinderpest Campaign Project (PARC) etc.

Projects targeted for lowland livestock system include Southern Rangelands Development Pilot Project (SORADEP), Second Livestock Development Project (SLDP), Third Livestock Development Project (TLDP) and Southeastern Rangelands Project (SERP). SORADEP was the first to be implemented in 1965, funded by USAID in Yabelo area with the aim of mainly assessing the potential and use by introduction of management practices and improving water supply of the rangelands. SLDP was implemented in 1973 to develop an integrated livestock marketing with emphasis on pastoral areas. TLDP was the first large-scale range improvement attempt in Ethiopia, which was implemented in the three

main lowland areas of Ethiopia; namely the Southern rangelands, Jijiga rangelands and Northeast rangelands as subprojects for Borana, Ogaden and Afar areas, respectively. Development interventions had included the pilot project at Southern Rangelands Development Unit (SORDU) in conjunction with the FLDP (1988), and SERP in the Ogaden (initiated in 1990). These projects were generally intended to foster greater integration among lowland and highland production systems.

Three projects on livestock, National Livestock Development Project (NLDP), Pan-African Programme for the Control of Epizootics (PACE), and Farming in Tsetse Infested areas (FITCA) have been operational at national level until recently. NLDP, which is an outcome of the National Livestock Development Programme of 1997, is now being implemented throughout the country, both the highlands and lowlands. With soft loan from the African Development Fund, it has three main components, namely, animal health improvement, strengthening of artificial insemination services to develop the cattle improvement program and forage development.

Several other livestock development projects are also underway currently with support from various sources. These include the Integrated Livestock Development Project (ILDP) in North Gondar (recently modified to include agricultural development in general), financed by Austrian Government; various USAID supported projects such as the Ethiopian Dairy Development Project implemented by Land O' Lakes; the Sanitary and Phytosanitary Livestock Meat Marketing Project led by Texas A&M University; and the Ethiopian Sheep and Goat Productivity Improvement project implemented by Prairie View A&M University in Texas and the American Institute for Goat Research of Langston University, Oklahoma. In addition, the Pastoralist Livelihood project (PLI) supported by the World Bank, SNV supported by the Netherlands Government and many other projects implemented by various NGOs are operational. There are also a number of development projects that have a livestock component being implemented by various national and international NGOs.

5 Overview of livestock input supply and services situation in Ethiopia

Various services and inputs are supplied to the livestock sector in Ethiopia. However, these services and inputs are way inadequate compared with the needs of the sector. Perhaps the most widely provided service is veterinary service. The components and manner of provision of inputs and services to livestock producers vary from region to region depending on their circumstances. In the following sections the current input supply and service system for major livestock interventions is discussed and results from the PLWs are provided for comparative understanding of the situation on the ground.

5.1 Breed improvement programs

The indigenous livestock breeds/populations of Ethiopia have the capacity to cope with the harsh environmental conditions of the country. They often have special adaptive traits for disease resistance, heat tolerance and ability to use poor quality feed which they have acquired through natural selection over hundreds of generations. They therefore need relatively less environmental modification to achieve increased productivity. On the other hand, the temperate livestock breeds, although they have the genetic capacity for higher production, their performance under the existing environment is not that attractive and they are often not viable. The focus of breed improvement in Ethiopia so far has been through crossbreeding of the local stock with exotic breeds. In line with this, different initiatives have been made to promote crossbreeding scheme. These include: establishment of National Artificial Insemination Centre (NAIC); establishment of cattle, sheep and poultry breed improvement and multiplication centres, with the major aim being to distribute improved animals to smallholders.

5.1.1 Cattle improvement

Cattle breeding and AI programs

There were three government operated cattle multiplication and improvement centres in different parts of the country. These centres also have an element of conserving identified cattle breeds/populations in their own environment. These centres are Boran breed improvement and multiplication centre, Arsi breed improvement and multiplication centre both in Oromia Region, and Fogera breed improvement and multiplication centre in Amhara Region. Recently, the Boran and Arsi improvement centres have been sold to private businesses for different purposes. There were also plans to establish similar centres for Begait cattle in Tigray, for Abigar breed in Gambella and for Horro breed in Oromia,

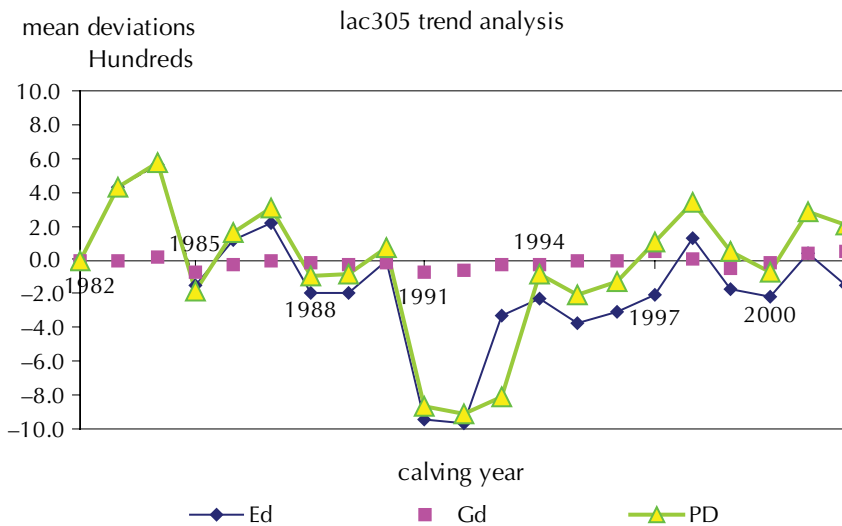
which are not yet realized. See Annex 1 for a case study on breeding efficiency in one of these centres.

The national artificial insemination service mainly focuses on cattle to boost milk production and uses exotic and local semen as appropriate. Exotic semen includes Friesian and Jersey, while the indigenous include Fogera, Horro, Boran and Begait. There has been semen importation as required. Having recognized the importance of AI in dairy development, the government embarked on the technology at a wider scale and established the National Artificial Insemination Centre (NAIC) at Kaliti in 1981. The centre was initially designed to accommodate 25–30 bulls at a time. Office, laboratory, AI technicians' training centre and other facilities were constructed. Bulls donated by the Cuban Government (25 Holstein and 10 Brahman) and importation of 44,800 doses of Friesian and 2000 doses of Jersey semen were source of semen used for frozen semen technology (Getachew and Gashaw 2001). The centre operates a semen processing laboratory and liquid nitrogen processing plants. To date, semen collection is based on exotic and indigenous as well as crosses of the breeds of Friesian, Jersey, Brahman, Boran, Begait, Fogera, Horro, Sheko and crosses of 50% and 75% Holstein–Friesian and indigenous bulls. From the total semen produced, the major share is from Friesian (75.3%) followed by Jersey (10.5%). NAIC is now the only centre that produces semen in the country. On average, about 120,000 doses of frozen semen and 40,000 to 50,000 litres of liquid nitrogen are produced annually at Kaliti. The centre keeps about 40 bulls for semen production. The total number of inseminations undertaken annually does not exceed 40,000 and about 50% of these inseminations are undertaken in and around Addis Ababa and Arsi where relatively large concentrations of crossbred dairy animals are available.

