

Forage seed systems in Ethiopia: A scoping study



ILRI PROJECT REPORT



Forage seed systems in Ethiopia: A scoping study

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Contents

Figures	v
Annexes	vi
Acknowledgements	vii
Acronyms	viii
Executive summary	x
Introduction	i
Current status and potential of the livestock sector	4
Historical efforts of forage seed development	7
Forage adaption and seed production mechanisms	9
Existing institutional arrangements to promote seed supply	13
Assessment of the ability and capacity of existing private and public forage seed enterprises to produce and sell quality seed	16
Supply and demand of forage seed	21
Variety release, forage seed quality control, standards and certification	22
Conclusions and recommendations	25
References	26
Annexes	29

Figures

Figure 1. Utilization of animal feed in Ethiopia	I
Figure 2. Trends in average number of animals, by livestock species, 1970-2008	4
Figure 3. Increasing trend in livestock population	5
Figure 4. Current and projected livestock populations	5
Figure 5. Land use/cover types and areas covered by the respective land use type in the Debre-Mewi Watershed in three different periods (1957, 1982 and 2008)	10
Figure 6. Trends in land use/cover type	11
Figure 7. Trends in human population	11
Figure 8. Projected arable land in Ethiopia	12
Figure 9. Forage seed system: an organizational and institutional framework	14
Figure 10. Forage Seed Value Chain Map	11

Annexes

Annex 1. Study contacts	29
Annex 2. Questionnaire prepared to assess the ability and capacity of existing seed enterprises to produce and sell quality seed	31
Annex 3. List of most adaptive and productive forage species for the different agro-ecologies of Ethiopia	32
Annex 4. Roster of attendees of the technical and business training at EMDIDI	33
Annex 5. Application form for variety release /registration/ of forage and pasture crops	34
Annex 6. Forage species and varieties released by EIAR since 1976	38

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Acronyms

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperatives Assistance
ARDU	Arsi Rural Development Unit
CDMD	Crop Diversification and Marketing Development
CSA	Central Statistical Agency
EAFA	Ethiopian Animal Feed Industry Association
ECX	Ethiopian Commodity Exchange
EMDIDI	Ethiopian Meat and Dairy Industry Development Institute
EIAR	Ethiopian Institute of Agricultural Research
ESAI	Ethiopian Sustainable Agribusiness Incubator
ESE	Ethiopian Seed Enterprise
ETG	Economic Transformation Group
FTC	Farmers' Training Center
FLDP	Fourth Livestock Development Project
GIZ	German International Cooperation
GRAD	Graduation with Resilience to achieve sustainable Development
ICARDA	International Center for Agricultural Research in Dry Areas
ILRI	International Livestock Research Institute
JICA	Japan International Cooperation Agency
MoA	Ministry of Agriculture
SNNPR	Southern Nations, Nationalities and People's Region
SNV	Netherlands Development Program

PCI	Precise Consult International
PPC	Public-Private Companies
TLU	Tropical Livestock Units
FAO	UN Food and Agriculture Organization
USAID	United States Agency for International Development

Executive summary

Ethiopian smallholder farmers have traditionally relied on natural open grazing animal feed practices. Although, Ethiopia has one of the highest livestock populations in Africa, it lacks modern and improved livestock feeding practices. As a result, current livestock productivity is low, while the cattle population continues to rapidly increase in both the highlands and lowlands of the country.

As open grazing land continues to dissipate, livestock is forced to use gross energy for grazing and trekking. Forage can significantly impact animal productivity in terms of milk production and weight gain. Along with a limited quantity of food; imbalanced nutrition is also a major factor responsible for low livestock productivity. Balanced nutrition contributes to improving animal output as well as to reducing production costs and decreasing emission of greenhouse gases per unit of animal product¹.

An increase in forage supply presupposes the availability of more forage seeds. It is estimated that Ethiopia will need about 8.9 thousand tons of annual and perennial forage seeds by the year 2020 (Livestock Master Plan draft, 2014). There are several advantages of using forage material as animal feed to increase livestock productivity. Forage can reduce risks associated with molasses toxicity in cattle fattening. Using quality forage along with proper animal health improves animal productivity in terms of gain in meat (carcass weight) and milk production per cow. The Livestock Master Plan draft projects that the carcass weight per animal will increase from 107 kg in 2014 to 138 kg in 2020. The volume of milk per traditional cow per year is expected to increase from 189 liters in 2014 to 313 liters in 2020. Milk productivity in commercial dairy farms is projected to grow from the 4608 liters to 5080 liters in 2020. The current seed quantity within the country is estimated to be 2.2 thousand tons and it is expected to increase by about 300% by 2020².

To address current forage seed limitation and improve the overall forage seed system in Ethiopia, GIZ funded ILRI to launch the FeedSeed Project in October 2013 with the following objectives:

- Assess the current status of forage seed production, dissemination and marketing in Ethiopia
- Create or maintain sustainable forage seed producers (private firms, public enterprises, cooperatives and individual farmers)
- Establish an incubation centre to help create and build forage seed companies

Historically, improving forage seed production, distribution and promotion have been given little attention by donor-funded development projects. Most smallholder farmers, are not able to produce and sell improved forage crops because they use the little land they have for subsistence production of food and cash crops. In addition, smallholder farmers and livestock owners have not yet developed the culture of purchasing seed as NGOs and regional agricultural bureaus often distribute the seed for free or at a subsidized price. Those smallholder farmers that do produce forage seed, use it for their own livestock needs and maintain the seed for the next cropping season rather than selling it.

¹ <http://www.fao.org/docrep/016/i3014e/i3014e00.pdf>

² Draft ILRI Livestock Master Plan (under preparation)

The formal forage seed system is underdeveloped due to a lack of technical and business expertise in seed production, processing and marketing. The majority of forage seed is exchanged by farmers through informal non-monetary transactions. About 60%-70% of forage seed used by smallholder farmers is saved on-farm or exchanged among farmers, and only 20%-30% percent is borrowed or purchased locally (Sahlu et al., 2008).

The country's current forage seed supply cannot cope with the rapidly growing demand coming from NGOs, federal and regional agricultural bureaus, farmers, livestock fatteners, and dairy farms. Prices paid are very high because there are not enough forage seed producers to supply quality seed relative to the quantity demanded. Further analysis is needed to determine a more accurate estimate of the scale of forage seed market demand and to identify appropriate species of forages for different regions with varying agro-ecological conditions.

There is evidence that farmers perceive the production and use of improved forage as a feasible option for improving livestock productivity. They, however, require an adequate and reliable supply of quality forage seeds with affordable prices (EIAR/FRG II, 2012).

The seed supply system is also weak because of the lack of effective extension systems focusing on forage development and livestock production in general. The existing forage seed market is very much dispersed with weak linkages between suppliers and buyers, and a general lack of market information.

In order to reduce the existing gap between the increasing demand and the stagnant supply of forage seed, it is essential to strengthen the capacity of the public and private sector. The lack of effective public sector extension services focusing on forage development and livestock production in general should be bolstered in order to support an organized and formal forage seed system throughout the country. Land allocation by the federal and regional governments is urgently needed to attract large scale investment in the commercial production of forage seed.

Currently, there is no single public or private regulatory body dealing with forage seed regulation and policies. Adequate seed quality standards and regulations are lacking and are thus having a negative effect on the performance of the seed system in Ethiopia, including forage seed. Establishing a national body specifically equipped with forage seed certification and quality control should be an immediate action undertaken by the government. Ensuring seed quality is a major factor in creating a well functioning forage seed system.

Recommendations

The recommendations based on the findings of the scoping study include:

- **Land allocation:** Federal and regional government land allocation is essential to attract large scale investors for commercial production of forage seeds.
- **Education extension:** The government should increase efforts at the regional, woreda and kebele levels to provide extension services on forage management through farmer education.
- **Variety release:** The application and approval process needs to be clearer and expedited in order to ensure new productive forage seed varieties are continually released and available.
- **Quality control:** Forage seed cleaning and processing centres need to be improved. A quality regulatory control body should be equipped with specific forage seed expertise and testing facilities to ensure quality seed is maintained across the value chain. Evaluation mechanisms need to be widespread geographically and both vertically and horizontally along the value chain.
- **Forage Seed Standards and Certification:** Current certification processes and designated governing responsibilities are unclear. The process of seed certification needs to be clarified, designated to specific government bodies and communicated to all relevant forage seed actors and stakeholders.
- **Value chain strengthening:** Forage seed value chain actors should be linked to ensure maximum efficiency and to provide a network that is enabled to advocate for supportive government policy.
- **Industry price standards:** Forage seed marketing systems with market prices should be promoted because current climate of over-subsidizing has created dependency and has halted a productive market.

-
- **Land preservation:** Forage development strategies should focus on water conservation and intercropping to minimize detriment to environment. Integration of food or cash crops and forages are essential in areas where land shortage is a bottleneck.
 - **Diversifying forage seed supply:** Further development of domestic and exotic high performing species tailored to specific agro-ecological conditions that improve animal nutrition while also improving soil fertility.

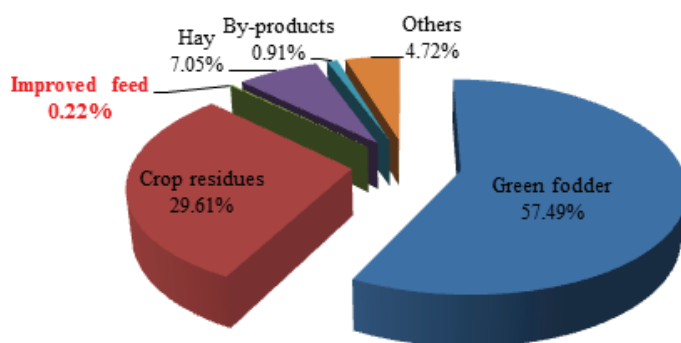
Introduction

Background of livestock and forage in Ethiopia

The livestock sector is a significant contributor to Ethiopia's economy at the national and household level. Livestock contributes to the livelihoods of approximately 70% of Ethiopians and accounts for 15-17% of the total national GDP and 35-49% of the agricultural GDP (Gebre Mariam et al., 2010). In addition to direct income benefits, livestock provides indirect benefits, such as fuel and fertilizer from animal manure and draught power for farm production.

