Forage seed quality in Ethiopia: issues and opportunities

ILRI PROJECT REPORT


USDA


ACDI VOCA
Expanding Opportunities Worldwide


CGIAR
RESEARCH
PROGRAM ON
Livestock

Forage seed quality in Ethiopia: issues and opportunities

Michael Turner[1], Getnet Assefa[1] and Alan Duncan[2]

[1]Independent consultants

[2]International Livestock Research Institute

November 2019

ILRI thanks all donors and organizations which globally support its work through their contributions to the CGIAR Trust Fund

Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo—ILRI/Michael Turner

ISBN: 92–9146–590–5

Citation: Turner, M., Assefa, G. and Duncan, A. 2019. *Forage seed quality in Ethiopia: issues and opportunities*. ILRI Project Report. Nairobi, Kenya: ILRI.

Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
better lives through livestock

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa

Contents

Abbreviations and acronyms

ATA	Agricultural Transformation Agency
COMESA	Common Market of East and Southern Africa
CRGE	Climate Resilient Green Economy
CSA	Central Statistical Agency
DUS	distinctness, uniformity and stability (of varieties)
EIAR	Ethiopian Institute of Agricultural Research
ESA	Ethiopian Standards Agency
ESE	Ethiopian Seed Enterprise
FAO	Food and Agricultural Organization of the United Nations
GIZ	German International Cooperation
GTP	Growth and Transformation Plan
IAR	Institute of Agriculture Research
IBC	Institute of Biodiversity Conservation
ILCA	International Livestock Center for Africa
ILRI	International Livestock Research Institute
ISTA	International Seed Testing Association
LMP	Livestock Master Plan
MoA	Ministry of Agriculture
NGO	nongovernment organization
NRM	natural resource management
OARI	Oromia Agricultural Research Institute
OECD	Organization for Economic Cooperation and Development
PBR	plant breeder rights
QDS	Quality Declared Seed
TARI	Tigray Agricultural Research Institute
USDA	United States Department of Agriculture

Acknowledgment

We are grateful to Carl Birkelo of ACDI/VOCA for commissioning this work under the FEED III (Feed Enhancement for Ethiopian Development) grant from USDA.

Executive summary

The need to improve the quantity and quality of livestock feed in Ethiopia has been recognized for many years. Development projects, policy documents and technical meetings have all emphasized this issue. Increasing the use of cultivated forages has been identified as a means to address this problem, by improving livestock productivity and, thus reducing pressure on the environment. A wide range of forage crops have been introduced and evaluated by the International Livestock Research Institute (ILRI) and passed on to the Ethiopian Institute of Agricultural Research (EIAR) for further development. However, lack of good quality seed is still commonly cited as a constraint to expanding the production of cultivated forages; much research has been done on this topic. All professionals working in the field understand this problem, but it has proved very difficult to find a way forward, despite the clear justification.

Providing a certification scheme for forage seeds may help to overcome this constraint by strengthening the production and marketing chain with an independent quality control mechanism. In particular, it could formalize the current fragmented production system and increase confidence in the final product.

Certification schemes are a key component of the regulatory framework and the formal seed sector in most countries. They provide a comprehensive quality control mechanism from the breeder/maintainer of the variety to the farmer who purchases "certified seed", based on the fundamental principle of traceability. The technical and administrative elements of seed certification are well known and are embodied in the international schemes managed by the Organization for Economic Cooperation and Development (OECD) to support the international seed trade.

Ethiopia has comprehensive seed legislation at the federal level and certification is a routine procedure for major cereal crops such as wheat, barley and teff; although the percentage of certified seed within the total seed requirement is small, as in many developing countries. The mechanics of certification are handled by regional authorities, and in most crops, the regional enterprises are the main seed suppliers.

A special feature of the national seed system is that the quality standards are prepared and published by the Ethiopian Standards Agency (ESA) in consultation with the Ministry of Agriculture (MoA). A separate standard exists for almost every crop (including forages) and they are remarkably detailed based on information collected from relevant sources worldwide. However, some aspects of these standards would be difficult or impossible to implement or enforce with the facilities at the disposal of the regional authorities.

In principle, all the elements of a certification scheme for forage seeds already exist in the published standards and they could be implemented immediately if the regional authorities wish to do so. However, in practice, very little forage seed is produced within the formal seed system. As a result, the certification system is not invoked for these crops. Despite the strong justification for increasing the availability and use of improved forage seeds, the regional enterprises still show little interest, probably for financial/commercial reasons that prevail over their social obligations.