In order to enhance the animal genetic improvement efforts of NAIC, the NLDP has provided substantial support to upgrading the Kaliti centre, procured a bull dam farm at Holetta, provided funding for purchase and installation of about 10 liquid nitrogen plants in strategically selected locations across the country and provided substantial support for training of AI technicians and to improve field AI operations.

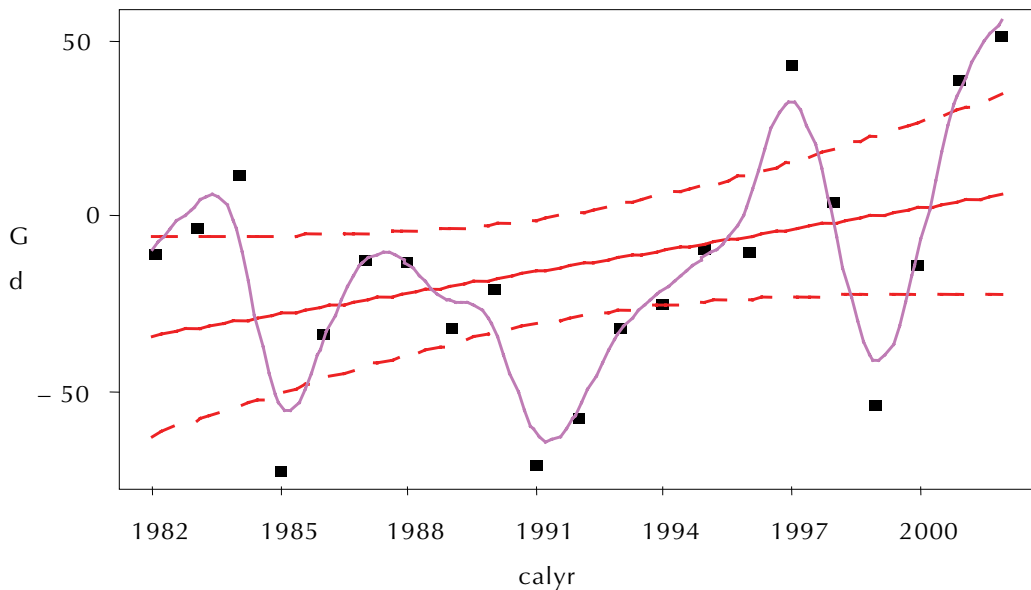
A study by Mohamed (2003) analysed production and reproduction data collected from 1981 to 2002 at Holetta, Selale and Stella dairy farms to examine if bull dam recruitment procedure for AI among local Holstein Friesian herds does lead to genetic progress. The trend in 305 days milk yield using the 1982 base population (Figure 2) phenotypic and genetic trends showed that the main determinant in phenotypic performance was the environmental deviation component. As a result, environmental influence and management situation in the time period explain the decline in phenotype from 1990 to 1993 and the slight improvement from 1994 to 1998. Annual genetic average regressed

against calving year showed positive trend (Figure 3). The author speculated that the slight recovery after 1994 compared to the base population might be due to imported germ line from Israel and the adopted bull dam selection procedure practised by the NAIC in addition to improvements in environmental conditions. He concluded that it was apparent (Figure 2), from the absence of significant annual trend with linear equation of $y = -4029 + 2.016x$, that no sustained improvement in the phenotype had been achieved in the 21 years of the study period. The efficiency and effectiveness of AI bull recruitment, semen production and quality, field AI operations have been evaluated under the NLDP project. Some of the major problems of the system include AI operation has remained under government as the sole provider of this service so far, lack of recording scheme, focus on AI and not on genetic improvement, lack of selection criteria for bulls, lack of pedigree information to technicians and consumers, limitation of activity to few cattle breeds only and problems with efficiency and effectiveness of AI technicians.



Source: Mohamed (2003).

Figure 2. Phenotypic, genotype and environmental deviation against a base population of 1982.



Source: Mohamed (2003).

Figure 3. Regression of genetic annual average deviation on calving year.

A recent study by Dessalegne et al. (2009) who evaluated the performance of AI in five regional states in Ethiopia revealed that 82% of the technical staff at NAIC and all participants of focus group discussions confirmed that there are no appropriate collaborations and communications between the NAIC, Regional Bureaus of Agriculture and Rural Development and other stakeholders. In addition, about 73.3% of the AI technicians do not provide AI service during weekends. With regard to effectiveness of AI service, the overall average conception rate to first service was as low as 16.1%, with significant variations between regions: 21.8% in Addis Ababa; 19.2% in Oromia; 17.7% in SNNPR; 16.3% in Amhara and only 3.7% in Tigray.

IPMS study results on genetic improvement of dairy and beef cattle

The IPMS study on input supply system for cattle included the dairy and beef production systems. The data for the dairy system were analysed for two farming systems; the teff–livestock system in Ada’a Liben and the coffee–livestock system in Dale. The percentage of households who actually received improved breeds was 0 and 1% in Ada’a Liben and Dale, respectively. With regard to AI services, only 8% of the households in the teff–livestock system in Ada’a Liben and none of the farmers in the coffee–livestock system in Dale received such a service.

Beef production was also identified as a priority market oriented commodity in the cereal–livestock production system in Alamata; the cotton–rice–livestock and sesame–

cotton–livestock production systems in Metema, the rice–livestock and cereal–livestock production systems in Fogera and the teff–dairy and teff–livestock systems in Ada’a Liben PLW. Data collected from sample households showed that there was no supply of improved animal genetic resources including AI service for beef production and improvement in all the PLWs.

5.1.2 Sheep and goat improvement

Sheep and goat breeding programs

Two centres located at Debre Berhan and Amed Guya in the Amhara Region concentrated on the improvement of the Menz sheep. The Horro sheep breeding centre in the Oromia Region, which was established recently with the aim to address the Horro breed/population predominantly found in the Western part of the country is not operational due to technical reason. Two other recently established sheep breeding centres are the Kokosa and Jijiga centres. The Kokosa centre in Oromia Region focuses on the improvement of the highland Arsi–Bale sheep, while the Jijiga centre in Somali Region focuses on the improvement of the lowland Wanke (Black-Head Ogaden) sheep. There is also an initiative to establish a Bonga sheep breeding and improvement centre in Kaffa Zone. The primary aim of the sheep breed improvement program is to increase production of good quality mutton, which commands a premium price on both the domestic and export markets. Wool production, though less important than meat, has a valuable role to play in sheep development, especially where its production is associated with peasant level handicraft industries. Apart from limited experiences of FARM Africa in crossbreeding of local goats with exotic dairy goats for improved milk production in the Hararghe highlands and the SNNPR, there has been no organized goat improvement program in the country. The major limitations in the sheep improvement program in Ethiopia include:

- Improvement programs through crossbreeding have been limited to Menz sheep only
- There has been no comprehensive local sheep improvement program
- There is no adequate information on meat, milk production and on reproduction, housing, feeding, disease control methods for different breeds of small ruminants in the country
- On-station or ranch based breed improvement programs have been inefficient and ineffective with little or no influence on the smallholder production system.

IPMS study results on input supply system for improved sheep and goat breeds

The IPMS study identified sheep production as a major commodity in the pulse–livestock production system in Atsbi-Wemberta, in the cereal–livestock production system in

Alamata, in the sesame–livestock and cotton–livestock production systems in Metema, in the teff–dairy and teff–livestock systems in Ada’a Liben, in the teff–haricot bean–livestock and pepper–livestock production systems in Alaba and in the bean–livestock system in Dale. Results from sample households showed that none of the households in the farming systems received improved sheep (either local or exotic) breeds.