In spite of its significant contribution, the country's livestock productivity is low. In addition to animal health problems, lack of adequate quantity and quality of feed is a major factor in poor livestock productivity. According to 2010 Central Statistical Agency (CSA) information on feed usage in rural areas of the country; a very limited amount of improved feed is used by livestock holders (Figure 1). Animal feed shortage remains the main constraint on herd size and productivity in both the lowlands and highlands.

Figure 1: Utilization of animal feed in Ethiopia.



Source: CSA, 2010

Utilizing improved forage varieties has several advantages. Not only does it improve animal nutrition resulting in higher producing livestock; it also complements crop production by maintaining soil fertility through nitrogen fixation. While grazing depletes the fertility of the land, forage growing improves soil health. For instance, intercropping species like maize and Lablab or coffee and Desmodium is more advantageous than growing one crop alone.

Ethiopia's seed sector is composed of formal and informal components. However, the informal sector dominates as farmers exchange the majority of seed amongst themselves. The concept of direct seed marketing is currently unfamiliar and currently not exercised. The main limitations of the forage seed industry also include a shortage of public and private sector expertise. Poor coordination among seed producers, extension service providers, and other market actors limits the viability of the value chain. Very few actors play a role in developing the forage seed value chain in Ethiopia.

ILRI/GIZ FeedSeed project

The mission of the ILRI is to improve food and nutritional security and to reduce poverty in developing countries through research for efficient, safe and sustainable use of livestock—ensuring better lives through livestock. ILRI is a partner in the Climate Change, Agriculture and Food Security (CCAFS) program of CGIAR. In support of that mission with funding from the GIZ, ILRI officially launched the FeedSeed Project in October 2013.

The FeedSeed Project aims at developing and piloting farmer, cooperative, private and public sector seed enterprise models to identify where and under what conditions varying types of seed enterprise models are most suitable and profitable. These efforts are anticipated to then stimulate an increased quantity and higher quality forage seed production and availability, and higher levels of forage use by smallholder livestock producers. In particular, the project engages private and public sector enterprises, smallholder farmers as well as cooperatives in forage seed production and marketing. The project follows a public-private partnership approach in developing sustainable forage seed production and marketing systems, along with nurturing the establishment of viable commercial forage seed enterprises. The FeedSeed Project activities are expected to increase the availability, purchase, and use of quality forage seed by land resource poor livestock farmers and enable them to better adapt to climate change by intensifying their feed and livestock production. This will lead to enhanced animal productivity and more productive and sustainable use of limited land resources thus relieving the pressure on communal grazing areas and fragile and marginally productive lands. In addition, the FeedSeed Project engages public and/or private incubators that provide various business development services and technical support to private and/or public enterprises in order to become viable seed businesses. The incubator and FeedSeed Project staff assist businesses in accessing loans and grants. The project also provides technical and business skills training to the batch group of entrepreneurs. These enterprises can act as demonstration sites and assist in idea sharing and linkages for start-up businesses.

Partner organizations engaged in improving livestock productivity like NGO projects (i.e. SNV-EDGET, CIDA-LIVES and Africa RISING), government offices and even cooperative unions are engaged in training of trainers (ToTs) to ensure forage related training and skill transfer. Private and public sector enterprises engaged in production,

processing and selling of forage seeds are FeedSeed Project clients.

The scoping study aims to:

- Assess the previous and current efforts made to improve the country's feed seed production
- Provide an overview of the ability and capacity of existing forage seed growers
- Assess the roles of the various actors within the “value chain”
- Review the current state of forage seed systems in terms of production, marketing and distribution are also parts of this study
- Suggest priority recommendations for improving Ethiopia's forage seed development

Study methodology

Primary data was gathered through consultation and discussion with senior forage agronomists, experts in public institutions and private firms involved in feed seed regulation, production and marketing. Key informant interviews were conducted with staff from the Ethiopian Seed Enterprise (ESE), the Ethiopian Institute of Agricultural Research (EIAR), the Ethiopian Animal Feed Industry Association (EAFIA) and Eden Field Agri-Seed Enterprise. Annex I provides the full list of individuals contacted throughout the study.

A literature and online review was compiled from surveys, evaluations and project progress reports to provide a baseline, guide further research and provide secondary data. Information was also collected from ILRI, EIAR and the animal and plant health regulatory directorate of the ministry of agriculture.

A total of four meetings involving FeedSeed project partners and potential project clients were held. Meetings provided a forum for networking, idea generation and information sharing about FeedSeed project activities. A questionnaire was administered to agricultural bureaus, private firms, cooperatives and farmers. It was designed to assess the existing forage seed growers' capacity and ability to supply high quality and sufficient seeds. The questionnaire was also used as a tool to gather information on current forage seed sources, main seed buyers, technical and business problems that existing seed growers face, and seed certification and regulation issues.

Qualitative and quantitative field data was collected from respondents based in in the SNNPR (Hawassa and Hossana) and in the Oromia regional state (Nekemte and Ambo). Farm operations supported by the FeedSeed project were also assessed to analyse the interest and potential they have in engaging in forage seed related businesses. The visits were also important in making the assessment of technical and business training needs of the project participants. Annex 2 provides questionnaire that new and existing forage seed producers and other involved in forage seed businesses were asked.

Limitations of the study

This scoping study faced three major limitations:

- **Inadequate information:** Previous studies regarding the evolution of the country's forage system do not exist. There is a lack of up-to-date published information. Data about the varieties and quantities of forage seeds produced in 2013 from agricultural research centre was not available.
- **Low emphasis given to forage seed:** There are not many entrepreneurs engaged in forage production. Thus, the scope of the study was limited to only a few actors.
- **Lack of concrete and in-depth analysis:** It is not clear how the CSA and other sources analyse the data they collect.

Current status and potential of the livestock sector

Livestock population and land use

In 2010, the total livestock population in Ethiopia was estimated at 55 million animals. Out of total population, cattle represented 82.4%, sheep represented 9.2%, goats represented 8.2% and poultry constituted 0.04% (Draft of the Ethiopian Livestock Master Plan, 2014). CSA 2012 findings indicate that 98.5% of the cattle in the country were local breeds and the remaining 0.94% hybrid and 0.11% exotic breeds.

According to the International Food Policy Research Institute (IFPRI) report (2012), the trend in the growth of the population of cattle, sheep, goats, and chickens for 2001/02-2008/09 was substantial, with annual growth rates of 3.2% for cattle, 9.3% for sheep and 8.2% for goats. The total national dairy cattle population varied from 8 million in 2004-5 to 9.9 million in 2008/09; reflecting an annual growth rate of 5.4%. In the same report, it was argued that sustained increase in this rate of livestock population could lead to continued land scarcity and negative environmental impacts such as overgrazing, deforestation, and soil erosion.

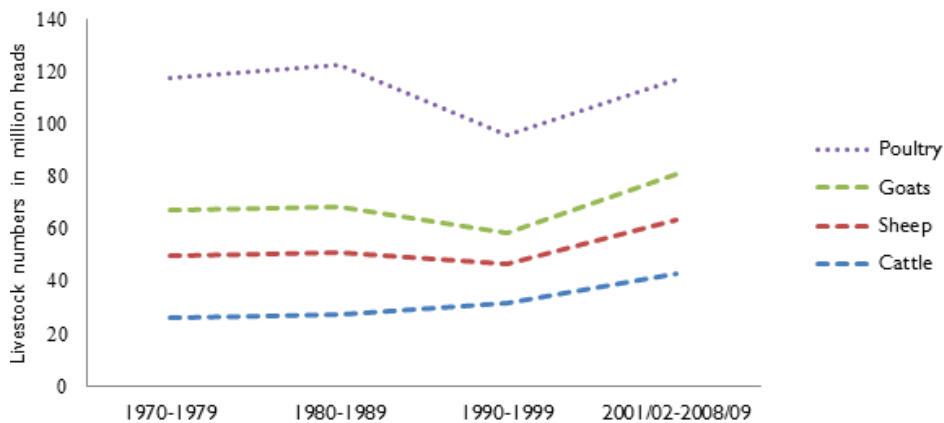
Figure 2: Trends in average number of animals, by livestock species, 1970-08.

Livestock	1970-79		1980-89		1990-99		2000-08		2001/02-2008/09	
	Number (million heads)	Growth Rate (%)	Number (million heads)	Growth Rate (%)	Number (million heads)	Growth Rate (%)	Number (million heads)	Growth Rate (%)	Number (million heads)	Growth Rate (%)
Cattle	26.2	-0.38	27.2	1.05	31.4	1.84	40.5	4.21	42.7	3.88
Sheep	23.4	-0.39	23.4	0.36	15.2	-7.14	18.5	12.45	20.7	10.44
Goats	17.3	-0.23	17.6	0.40	11.5	-7.54	15.0	13.38	17.3	9.48
Poultry	50.7	0.85	54.4	1.40	37.7	-7.65	35.3	0.11	36.2	-0.16

Source: IFPRI: Food and Agriculture in Ethiopia, 2012

Notes: Annual total number averaged over the time period, growth rate: calculated from logarithmic regressions

Figure 3: Increasing trend in livestock population.



The IFPRI report also indicated that despite the fact that the livestock population is increasing, many animals are not productive and therefore not maximizing their value at market. There is a need for significant change in smallholder farmers' production systems to increase the quantity and quality of animals appropriate for the market. The most notable constraints are feed shortage and poor animal health.

The conditions and trends of grazing lands are becoming key challenges in feeding the increased numbers of livestock population. According to the Food and Agriculture Organization (FAO), the highlands face slow plant growth due to low temperatures. The high stocking density and intensity of cultivation is out of proportion to the carrying capacity. In the lowlands, the short growing season suits only fast maturing plants. Limited rainfall and recurrent drought, shrub invasion and overgrazing are major issues within the lowland grasslands. Overgrazing and seasonal feed shortages are recurring problems within the country. Ethiopia's grazing lands are classified as in "poor" to "very poor" condition and will deteriorate further without immediate action. Even protected national parks are encroached upon by livestock and flora is often cut and carried to be sold as animal feed. A study done by USAID's Sanitary and Phytosanitary Standards and Livestock and Meat Marketing Program (SPS-LMM) in 2010 in the Tigray regional state indicated that the role of natural grazing as a major livestock feed resource is diminishing due to the high degree of chronic degradation and shrinking grazing land size.