In these circumstances, preparing the technical and administrative details of a certification scheme is unlikely to energize the existing system sufficiently in the short term. It will require a strong commitment by key participants and stakeholders to provide the technical services for certification and to follow through with the delivery of seeds

to end users. Such an initiative should probably be piloted at a regional level, where most of the seed system is now organized. Policy support from the regional Bureau of Agriculture and at national level from the Agricultural Transformation Agency (ATA) would be helpful. The Seed Policy and Seed Proclamation are currently under review and, if possible, these key documents should reflect the importance of improving the feed supply situation, given that this has been a matter of concern for many years.

A full certification scheme is demanding and costly to manage and this may be one reason why it has not been implemented for "marginal crops" like forages. An alternative approach known as Quality Declared Seed (QDS) places more responsibility on producers for the quality of their products and is; therefore, more flexible, provided the standards are respected. QDS is recognized under the Seed Proclamation and should be considered as an alternative to certification as an intermediate step.

The marketing system for seeds and other inputs in Ethiopia has traditionally been administered through official channels; this did not allow for direct connection between producers and users. It was also an impediment to the distribution of uncertified seeds, such as forages. The Direct Seed Marketing initiative is being rolled out and this model will facilitate the development of a real market for forage seeds, by linking producers and farmers more closely in a supply chain

The GIZ-funded FeedSeed project that ran from 2013–16 generated much useful information on the forage seed market, although it was probably too optimistic about the prospects for commercialization. There was no follow up and momentum has since been lost. It would be useful to revisit the outputs of the project, particularly with regard to the economics of seed production. A quality assurance scheme (certification or QDS) can only be implemented once there is an organized production system and a commitment among stakeholders to improve quality.

Despite the clear recognition of the need to improve feed supplies and the role that cultivated forages could play in achieving that, most of the livestock in Ethiopia are kept by subsistence farmers and they play a diverse role in the household. Farmers of this kind will not create a consistent demand for forage seeds because they will not see a cash return from their purchase. A more organized livestock industry is emerging and will be the main driver for increasing forage production not only by livestock keepers themselves, but also by arable farmers who could regard this as a cash crop. The wider use of irrigation would also increase the productivity of forage crops and make them a more attractive component of the farming system.

Discussion about certification schemes relates entirely to the formal seed sector, which still accounts for a small part of the total seed supply/requirement in all crops, except hybrid maize. Although cultivated forages were not part of the traditional farming system, there is a significant informal trade in these seeds. This is handled directly by farmers and traders who operate without regulation and sell directly to NGOs and other buyers at favorable prices. While this parallel production system does provide seeds to poor farmers who are clients of NGO projects, it inhibits the development of a more organized market because farmers are conditioned to receive free or subsidized seed. This issue requires attention at the policy level if a sustainable and financially viable production model is to emerge.

1. Introduction

There is abundant information reflected in several official documents regarding the importance of livestock in the rural economy. For this reason, a series of large development projects have targeted the livestock sector; many interventions have been proposed and implemented. Key among these is the need to improve the quality of available feed because natural pastures and low-grade crop residues still provide well over 90% of the intake. Many factors contribute to this situation, particularly the small size of farms and the general pressure on land use from an increasing population of both humans and animals. The diverse uses of livestock at household level and many social aspects add further complexity given the predominance of smallholder farming in Ethiopia.

The conclusion of most studies is that the productivity of livestock remains low and must be improved as a matter of urgency if their role as a driver in the rural economy is to be fulfilled. Increasing the supply of cultivated forage is one approach that has been extensively studied, and this in turn, creates a need for seed to grow these crops. Consequently, there has also been much research on the technology of seed production but despite concerted efforts over many years, the lack of sufficient good quality seed is routinely cited as a constraint to improving forage production.

The seed certification scheme proposed in this report is an attempt to formalize a very diffuse production system and thereby improve the quantity and quality of seed available to farmers. However, it is recognized that many external factors will affect the achievement of this goal. These factors are highlighted in the report so they can be discussed, and if possible, addressed from the start.

This report has been prepared by ILRI under a contract with the Feed III project funded by the United States Department of Agriculture (USDA) and managed by ACDI-VOCA in collaboration with local partners. For this purpose, ILRI hired Getnet Asefa[1] and Michael Turner[2], independent consultants with complementary experience, to carry out the assignment under supervision of ILRI staff. A workplan extending from February–November 2019 was agreed, allowing ample time for review and consultation. The first activity was a scoping study to provide a background to the work and; this was submitted at the end of March 2019.

