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Efforts Being Made and Success Achieved In Producing Improved Seed of Forage Copsin Ethiopia: Review Article

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Ethiopia stands first in Africa and tenth in the world in its livestock population. In order to attain sustainable production and productivity of the wealth livestock, improved forage production in quality and quantity is highly important. Improved forage production is largely depending on the improved seed production system. To this end, the current review is aimed to summarize the comprehensive information on the potential efforts being made and achievements so far on the improved forage seed production in the country. So far different approaches have been applied to meet the need of improved forage seed production in the country. Among these involving different public institutes, seed producing enterprises, privet sectors, NGOs' and "famers" groups are the major one and produced a large amount of forage seed through different seed system. Besides, development of improved varieties and different agronomic practice, capacity building in seed technology and indigenous "germplasims" collection for variety development are also the effort that under took and significantly enhanced the improved forage seed production. Despite these major efforts and achievements, years of work have showed that forage seed production still faced with many problems such as lack of inadequate forage seed research, reliable forage seed production, processing and distribution schemes, less involvement of privet seed producers, lack of information on the national demand for forage seeds, poorly developed seed marketing systems, and lack of financial incentives for seed prices. Therefore, these problems need to intervene properly in order to enhance future improved forage seed production in the country.

Keywords: agronomic practice, institutions varieties

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INTRODUCTION

Seed is one of the most important sources of innovation, particularly in resource constrained small farm environments. It carries the genetic potential of the crops, determining the upper limit on yield and therefore, the ultimate productivity of other inputs (Jaffee and Srivastava 1992). It is a key input for improving crop production and productivity. Increasing the quality of seeds can increase the yield potential of the crop by significant folds and thus, is one of the most economical and efficient inputs to agricultural development (FAO, 2006).

Forages comprise many different plant types including

trees, shrubs and herbaceous plants. These plants differ in their growth forms which could be either determinate or indeterminate. They may also be annual or perennial in their persistence (HSU, 1994). There are three categories of forages: legumes, grasses, and multipurpose browses (fodder trees). These are grown in different amount and locations in the country.

The feed shortages and poor quality feed are the major constraints to increased livestock productivity in sub-Saharan Africa (SSA), particularly in Ethiopia that holds the largest livestock population in Africa with livestock ownership currently supporting and sustaining the livelihoods of an estimated 80 percent of the rural poor population (FAO, 2004). Therefore, selection of high yielding and better quality forage varieties, and development of improved forage production systems are critically important for improving livestock productivity. In addition, the use of improved forages would also reduce the pressure on natural pastures, improve soil fertility and erosion on marginal lands, improve carbon sequestration to mitigate climate change, support system sustainability, and enhance natural assets and system resilience (ILRI, 2009).

Sowing a new pasture or improving an existing natural pasture requires a reliable source of seed or vegetative material of species recommended and adapted for the area. The aim of forage seed programme is to make available quality seed or vegetative material at is suited to farmers' needs for livestock production (HSU, 1994). Seed production methods for forage crops are quite different from those used with cereal crops. Each herbage plant has its own peculiarities. It is important to know the proper rate, time, and method of seeding, as well as the best stage of plant development at which the seed is sufficiently mature to harvest (Grass L. and Turner M., 1998).

Forage Seed production is also a specialized activity that somehow differs from regular forage production in that care is required in harvesting, processing and preservation of the seeds (Mengistu*et al*., 2010).

In SSA, no single system of seed production is suited to the varying social or environmental situations. Current seed production systems can be formal, well developed commercial activities involving both the public and private sector. In these systems, the focus is on commercial large-scale seed production and marketing. However, forages are not widely sown as crops in sub-Saharan Africa and market demand for high quality uniform seeds is very low. This has resulted in very few seed companies dealing with forages in the region. Much of the forage seed production is in the informal or traditional seed sector where farmers do their own selection and seed production to meet their own needs and may also sell or exchange excess seeds within the local community (Humphreys, 1978).