According to the draft Ethiopian Livestock Master Plan Project being undertaken by ILRI, livestock types including cattle, sheep, goats and poultry are expected to increase significantly as shown below. Such increase in livestock population creates greater pressure on existing natural pasture.

Figure 4: Current and projected livestock populations.

Livestock type	Population as of 2013	Population projection for 2028
Cattle	54,022,455	77,291,124
Sheep	29,361,124	106,671,607
Goat	28,951,303	69,981,126
Camel	4,500,000	4,706,808

Natural pasture comprises the largest feed resource in Ethiopia. With the rapid increase of human and livestock populations coupled with an increasing demand for food; grazing lands are steadily shrinking and being converted to arable land. This is particularly evident in the mixed farming highlands and mid-altitudes. In the highlands and semi-highlands, natural pastures account for 80% of animal feed and the remaining 20% is constituted of concentrated feed made with agricultural by-products. Natural pasture is the sole forage source of livestock feed in the lowland regions with a wide range of grasses, legumes, and other herbs.

The two major livestock producing areas in Ethiopia are the agro-pastoral and pastoral areas. The pastoral livestock system is thought to account for 20% of the total Ethiopian cattle population and is used primarily for dairy and the agro-pastoral system accounts for 80% (42 million cattle). Cattle in the highlands are used mainly for draught power and dairy; meat production is secondary and likely to involve the use of old and unproductive animals such as retired draught oxen.

Promising factors for the livestock sector

Ethiopia's environment has always been well suited for livestock production due to its diverse agro-ecology and mild climate. However, the country's per capita milk and meat consumption is relatively low (46 liters/annum and 10 kg, respectively) compared with those neighboring Kenya (125 l/annum and 20 kg, respectively).

Livestock's role in smallholder livelihoods and income has considerable potential to contribute to Ethiopia's agricultural growth and GDP. Livestock commercialization creates opportunities to increase incomes for producers and other related value chain actors. Significant potential for demand growth domestic and export markets exist. Livestock productivity can be enhanced through improved breeds, high quality feed and well managed dairy farms and fattening feedlots. The feedlot sub-sector is growing rapidly as fattening facilities are strategically located at key locations. There are a number of private farms and cooperatives such as Lula and Yalfal Dairy Calf Fatteners' Cooperatives engaged in this sub-sector. However, constraints such as feed shortage, land scarcity and weak market linkages hinder future growth.

Historical efforts of forage seed development

Discussions with relevant stakeholders indicated that historically efforts have been made by the public sector, research and development institutions in developing forage seed. Although still small in scale, private seed producers are laying the groundwork to fill the gap between the growing demand and low supply.

In the 1970s, the Arsi Rural Development Unit (ARDU) first introduced annual forage legumes and perennial grass species, as well as pastures. Key species under production were oats, vetch, Rhodes grass, Phalaris, Panicum, Buffel grass, Elephant grass, Desmodium greenleaf and Fodder beet. Production sites included Kulumsa, Dera, Bekoji and Assela livestock farms (ARDU Annual Report, 1972-80). ARDU's forage seed production efforts were sustained and were well received among farmers where they multiplied starter seeds of oats, vetch and fodder beet offered by the unit.

Between 1987 and 1988, the Fourth Livestock Development Project (FLDP) of the MoA introduced a contract system where farmers were contracted to produce seeds. The FLDP project gave more emphasis on herbaceous and tree legumes and collected seeds mainly from forage development sites and a number of model farmers. The aim was to produce high-quality seed locally at a lower price and in greater quantities within an organized and controlled system. The system functioned well during the project lifespan, but after the project phased out, seed production related activities failed to operate as successfully as they did during FLDP. Efforts of promoting forage seed production and dissemination did not sustain as the agricultural offices did not have sufficient grant money to purchase and supply seed. Farmers no longer had the capacity to produce and supply seeds due to scarcity of land and labor, as well as insufficient working capital. Forage seed production also ceased because farmers chose to use their land to produce other types of seed and crops that had a more significant impact on their livelihoods.

Other projects such as the Crop Diversification and Marketing Development (CDMD), with the assistance of the FAO and Land O'Lakes International Development, contributed to forage seed production and development through the production of seeds and seedlings. Fodder beet, alfalfa, Tree lucerne, Sesbania, Oats, Vetch, Buffalo grass and Elephant grasses were among the seeds widely produced in backyard farms.

The Herbage Seed Unit of ILRI focuses on supplying tropical forage seeds and planting material of selected "best bet" species for experimental purposes and to provide training on forage seed production and management to farmers, extension workers and commercial producers. In addition, the FEED I (Feed Enhancement for Ethiopian Development I) project built on the work of ACDI/VOCA's two successful USAID-funded projects (Agricultural Cooperatives in Ethiopia and Pastoralist Livelihoods initiative-Livestock Marketing) was initiated to minimize the animal feed problem encountered in Ethiopia. The project areas in the five regions (Amhara, Tigray, Somali, Oromia and SNNPR) were characterized by mixed farming and large animal populations (Forage Seed Research and Development in Ethiopia, 2012). The project provided over 8570 kg of improved forage seed and seedlings, as well as financial support and technical assistance for smallholder livestock producers. In addition, it supported 13 farmer unions and cooperatives specializing in feedlot and dairy nutrition, feeding management and forage production (FEED Project profile, March 2012). The training and technical support obtained through participation in the FEED project played a major role in developing the knowledge and confidence needed for project participants to engage profit

making enterprises. Project participants started businesses or expanded existing ones thus contributing to improved forage seed production on a large scale.

Kulumsa and Melkassa Agricultural Research Centres have been producing breeder and basic seeds while also maintaining propagated forage materials for research and dissemination activities. The Adami Tulu Agricultural Research Centre in collaboration with Japan International Cooperation Agency (JICA) undertook a participatory community based forage seed production study using a farmer research group approach in Adami Tulu and Arsi-Negelle districts. These pioneer centres have been producing and distributing improved forage seed mainly to research students, but the majority of the varieties have reached only a few farmers due to poor market linkages.

The private sector has only been engaged in forage seed production activities in recent years. Although participation has grown, its capacity is still limited and is not equipped to meet Ethiopia's forage seed demand. Currently, businesses like Eden Field Agri-Seed Enterprise, Sidama Seed Enterprise and Seid Improved Forage Seed Producers are operating in the production and dissemination of certified seed.

Forage adaption and seed production mechanisms

Forage management and adaptability to the Ethiopian ecology

Extensive research has been carried out to test and evaluate the adaptability and performance of forage species in different agro-ecological zones. Many indigenous forage species have low productivity, which reduces their usefulness for animal nutrition and livestock productivity. A lack of technical knowledge and awareness has contributed to low adoption of forage crops (Benin et al., 2003).

Annual forage crops require simple management practices for seed production and show higher productivity compared to perennial ones. Seed processing techniques such as threshing, drying and cleaning for most perennial species are difficult and require special skills and knowledge. Seed productivity of most perennial forage grasses and legumes is in a range of 1-4 quintiles per hectare. Annex 3 shows the list of forage species with high biomass yield potential (Ethiopian Animal Feed Industry Association, 2012). With the careful selection of well-adapted species of forage crops, Ethiopia could potentially establish forage seed production to supply domestic as well as international markets. Forage species can improve soil fertility, and mitigate the effects of soil erosion resulting in positive environmental effects.

According to the FAO, over the past two decades several forages have been tested in different ecological zones. Considerable efforts have been made to test the adaptability of different species of pasture and forage crops under varying agro-ecological conditions. As a result, a number of useful forages have been selected for different zones. Improved pasture and forages have been grown and used in government ranches, state farms, farmer demonstration plots and dairy and fattening enterprises. Forage crops are most commonly grown as supplementary animal feed to improve the milk production of dairy cows. Common forage species include Oats, Vetch, Fodder beet, Elephant grass, Siratro, Desmodium, Rhodes grass, Lucerne, Phalaris, Trifolium, Sesbania, Leucaena and Tree lucerne. Yield of improved pasture and forage grasses range from 6-8t, legumes range from 3-5 t and tree legumes 10-12 t of dry matter per hectare. Due to land scarcity and crop dominated farming there has been limited introduction of improved pasture and forages. During the FLDP, different strategies and species for pasture and forage development were selected (Alemayehu, 2002). These strategies and forages have been promoted widely in crop and livestock systems, traditional grazing areas, around homesteads, within soil and water conservation structures and under plantation crops and forestry.

Feed quality and quantity, ecological degradation, overgrazing, border conflicts, drought and lack of seed and planting materials remain major challenges in developing Ethiopia's livestock sector. Natural grazing remains the major source of livestock feed, especially in the lowlands. However, grazing lands do not fulfill animal's nutritional requirements leading to low productivity and quality. In the highlands, with the rapid increase of human population and high demand for food, pastures are steadily being converted to farmlands. Land that is not used for cultivation is often waterlogged, flooded and steep thus unsuitable for grazing. Environmental degradation due to deforestation and overgrazing have also substantially reduced soil fertility and further reduced arable and grazing land productivity.

Natural grazing land is also deteriorating rapidly due to high stocking, especially in pastoral areas. Since the ecosystem is very fragile, mismanagement of resources has created severe problems for people in grazing lands. Pastoralists are facing ecological crisis. In many pastoral areas, livestock ownership has significant economic and socio-cultural value. Due to its importance, herd sizes continue to increase and are quickly diminishing already overstretched grazing lands. Desertification and land degradation is another devastating impact of overgrazing. In a recent study, 91% of subsistence pastoralists, adept at recognizing land changes, reported that rangeland conditions have worsened in recent years and identified overgrazing as one of the three main causes¹.

Soils are under high risk of degradation due to reduced infiltration, low permeability and a reduction in water holding capacity. The result is a decrease in soil's ability to support plant production. In addition, the absence of quantity and quality seed and seedling production limits the expansion of improved pasture and forage development (especially around the dairy farming and fattening areas).