This report is based mostly on fieldwork carried out by the consultants from 14–28 May 2019, during which time information was gathered and key stakeholders were interviewed (see Annex 3 for the list of people consulted). Most meetings were held in Addis Ababa but a visit was made to the EIAR station and ILRI seed unit in Debre Zeit to inspect the forage plots. An overnight trip was made to Bahir Dar to obtain a regional perspective. Some relevant text from the scoping study has been assimilated into this report, the priority now being to understand the current status of forage seed production and prepare a draft certification scheme as a basis for further review.

Section 2 provides a brief background to the livestock and feed sector, emphasizing trends and issues that may have implications for forage and seed requirement. Section 3 explains the key principles and practices of seed certification

1. Getnet Asefa was formerly Director of livestock research EIAR.

2. Michael Turner was formerly Director of the Seed Technology program at the University of Edinburgh, UK and later Head of the Seed Unit at the International Center for Agricultural Research in the Dry Areas (ICARDA).

that must be reflected in the scheme and Section 4 describes the current status of seed production, regulation and institutions into which the scheme will be placed, Section 5 considers some of the issues and challenges that may need to be addressed in making the scheme operational and sustainable and finally, Section 6 presents a summary of conclusions and recommendations. A proposed "guideline" for the scheme is presented as Annex 5.

According to the workplan, this report will be circulated to stakeholders for comment before being finalized and presented at a workshop later in 2019. To that extent, it should be considered as an interim document.

In view of the substantial amount of relevant information in the literature, an annotated list of key documents is provided in Annex 4, rather than referencing the text.

2. Background information

2.1 The livestock Sector

Livestock production in Ethiopia is the main means of livelihood for pastoralists and farmers. It provides food for the family, supports crop production and makes a significant contribution to the national economy. However, productivity remains very low mainly constrained by inadequate supply of quality feed. In the national development strategy, livestock is considered as a key driver for change. The Livestock Master Plan (LMP), the Climate-resilient Green Economy Strategy (CRGE) and the Growth and Transformation Plan (GTP II) all propose improved quality feed supply from the cultivation of forages as a key intervention for increasing productivity. Development initiatives by various agencies indicate that the supply of high-quality forage seeds is a critical constraint in achieving this goal. This calls for improved supply of forage seeds and a strengthening of the seed production system.

2.2 Feed resources

Insufficient feed of good quality is the most critical and widespread technical constraint. The main feed resources currently are natural grazing pastures and poor-quality roughage, such as crop residues. A recent assessment of feed resources by working groups established and supported by ATA in the four major regions of the country indicated that the contribution of cultivated forages and concentrates to the feed resource base was only 3 and 2 %, respectively (ATA, unpublished)[3], crop residues contributed 54.5% and grazing 40.5%. The national agricultural sample survey statistics in sedentary areas has also shown that the contribution of improved forages was only 1% (Central Statistical Agency 2017)[4]. Various studies on these feed resources in different agroecologies indicated that available poor-quality feed supply is hardly enough for year-round feeding of the existing livestock population. Under such conditions, transformation of the production and productivity of livestock is only possible through the supply of quality feed. Experience from many countries and various research recommendations in Ethiopia show us the wider use of cultivated forages clearly offers great potential for improving livestock performance in most of the regions in the country.

2.3 Role of cultivated forages

Research on forage crops was formally started as a national program when the Institute of Agricultural Research (IAR) was established in the mid 1960s. At this time, a wide range of tropical and temperate pasture and fodder species were introduced from different parts of the world with the support of the Food and Agriculture Organization of the United Nations (FAO). The aim was to broaden the genetic base for evaluation and to select suitable species and cultivars for the diverse agroecological conditions of the country. The former ILCA (now ILRI) also played a significant role in introducing various fodder species and establishing a collection of species indigenous to Africa. As a result of

3. ATA, unpublished report.

4. Central Statistical Agency (CSA). 2017. Agricultural sample survey 2016/17 [2009 E.C.]. Volume II, Report on livestock and livestock characteristics (Private peasant holdings), Statistical Bulletin 585. Addis Ababa, Ethiopia: CSA.

these efforts, ILRI has developed and recommended about 50 well-adapted forage crops together with appropriate production packages for the different agroecologies. However, the adoption of this improved material has been limited.