Historically, the emphasis in southern Africa has been on range management, and research on sown pastures or range reinforcement and replacement techniques has started only recently in most sub-Saharan countries. Kenya and Zimbabwe have somewhat longer experience in replacement techniques. These two countries are also the only ones with a herbage seed industry strong enough to offer sizeable quantities of herbage seed on export markets (Jutzi S.1986). Africa ranks last for the three basic seed industry components (cultivar improvement, seed quality control and production and distribution) and for the two crop groups reviewed (food and pasture). Kenya and Zimbabwe have undoubtedly made the greatest progress in the development of sizeable commercial supplies of improved seed of both food and pasture crops. Seed related activities are more recent in Ethiopia, Ivory Coast, Madagascar, Malawi, Nigeria and Zambia.

The formal forage seed system in Ethiopia is underdeveloped due to lack of technical and business expertise in seed production, processing and marketing (Sahlu *et al*., 2008). Lack of a market-driven forage seed industry is also a key limiting factor to more and better quality seed being produced and marketed (USAID EDDP, 2011). This paper is therefore, aimed to review the various efforts that have been made for production of improved forge seed production, the achievements and suggests possible interventions for future implementation.

LITERATURE REVIEW

Efforts Made in Producing Improved Seed of Forage Crops

There have been made many efforts to under took forage seed production in Ethiopia in past and present. This cloud be done using different approaches and obtained some achievements even the sector is still faced with many challenges after all these efforts. Different research out puts on this will be summarized as follows.

Involvement of institutions in improved forage seed production

The development of any improved forage seed production system realizing the success of sustainable, quality and adequate forage seed production. So far various attempts have been made in the establishment of improved forage seed production mechanism by involving different public institutions, Research Centers, NGO's and private sectors in the country.

Forage development for livestock has a long history in Ethiopia going back to the 1950's at Jimma and moving on through activities at Haramaya University; the Swedish funded Chilalo Agricultural Development Unit (CADU) starting in the late 1960's (Duncan *et al*., 2011).

The forage and pasture seed production began in 1970 in Ethiopia by Arsi Rural Development Unit (ARDU/ CADU) (Jutzi, 1986; Alemayehu M. and Getnet A., 2012). It 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'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. The Dairy coops were also done in selected milk shed with forage/seed options from 1974–1991.

Seed production of agricultural crops is the mandate of the Ethiopian Seed Enterprise (ESE) formerly Ethiopian Seed Corporation, which is a state controlled company set up in 1979(Jutzi 1986).It is a major public seed enterprise that has been in operation for a number of years. The enterprise is responsible for production of seed for all crops (cereals, pulses, fruits, vegetables and forage), although its seed production is dominated by cereals, especially maize and wheat (Atilaw, 2010). The enterprise produces relatively small amounts of oat and vetch seed for use on some privately owned dairy farms and for sale to some institutions, but does not have a seed production program for the other forage crops (Alemu D., 2011). The Ethiopian Seed Enterprise has taken the lead in promoting farmer based seed multiplication (FBSM) programmes. The more recently emerged regional seed enterprises such as, Oromiya Seed Enterprise (OSE), Amhara Seed Enterprise (ASE), and South Seed Enterprise (SSE), are also involved in FBSM programmes on a contract basis, following the approach lead by ESE. In general, the public seed enterprises deal with formally released varieties in FBSM through formal contracts with "famers" clusters that have been formed for the purpose of quality maintenance. It produces, processes, distributes, and markets improved seed based on the official demand projection of the regional bureaus of agriculture. Except few attempts, Ethiopian Seed Enterprise (ESE) does not adequately address forage seed production (Muluneh M. et al., 2012).

The Fourth Livestock Development Project **(**FLDP) of the Ministry of agriculture initiated contract system of forage seed production in Ethiopia in 1987/88. Its forage seed production program aimed at producing better quality seed at lower prices and greater quantities in centrally controlled seed production systems using individual farmers and "famers" cooperatives. The program placed emphasis on the production of forage legume seed, with a capacity of 100-120 tons of forage seed per year during its period of operation (Alemayehu M., 1996; Grass L. and Turner M., 1998). 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. "Famers" 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 famers chose to use their land to produce other types of seed and crops that had a more significant impact on their livelihoods (Tekalign E., 2014). The forage seed production intervention was continued by Smallholder Dairy Development Program (SDDP) from 1987-1991 in Heifer distribution together with forage/seed (Eshetu Y. and Teklu K. 2015).