Goat production has also been identified as an important marketable commodity in the apiculture–livestock system in Atsbi-Wemberta; the cereal–livestock system in Alamata; the cotton–rice–livestock and sesame–cotton–sorghum–livestock systems in Metema; the teff–dairy and teff–livestock systems in Ada’a Liben; the teff–bean–livestock and pepper–livestock systems in Alaba; and the bean–livestock system in Dale. Data from sample households showed that only 1% of the households in the teff–bean–livestock in Alaba and none of the households in all the other farming systems received improved breeds (local or exotic) of goats.

5.1.3 Poultry improvement

Poultry breeding programs

There were 11 poultry breeding and multiplication centres (some are still operational) located at Mekelle and Adigrat (Tigray); Andassa and Combolcha (Amhara); Nazareth/Adama, Adelle, Bedelle and Nekempt (Oromia); Awassa (SNNPR), Dire Dawa and Harar that mainly focus on Rhode Island Red breed. Unlike the cattle and sheep breeding program for genetic improvement, the poultry breeding program favours distribution of pure exotic breeds than crosses. The overall objective of the poultry breeding program is genetic improvement for egg and meat production through the provision of improved breeding cockerels, pullets, chicks and fertile hatching eggs. There has never been an indigenous poultry improvement program in the country.

Generally, however, like elsewhere in the tropics, crossbreeding schemes between exotic and indigenous breeds resulted in limited improvement in productive traits and even less improvement in fitness traits. Crossbreds are hardier than pure exotics due to adaptive traits inherited from their local parents but they still require substantial feed and veterinary inputs to survive and maintain reasonable productivity in the existing environment. Therefore, the importance of setting up a breeding program with emphasis on appropriate local breeds in each ecological zone should be well recognized. The following are some of the characteristics of the poultry breeding and improvement efforts in Ethiopia.

- Limited or no activity in improving or promoting local chicken
- Lack of attention to improve egg collection, storage and marketing from local chicken

- Focus has been on promotion of exotic breeds—broiler, egg or dual-purpose breeds
- Genetic material supply has been mainly from government multiplication centres and there has been limited attempt to develop new or alternative organizational models
- Limited capacity in parent stock development and supply
- Disease threats, limited and unsustainable vaccine and feed supply system
- Restriction in distribution of inputs to farmers, e.g. five pullets and one cock, or cock distribution to communities lacked proper targeting and follow-up
- Improved breed distribution lacked follow-up and was not accompanied by organized input supply and marketing system.

IPMS study results on input supply system for improved poultry breeds

IPMS in collaboration with stakeholders identified poultry as an important marketable commodity in the pulse–livestock and apiculture–livestock systems in Atsbi-Wemberta; the cereal–livestock system in Alamata; the rice–livestock and cereal–livestock systems in Fogera; the teff–dairy and teff–livestock systems in Ada’a Liben; the teff–bean–livestock and pepper–livestock systems in Alaba; and the coffee–livestock and bean–livestock systems in Dale. The percentage of sampled households that actually received improved breeds is shown in Table 4.

Table 4. *Percentage of sample households who received improved poultry breeds*

Pilot Learning <i>Woreda</i>	Farming system	%
Atsbi-Wemberta	Pulse–livestock	10
	Apiculture–livestock	0
Alamata	Cereal–livestock	9
Fogera	Rice–livestock	2
	Cereal–livestock	12
Ada’a Liben	Teff–dairy	21
	Teff–livestock	16
Alaba	Teff–bean–livestock	17
	Pepper–livestock	7
Dale	Coffee–livestock	4
	Bean–livestock	2

5.1.4 Assessing livestock breed improvement programs

The above results clearly indicate that access and availability of improved breeds is a major bottleneck for market-oriented livestock development in the country. This is specifically critical for dairy and poultry production, where improved animals are produced mainly in government owned ranches and multiplication centres. In addition, MoARD is the sole provider of artificial insemination services for dairy development. In general, the major problems associated with genetic improvement of livestock include

lack of selection and genetic improvement programs for indigenous breeds, limited crossbreeding of local breeds with exotic animals for dairy and sheep only, limited capacity of government ranches and multiplication centres for the supply of improved animals, inefficient and ineffective AI services, distribution of improved breeds or technologies in isolation from other associated inputs and services, weak follow-up and extension services and limitation on number of improved genetic resources distribution per household. Alternative systems have to be explored in order to have an effective and efficient improved breed improvement and supply system. IPMS is exploring a number of alternative systems with main emphasis on the private sector and/or community-based approaches to enhance the supply of improved animal genetic resources.

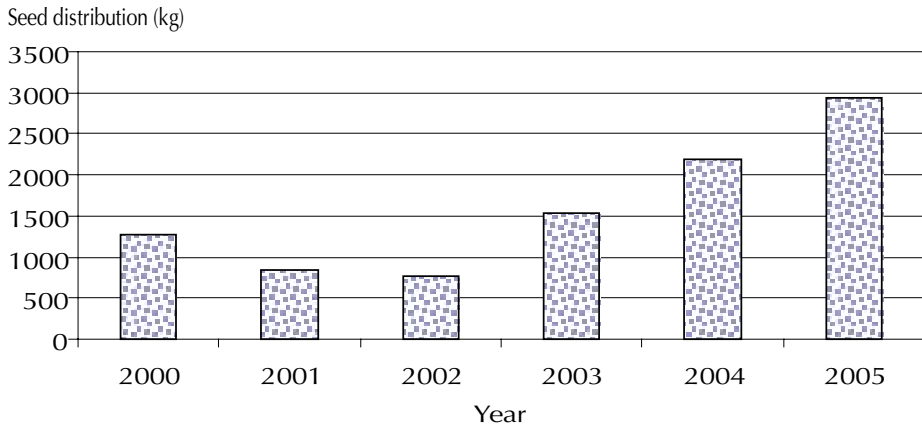
5.2 Feed and water resources

5.2.1 Feed and water resource development programs

Although a number of projects were involved in feed and water resources development in both crop–livestock and pastoral systems, the recent ones included the Fourth National Livestock Development Project (FNLDP), the Smallholder Dairy Development Project (SDDP), and the National Livestock Development Project (NLDP). Activities in these projects included improvements in natural pastures and crop residue use, feed conservation practices, and introduction of improved forages using different strategies. Introduction of improved forages was facilitated through these projects and used government nurseries for multiplication and seed production. However, the success of these projects in developing a market-oriented livestock production system that responds to adoption of feeds technologies remains to be determined.