The advantages of cultivated forages include:

- opportunity to use a range of species and practices recommended for specific locations and production systems as a source of high-quality feed.
- ease of production close to dwellings and farmyards, including inaccessible areas.
- possibility of integrating forage production with food crops to improve soil management.
- relatively low cost of production.
- benefits to environmental protection and natural resource management.

2.4 Environmental context and justification

With frequent drought and degradation of natural resources, including grazing lands, and critical feed shortage in Ethiopia, forage crops have decisive roles in:

i providing quality feed close to the household, especially in areas where there is poor supply of other feed sources like concentrates.

ii combining the key objectives of improved conservation and productivity enhancement by introducing perennials and leguminous crops more widely in the farming system.

iii improving cultivated forage production to reduce global warming; pasture lands are very good carbon sinks and animals with higher productivity resulting from improved feeding regimes have lower greenhouse gas emissions.

It should be noted that Ethiopia is currently implementing a climate resilient green economy and wider use of forage crops is indicated in the different national strategies. This calls for a substantial increase in the supply of forage seeds and planting materials for implementing these strategies.

3. Overview of seed certification

3.1 Historical background

Certification emerged in the middle of the last century in response to the increasing number of varieties coming from plant breeding programs and the need to confirm the identity of these varieties for purchasers by carrying out field inspections of the seed crop. These schemes were often voluntary and were established by producers who wished to enhance the status of their products in the marketplace. The Crop Improvement Associations in the USA are a good example of this but similar schemes were set up in many countries. In due course, certification embraced the quality standards for seed lots that are determined by laboratory analysis and thus, became a comprehensive statement covering all components of variety and seed quality.

Certification was assimilated as an official process in some countries, particularly in Europe, where it was made compulsory for seeds of major agricultural crops. This has been a cornerstone of the regulatory regime for seeds in the European Union for the past 50 years and has helped raise quality standards across diverse countries and facilitated trade between them. When national seed projects were set up in developing countries from the 1970s onwards, certification formed part of the quality control/assurance component and was in some cases made compulsory for major crops, despite the limited capacity of local institutions to carry out the necessary technical work. In practice, these projects supplied a small proportion of the total seed requirement and the majority of farmers continued to depend on traditional sources within the farm or local community.

Certification is an essential element in the formal seed system, which is subject to official control based on laws and regulations. In contrast, unregulated sources such as on-farm seed saving, community exchange or purchasing in local markets, are collectively referred to as the "informal seed system"[5]. For smallholders in tropical countries, this remains the default source of supply for cereal and legume crops, in which it is easy to save a portion of the grain from one harvest and use it as seed the following season. There is little differentiation between seed and grain in the informal system. From a farmer's perspective, the informal system has advantages and it should not be regarded in a purely negative way. There is sound logic in retaining seed of open pollinating crops on farms and renewing the stock every three to four years; hence the concept of "seed replacement rate".

3.2 Guiding principles of certification

Certification schemes are now used in many countries as the standard system of seed quality control. They provide a comprehensive package of measures that is intended to monitor each stage of the seed production process and thus, assure the quality of the final product sown by farmers. This is achieved by prescribing standards and procedures for the production field and for testing the seed lot after harvest. To support these activities, there must be a system of

5. The term "seed system" has come into common use in recent years as an umbrella covering all the mechanisms through which farmers meet their annual seed requirement. Besides the clearly defined formal and informal areas, there is much interest in semi-formal and integrated seed systems, which fill the space in between and may have particular relevance to the needs of developing countries.

record keeping that follows each crop from sowing though to final sale in sealed units, which are labeled as certified seed. This is always the generation sold to farmers.

This sequence of control measures is applied not only to the final generation but also to preceding multiplications leading back to the breeder, who is responsible for maintaining the variety in its original genetic condition[6]. This gives rise to the concept of named generations and a system of reference numbers for seed crops and lots that link them together. In this way, seed certification was an early example of traceability, which is now widely used in many spheres of production. It is especially important in seeds because each stage of multiplication carries risks of contamination or deterioration.

The label is a key element of the scheme because it is a symbol of the entire quality control system. For this reason, it is essential to maintain the reputation and status of the label in the eye of the users. It has the same function as a logo or a brand name but of course it can be used by many different producers and requires good supervision to maintain consistent standards. The entire scheme may lose credibility if the reputation of the label becomes compromised through poor supervision or deliberate malpractice. These issues are relevant to the scheme proposed here.