The forage component of the project aimed also to train farm families to become self-sufficient in improved forage production and feed their dairy cows. SDDP adapted the FLDP's forage development strategies and seed production systems. The project contracted dairy "famers" s to produce forage seeds. It also produced and harvested seed from government ranches that were assisted by the project. Seedlings of tree legumes and cuttings of elephant grasses were raised in nurseries established in various locations (Mengistu A. *et al*., 2016).

The Institute of Agricultural Research (IAR) has a program for the production of seed of various forage crops in small quantities at its centers in the different agro-ecological Zones of the country (Grass L. and Turner M., 1998). The primary target of the IAR's micro-forage seed increase program is to meet its research requirements and distribute seed to other government organizations for research and demonstration purposes (Grass L. and Turner M., 1998). As reported by Tekalign E. (2014), Kulumsa and Melkassa Agricultural Research Centers 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 "famers" research group approach in Adami Tulu and Arsi-Negelle districts. These pioneer centers have been producing and distributing improved forage seed mainly to research students, but the majority of the varieties have reached only a few "famers" due to poor market linkages (Tekalign, E. 2014).

The International Livestock Research Institute (ILRI) has a forage "germplasims" unit, which produces seed of different forage species for the National Agricultural Research Systems (NARS) in Africa, including Ethiopia and other parts of the world. ILRI provides forage seed to the NARS in small quantities for research purposes

(Grass L. and Turner M., 1998). Particularly, in Ethiopia it provides basic seeds for high altitude research centers including Holetta and Kulumsa, mid-altitude agricultural research centers including Melkassa, Bako and the Melka Worer Research Centre for pastoral areas (Tekalign, E. 2014).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 "famers", extension workers and commercial producers. According to Tekalign E. (2014), other projects also involved in forage seed production 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. Currently, the Ministry of Livestock and Fishery resources set Ambitious year 2020 feed/forage-seed plans to overcome forage/seed shortages (Eshetu Yimer and Teklu Kidane, 2015).

Pioneer private enterprise and individual forage seed growers

Eden Field Agri Seed Enterprise is first private its kind in producing forage seed in Ethiopia. It was established in 2008 with the main focus of producing quality seed to "famers" 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 "famers", research centers, 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 (Tekalign E. 2014).

Gadissa Gobena Private Farm was established in 1990. It currently produces three varieties of legumes (Vetch, Pigeon pea and Alfalfa) and three varieties of grasses (Rhodes grass, Elephant grassland Oats). The farm receives starter seed from Holetta, Kulumsa and Bakoa Agricultural research centers of Ethiopian Institute of Agricultural Research (EIAR) and provides them to "famers" for multiplication. The annual production of the farm is between 2 and 5 mt. Three quarters of the supply is purchased by "famers" 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 centers 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 "famers" to encourage other "famers" to buy seeds (Tekalign, E. 2014).

Development of production technologies

Development of production technologies is very essential for the production of high quantity of quality forage seed. In Ethiopia, during the last five decades considerable research effort has been made with main emphasis on introduction, evaluation, and selection of forage crops in different agro-ecological zones of the country. A wide range of annual and perennial forage species were evaluated in areas ranging in altitude from 600-3000 meters above sea level, and many promising species have been selected for high, medium, and low altitudes. The selected forage crops are generally well adapted to the different agro-ecologies and high yielding, and have better quality compared to natural pasture. More than 44 forage species and varieties have been recommended for different agro-ecologies of the country (Table 1). Most of these forage crops are propagated by seed and few of them are propagated by vegetative method (Atilaw A., *et al*, 2012). Of which only 19 forage species were registered officially by Crop development department of the Ministry of Agriculture, crop variety register (Getnet Assefa, 2012).In addition to the forage "germplasims" evaluation, numerous agronomic and management studies on establishment methods, fertilizer and seed rates, sowing date and methods, harvesting date for forage and seed, frequency of harvesting, forage and seed yields were carried out, and appropriate cultural practices have been identified for these selected forage crops (Atilaw A., *et al*, 2012).