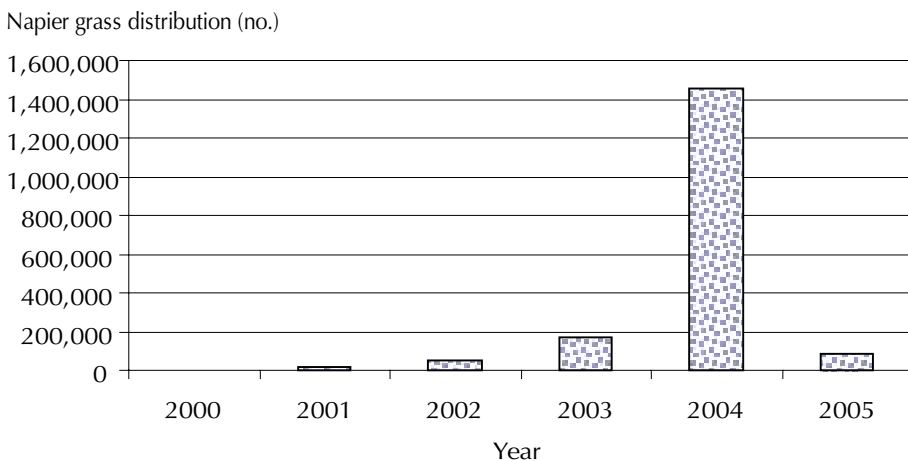
Recent trends, however, indicate that there is a renewed interest to improved forages for feed production and natural resources management in various parts of the country. According to Jean Hanson (senior scientist at ILRI, personal communication, 2009), requests by regional governments, NGOs and the private sector for forage seeds and cuttings from ILRI's forage germplasm collections has increased over the last five years (Figures 4 to 6). The total amount of sales of forage seeds from the year 2001 to 2005 increased by a factor of 3.5. Over the last five years, the highest demand for forage seeds included *Avena sativa* (1620 kg), *Lablab purpureus* (665 kg), *Vicia dasycarpa* (350 kg), *Trifolium quartinianum* (180 kg), and *Vigna unguiculata* (100 kg). Similarly, sales of Napier grass increased from 580 in 2000 to about 1.5 million cuttings in 2005. These figures should be taken with caution as they relate only to requests to ILRI and additional materials could have been supplied from other sources. In addition, apart from increasing trends in requests, data on use of these materials under farm conditions are not available.

Data regarding other feeds improvement operations including efforts on natural pasture and water resources improvements in various parts of the country are not available. In addition, the involvement of the private sector in forage feed production has been limited as the market at farmers level for these resources has not yet been developed. Although the Government of Ethiopia has put tremendous effort in water harvesting systems and technologies, the extent of benefits to the development of the livestock sector needs careful assessment.



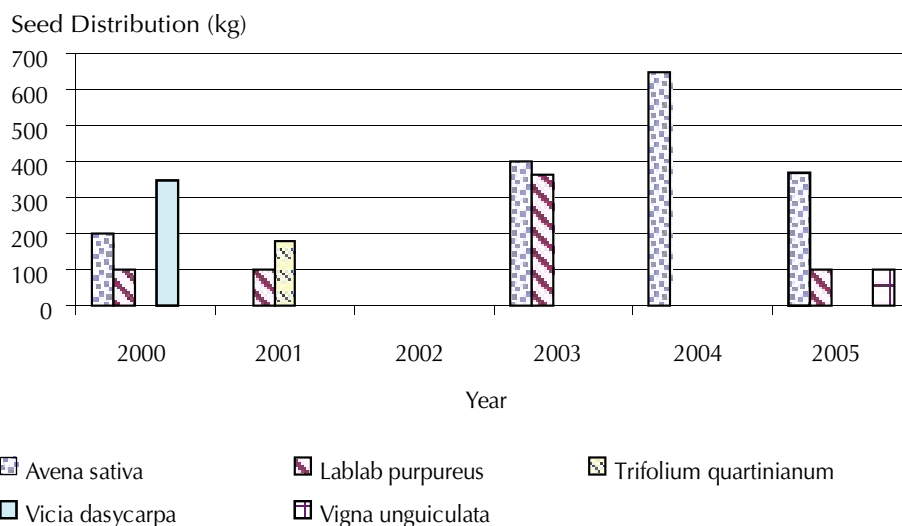
Source: Jean Hanson (ILRI, personal communication).

Figure 4. Total amount of forages seeds sold by ILRI to various governmental and non-governmental bodies from 2000 to 2005 (Ethiopia).



Source: Jean Hanson (ILRI, personal communication).

Figure 5. Total number of cuttings of Napier grass sold by ILRI to various governmental and non-governmental bodies from 2000 to 2005 (Ethiopia).



Source: Jean Hanson (ILRI, personal communication).

Figure 6. Amount of the top five forage seeds sold by ILRI from 2000 to 2005 (Ethiopia).

5.2.2 IPMS study results on forage and water development

Forage and feed technologies and water resources are critical to improved dairy production. IPMS baseline data showed that about 6% and 13% of the sample households in the teff–dairy system of Ada’a Liben and the coffee–livestock system of Dale, respectively, received forage/feed input supply. With regard to farmers engaged in beef production, all the sample households in Alamata and Metema indicated that they had not received forage and feed technologies. Also, none of the sample households in the rice–livestock and only 2% of the sample households in the cereal–livestock system in Fogera and 15% and 24% of the sample households in the teff–dairy and teff–livestock systems in Ada’a Liben, respectively, actually received these inputs.

No sample household reported receiving forage–feed technology inputs for sheep production in the pulse–livestock production system of Atsbi-Wemberta and only 6% of the sample households in the teff–bean–livestock production system of Alaba reported receiving the input. Similarly, sample households in all the PLWs indicated that they had not received forage and feed technologies for goat production, except for 5% of the sample households in the teff–bean–livestock production system in Alaba.

Among the sample households, improved poultry feed inputs were available to only 1% of the households in the pulse–livestock and none in the apiculture–livestock system in Atsbi-Wemberta; 3% in cereal–livestock system in Alamata; none and 6% in rice–livestock and cereal–livestock system in Fogera, respectively; 9 and 22% in the

teff–dairy and teff–livestock systems of Ada’a Liben, respectively; 8% and none in teff–bean–livestock and pepper–livestock systems in Alaba, respectively; and 8 and 4% in the coffee–livestock and bean–livestock systems in Dale, respectively.

The data presented above from the IPMS study clearly indicate that access and availability of forage–feed technologies in support of market-oriented livestock development are far below adequate. Feed resources are mainly confined to government nurseries; limited activity in introduction of improved forages and no targeted activity to develop bee forages, almost no inputs and development activities on natural pasture and crop residues. IPMS is considering a number of options of availing forage–feed technologies targeting the different market-oriented livestock commodities in the PLWs. In addition, the project is attempting to develop community based forage seed/seedling production system and develop feed resources (feed market, seed/seedling production).

5.3 Animal health services

5.3.1 Animal health service programs

In general, animal health inputs and services in Ethiopia include:

- Preventive services and vaccinations
- Education/extension including public health education
- Regulatory services to control occurrence of new diseases
- Clinical services which include diagnosis and treatment of sick animals
- Supply of livestock drugs
- Meat inspection services at abattoirs
- Public health in relation to zoonotic and food-borne disease control, hygiene, food and feed safety and the environment.

In Ethiopia, the government is the major animal health service provider with limited involvement of the private sector and NGOs in the provision of drugs and animal health services. A few years back, there have been attempts to promote privatized veterinary services, but that has not been effectively materialized. Due to the nature and variability of livestock production system in Ethiopia, some animal health services have public good characteristics. The widespread nature of killer diseases, limitations in accessibility, cross-border animal movement and drug supplies, lack of adequate infrastructure and the presence of incomplete markets contribute to market failure in the provision of animal health services. This situation is not different from many African countries (de Haan and Bekure 1991; Smith 2001).