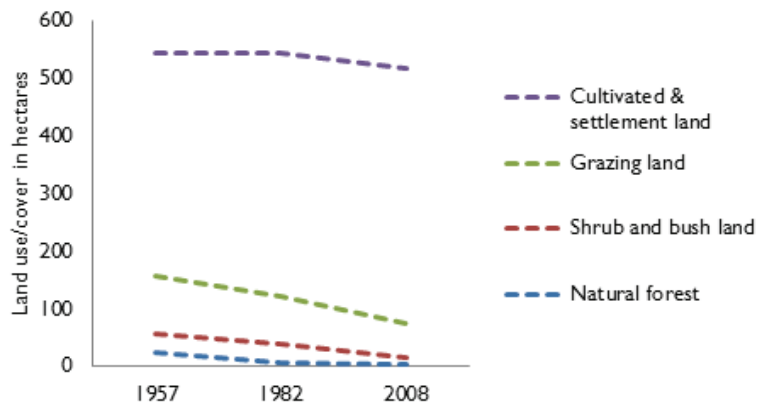
The Journal of Biodiversity and Environmental Sciences (2011) produced a study showing that the size of grazing land in Ethiopia has been declining over time. The study was conducted in Debre-Mewi watershed in northwest Ethiopia using data analyzed over a period of 51 years (1957-08). The analysis included four major land use/cover classes (natural forest, shrub, grazing, and cultivated land). Rampant conversion of land covered by vegetation to cultivation without adequate use of soil and water conservation and rehabilitation practices has made significant changes in the agro-ecology of the areas studied.

Figure 5: Land use/cover types and areas covered by the respective land use type in the Debre-Mewi Watershed in three different periods (1957, 1982 and 2008).

Land use/cover type	Area covered by respective land use/cover type					
	1957		1982		2008	
	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)
Natural forest	24.3	4.5	7.1	1.3	2.0	0.4
Shrub and bush land	33.2	6.1	32.7	6	13	2.4
Grazing land	100	18.4	80.8	14.9	60.6	11.1
Cultivated and settlement land	386.3	71	423.3	77.8	443.3	81.5

¹ <http://www.lrrd.org/lrrd21/7/abat21101.htm>

Figure 6: Trends in land use/cover type.

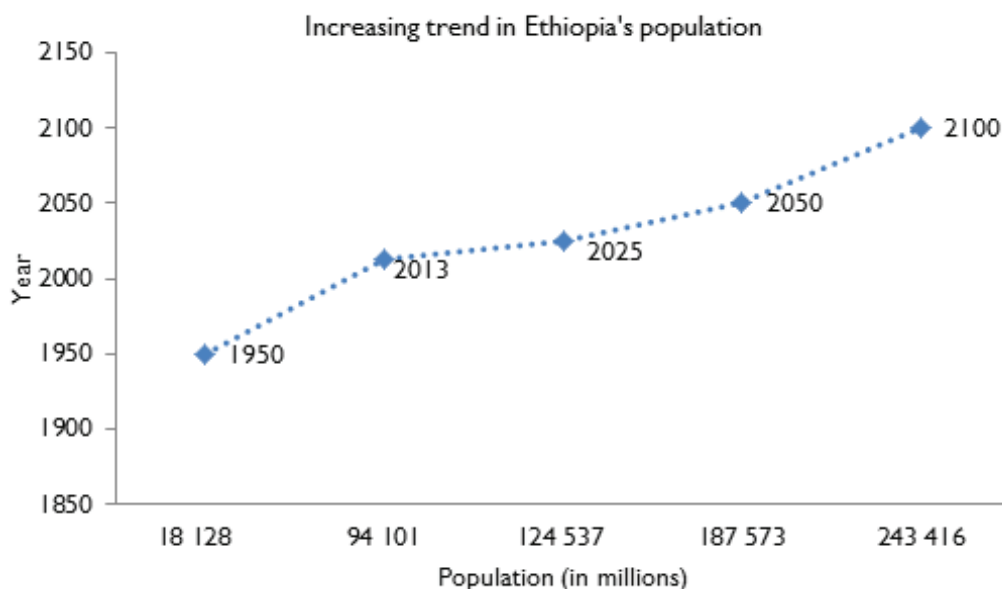


The Global Assessment of Human-induced Soil Degradation (GLASOD) cited overgrazing as the cause of nearly 50% of soil degradation in Africa. Currently, over one-third of the continent is threatened by desertification due to soil erosion (Ilyin, 2011).

According to the publication *The Looming Threat of Overgrazing: Effects and Recommendations* addressing issues of overgrazing 'the sustained increase in Ethiopia's human population in rural areas is also limiting the size of land available for natural pasture. As shown in the figure below, human and livestock growth rates are increasing rapidly, while available land productive agricultural land has shown no growth. It will be crucial to identify new methods of animal feed production or new alternative livelihood sources for livestock rearing households. If not addressed, grazing land shortages will have devastating effects on food security, the environment and peace and security.' (Ilyin, 2011)

According to United Nation's human population prospectus report (2013), Ethiopia's population will steadily increase in the years to come as shown below.

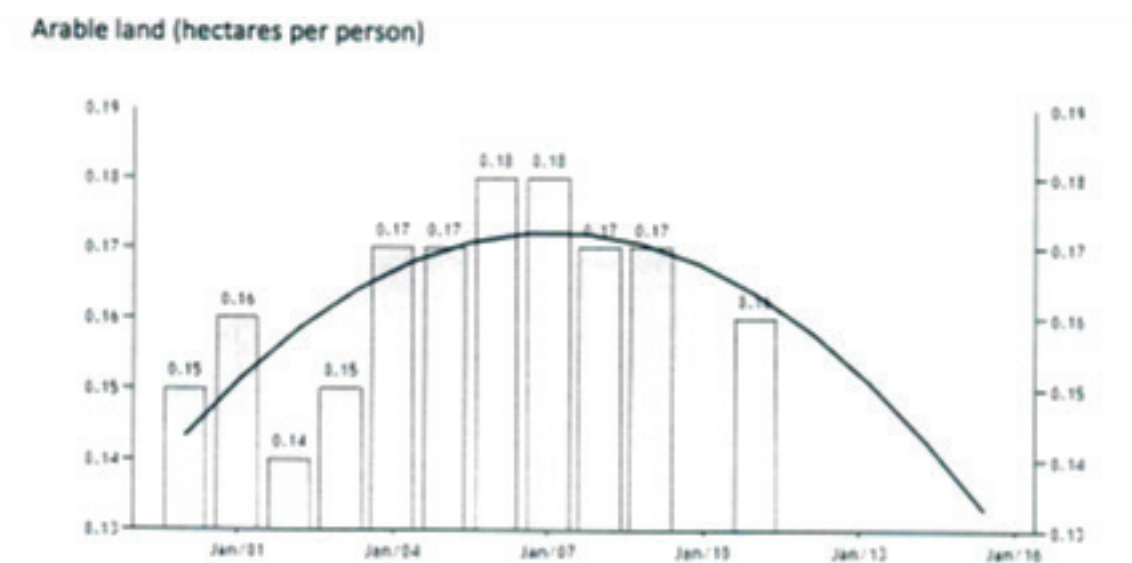
Figure 7: Trends in human population.



Source: United Nations, World Population Prospects, 2013

The human population growth estimates above, especially in rural Ethiopia, implies that farmers will face an ever growing shortage of agricultural land. Farmers will likely choose to use arable land for subsistence or cash crop production, which will put an increasing amount of pressure on grazing lands and lead to detrimental environmental effects. Population pressure will continue to decrease the amount of arable land available to individual farmers.

Figure 8: Projected arable land in Ethiopia.



Source: <http://www.tradingeconomics.com/analytics/plans.aspx?source=chart>

Experience of contractual forage seed growers and Farmers' Training Centres in developing forage seed production and marketing systems

Forage production is often produced through a contract farming model. Contract farming refers to a system in which a firm purchases the harvest of individual farmers, and the terms of the purchase are arranged through contracts. The term out-grower is also used in the same arrangement except that production and marketing services take place on the farmer's own land. Contractual seed production schemes are familiar amongst farmer unions, private companies and the public sector (SNNPR Agricultural Bureau, 2013). This type of arrangement is attractive to farmers because they get reasonable and predetermined fixed prices for each forage species avoiding uncertainty of selling their seed for a profitable price.

The other alternative for producing forage seed is using Farmer Training Centres (FTCs) which can serve as an entry point for scaling forage development. Significant amount of forage seeds are harvested from these centres and then distributed to interested farmers. Major forage seed types harvested are cowpea, vetch and multi-purpose tree legumes. Despite the close to 20,000 FTCs implemented all over the country, there are very few that provide forage seed related services. This is due to shortage of forage planting materials, land, capital and qualified extension staff.

Existing institutional arrangements to promote seed supply

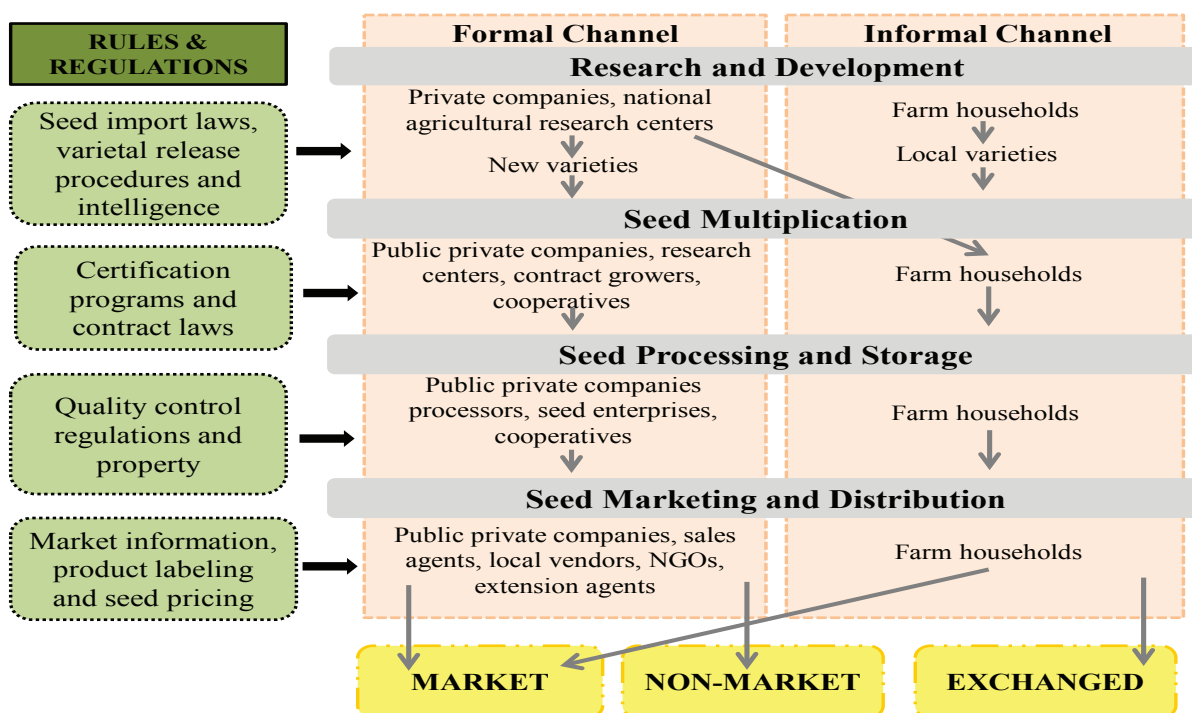
The seed system represents the entire complex of organizational, institutional and individual operations associated with the development, multiplication, processing, storage, marketing and distribution of seed in the country (Abebe et al., 2007). Rules and regulations such as variety release procedures, intellectual property rights, certification programs, seed standards, and contract laws influence the structure, coordination and performance of the seed system.