Development of national seed policy

Until 1992, there was no coherent national policy for the development of seed industry. In 1993, a national seed industry policy and strategy was formulated to guide seed sector development. The National Seed Industry Council (NSIC) was established under Proclamation No 56/1993 and become responsible for advising the Government on

Table 1. Number of recommended forage crops in different agro-ecological zones in Ethiopia

Species	High altitude	Mid-altitude	Low altitude	Total
Grasses	>7	>12 (1*)	>3 (2**)	>19
Herbaceous Legume	>5	> 12 (1*)	>5 (5**)	>16
Browse Trees	1	>6	>3 (2**)	>8
Root crops	1	-	-	1
Total	>14	> 30 (2*)	>11(9**)	>44

* Can also grow in high altitude areas; **can also grow in mid-altitude areas
Source: DawitAlemu*et al*. (2012)

policy and regulatory issues that would help improve and build a sustainable national seed supply system. Proclamation No 122/98 amended the members of the Council. In the national seed industry policy, emphasis have been given to agricultural research institutions, the Ethiopian Seed Enterprise (ESE), state farms, private farms and "famers" as major producers and suppliers of seed. The private sector is expected to play an important role in seed sector development (Bishaw, 2001). However, 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 (Tekalign, E. 2014).

Human resources and physical capacity

Availability of qualified experts is key to ensure quality source seeds. In terms of qualified human resources, EIAR and other regional research centers does not have trained professionals specialized in seed science and technology. In all the 14 federal research centers under EIAR there currently are about 220 employees involved in Technology Multiplication and Center Development (TMCD) program, and most of them hold below diploma level. Besides, there is little or no formal seed technology related research in the country due mainly to lack of seed technologists. This situation is not surprising since little attention was given to seed technology in the past. The current situation is likely to change such that at least one seed technologist would expected to be recruited for each research center. Beside to this the Haramaya University has already introduced post-graduate program in seed science and technology, and some graduates are being employed (Atilaw A., 2012). Despite the fact that, Technology Multiplication and Center Development program target on the seed production of food crops the effort would have no little importance on the research centers and the organizations whose involve the seed technologist for quality forage seed production.

Development of forage and pasture conservation

To employ collection for forage "germplasims", there is great opportunity in country that known with great diversity of forage grasses, legumes and browse species indigenous to the country. These biological resources are the primary sources of animal feed which support about 20% of the Gross Domestic Product (GDP) of the country, and the potential of the indigenous forage and pasture gene pool for improvement of the livestock feed. The improved forage seed production is highly depending on the availability of improved forage seed source. This can be achieved through either the introduction of materials from abroad or collection of indigenous "germplasims" from the country and evaluate for yield and quality of seed.

In Ethiopia ILRI and IBC are played the major roles in under taking these activities. The International Livestock Research Institute (ILRI) is the pioneer in Ethiopia for systematic exploration and collection of forage genetic resources, conservation and research. Accessions from different species of grass, forage legumes and browse species were collected from all ecological regions of Ethiopia (Getnet Assefa, 2012; Tesfaye Awas and Delessa Angassa, 2012). These activities were initiated in the Institute of Biodiversity and conservation (IBC) and since 1998; IBC has been conducting collection and conservation of forage genetic resources. Over the past decade, IBC has developed short and long-term conservation and assessed the status of forage genetic resources in Ethiopia (Tesfaye Awas and Delessa Angassa, 2012).

IBC under took forage genetic resources conservation in*In-situ* and *ex-situ* conservation method. Though it is not directly involved in the *in-situ* conservation of forage genetic resources rather conserve as "famers" based *in-situ* conservation, Pastoral *in-situ* conservation, National parks as *in-situ* conservation areas, Ranches as *in-situ* conservation areas and Area closure and cut and carry systems as *in-situ* conservation areas. It is involved in the *ex-situ* conservation of forage Genetic Resources in the form of Gene bank/cold room storage and the field gene bank (Getnet Assefa, 2012).

Success Achieved in Producing Improved Seed of Forage Cops

Improved forage seed production is not as simple as like crop seed production. The nature of forage plant, inadequate improved production technology, lack of attention of different seed producing public and private institutions, lack of attractive price and poor market linkage and the low perception of end users make difficult in the production of improved forage seed in the past and present. Despite, So far a variety of approaches have been applied to establish and enhance improved forage seed production in Ethiopia. The involvement of different institutions, privet sector, NGOs, projects in public sectors, “famers” group are take the major place in the success of improved forage seed production in the country. In addition to these developments of production technologies, national seed policy, human resources and physical capacity building and development of forage and pasture conservation are also playing role in success of improved forage seed production.