In Ethiopia, public sector involvement and support has often been associated with disease surveillance, eradication campaigns, vaccine production, drug and vaccine quality control, quarantine, and food hygiene and inspection measures. Eradication and control programs of killer diseases call for national and international efforts, and surveillance and control measures often require national coverage including remote and inaccessible areas. However, the public sector has been limited by lack of adequate resources to deliver the services. Shortage of manpower (quantity and quality), lack of transport, availability of drugs and other supplies, poor information, communication and reporting systems, and limited finances are some of the reasons frequently raised by professionals in the field. The major complaint and dissatisfaction of livestock keepers is unavailability of professionals, lack of communication, unavailability or shortage of drugs, poor diagnostics capability and lack of confidence in the quality of the service. Public or private service provisions could include diagnostic services, vaccination, vector control, and treatment. However, private sector animal health service provision is limited in Ethiopia due to a number of factors. These include lack of capital, willingness of livestock keepers to pay, affordability of drugs and services, poor accessibility, high transportation costs, alternative cheap supplies of drugs from illegal markets, NGO and public sector provision of drugs and services at subsidized rates, and isolated herds.

Other public health services such as zoonotic and food-borne disease control, hygiene, food and feed safety and environmental control are often very weak and at best are limited to major urban centres. Farmers tend not to report risk factors on the farm due to deterrent costs of treatments or scare of some serious zoonotic diseases such as brucellosis or tuberculosis that may result in slaughtering of animals without compensation. Furthermore, given the poor communication and transport system, and lack of appreciation of timely information, reporting could be costly, ineffective and inadequate. In urban areas, meat inspection is undertaken in abattoirs and is the responsibility of the Ministry of Agriculture and Rural Development. However, the administrative responsibility is Public Health Department or Municipality. In Ethiopia, it is also common to slaughter for home consumption, without undergoing any inspection.

In commercial farming such as large dairy farms and intensive poultry production systems, extension and (veterinary) public health services are more likely to be delivered privately without extensive public intervention. Smallholder dairy producers often form cooperatives and provide farm inputs and animal health services. For example, the Ada'a Liben dairy cooperative in Debre Zeit provides animal health and milk quality control services.

5.3.2 IPMS study results on animal health services

The IPMS study on animal health services for dairy production showed that about 23 and 46% of the sample households in Ada'a Liben and Dale, respectively, had received vaccination services. As with other services and inputs, farmers identified only one source for vaccination services, i.e. the office of agriculture and rural development.

With regard to beef cattle, 92% of sample households in Alamata, none in Metema, none and 2% of the households in the rice–livestock and cereal–livestock production systems, respectively, in Fogera and none and 32% of the households in the teff–dairy and teff–livestock production systems, respectively, in Ada'a Liben had received vaccination services; the only supplier being the OoARD.

As far as sheep production is concerned, the percentage of sample households who actually received vaccination service was 14% in Atsbi-Wemberta, and 16 and 6% in the two farming systems in Alaba. Data on health services for goats indicated that the percentage of sample households who actually received vaccination service was 3% in Atsbi-Wemberta; 14 and 6% in Alaba farming systems, respectively.

Health service for improved poultry production is very critical. The respective values for percentages of sample households who actually received vaccination service for poultry were exceptionally low *vis-à-vis* the susceptibility of improved poultry breeds to various diseases. The data showed that only 1 and 3% of the sample households in the pulse–livestock and the apiculture–livestock systems in Atsbi-Wemberta; 5% in Alamata; none and 6% in the rice–livestock and cereal–livestock systems in Fogera, respectively; 17 and 16% in the teff–dairy and teff–livestock systems in Ada'a Liben, respectively; 19% and 4% in the teff–bean–livestock and pepper–livestock systems in Alaba, respectively; and a mere 4 and 2% in the coffee–livestock and the beans–livestock systems in Dale, respectively, actually received the service.

As the results from the IPMS study clearly show access to and availability of vaccines and other animal health services are far below the requirements for the development of a market-oriented livestock production system. The government is the major supplier of vaccines and other animal health services and in most cases has limitations in delivery of these services. IPMS is considering alternative means of animal health delivery system with particular attention to the private sector, farmer groups and cooperatives. Possible IPMS interventions to improve animal health services and supply of drugs and diagnostics include encouraging cooperatives and private health technicians and private drugs vendors and paravets to provide animal health services and supply of veterinary drugs.

6 Extension service

In many developed countries, public extension services have been significantly reduced or commercialized. Although some developing countries are downsizing their public agricultural extension services, extension services by the public sector continues to be dominant. In Ethiopia, there has been significant expansion of the public extension service recently. As shown in the various sections above, extension service for the livestock sector have included input supply services. MoARD (2005) developed a strategy document which deals with input and output marketing and implementation mechanisms. The document clearly states the need for increased privatization of input supply and rural finance, while recognizing the role of the government.

The MoARD Extension and TVETs Department was until recently (2008) organized into three extension teams—moisture reliable, moisture stressed and pastoralist teams. Although livestock is considered as part of the extension activity, most of the focus revolved around cereal crops production. The major input supply system in the extension department also focused on extension packages. The minimum and regular packages mainly involved crop production and protection activities such as the use of improved seeds, inorganic fertilizers, agricultural chemicals and soil and water management practices. The household package provided opportunities for farmers to choose from a menu of extension packages which included livestock technologies such as improved poultry breeds, improved dairy cows, improved beehives and fattening. For inputs involving extension packages, the *woreda* OoARD was involved in the operation and the procedure includes estimation of farmers' needs, production or procurement of inputs and delivery of inputs. For the estimation of inputs, DAs were involved and the procedure was more or less similar in all the regions. Estimates of inputs in each PA was collected and passed on to the input supply desk or cooperatives desk at the *woreda* OoARD which compiled estimates and passed on to the Region for central production or purchase. The Regions arranged the supplies through companies or organizations which either purchased or produced the inputs. These inputs finally were distributed to farmers on credit basis.

The major livestock inputs handled by the OoARD were purchase and delivery of small ruminants (breeding and fattening), cattle (fattening, draught power), improved poultry (eggs and meat), improved beehives and improved dairy animals on credit basis and AI and veterinary services and drugs mostly on cash basis at subsidized rates. In addition to the OoARD, a number of other institutions such as NGOs, women's affairs offices, microfinance institutions, small-scale and micro-enterprise provide financial support for livestock development activities independent of the OoARD.

The procedure for the procurement of animals from local markets (mainly small ruminants, beef cattle) included in the extension package involved a committee composed of staff from the OoARD, PA leaders and a number of representatives from *woreda* level government offices. The effectiveness of this procedure and the impact of the intervention in improving market-oriented livestock production are subject to research. The main source of supply of improved dairy animals had been the government ranches that have very limited capacity and were not able to meet the demand.

The supply of improved beehives appeared to be higher than the demand and lacked an integrated value chain approach. Parallel activities in availability of auxiliary equipment such as queen excluder, smokers, veil, bee forage development, bee colony or queen rearing activity, availability of bees wax are essential for the success of the operation. One of the critical factors that derive apiculture development is availability of adequate quantities and quality of bee forages. As it stands until recently, the sole supply of boxes of improved beehives may not enhance apiculture development significantly and may even result in mere replacement of the traditional beehives, with more competition for bee forages.