A well-functioning seed system is defined as one that uses the appropriate combination of formal, informal, market and non-market channels to efficiently meet farmers' demand for quality seeds (Figure 3).

Both the formal and informal seed systems operate simultaneously in the country and it is difficult to distinguish between the two systems. According to analysis conducted by the USAID's Office of Sustainable Development, there are four phases which a seed system passes through as it evolves from a traditional to an advanced system. In phase one, the informal seed system predominates; most farmers save their own seed or obtain seed from nearby farmers, and the rate of new variety development and adoption of new seeds is low. In phase two, seeds of improved varieties developed by the public sector begin to replace local varieties; the use of complementary inputs, such as fertilizers is limited but increasing, and an emerging private sector is involved in multiplication and distribution of released varieties. During phase three, the private sector begins to play an active role in research and development, particularly in developing hybrids. Seed systems become more organizationally varied, but the seed supply from the informal sector still ranges from fair to poor. In the last phase, the seed system as a whole is well developed; commercial seed

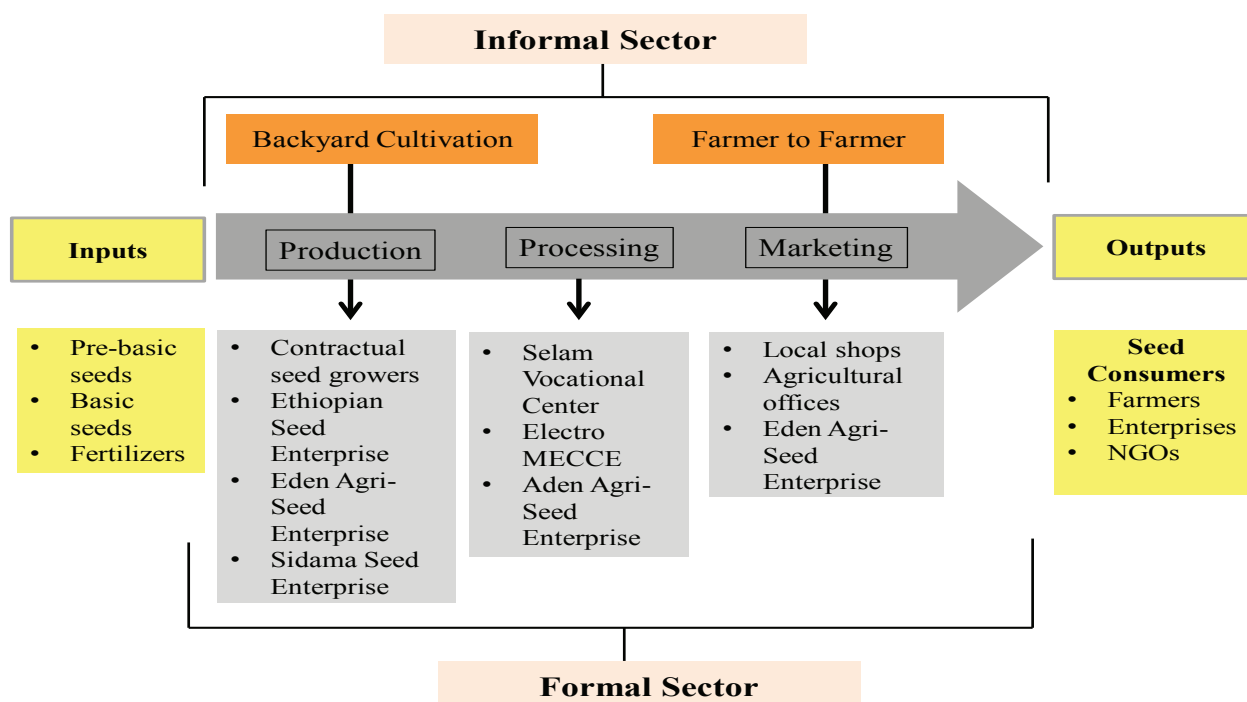
production and marketing are common, effective seed laws and regulations are in place, linkages with actors outside the seed sector are well established, and the use of improved seed is high.

Figure 9: Forage seed system: an organizational and institutional framework. Source: USAID, 2012.



Seed supply functions and organizations

Figure 10: Forage Seed Value Chain Map.



The forage seed value chain

A defined forage seed value chain does not currently function productively in Ethiopia. To ensure continuity of forage seed production and dissemination; institutional linkages need to be established and each must have commitment along the chain from initial forage seed production to marketing systems. In the informal sector, farmers are the main forage seed producers and multipliers where they grow seed in their backyard or in small plots. Existing bottlenecks include shortage of certified and quality seed, lack of technology (i.e. access to improved varieties and fertilizer, limited improved agronomic practices) and financial capacity limitations. In order to improve production, the private sector engagement should be more aggressively pursued. Regional agricultural research institutes, organizations like Ethiopian Institute of Agricultural Research (EIAR) and ILRI, as well as other relevant stakeholders should develop integrated forage production technologies by combining research and development.

Currently, forage seed is either exchanged among farmers or sold to commercial companies. It has not been well propagated throughout the entire country since the existing marketing systems are weak and barely operational. There is a lack of emphasis and enabling environment to enter the forage seed business. Federal and regional agricultural offices should establish appropriate forage production and distribution initiatives (i.e. education, advice, support and access to land). In addition, the current supply of certified seeds is very limited and access to markets is difficult due to the absence of producer-consumer linkages. New forage seed producers should be encouraged to start production to tackle the shortage of certified seeds. Market forums should be created involving producers, dealers and consumers.

Forage seed producers in the formal sector currently include the Ethiopian Seed Enterprise (ESE) and regional seed enterprises such as Somali Seed and Forage Enterprise and Eden Field Agri-Seed Enterprise. To date they are the sole commercialized forage seed producers in Ethiopia. The formal sector also consists of farmers that grow seed in a contractual scheme. However, this type of production of forage seed is not well developed since farmers and agro-industrial firms generally prioritize food crop production. The government can strengthen the entire system by supporting and promoting contract farming programs.

A number of problems persist in the existing forage seed value chain. Seed producers face lack of information about the buyers and their exact demand. Limitations in working capital and the absence of effective certification mechanisms prevent private seed producers from starting seed production. Financial institutions need to facilitate access to loans to potential and existing seed enterprises. It is also crucial that the MoA creates independent forage seed certification mechanisms in which key stakeholders are represented as per international best practice standards. In some African countries, independent institutions or centres have been assigned the authority of regulating and certifying seed. Land inaccessibility is another major deterrent to private sector investment and engagement in the forage seed industry. These challenges can be addressed through a multi-pronged government approach involving new technology, market information sharing, regulatory certification establishment and access to finance and lands. The government can also ensure the industry is attractive to investment and business operations to avoid the challenges of bureaucracy.

A proper and functioning value chain also comprises traders. Due to the limited amount of traders in the forage seed value chain, the market is largely inaccessible as few individuals simplify transactions between seed suppliers and buyers. A sustainable system enabling the role of traders should be created to ensure their involvement in the value chain. The roles of agricultural offices in supporting and facilitating an enabling environment needs to be more clearly defined. A seed source and viability strategy should be developed and should involve the scaling up and adoption by farmers. Higher learning institutions should prioritize forage seed education and research development to enable the development of expertise in the industry.

Assessment of the ability and capacity of existing private and public forage seed enterprises to produce and sell quality seed

The findings in the following summary were obtained from a questionnaire that was prepared to learn more about the operating public and private companies engaged in forage seed production, dissemination and marketing.

Pioneer private enterprise and individual forage seed growers

Eden Field Agri-Seed Enterprise was established in 2008 with the main focus of producing quality seed to farmers with support of development partners such as FAO, SNV-EDGET, World Vision and others. The enterprise has been playing a substantial role in fulfilling the supply gap of forage seed and promoting improved seed production and processing techniques. It has played an important role in technology transfer in the country by working in collaboration with out-grower farmers, research centres, NGOs and other actors involved in this sector. ILRI, government institutions such as the national and regional research institutes and community groups involved in forage and tree seed production are the main sources of basic seeds for Eden Field Farms.

The enterprise has been producing various species of legumes, grasses and fodder trees and will include species such as of *Brachiaria*, *Phalaris*, *Axillaris* and Sudan grass if able to acquire starter seeds. ILRI provides basic seeds for high altitude research centres including Holetta and Kulumsa, mid-altitude agricultural research centres including Melkassa, Bako and the Melka Worer research centre for pastoral areas.

The amount of seed production is based on the number of interested out-grower farmers and size of area contracted from other institutions and farmers. The enterprise produces an average of 150 to 200 mt of forage seeds per year. Between 2008 and 2012, the amount of forage seed sold increased from 60 mt to 200 mt. The demand for Elephant grass, Rhodes grass, Desmodium, Lablab, Beta vulgaris, Pigeon pea and Leucaena is increasing every year. About 50% of the enterprise's supply is purchased by NGOs, 48% by government offices and 2% by the private sector.