3.3 Practices

The key components of seed certification are common to all schemes and are listed below.

- The variety must be known and registered with a description of its characters sufficient for it to be distinguished from other varieties of the same species/crop and for its identity to be confirmed during field inspection.
- The production field must meet certain criteria, particularly with regard to its previous cropping history, uniformity and general agronomic suitability for the crop.
- The crop must be formally entered in the certification scheme and given a reference number; there may be an application fee at this stage according to the size of the crop.
- The grower (company or individual farmer) must normally be registered as a recognized seed producer and there may be some specific criteria for this.
- The seed sown must be of known origin (with a reference number) and ultimately, traceable to material produced by the breeder or maintainer through named generations.
- During the growing season, the seed crop must be sufficiently isolated from any other crop that might cause contamination; isolation distance depends on the pollination mechanism of the species and may range from two metres to a kilometre or more.
- The crop is inspected one or more times at critical growth stages to confirm that it is free of contaminants, particularly other varieties of the same crop, and that the isolation requirement is satisfied. A crop inspection report is then prepared; the crop may be failed if it does not meet the required standards, but re-inspection is generally allowed within a specified period if the reasons for failure have been rectified.
- The harvest and post-harvest procedures must be carried out in an approved way to avoid any risk of contamination of the seed lot. The facilities used for seed cleaning (processing) and storage may need to be registered and approved by the scheme; they may be subject to spot inspection to confirm that correct procedures are being followed. All bags used at this stage must be clean and labeled immediately.

6. The maintainer is not always the original breeder; this task may be transferred or delegated to others. The key issue is that there is a person or institution responsible for maintaining the genetic quality of the variety in its original state and producing breeder seed on a regular basis to initiate the multiplication cycle.

- After processing is complete, a sample is taken from the seed lot according to defined procedures and specified quality tests are carried out on this sample in a laboratory, again following the procedures established for the species. A reference sample of the seed lot is kept by the laboratory for a specified time (normally one or two years) in case of disputes about quality.
- If the crop inspection report and all laboratory tests are satisfactory, the seed lot is given a reference number and is regarded as being "certified" and ready for sale. A fee may be charged at this time to issue the certificate.
- When certified seed is sold, it must be in a closed package and must carry an official label that shows the reference number and any other information specified under the scheme. If any defects are subsequently found in the crop, the source should be traceable. Seals or other techniques may be used to reduce the risk of tampering.
- Ideally, a post-control plot (or grow-out test) should be carried out on a sample of the seed lot to confirm that it complies with the standards of genetic purity. This is not always done in practice because of the resources required. Post-control plots may be carried out on a certain percentage of the seed lots, or on those that may be suspect.
- In addition to these technical elements, there must be an administrative office that takes care of all the above activities, keeps the records, allocates numbers and issues labels. The availability of computers has greatly simplified this process. Crop inspection reports can now be entered directly in the field and all information about the crop and seed lot can be kept in a central database.

All the above activities would normally be carried out by a designated seed certification agency but the task may belong to other organs of the Ministry or delegated to third parties. Trained personnel are required for the key technical operations of inspection, sampling and seed testing. Because of the seasonal nature of crops, it can often be difficult to inspect all crops within a limited time and this prompts the use of licensed inspectors who are employed on a temporary basis.

Implementing a certification scheme involves a considerable amount of work in the field, laboratory and office, so it is customary to charge the users, who are normally seed companies. The level of charging is a matter of policy; it may vary from a token amount to full cost recovery. If certification is provided at very low cost as a service to farmers, it may then be a considerable burden for the Ministry. This raises the prospect of weak implementation. There is a global trend towards the delegation of certification to third parties, with the government playing a monitoring role.

The scheme proposed in this report should define how each of the above activities will be carried out in a coordinated way. In practice, this will need to be linked to existing quality control activities carried out for other crops for which an organizational framework is already in place. However, forage crops may be more demanding and may be less well served by the system than cereals and legumes. If difficulties are foreseen, alternative arrangements may be required for the scheme to be successfully implemented and achieve its goal. These issues are discussed in Section 5.

3.4 Special considerations for forage crops and seeds

These main components of certification described above are common to all schemes, but forage crops may present some additional challenges because:

- varieties may not be well-defined and less uniform than is normally the case in grain crops such as cereals and legumes, although there are also far fewer varieties.
- management of the crops and field inspection may be more difficult due to their branching habit and perennial growth, which means that seed can be harvested in successive years from the same crop.