In line with the government strategy, efforts to improve agricultural input supply at *woreda* level are just emerging and some encouraging innovations are happening. In the livestock sector, the involvement of the private sector in beehive manufacturing is a good example. In *woredas* like Ada'a Liben, animal health services, drug and feed supplies, and artificial insemination services are taken up by a dairy cooperative. In Alaba *woreda*, nursery and forage seed production and marketing is being taken up by the private sector. Production of day old chicks and pullets for distribution to smallholder framers is also being outsourced to private companies such as ELFORA and Genesis Farms. However, most livestock extension and development activities could be characterized as follows:

- Livestock development issues have been left to donor funded projects and limited to species of convenience
- Recently, food security and SaftayNet programs, rural finance and micro- and small-scale enterprises are getting involved in livestock development based on credit. However, there is need to coordinate activities with technical support from the OoARD
- Livestock development activities lacked comprehensive market chain approach with limited linkages with rural finance, input supply, marketing, quality control and value addition systems
- Most often, OoARD development plans and programs focus on input and technology supply rather than on commodity development, e.g. number of artificial insemination delivered or number of beehive distributed per year than improvement in milk or honey production, respectively

- The current organizational set-up and resource allocation (human and material) at Federal, Regional and *woreda* levels do not allow sufficient and adequate flexibility to respond to the demands of livestock keepers in different production systems.

The IPMS study on involvement of households in livestock extension and technology adoption and in capacity development is summarized in the following section. For ease of understanding, data are presented by PLW and no comparisons are made between PLWs. It is hoped that the reader will draw a comparative understanding of the extension activities in livestock development in the four Regional States. Although household, regular and minimum packages are identified by the MoARD, the household package was not practised much in Oromia Regional State.

6.1 Dairy (fluid milk and butter systems) extension

Dairy extension is destined to provide knowledge and technologies to enhance fluid milk and butter production in the PLWs. In the fluid milk extension system, Ada'a Liben and Dale PLWs were considered in this study. The butter production system included Atsbi-Wemberta and Alamata in Tigray, Fogera in Amhara, Ada'a Liben in Oromia and Alaba and Dale PLWs in the SNNPR.

Regarding fluid milk production systems, the percent of sample households involved in extension in 2004/05 was limited to 12% and 4% for the teff–dairy system in Ada'a Liben and the coffee–livestock system in Dale, respectively. In Ada'a Liben, 100% of the households indicated that they were involved in the regular extension package, while in Dale, 67% indicated that they were involved in the household package, 33% in the regular, and none in minimum package. The percentage of households exposed to new dairy technologies was 19% and 4% in Ada'a Liben and Dale, respectively. In both PLWs, the sole source of information on dairy extension was the OoARD.

Participation in butter extension packages by sample households is shown in Table 5. As can be seen, participation varied from 0 to 39% of the sample farmers, with household packages being the predominant form. Information on new technologies received by sample farmers varied between 0 and 58% with the OoARD being the main source of this information.

6.2 Beef cattle production extension

The participation in beef extension packages by sample households is shown in Table 6. As can be seen, participation varied from 0 to 46% of the sample farmers with household packages being the predominant form. Only 3 of the 7 farming systems

received information on new technologies, with the OoARD being the main source of this information.

Table 5. *Butter extension participation by farming systems in IPMS PLWs**

PLW	Farming system	HH participating in butter extension (%)	Package (%)			Access to new information	Source of information	
			HH	Minimum	Regular		OoARD	Private
Atsbi-Wemberta	Pulse–livestock	19	50	38	12	58	79	59
	Apiculture–livestock	12	33	67	0	9	100	100
Alamata	Cereal–livestock	39	100	0	0	0	NA	NA
Fogera	Rice–livestock	36	45	55	0	33	100	0
	Cereal–livestock	17	50	50	0	30	95	5
Ada’a Liben	Teff–livestock	38	0	0	100	38	100	0
Alaba	Teff–bean–livestock	0	NA	NA	NA	13	42	58
	Pepper–livestock	6	100	0	0	0	NA	NA
Dale	Bean–livestock	3	100	0	0	0	NA	NA

* Only farming systems in which butter has been identified as a priority marketable commodity.

Table 6. *Beef extension participation by farming systems in IPMS PLWs**

PLW	Farming system	HH participating in beef extension (%)	Package (%)			Access to new information	Source of information	
			HH	Minimum	Regular		OoARD	Other
Alamata	Cereal–livestock	15	100	0	0	0	NA	NA
Metema	All	0	NA	NA	NA	0	NA	NA
Fogera	Rice–livestock	46	36	64	0	55	94	6
	Cereal–livestock	32	32	68	0	38	96	4
Ada’a Liben	Teff–livestock	41	0	14	86	41	100	0
	Teff–dairy	0	NA	NA	NA	0	NA	NA

* Only farming systems in which beef has been identified as a priority marketable commodity.
NA = Not available.

6.3 Sheep and goat production extension

Although sheep and/or goats production is important in Atsbi-Wemberta, Alamata, Metema, Ada’a Liben, Alaba and Dale PLWs, the only PLW where households indicated that they participated in extension program were the pulse–livestock system for sheep and

the apiculture–livestock system for goats, both in Atsbi-Wemberta PLW. In this *woreda*, about 19% and 12% of the households indicated that they participated in sheep and goat extension programs, respectively. About 50, 25 and 25% of the sample households participated in households, regular and minimum packages for sheep production in the pulse–livestock system. About 32% and 37% of the households indicated that they were exposed to new or improved technologies on sheep and goats production, respectively. Although 97 and 100% of the households indicated that the sole source of information on sheep and goats production was the OoARD, about 26 and 33% of the households indicated that they also got information on sheep and goats production, respectively, from the private sector.

6.4 Poultry extension

The participation in poultry extension packages by sample households is shown in Table 7. As can be seen, participation varied from 6 to 61% of the sample farmers with the household and minimum packages being the predominant forms. All farming systems received information on new technologies, with the OoARD being the main source of this information.

Table 7. Participation in poultry extension by farming systems in IPMS PLWs*

PLW	Farming system	HH participating in poultry extension (%)	Package (%)			Access to new information	Source of information	
			HH	Minimum	Regular		OoARD	Private
Atsbi-Wemberta	Pulse–live–stock	16	70	10	20	100	86	63
	Apiculture–livestock	22	100	0	0	85	92	90
Alamata	Cereal–livestock	8	100	0	0	89	100	0
Fogera	Rice–live–stock	44	0	0	100	44	100	0
	Cereal–livestock	61	25	63	12	68	96	6
Ada’a Liben	Teff–live–stock	54	4	48	48	63	100	0
	Teff–dairy	47	0	80	20	61	83	0
Alaba	Teff–bean–livestock	17	88	0	12	48	94	12
	Pepper–livestock	11	100	0	0	8	100	0
Dale	Coffee–livestock	6	50	0	50	13	44	32

* Only farming systems in which poultry has been identified as a priority marketable commodity.

6.5 Apiculture extension

Participation in apiculture extension packages by sample households is shown in Table 8. As can be seen, participation varied from 6 to 61% of the sample farmers with the household and minimum packages being the predominant form. All farming systems received information on new technologies, with the OoARD being the main source of this information.