There are a few unions and cooperatives that act as agro-dealers and supply agri-chemicals and vegetable seeds. These groups are in discussion with Eden Field Farms about agri-business activity collaboration. Currently, Eden Field Agri-Seed Enterprise is working with SNV-EDGET Graduation with Resilience to Achieve sustainable Development (GRAD) in four woredas in the Oromia region. The project has selected 40 model farmers around Ziwai (Batu), Dugda, Adami-Tulu, Arsi-Negelle and Shalla. Using a cost sharing approach, this project is implementing different forage development strategies such as backyard cultivation, intercropping and on-farm production practices.

The enterprise's seed cleaning is limited to traditional hand picking methods due to a lack of financial capacity to invest in new technology. The business implements regular germination testing. Marketing and advertising is primarily done through exhibitions with relevant stakeholders like the MoA, EIAR, Ethiopian Development Bank, local woreda

government offices, NGOs, ILRI, FAO and local farmers. When seeds are ready to be used and sold, the enterprise takes them to the central store in Addis Ababa to directly sell to end users.

Current major technical and business challenges that Eden Field Agri-Seed Enterprise faces include:

- Poor linkages among stakeholders
- Lack of innovation regarding seed production
- Limited seed processing and storage facilities
- High prices of forage seed for end customer farmers
- Inadequate supply of basic seed
- Inaccessibility of land for forage seed multiplication
- Market uncertainty
- High cost of product and affordability; consumers unable to afford high prices
- Lack of rules and regulations and implementing institutions regulating seed quality control (i.e. basic seed source, viability and environmental impacts and nutrition value).

Short term study tour programs to other countries like Kenya and India experienced in forage seed production, processing and dissemination and related activities should be considered in order to enhance the capacity of the enterprise.

Starting production in a limited scale and scaling up gradually is an important lesson learned that can be incorporated in the FeedSeed project model. Businesses can use out-grower scheme forage seed production and then supply product to commercial companies. This model can help them to acclimate to the market environment.

Cowpea, Eden Field Agri-Seed Enterprise



Buffel Grass, Eden Field Agri-Seed Enterprise



Gadissa Gobena Private Farm was established in 1990. It currently produces two varieties of legumes (Vetch and Alfalfa) and four varieties of grasses (Rhodes grass, Elephant grass, Pigeon pea and Oats). The farm receives starter seed from Holetta, Kulumsa and Bako research centres of EIAR and provides them to farmers for multiplication. The annual production of the farm is between 2 and 5 mt. Three-quarters of the supply is purchased by farmers while NGOs buy one quarter of the seed. There has been a significant increase in seed supply and demand in recent years. The farm possesses about 17.5 ha of land and owns seed multiplication and processing equipment. However, the equipment can't be used as the business lacks connection to the electric power grid.

Seeds are transported to research centres and laboratory for moisture and purity tests. The farm markets entirely by word of mouth and the farm prepares demonstration trials a few times per year. It also uses model farmers to encourage other farmers to buy seeds. They distribute the seeds just after the harvesting period between May and

June. The farm hopes to work with consulting agents in order to improve their business skills and cover a larger number of clients.

The farm faces many challenges and it has not grown at the scale anticipated in recent years. Shortage of basic seeds of various varieties, unstable weather conditions, financial instability, high rental costs of contract land and increases in labor costs have restrained the farm's growth. Managerial and technical trainings related to seed production are critical to enhance the capacity of the farm.

The FeedSeed team observed farmers and cooperatives growing seed in their backyard and on large farms during field visits to Meki, Hawassa and Akaki. Eden Field Agri-Seed Enterprise has leased a total of 12 ha around Meki to grow and sell different species of legumes (Alfalfa, Cowpea) and grasses (Pigeon pea, Rhodes, Guinea, White Buffalo, Buffel, Signal, Siratro).

Sidama Seed Enterprise in the SNNPR uses its Habela site located near Hawassa town for forage seed production. The farm has fully established Rhodes, Napier and Guatemala grasses and has recently sowed Lablab to be harvested in September 2014.

Guatemala grass, Sidama Seed Enterprise



Napier grass, Sidama Seed Enterprise



Public forage seed enterprises

Nationally or regionally mandated public seed enterprises have had limited involvement in forage seed production. They typically produce a small number of improved seeds for use mainly by state dairy farms. Most of the seed enterprises fail to produce forage seeds mainly due to land scarcity and lack of awareness of the benefits of forage use. For instance, the Somali Seed Enterprise located in an area where 80% of the population is pastoralist, was not involved in forage seed production due to lack of interest from local pastoralists. The public sector produces limited varieties and amounts of forage seed that does not meet Ethiopia's growing demand.

The **Ethiopian Seed Enterprise (ESE)** is a profit-oriented public institution producing and distributing crop seed for the past 36 years. It produces, processes, distributes, and markets improved seeds based on demand projections obtained from the regional bureaus of agriculture. The ESE operates a central seed testing laboratory at headquarters and mini laboratories attached to seed processing plants and storage facilities located in different regions. ESE maintains internal seed quality assurance methods. Regional seed enterprises and private seed growers can access seed laboratories of their respective and neighboring region for quality assurance testing, cleaning and labeling seeds. In addition, the ESE produces a variety of seed, predominantly cereals, but also pulses, fruits, vegetables and forage seed. ESE introduced but is no longer producing Rhodes grass and currently produces oats (CI 8235 and CI 8251) and vetch (Lana and Calaide).

The ESE has been providing high quality seed on a contractual basis by multiplying and processing breeder and pre-basic seeds acquired from national research centres and imported from abroad. The enterprise has devoted a block of about 200 ha for forage seed production. During the year 2012-13, the enterprise sold about 850 mt of oats to the MoA and cooperatives.

Amount of certified forage seeds produced by ESE in Quintals for five years (2006/07-2010/11)²

Crop	2005-06	2006-07	2007-08	2008-09	2009-10
Forage crops	88.95	103.15	-	176.14	93.29

Sales of certified seed produced by ESE in Quintals for five years (2006/07-2010/11)³

Crop	2005-06	2006-07	2007-08	2008-09	2009-10
Forage crops	64	63	92	15	5

While perceived demand for forage seed is high, actual demand is unconfirmed. The lack of a proper and well-functioning marketing system for forage crops in the country is a major business challenge for ESE. The ESE possesses six quality control laboratories and has an internal committee that verifies and analyses seed germination and purity tests. Currently ESE relies mainly on the MoA to buy and distribute its seeds.

Lessons learned from ESE to be applied to new forage seed producer enterprises include:

- Thorough market assessments and understanding consumer needs value chain analysis is essential
- Effective land use and suitable agro-ecology are essential in sustaining forage seed businesses

The **Somali Seed and Forage Enterprise (SSFE)** is one of the main forage seed producers at the regional level. Breeder seed is provided by different research institutes and centres such as the Somali Region Pastoral Agricultural Research Institute (SoRPARI) and the Melkassa Agricultural Research Centre. The enterprise operates seed multiplication centres in Jigjiga. Largely based on an irrigation scheme, the region also produces crops during the short rainy period from April-May. The SSFE most widely produces Sudan grass (2000 mt) and Alfalfa (1100 mt) annually. From 2012-13, the quantity of improved forage seed produced increased by 22%. Since the region is mainly pastoralist, the enterprise is also involved in hay production to respond to recurrent droughts that plague the region.

The enterprise's main clients include cooperatives, private companies, farmers, NGOs and agricultural bureaus (about 70% of sales). The SSFE follows seed quality control standards. They promote their product through Ethiopia Somali TV, local brochures as well as demonstration trials with lead farmers. Business development agents sell seeds by supplying the seeds to the market and linking the farmers to the enterprise. Post-harvest activities (i.e. threshing and winnowing are done manually using local equipment.

The enterprise faces many challenges including inadequately skilled labor, lack of access to inputs and materials, and limited knowledge and experience sharing between regional bureaus and farmers. In particular, staff needs training related to seed quality control. The method of seed quality testing used by the enterprise consists of germination, purity and moisture testing of each variety.

Southern Nations, Nationalities and People's (SNNP) regional agricultural bureau ILRI and a number of research centres provide the SNNP regional bureau with certified seed. It produces a total of seven varieties of legumes and grasses. Key production includes varieties of Alfalfa, Lablab and Rhodes grass; up to 30 mt of each of variety were produced between 2012 and 2013. Private entrepreneurs are involved in seed multiplication and are supervised by the bureau.

The major challenge the bureau faces relates to annual forage budget funding as it is calculated at the woreda rather than the regional level. Another challenge is that seed development is not always well tracked which can negatively affect the planned harvest time and expected growth rate, resulting in limited seed production.

Forage seed experts and farmers' associations at the kebele level conduct demonstration trials and provide training to new farmers. Training needs include forage seed variety assessment and identification as well as technical production skills (sowing, handling and storage). Local NGOs provide the regional agricultural bureau with equipment for seed

² Source: The African Seed Trade Association, A Baseline survey on the Ethiopian Seed Sector (2010)

³ Source: same as above

quality testing. The germination test centres are located in three different areas. Marketing channels for forage seed have not been properly developed since there are a limited number of producers. The key clients consist of the public sector, including other regional agricultural bureaus, agricultural zone offices and woreda offices.

Agribusiness development services

Precise Consult International (PCI) is a management consulting firm based in Addis Ababa, specializing in the provision of business and investment advisory services to enterprises. PCI also conducts private sector development and economic analysis on behalf of international development agencies and governments. The primary aim of PCI is to decrease the level of difficulty to run successful businesses. PCI has been carrying out business development service activities throughout Ethiopia since its establishment in 2007.

In association with the Economic Transformation Group (ETG), PCI helped to implement the Ethiopian Sustainable Agribusiness Incubator (ESAI), a USAID-funded project. ESAI operates in the dairy, sesame and honey value chains. The project aims to transform the Ethiopian agriculture sector through the establishment of incubator businesses and to enhance the competitiveness of agri-business value chains. The project is modeled after international best practices of successful agri-business incubators. ESAI works along the entire agri-business value chain with a dual focus of identifying and supporting pioneer firms as well as stimulating and promoting existing entrepreneurs. Private investors and organizations are target clients. PCI provides entrepreneurship, business plan development and financial management trainings to its clients. As a pioneer of business incubation in the country, PCI identified challenges such as selection of high potential entrepreneurs and assisting start-ups in accessing finance.