- seed quality attributes such as purity and germination are often more difficult to determine accurately. Therefore, it may be necessary to adopt specialized testing procedures and accept relatively low standards for certification purposes.

- some forage crops are propagated by cuttings or root splits and may not produce seeds. It is still possible to certify these vegetative materials, but the procedures are completely different.

One positive attribute of forage grasses and some legumes is that the seeds are small, which means a high multiplication factor can be achieved in each generation. This reduces the number of generations required to supply commercial quantities from the small stock of elite seeds released by breeders. It is a basic principle of seed production that all possible steps are taken to maximize the multiplication factor through good crop management, reducing the number of generations required. For this reason, seed production should always be done with farmers who have sufficient resources and ability to manage the crop well.

Most of the species used as cultivated forage crops in the tropics were not part of traditional farming systems and because of their more complex seed production practices, they may not be easily accommodated in the informal system. Moreover, quality might be unpredictable because of their more complex seed structure and physiology. This provides a justification for having an organized system of forage seed supply that can meet the demand for livestock feed in a sustainable way.

It should be emphasized that seed can be harvested opportunistically by allowing an ordinary forage crop to flower after a certain period of cutting. This may enable seeds to be produced relatively cheaply by farmers without any special management procedures or quality control, enabling them to enter informal trade. According to various sources of information, seed produced by farmers informally is the major sources of seed supply in Ethiopia. Perennial grasses and oats may be particularly susceptible to this approach. A contrary possibility is that a crop grown for seed production may be harvested prematurely as forage if there is a good market price. These scenarios arise because unlike grain crops, there are alternative uses and market options for forage crop during its lifespan. Such alternative sources of supply are not subject to any quality control process and therefore constitute a risk for the final users.

3.5 International dimensions of certification

The Organization for Economic Cooperation and Development (OECD) provides certification schemes to facilitate international trade in seeds[7]. These focus on eight different groups of crops, one of which includes 86 grass and 54 legume species. The species list does not differentiate on the basis of use and while many of the grasses are used for forage, the legumes include both food and feed species. As of 2018, 61 countries participated in one or more of these schemes as producers or importers according to their needs. The members of the OECD schemes are predominantly countries with a temperate climate and the crops covered are largely, but not exclusively, grown in temperate regions. Countries that make most use of these schemes are those that are major producers for export into the international trade, such as Australia, Canada, Denmark and New Zealand. In East and Southern Africa, the only member countries are Kenya, South Africa, Zambia and Zimbabwe. Among these, only Kenya and South Africa are in the herbage scheme. The certification agencies in those countries are Kenya Plant Health Inspectorate Service (KEPHIS) and South African National Seed Organization (SANSOR), respectively. Participation in the OECD seed schemes is open to any country and does not require membership of the OECD itself.

It should be noted that the OECD schemes relate specifically to varieties and no standards for purity and germination of seeds are specified because these are matters of national legislation. In practice, seed moving under OECD labels would generally be accompanied by an Orange International Certificate issued by a laboratory accredited by the

7. The full title of the document is "OECD schemes for the varietal certification of seed moving in the international trade", 172pp. It sets out the general conditions for certification and specific requirements for the different groups of crops in a series of annexes, one of which relates to grasses and legumes.

International Seed Testing Association (ISTA). Ethiopia does not have an ISTA accredited laboratory but the seed testing laboratories that do exist, whether in institutions or companies, would probably use the ISTA Rules for carrying out seed analysis. This is standard practice because the rules are based on long experience and validation by seed analysts. Most forage species grown in Ethiopia appear in the ISTA rules, but these only specify the procedures for testing, not actual standards. Of course, there are no standards for vegetatively- propagated species, which would require different procedures if they were to be included in the scheme proposed here.

Given the predominance of the OECD schemes as a global model, there is little justification for following up on the domestic schemes of individual countries because these will, or should, broadly follow the OECD format. The seed quality standards of other countries such as Kenya or South Africa may be of interest if they are radically different from those published by ESA for Ethiopia.

4. Current status

As explained above, certification is a regulatory procedure and a key component of the formal seed system in many countries. To implement a certification scheme for forage seed in Ethiopia, it will be necessary to integrate the practices and requirements listed in section 3.3 into the existing regulatory framework and to apply this to the existing seed production system. Based on consultations with stakeholders and review of available documents, this section outlines how this alignment may be achieved and where problems might arise.