Table 8. *Participation in apiculture extension by farming systems in IPMS PLWs**

PLW	Farming system	HH participating in apiculture extension (%)	Package (%)			Access to new information	Source of information	
			HH	Minimum	Regular		OoARD	Private
Atsbi-Wemberta	Pulse–livestock	0	NA	NA	NA	34	0	100
	Apiculture–livestock	14	100	0	0	64	93	43
Fogera	Rice–livestock	100	0	0	100	100	100	0
	Cereal–livestock	41	15	77	8	53	96	4
Alaba	Pepper–livestock	27	100	0	0	27	100	0

* Only farming systems in which apiculture has been identified as a priority marketable commodity.

7 Research

Technological change generated by research and development can play a pivotal role in promoting agricultural growth and development. Research services include generation of knowledge in plant and animal genetic resources, balanced rations, drugs, vaccines, machinery and equipment, and organizational and institutional interventions. As is common in many developing countries, the public research organization has been the main provider of research outputs in Ethiopia. Although there are some limited research undertaken by the private sector and NGOs in Ethiopia, the core scientific activity has remained in the public sector. In countries like Ethiopia, the private sector investment in agricultural research is limited due to the public goods nature and uncertainty associated with the outputs and the difficulties in recouping returns to investment, and the fact that it requires expensive scientific equipment. Therefore, public investment in agricultural research in Ethiopia should be considered as a springboard to economic development.

Studies based on appraisals of investments in agricultural research in developing countries indicate high payoff investment opportunities. According to Townsend and Thirtle (2001), the mean Internal Rate of Return (IRR) for agricultural research in Africa was found to be 49% for 375 appraisals of applied research projects. For livestock specific research (Townsend and Thirtle 2001), rates of return also appear high, although lower than for crop research. Analysis of returns to agricultural research in South Africa, showed that, in the absence of research, livestock production would have declined due to losses from animal diseases. When this effect is taken into account, the estimated rate of return on livestock research is increased from initial estimates of 0–5% to 35% for animal health research and 18–27% for other animal research (Townsend and Thirtle 2001).

In Ethiopia, livestock research in the national research system has focused on genetic improvement studies for dairy production, beef production, sheep and goat production, feed resources development, animal nutrition, animal health, animal power, poultry production, fisheries and aquaculture, and apiculture. Thesis research outputs conducted by a number of DVM and postgraduate students in various universities are also valuable sources of information and knowledge. In addition, the country has benefited from the research outputs of ILRI in various aspects of livestock production. However, most of this scientific information is not available in an organized and useful manner to livestock keepers and is not easily accessible. It has also been argued that the uptake of these technologies and knowledge by the smallholder farmers is far from satisfactory. The reasons for this lack of or poor adoption of technologies require careful study and analysis.

In an attempt to improve the effectiveness and relevance of research, IPMS uses different approaches to focus on problems and interventions identified by communities in the different PLWs. IPMS also engages in testing different ways of developing effective linkages between extension and research through commodity platforms, exchange programs, seminars, publication of scientific papers, working papers etc. In addition, IPMS sponsored graduate students are targeted to focus their theses research on practical problems of communities in the PLWs with the objective of enhancing linkages between universities, research institutions and the extension system. This will help develop a new modality of operation and partnership for more relevance and effectiveness of research in development. In addition, IPMS develops collaborative research projects with Ethiopian agricultural research institutions (Federal and Regional). These projects are more of action research type with a value chain approach and commodity focus. This is expected to enhance multidisciplinary research and create a conducive working condition to nurture the culture of sharing knowledge and resources for specific targeted interventions.

8 Credit and insurance for livestock

Provision of credit/loans for the purchase of livestock, feed, and health services and insurance against the loss of valuable productive assets play an important role in encouraging new investments in the sector and also in coping with difficult problems such as drought and disease. In Ethiopia, the sources of financing for livestock development generally include government owned banks, private banks, micro-finance organizations or NGOs. Microfinance institutions (Dedebit in Tigray; ACSI in Amhara; OCSI in Oromia; Omo Microfinance and Sidama Microfinance in the SNNPR) provide credit for livestock development. However, their interest rates vary and have upper limits on credit access which in most cases do not encourage larger investments in the livestock sector. The involvement of commercial banks is limited and most often they provide credit in situations where the government provides incentives for special agricultural development activities or are supported with guarantee funds against loss of animals or low repayment conditions. These sources of financing, generally involving subsidized, low-interest credit, tend not to allow smallholders to borrow money unless they are organized in groups or through cooperative arrangements.

Although investments in the livestock sector can be considered as high risk, some microfinance and NGO credit schemes have become successful through the application of appropriate approaches and methodologies. For example, according to FAO (1992), the Grameen Bank in Bangladesh extends its credits to about 40–50% of landless farmers to acquire and raise livestock. Similar practice in India, particularly focused on women livestock keepers, has also been successful.

In Ethiopia, communities have established coping mechanisms for households through traditional livestock insurance mechanisms by contributing breeding animals to affected households due to risk associated with livestock production due to recurrent drought and disease outbreaks, and recently flood that incur high social and economic disasters. In communities where livelihoods are based on livestock, responses to losses of livestock and livelihoods as a result of natural calamities have been through provision of food aid to the affected people. Support to such communities seldom considered feed aid and compensation to losses of livestock. The guidelines and mechanisms for implementation of livestock insurance have to be developed taking into account the various production systems and the species of animals involved. Lessons from countries such as India, Nepal, Thailand, Indonesia, Malaysia and the Philippines that successfully implemented livestock insurance schemes through public and private banks are important to consider in developing such a scheme in Ethiopia (FAO 1992).

As shown above, in general, there is limited credit facility for livestock development. The problems associated with the existing credit facility include high interest rates, small amounts and discouraging upper limits of credit that is not attractive for livestock intervention. In addition, the focus of the available credit for livestock is on short term activities such as fattening that has short re-payment schedule. Moreover, there is no livestock insurance system in the country.

IPMS is introducing innovative credit facility for livestock development through joint interventions with micro-finance institutions, rural fund, cooperatives and unions. The project is also exploring the possibility to create institutional/organizational innovations for insurance schemes, including community based insurance schemes for livestock development.

The percentage of sample households receiving credit in selected farming systems in the IPMS PLWs is shown in Table 9.

Table 9. *Percentage of sample households (%) who received credit for different commodities*

PLW	Farming system	Milk	Butter	Beef	Sheep	Goat	Poultry	Apiculture
Atsbi-Wemberta	Pulse-livestock	×	39	×	18	×	9	2
	Apiculture-livestock	×	35	×	×	4	16	13
Alamata	Cereal-livestock	×	42	16	0	0	4	×
Metema	Cotton-livestock	×	68	0	0	0	×	×
	Sesame-livestock	×	0	0	0	0	×	×
Fogera	Rice-livestock	×	14	18	×	×	×	×
	Cereal-livestock	×	9	7	×	×	10	10
Ada'a Liben	Teff-livestock	×	0	16	0	0	22	×
	Teff-dairy	0	×	11	0	0	14	×
Alaba	Teff-bean-livestock	×	0	×	0	0	0	×
	Pepper-livestock	×	0	×	0	9	0	32
Dale	Bean-livestock	×	0	×	×	×	0	×
	Coffee-livestock	13	×	×	×	×	0	×

× = Commodity not identified as priority commodity in the farming system.