The project's objectives are as follows:

- Analyzing the underlying economics of these chains
- Undertaking strategic interventions in each chain which afford the greatest breakthrough gains
- Engaging pioneering business leaders, innovators, and entrepreneurs to test strategic interventions along multiple trajectories

PCI, along with the Ethiopian Meat and Dairy Industry Development Institute (EMDIDI) can potentially partner with the FeedSeed project in assisting with advisory services. They could also be instrumental in providing in-depth business related training in collaboration with the FeedSeed team. Although PCI, has not assisted crop or forage seed enterprises before, it has worked with animal feed producers involved in government land leases.

Relevant services that PCI could potentially provide to the FeedSeed business clients include:

- Identifying clients with feasible business concepts and high entrepreneur potential
- Creating linkages with inputs, technology and market
- Facilitating access to finance (i.e. equity, loan, grants)
- Business infrastructure and support services (taxation structure, financial management and record keeping,)
- Business development trainings and training of trainers (ToT)

PCI-type services that can benefit FeedSeed incubator clients include:

- Business plan preparation
- Market assessment and linkages
- Business advisory services (i.e. management, marketing strategy and investment analysis)
- Financial model structuring
- Access to finance (equity and debt)
- Grant facilitation

Supply and demand of forage seed

The current forage seed demand outpaces supply and creating high prices for end consumers. The forage seed sector is faced with the following major challenges in terms of meeting supply and demand:

- **Weak value chain with limited actors:** Historically and currently forage seed supply in the country has been dominated by only a few private and public institutions, leading to limited quantity and very high forage seed prices. The actual forage seed market is dispersed; suppliers and buyers have difficulty interfacing due to lack of information and awareness.
- **Informal production and trade:** About 60 -70% of forage seed supply is informal; seed used by Ethiopian smallholder farmers is saved on-farm and exchanged among farmers. The remaining 20-30% of forage seed used is borrowed or purchased locally (Belay, 2004).
- Forage seed production is primarily aimed at satisfying household level demand and maintaining seed for the next cropping season rather than for selling seeds for profit. In addition most smallholder farmers are not willing to produce improved forage crops because they prioritize their land for the production of subsistence food and cash crops.
- **Lack of technical support via agricultural extension:** The forage seed supply is also weak due to the lack of an effective extension system in forage development and livestock production in general. In order to assess the existing gap and increase private sector engagement, the FeedSeed Project team conducted 15 field trips in the Oromia and SNNP regions of Ethiopia, respectively. After proper and in-depth assessment, the team selected 15 individuals/commercial companies to be considered as the project's potential business clients. The selected clients (Annex 4) were then provided with technical and business training. Some of them bought forage seeds to plant in the coming season.

Variety release, forage seed quality control, standards and certification

Variety release

Currently, newly developed varieties are tested by breeders and evaluated for their superiority over existing varieties by a MoA technical committee. The committee is composed of professionals represented from the MoA, EIAR, regional agricultural research institutions and universities. The technical committee meets once a year to evaluate prospective varieties submitted by agricultural research institutions, universities and seed companies. The National Variety Release Committee (NVRC) authorizes the actual release of the varieties. Released varieties are then registered in the annual MoA crop variety registry book. The register is published with the list of new crop varieties approved for that specific year, along with the list of all previously approved varieties. The newly released crop varieties in the most recent year are provided in the registry book together with their cropping season and their respective agronomic and morphological descriptors. Varieties released beyond the most recent year are provided only with the year of their initial release and the research institution that is responsible for their maintenance. For imported varieties, the importer must first apply to the MoA for registration and submit an application to the EIAR. Imported varieties must undergo an adaptation trial using the imported seeds before being approved or rejected by the NVRC.

Variety release requests (typically initiated by research institutions) are accompanied by a complete description and distinguishing characteristic of a candidate variety. Annex 5 provides the application form for variety release and registration. If a new variety is approved, individual and institutional applicants are notified by the Animal and Plant Health Regulatory Directorate of the MoA. To date the Directorate has released 19 varieties of 13 species (Annex 6). The lengthy amount of time required to register and approve varieties by the NVRC is a major challenge faced by applicants.

Forage seed quality control

Seed cleaning and processing centres across the country are very weak due to lack of expertise, low quality equipment and facilities as well as a lack of access to finance. To date, controlling and assuring seed quality has been given little attention. In most cases, it is very difficult to trace the breeder or maintainer of the initial seed source as there is no record (sometimes known as a “passport”) moving along with the seeds. As the seeds are exchanged between various actors within the value chain, the traceability of the seeds to their sources vanishes. As the seeds move within the value chain, the quality deteriorates. Although there are quality checks efforts being made by some of the regional public seed enterprises they are still limited. As they are not initiated proactively by the seed enterprises themselves, quality checks only occur when a seed producer or seller initiates a check independently.

The major actors within the existing forage seed system are producers, wholesalers, retailers and buyers. There are no widely known private enterprises engaged in professional commercial forage seed processing (cleaning and packaging). Individual traders move along the value chain and collect seeds of all varieties and bulk them up for resale without proper cleaning and processing. The bulk of the seeds are sold to NGOs and government offices for further distribution to farmers. Unless major buyers insist on quality checks, there is no regulatory tracking of the quality of the seeds circulating in the country. Evaluation mechanisms are minimal and when implemented they consist of simple control mechanisms for physiological purity, germination and moisture content. In general, there is lack of information about the seed source and quality as it transits along the value chain end user. Some regional public seed enterprises located in the Amhara and Somali regions are implementing seed inspection and certification systems in planning to popularize available varieties and seed production technologies, but this is still only when the seed producer or seller initiates it.

Forage seed standards and certification

For product standard control, including forage seeds, the Ethiopian national standardization council determines the use of national standard marks and also approves mandatory standard requirements. This national council works closely with the Ethiopian Standards Agency (ESA). The core business of the ESA is to formulate standards, conformity assessment procedures and technical regulations, to provide training and technical support and to organize and disseminate information to the wider community. The ESA has so far developed standards for 25 forage seeds including popular types like Cowpea, Pigeon pea, Sesbania, Leucaena, Tree lucerne, Vetch, Oats, Stylos, Siratro, Buffel grass, Lablab, Alfalfa, Rhodes grass, Guinea grass, Sudan grass, Seteria, Napier grass, Desmodium (silver and green leaf) and axillaries. The ESA has also developed standards for the labeling and marking of seed containers (ES 481:2000).

Once the ESA establishes a seed standard, the next step will be developing a process through the Ethiopian Conformity Assessment Enterprise (ECAE). The ECAE's product certification services are based on "mandatory" and "voluntary" Ethiopian Standards (ES). The ECAE issues quality and standards certification for seeds that meet all the minimum standard requirements. This includes certification, laboratory testing and inspection services.

The third relevant government office is the Ethiopian National Accreditation Office (ENAO). Its mandate is to accredit (by formal third-party recognition), the competence of conformity assessment bodies to perform specific activities, such as test, calibrations, certifications or inspections. It is assumed that all laboratories accredited by this office have the capacity to undertake conformity assessment and certify seed producers. The ENAO supply accreditation services in accordance with the requirements of ISO/IEC 17011.

The recently issued seed proclamation (Proclamation No. 782/2013 implies that the MoA is primarily responsible for handling seed related legal matters:

- Seed is defined as 'true botanical seed, bulbs, tubers, cuttings, rhizomes, roots, seedlings and any other plant propagating material.'
- Ethiopian seed standards is defined as 'the minimum limits of germination, varietal purity, physical purity and other quality attributes of prescribed seeds as set by the Ethiopian Standards Agency.'
- Certified seed means 'a direct descent seed from basic seed or a seed found in first, second and third generation of basic seed.'
- Quality control is defined as 'the process of evaluating the quality of a seed for compliance with Ethiopian seeds standards.' It is also mentioned that 'the ministry shall formulate procedures for quality control of seed, shall verify the conformity of imported seeds with the Ethiopian seeds standards, and shall verify the quality of seed produced for export market in conformity with the standards of the recipient country.'
- Seed release: Any variety intended for domestic or export market shall be released by the MoA before it is produced locally.
- Commercial seeds production: Any person who intends to engage in commercial seed production shall establish an internal seed quality control system.

-
- **Distribution:** Any person in order to engage in commercial seed distribution shall have a certificate of competence.
 - **Standards:** The Ministry of Agriculture shall cooperate with the Ethiopian standards agency in developing seed standards.
 - **Seed quality control:** Authority responsible for agriculture at regional level shall undertake seed quality control on seed produced in the region for domestic market.
 - **Seed Inspection:** The Ministry and each regional authority shall appoint seed inspectors to ensure compliance with this proclamation and related regulations and directives. Any seed inspector should take seed sample to make laboratory test in order to determine that a seed confirms to the applicable Ethiopian seed standards. The Ministry shall ensure standardized inspection procedures throughout the country and provide inspection training and support to regional authority when necessary.
 - **Scope of application of the proclamation** is indicted to include 'any seed.' However, the proclamation may not be applicable to (a) the use of farm-saved seed by person (b) the exchange or sale of farm-saved seeds among smallholder farmers or agro-pastoralists (c) seed to be used for research purposes and (d) forestry seed.

It is encouraging that Ethiopia has established a seed proclamation that is providing a legal framework for seed businesses. The effective implementation of the proclamation, however, is equally important for the speedy growth of the entire seed system. It is also not clear where seed companies should go when they need quality certifications, as there is an overlap of mandates between the MoA (as provided in the proclamation) and that of the ESA and the ECAE. Current forage seed certification, variety release and quality control programs are inconsistently enforced and weak. Problems associated with variety release procedures, certification as well as practical enforcement should be dealt with by relevant institutions. Additional forage seed standards are also required. Clarity is required to move forward in establishing a system that is accessible to all actors along the forage seed value chain.