4.1 The regulatory framework

The primary legislation governing the seed sector in Ethiopia is the Proclamation on Seed (No 783/2013). The secondary legislation was made under the previous proclamation in 2002 and has not yet been revised. It is not known if this gives rise to any practical problems in implementation. The proclamation has been reviewed recently and a revised version is expected within one year. The changes will have the effect of simplifying the registration of varieties but should not have any major impact on forage varieties because they all originate from the official research stations of EIAR or the regions. Another motivation for reviewing the proclamation is that Ethiopia is a member of COMESA, which has a regional seed scheme. However, this scheme does not currently include any reference to forage seeds. The proclamation applies to all regions but responsibility for carrying out some of the tasks, including quality control, rests with authorities in the regions.

The proclamation does not explicitly state that seed certification is compulsory although that is implied by Article 13, which refers to the issue of a certificate of seed quality. It is said that bureau and woreda offices do expect the seed they handle to have an official certificate. Thus, certification would be compulsory in practice for seeds distributed through this channel. The major grain crops are normally all certified; however, the category of Quality Declared Seed (QDS) is also recognized in Definition 13 and Article 13 of the proclamation and the possible use of this option is discussed in Section 5.2.

Eligible varieties

Varieties can only be multiplied and certified if they have been evaluated and approved by the National Variety Release Committee. They are then included in the crop variety register published annually by the MoA. The most recent issue (no. 20) is dated June 2017 and the 2018 edition is currently in preparation. This is a substantial document of 370 pages listing all varieties of the crops covered by registration procedures. At present, there is no procedure for review or deletion and many of the varieties listed are actually obsolete. This issue may be addressed in the current revision of the proclamation.

Forage and pasture crops (Group VII) are covered in pages 327–357 of the 2017 register, which lists a total of 23 species and 49 varieties, as shown in Annex 1. It may be assumed that many of these have been superseded by later introductions and that only a relatively small number would be considered for inclusion in the scheme. The final list of eligible varieties will be agreed between the key stakeholders when the scheme is being finalized. Initially, it would be

desirable to select one superior variety from each of the major crops and with six to eight varieties in total reflecting the different uses and agroecologies. This will make the scheme manageable and allow its procedures to be developed and tested gradually.

Almost all varieties listed in the register have been released from EIAR or regional research institutes. They are mostly based on lines originally obtained from ILRI and evaluated to identify those best adapted to specific agroecologies. There is no active breeding of forage crops in Ethiopia because the diversity of material held in the ILRI gene bank, including many introduced accessions, is considered to be a sufficient resource. Forage oats are the subject of commercial breeding in some countries, but the resulting varieties will almost certainly be protected. This issue is discussed in section 5.4.

The procedures for variety registration are set out in Part 2 of the proclamation and are based on a review of all available information by the National Variety Release Committee, which recommends addition to the register. In the year of first registration, a description of the variety is included in the register and this would be the point of reference in subsequent years. This does not amount to a full morphological description, as would be required for distinctness, uniformity and stability (DUS) testing that is required for plant variety protection.

No attempt has been made to evaluate the registration system and evaluating perennial forage varieties is intrinsically more complex than grain crops because of the extended period of production, the many quality attributes involved and different systems of management. However, there is substantial experience of forages within the research system and new varieties are regularly added to the register, as shown in Annex 1. It may be assumed that the variety evaluation and registration system is effective and is certainly not an impediment to the introduction of new materials to the market.

Variety maintenance and naming of generations

The proclamation requires the breeder to maintain the variety and defines the subsequent generations as breeder, pre-basic, basic and certified, in accordance with the nomenclature of the OECD scheme. The color coding of labels for each generation also follows the OECD scheme and is being applied for cereal crops.

Field standards and seed standards

These are not part of the proclamation itself but are contained in "specifications" published by the Ethiopian Standards Agency (ESA). There is one standard per crop and almost all the forage crops have a standard, as shown in Annex 2. Among the important forage species, Desho (*Pennisetum glaucifolium*) is the one notable exception but like Napier grass, it is propagated vegetatively and will not fit into a "seed scheme". The intervention of a national standards institution in seeds is unusual, possibly unique, and presumably reflects a strong culture of standardization within the government system. However, the standards are prepared by the Technical Committee for Seeds (TC16) in which the MoA participates. Since certification is apparently compulsory, these are effectively the standards that would be applied within the scheme.