In view of the long term efforts made in producing improved forage seed, many organizations achieved the production of forage seed in adopting different production system such as “famers” contract seed production system, seed production on ranches, seed production on specialized plots and opportunistic seed production. The improved forage seed production has been done by different organizations in different seed production systems with variable quantity in various area of the country. ARDU is one of the institutions that involved in the production of forage seed in the country. The main forage seeds included in the production are oats (Avenasativa), Vetch (Viciaspp.), Rhodes Grass (Chlorisgayana), Phalaris, Panicum (Panicum spp.), Buffel Grass (Cenchrusciliaris), Setaria, cocksfoot grass (Dactylisglomerata), Ryegrass (Loliumperenne), elephant grass (Pennisetumpurpureum), green leaf Desmodium and fodder beet (Beta vulgaris).

The forage seed production is expanded to the Fourth Livestock Development Project (FLDP) Under the Ministry of Agriculture. FLDP introduced the contract seed system of forage seed production in 1988 that extended up to 1994. The system involved producing seed under contract with individual “famers” and cooperatives. Under this production system the total annual production of forage seed reached to150 tones (Mengistu A. 1994a). The major forage seeds produced in the course of project were Grasses (2650 kg), Herbaceous Legumes (3800) and Tree legume (6000 kg) (Mengistu A. 1994b). The Smallholder Dairy Development Project (SDDP) adopted the seed production system of FLDP's and produced about 1957.5, 10362.5 and 12242.5 tonnes of forage seeds in SNNP, Oromiya and Amhara respectively in 1997 and 1998.The forage types included in the production are Oats, vetch, sesbania, leucaena and tree Lucerne (Alemayehu M. and Getnet A., 2012).

Few attempts have been made by public forage seed enterprises such as Ethiopian Seed Enterprise (ESE) in producing forage seed through “famers” based seed production and marketing scheme and obtained about 18 tons of different forage seeds from 1998- 2001 (Muluneh M. *et al.,* 2012). The Somali Seed and Forage Enterprise (SSFE) is also one of the main forage seed producers at the regional level. The SSFE most widely produces Sudan grass and Alfalfa with the amount of 2000 mt and 1100 mt respectively annually. From 2012-13, the quantity of improved forage seed produced increased by 22%. The Sidama Seed Enterprise also produced Rhodes, Napier and Guatemala grasses and has recently sowed Lablab in the SNNPR at Habela site located near to Hawassa town in September 2014 (Tekalign, 2014). Between 2012 and 2013 the regional bureau of SNNP produced 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.

Under the Institute of Agricultural Research, Holeta research Center engaged in the production of improved forage seed. The center has produced 213.4 tons of different forage seeds from 2002-2010. Nearly 94% and 5% of total seeds produced were that of oats and vetches respectively. Perhaps, both forage species are well adapted to highlands and have high demand by producers. A produced seed of perennial grasses and some legumes is very small although seed yield of these species is generally low (Muluneh M. *et al*, 2012).Recently forage seed production is also under taking in higher educational institutions such as Haromaya University. The University produced a total of 67350 kg of forage seed in 2008 and 2010 at both Haromaya and Fedis research sites. The main forage seeds included in the production are Alfalfa, Oats, Vetch, Panicumcoloratum, Panicum maximum, Chlorisgayana, Cenchruscilaris, Phalaris spp., Beta vulgaris, Sudan grass, Melilotusalba and Lablab purprous (Debalke B. and Wolkaro T., 2012).

Recently, private enterprise and individual forage seed growers were also involved in the production of forage seeds. The Eden Field Agri-Seed Enterprise is one of the privet enterprises involved in the production forage seed. The enterprise produced annually an average of 150 to 200 mt of forage seeds. The sold amount of forage seed between 2008 and 2012 is reached about 60 mt to 200 mt. The Gadissa Gobena Private Farm which is found in Oromia is annually produced 2 and 5 mt of three varieties of legumes (Vetch, Pigeon pea and Alfalfa) and three varieties of grasses (Rhodes grass, Elephant grass and Oats) (Tekalign, E. 2014).