9 Livestock marketing support services

Marketing of livestock and livestock products is an important activity all over the country. Farmers sell livestock and livestock products to cover household cash expenses and to purchase crop inputs. Live animals are marketed through traditional marketing routes developed over the years. Livestock pass from primary markets (collection centres) to secondary and tertiary markets to reach the consumer. Cross-border exports are also common in the southeastern, southern and northwestern parts of the country. Marketing of livestock products such as milk, butter, egg, hide and skin is also important to households. Fresh milk and eggs are directly sold after meeting family needs at farm level. Surplus production and supply is usually higher in urban areas due to market orientation and urbanization, which creates better demand for products.

Marketing of livestock and livestock products in Ethiopia is underdeveloped. The major problems are the traditional production system which is not market oriented, underdeveloped marketing systems and poor infrastructure, poor financial services, and presence of cross-border trade. Experiences from other countries indicate that direct government intervention in livestock markets has achieved some success. For example, The Botswana Meat Commission (BMC), has established and maintained favourable export markets for local beef, and has stimulated an off-take rate for cattle, much higher than on similar range grazing conditions in other parts of Africa. India's 'Operation Flood', has successfully moved the country to be self-sufficient in milk and to become the largest single milk producer in the world. On the other hand, in Ethiopia large government projects aimed at promoting market off-take from pastoral systems, by providing stock routes, watering points, holding grounds and marketing have been criticized for not bringing sustainable development and for not benefiting smallholders. In general, most argue that direct state involvement in the provision of marketing and processing services has had little success in promoting development of the livestock sector and favour liberalized markets. In Ethiopia, in order to develop the livestock market in line with the government's livestock development objectives, the structure of livestock and livestock products marketing system and the roles of the public and the private sector need to be identified.

In many countries, livestock marketing services include provision of market information, quality control and grading of meat or milk, operation of auction markets, facilitation of market linkages, provision of marketing and processing facilities, and transport of livestock or livestock products. Marketing boards and producer cooperatives have been involved in livestock and livestock product marketing in Ethiopia. In Ethiopia, government arrangements in livestock marketing activities have taken various

organizational forms. The Livestock and Meat Board was the first one established to develop livestock production and marketing in the country. The Ethiopian Dairy Board also dealt with the regulation, promotion and development of the dairy sector. A number of other development projects also dealt with livestock marketing issues over the years. The most recent one was the Livestock Marketing Authority (LMA) which took national responsibility for the promotion of livestock marketing (with focus on live animal and meat marketing) until it was dissolved in 2004. Currently, livestock marketing support is handled by the Agricultural Marketing and Inputs Sector of the MoARD.

10 Conclusion and recommendation

Although Ethiopia owns a significantly large livestock population, the sector has remained underdeveloped and its potential has not been efficiently and effectively used. In the crop–livestock system of the highland agro-ecology, the sector is an essential component of the over-all farming system, being a major source of traction power, food, cash income, fuel and organic fertilizer. In the pastoral and agropastoral areas, livelihoods of the people entirely depend on livestock. The contribution of livestock to the national effort in ensuring food security is significant. The large human population the country owns and its proximity to potential export markets offer great opportunities for market-oriented development of the sector.

Despite the huge livestock resource and the important role of livestock in agriculture, livestock resource of the country is characterized by low productivity and production levels. New challenges are emerging at global and national levels. The use of crops for food, feed and fuel has created serious food shortage at the global level. Emission of green house gases and global climate change have threatened both crop and livestock production. New and emerging diseases are increasingly becoming threats to human health and livestock production and marketing.

The unique genetic diversity of the livestock population and the diverse agro-ecologies of the country allow different production systems and should take advantage of the current and future opportunities for more market-oriented development. Location and commodity specific interventions with appropriate targeting of production systems and households have to be designed to address major constraints to the livestock sector.

The major constraints for livestock development in Ethiopia can be broadly categorized into technical, organizational, institutional, infrastructural, environmental and policy aspects. The major technical constraints are undernutrition and malnutrition, high prevalence of diseases, relatively low genetic potential for productive traits, poor management practices and weak market infrastructure. Improved technological applications, efficient and effective input supply system, better management options, access to knowledge and credit are required on the supply side. The development of market infrastructure and market institutions is also very important for inducing efficiency and incentives for market participants along the value chain.

The Government of Ethiopia has attached a significant importance to the development of the livestock sector in a sustainable manner. However, it has to be noted that livestock development programs are expensive, have long gestation period, and require strong and continuous commitment and collaboration from stakeholders at all levels. One of the

limiting factors for developing the livestock sector is that substantial number of oxen are locked into fulfilling the power requirements of millions of smallholder farmers for crop production. Development and use of alternative sources of traction power need to be looked into wherever feasible. Controlled grazing and intensification are key elements that need to be addressed in optimizing productivity with minimal environmental impacts. This has to be based on the value chain development framework and innovation systems approach. Ensuring quality, sanitary and phytosanitary standards and food safety are key elements for market participation. This will require capacity building in the regulatory directorate and in market extension.

Changes in organizational and institutional arrangements need to be addressed and re-focused to respond to more market-oriented challenges. Higher learning institutions have to revisit the relevance of their curricula. The research system has to also refocus its efforts to addressing key constraints to commodity development along the value chain. Capacity building of farmers and the private sector in knowledge-based commercial livestock production and processing is essential.

The existing livestock input supply and service provision is weak and has to be re-oriented and re-focused to face the current challenges and open up opportunities for the development of market-oriented livestock production system. This will require public-private partnerships, such as establishment of a dairy board for the dairy sector, and a more targeted intervention with stratified and segmented approach. The role of the private sector has to be promoted and supported in different forms to ensure proper input supply system. The government's role in capacity building and regulating has to be strengthened.

The Middle East countries are Ethiopia's traditional destinations for meat and livestock exports and the exports to these countries have been increasing over the years. Given their high income and the consumer preferences for Ethiopian products and the proximity to these countries, there is high possibility to boost export. New markets in Africa and Asia should also be explored and pursued aggressively. A major shift from live animal export to value added animal products with compliance to sanitary and phytosanitary standards and food safety should be considered in order to increase income and minimize the risk of export bans due to diseases.

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Annex 1: Case study on cattle breeding efficiency

A study by Ababu et al. (2006) designed to determine Boran × Holstein Friesian crossbred heifer production efficiency at the Abernossa ranch, used sale value, cull value and annual operation cost including labour cost (salary). They found out that on average only 65% of the female calves born reached puberty; and the average efficiency of getting heifers in-calf to the third month of pregnancy was only 61.4%. Out of the in-calf heifers, 95% could be distributed. Overall, about 38% of the female calves born could be distributed as in-calf heifers to smallholder farmers. Comparison of operation cost with the value from sale of crossbred heifers and culled animal showed that crossbred heifer production was at lower cost recovery. Taking into account the actual number of cows, their calving rate and observed calf viability, the projected heifer production efficiency was found to be 42.8%. This index assumes that all cows present in the ranch are fertile and used for crossbred heifer production and this is nearly triple (14.6%) of the effective heifer distribution efficiency of heifer production and sale during the period from 1994 to 2000. Late age at first calving, prolonged days open, long calving intervals and high mortality were responsible for the low returns. High mortality and high rate of culling of females substantially reduced the number of heifers available for distribution. The major problems associated with the ranch included a shift in focus to crossbreeding only and termination of the Boran improvement program, frequent change in management, poor data collection scheme and lack of timely and proper data analysis, poor understanding of the genetic value of the herd and poor and variable management with limited financial outlay, poor staffing and other resource allocation.



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