Conclusions and recommendations

Overall conclusions

- Farmers are highly dependent on NGOs and other public institutions for forage seed supply.
- Insufficient government strategy and enabling environment has led to the underdevelopment of forage seed systems.
- Private producers and farmers lack the necessary awareness about the level of the current demand for forage seed and the potential profitability of the forage seed businesses.
- A national forage seed quality control and certification institute needs to be established and processes need to be clarified and communicated.
- Further training and technical support is needed for commercial seed growers. Heavily populated livestock areas such as the lowlands need increased attention.
- A platform that brings together relevant private and public sector actors to jointly address the current challenges and potential development of forage seed sector needs to be created.

Recommendations

Unless addressed, animal feed shortage will continue to remain a main constraint to herd size and animal productivity in both the lowlands and the highlands of Ethiopia. Current demand outweighs the limited supply produced in the country. Utilizing improved forage seed is a crucial engine to improve livestock productivity. Forage seed production can also have significant impact on relieving the effects of climate change, desertification and grazing land shortages. Intercropping is a viable option where arable land is limited and can also have positive impacts on soil health. Many forage crops are adaptable and can be suitably planted on soil conservation structures; such as soil bunds and as alley crops.

As the number of the private sector actors is limited in the forage seed value chain, new and existing private and public enterprises need to be supported to enable the production and supply of high quality forage seed. In addition, market linkages along the value chain need to be more fully developed. Actors that are involved in seed production and marketing require assistance in improving their business skills. The value chain needs to reduce its over-dependency on agricultural bureaus and NGOs for the purchase and distribution of forage seeds to farmers to function more effectively. It is crucial to educate potential producers and consumers about the importance of growing forage seed for their own use as well as its potential as a viable source of income. Agricultural extension services focusing on forage seed production and management need to be developed and expanded at the national, regional, woreda and kebele levels. Farmers need technical support to successfully produce and multiply forage seed.

The introduction of new varieties of highly productive forage species needs to be prioritized. In order to achieve this, the government needs to clarify the variety release, quality control, certification and regulation standards.

A multi-pronged approach with multiple actors can lead to a higher functioning, more efficient and profitable forage seed value chain, while also improving the country's livestock productivity.

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Annexes

Annex I: Study Contacts

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Yonas Sahlu	Ethiopia Country Coordinator; Scaling Seed & Technologies Partnership for Africa (SSTP)	Alliance for a Green Revolution in Africa	sahlu_yonas@yahoo.com
Zewdie Bishaw	Head of the Seed Unit	ICARDA	z.bishaw@cgiar.org

Annex 2: Questionnaire prepared to assess the ability and capacity of existing seed enterprises to produce and sell quality seed

Seed Enterprise Questionnaire

- 1 What species of forage seed do you produce?
- 2 How many varieties do you produce? Do you have any interests to produce more, if yes, what varieties?
- 3 Where do you get the root seeds?
- 4 What are the critical technical and business problems you face?
- 5 What kind of training do you need?
- 6 What amount of forage seed do you produce per year?
- 7 What amount of forage seed do you sell per year?
- 8 Are there any improvements in terms of demand? What varieties are the most requested?
- 9 Who are your clients? What percentage does each account for?
- 10 Do you work with business development services or agents?
- 11 How do you market and advertise seed?
- 12 Do you do demonstration trials to interest farmers to buy your seed? Do you use lead farmers to demonstrate and/or sell seed?
- 13 Where do you get your equipment for threshing, winnowing, etc from? Locally or abroad?
- 14 What methods of seed quality testing do you use?
- 15 What marketing channels do you use to distribute seeds?

Annex 3: List of most adaptive and productive forage species for the different agro-ecologies of Ethiopia

Forage species	Adaptation
Legumes	
Lablab	Mid to low altitude
Alfalfa	High to low altitude
Vetch	High to mid altitude
Green leaf Desmodium	Mid to low altitude
Silver leaf Desmodium	Mid to low altitude
Stylo	Mid to low altitude
Grasses	
Napier grass	Low to mid altitude
Rhodes grass	Low to mid altitude
Guinea grass	Low to mid altitude
Sudan grass	Low to mid altitude
Colombus grass	Low to mid altitude
Buffel grass	Low to mid altitude
Browse Trees	
Pigeon pea	Mid to low altitude
Leucaena	Mid to low altitude
Sesbania	Mid to low altitude
Tree Lucerne	High altitude

Source: Ethiopian Institute of Agricultural Research, 2012.

Annex 4: Roster of attendees of the technical and business training at EMDIDI.

No	Name	Company	Address	
			Region	Specific location
1.	Petros Dubisso	Private Farm	SNNPR	Hawassa Zuria, Tula Kebele
2.	Degu Kebebew	Gadissa Gobena Commercial Farm	Oromia	Ambo Town
3.	Melkamu Kassahun	Private Farm	SNNPR	Hawassa Zuria Alamura Welbata
4.	Kassahun Kema	Sidama Seed Enterprise	SNNPR	Hawassa Zuria, Hawela Kebele
5.	Degefa Bejira	Hadia Seed Production and Agro Industry PLC	Oromia	Sasiga Woreda, Anger 8
6.	Lealem Berhane	Private Farm	Amhara	Debre Markos, Gojam
7.	Mekuria Abebe	Private Farm	Oromia	Merab Arsi Zone, Adaba Woreda
8.	Seid Hussen Bushira	Seid Improved Forage Seed Enterprise	Amhara	South Wollo, Worebabu Woreda
9.	Adinew Ayele	Farmer	SNNPR	Hosana area, Lemu Woreda, Jawi Kebele
10.	Aberash Ludago	Farmer	SNNPR	Hosana area
11.	Abiy Tsemru	Private Farm and Zelalem Fattening Lot	Oromia	Misrak Shoa Zone, Dugda Woreda, Meki
12.	Mohammed Awol Hassen	Private Farm	Afar	Afar Region, Dubti Woreda
13.	Teshome Endale and Tesfaye	Anno Agro Industry	Oromia	East Wollega Zone, Gobu Sayo District
14.	Adujna Bejina	Farmer	Oromia	East Wolega Zone, Arjo Gudetu, Jeldu Kebele
15.	Belay Bada	Private Farm	SNNPR	Hawassa Zuria, Shembedino Kebele

Annex 5: Application form for variety release / registration/ of forage and pasture crops.

VARIETY RELEASE REGISTRATION APPLICATION

1. Name and address of researcher/ institute responsible for developing the cultivar (s)

2. Research commodity _____

3. Name of crop (with Latin Name) _____

4. Variety designation (breeder's reference) _____

5. Origin of cultivar: Information on origin, pedigree and mode of reproduction. (Hybrid/open pollinated, seedling/bud sprout/clone/selection/imported/unknown)

6. Recommended ecological zones of adaptation and rainfall requirement.

7. The main positive feature(s) of the variety, which makes it superior to those in current use. Indicate also shortcomings, which may restrict its use in some areas:

8. Results

8.1. Annex statistical analysis of yield and other relevant agronomic data (year, location, and year x location)

Year	Location name	Average yield of the variety Year x Location	Average yield of check in trial Year x Location	Yield advantage over the check (%)

8.2 This variety required (kg/ha) to achieve the above yield

N _____

P _____

K _____

Other sources _____

8.3. The trials **received** / **did not receive** irrigation. (circle one)8.4. Pesticide **applied** / **not applied** (circle one). Indicate type, chemical name and rate/ha.

Type	Name	Rate

8.5. Test years and locations providing data for this assessment:

Year	No. of locations	No. of varieties in trial

Regions/locations where trials were conducted:

8.6. Main morphological characteristic which distinguish this variety

Morphological characteristics	Measurement or description

8.7. Quality of Product (CP, NDF, In vitro digestibility etc.)

8.8. Harvest period (s)

8.9. Resistance to disease/insects and other hazards (e.g. cold, heat, drought and salinity).

Explain scoring system and classify resistance in comparison with standard check.

Disease/insect and other hazards	Year	Location name	Average score/count for the candidate	Average score/count for the check

8.10. Utilization information (cut and carry, grazing, hay, silage etc.)

8.11. Additional information (adaptability, suitability for large scale production or small farmer cropping systems, target animal, mode of offer etc.)

8.12. Main contributor for the release of the variety

Name	Institution	Profession

8.13. Organization/institution responsible for maintaining breeder's stock

I, the undersigned, attest by my signature that the information given is true to the best of my knowledge.

I, hereby, apply to the National Variety Release Committee for the release and registration of this/these

Name _____ Signature _____

Position _____

Institution _____

(Stamp and approval) _____

Date _____

FOR NVRC USE ONLY

Release and Registration of _____ Full release/provisional/ repeat/ rejected

_____ Full release/ provisional/ repeat/ rejected

_____ Full release/ provisional/ repeat/ rejected

(circle one)

NVRC Chairperson _____

Signature _____

Date _____

NVRC Secretary _____

Signature _____

Date _____

NVRSCA, Director: _____

Signature _____

Date _____

Source: Ministry of Agriculture, June 2008.

Annex 6: Forage species and varieties released by EIAR since 1976.

Forage and Pasture Species	Variety	Year of release	Breeder/Maintainer
1. Tree Lucerne	-----	1992	HARC/EIAR
2. Elephant Grass	ILCA-16984	1984	
3. Rhodes Grass	Massaba	1984	HARC/EIAR
4. Panicum	Colloratum	1984	HARC/EIAR
5. Dolicos Lablab	-----	1984	HARC/EIAR
6. Phalaries	Sirosa	1982	HARC/EIAR
7. Trifolium	-----	1976	HARC/EIAR
8. Vetch	Lana	1976	HARC/EIAR
	Lalisa	2011	SARC/OARI
	ICARDA – 61509	2012	HARC/EIAR
	Gebisa (IG.No 62632)	2011	SARC/OARI
	Abdeta (IG.No 118)	2011	SARC/OARI
9. Cow pea	Sewinet	2009	Pawe Agricultural Research Centre
10. Andropogon Gayanus	Dirki Ayifera	2009	Pawe Agricultural Research Centre
11. Pigeon pea	DURSA	2009	MARC/EIAR
12. Oats	Bonsa	2011	SARC/OARI
	Bona-bas	2011	SARC/OARI
	CI-8237	1976	HARC/EIAR
13. Sesbania	DZF 092	2012	DZARC/EIAR

Source: Crop Variety Register, Ministry of Agriculture, June 2012

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