Under different forage seed production systems: “famers” contract seed production system, seed

production on ranches, seed production on specialized plots and opportunistic seed production over 200,000 tonnes of forage seed were produced from 1988 to 2002. Of the seeds produced: Vetch, Lablab, Cowpea, Axillaries, Siratro, Stylos, Desmodium, Oats, Rhodes, rupanicum, Tree-Lucerne, Leucaena and Sesbania are “pdominant”. Large local seed production is under way using “famers” contracts (Alemayehu M., 2001).

In view of the long term efforts made by different research centers, recommended forage species have been cultivated, and small quantities of their seeds/planting materials have been maintained in the different federal and regional research centers. Forage species most commonly produced in different parts of the country and whose seeds are maintained in small quantities include oats, rhodes, phalaris, napier, panicum, cenchrus, andropogon, sudan grass, setaria, tall fescue, vetches, clovers, lablab, medics, cowpea, alfalfa, lotus, desmodium, stylosanthes, pigeon pea, leucaena, tagasaste and fodder beet (EARO, 2000).There is also a national seed standard for 26 forage species: 10 grasses, 12 legumes, 3 browse trees and 1 root crop in Ethiopia. The standards are categorized into two: field standards where land requirements, crop rotation, crop isolation, packing and marketing of forage seeds are inspected; and laboratory standards where seed purity, diseases, germination and moisture content are checked (Eshetu Y. and Teklu K. 2015).

Government strengthened the seed technology unit in the research centers by capacitating at master’s degree and bachelor degree level in seed technology which is recently opened in Harmoya University. Similarly capacity building has been offering in plant laboratory clinic which has the authority in the evaluation of seed for certification. The international organization; ILRI has been providing training for national and international scientists, technicians and “famers” in “germplasims” management and seed production. More than 75% of the beneficiaries were from Ethiopia plus a wide range of other African, European, Asian and American countries.

The indigenous forage and pasture species collection and conservation has been done by ILRI and IBC. ILRI has done a lot to fill the gap by collecting grasses from different parts of Ethiopia and by acquiring access to world collections of forage grass “germplasims”. Currently over 371 accessions of grasses from 77 species and 37 genera, 2076 accession of legumes from 140 species and 35 genera and 185 accession of browse from 41species 18 genera are collected and conserved (Mengistu A. *et al*., 2017). The Ethiopia biodiversity institute has also pursued similar duty in the collection and conservation of indigenous forage and pasture “germplasims” in the country. During the course of worka total of 326 accessions from 25 forage legume and 2 browse species were conserved in the FGB at Wendo Genet in half a hectare area in 2004. Of which 252 accessions seed were increased, characterized for important traits and conserved for long term in the gene bank. Currently there are 173 accessions of herbaceous legumes and 10 grass species in plot base at the site (Awas T. and Angassa D., 2012).

SUMMARY AND CONCLUSION

In the long history of Ethiopian forage seed production many approaches have been applied to develop improved forage seed production. Of which the involvement of different public institutions such as ARDU, ESE including regional enterprises and University (Haromaya University), NGOs (ILRI), private enterprises and private farm are the major effort applied in the production of forage seed. The projects like FLDP under the ministry of agriculture, SDDP and Southern Nations, Nationalities and People’s (SNNP) regional agricultural bureau are also the approaches which highly involved in the production of forage seed. These organizations and projects were produced different forage varieties in different quantity, place and time. Although different organizations and projects involved so far in the production of forage seed, the existing forage seed production system does not tell the clear status of forage seed produced in the country.

The other important activities under took so far to enhance improved forage seed production are collection and conservation of indigenous forage and pasture species, development of production technologies, capacity building, and development of national seed policy. In respect to these, widely and specifically adapted varieties and improved agronomic practice for forage seed production have been developed. The presence of a number of collected indigenous “germplasims” emerged private seed enterprises, skilled man power in seed technology, contractual and other seed system are also the other achievements in producing forage seed in the country.

Despite these major efforts and achievements, the forage seed production still faced with many problems in the country. Those are lack of adequate forage seed research, reliable forage seed production, processing and distribution schemes, less involvement of privet seed producers, lack of information on the national demand for forage seeds, poorly developed seed marketing systems, and lack of financial incentives for seed prices. Thus, the future efforts should target answering on these challenges that may hamper improved forage seed production in the country.

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