The actual standards presented in these specifications are extremely detailed and contain all possible quality attributes, particularly with regard to seed health, the assessment of which is quite demanding. Moreover, the generations named do not reflect the reality of seed production in many of the crops, including forages. These standards have clearly been prepared as a rather theoretical exercise using many different sources of information to achieve maximum control but without sufficient consideration for the practical implications in seed production or seed testing. This is a possible impediment and it discussed in Section 5, together with the alternative strategies that might be available. Many of the details, particularly on seed health, may be overlooked in practice because the tests are not relevant or cannot be carried out. However, attention should be given to any specific pathogens of forage that may be seed transmitted.

The technical procedures related to quality control, such as the sampling of seed lots and laboratory testing, apply to all crops and are set out in separate specifications from ESA. These are also shown in Annex 2 for reference.

Implementation and documentation

Part four of the proclamation assigns responsibility for implementing seed quality control to the regional authorities responsible for agriculture. At present, only Amhara, Oromia, Southern and Tigray bureaus have established the necessary infrastructure although it is reported that others are working on this. In the case of Amhara region, the full title of this body is the Seed Quality Control and Quarantine Authority.

We visited Amhara region and observed the procedures of the Amhara Seed Enterprise. They carry out their own internal quality control throughout the production and processing chain and fix their own label to each bag when it is closed with stitching. Staff of the Authority visit the store periodically to take samples from the bagged seed lots and test these in their own laboratory. If the standards are satisfied, a sticker is added to the company label to confirm that the seed is officially certified by the authority. This is a logical procedure, but the addition of stickers looks like a time-consuming job that requires every sack to be handled again. An alternative approach in many countries is for the internal laboratory of the enterprise to be accredited for certification and for its results to be monitored by random/spot testing of seed lots.

It should be noted that the process described above is not radically different from that of a QDS model. The primary quality assurance work is done internally by the enterprises and their results are checked by the relevant authority. If only a randomly selected proportion of the seed lots were sampled for the monitoring function, this would effectively be a QDS system. For historical reasons, the regional enterprises all have seed testing facilities whereas other independent companies probably do not, with the exception of the international company Pioneer.

The various forms and other procedures relating to quality control are stipulated by the MoA in the regulations and are used nationally. Some aspects may be specific to certain crops like hybrid maize. It is assumed that other minor modifications could be made if required, such as in the case of perennial grass crops. Whatever forms exist at present would be used by the proposed scheme.

Other regulatory procedures

Part five of the proclamation requires any party involved in seed activities to hold a "certificate of competence". There is a clear guideline (in Amharic) that describes all the steps and criteria required to obtain a certificate of competence. It is understood that at present, no fee is charged for this process. If the activities are conducted within one region, then it is the regional authority that issues this certificate.

The requirements for labelling of seed packages/containers are set out in the standard ESA 481. Based on labels used by the Amhara Seed Enterprise, the information provided includes species, variety, weight, lot number, date of sealing, purity, germination and moisture content. Given the small size of the label, this information has to be written by hand on each label.

Plant variety protection

While considering regulatory issues, it is appropriate to mention that plant breeders' rights (PBR) exist in Ethiopia under Proclamation No. 1068/2017. However, the system is not in use yet because the Ministry does not have the facilities to carry out the necessary tests for DUS. Even if this system were operational, it is very unlikely that PBR would have any relevance to forage varieties from the public sector. ILRI would have a view on this since they are the source of the materials. In principle, a foreign breeder could seek PBR for an introduced variety, but this would depend on the confidence they have in the enforcement of the law, which could be problematic. The purpose of PBR is to secure revenue from the use of protected varieties through a royalty system but this is difficult to manage when the majority of farmers are smallholders.

4.2 The formal seed sector

The public sector is still a dominant player through one national and four regional seed enterprises. These handle the full portfolio of agricultural (grain) crops, including the less profitable self-pollinating crops such as teff, wheat and barley that are unattractive to the private sector. They are expected to break-even financially but also have a social/development role in providing a reasonable quantity of certified seed. In practice, they are the delivery arm for the EIAR and regional research stations but despite this, they do not supply forage seed to any significant extent

The major international company is Pioneer, which produces and sells large quantities of mid-altitude hybrid maize seed, all from its own breeding programs. Pioneer gained this commanding lead by forming a joint venture with the former Ethiopian Seed Corporation when it was restructured. Unlike neighboring countries, none of the other international companies are significant players in the market. All local companies are relatively small, leading to lack of commercial diversity in the market. The reasons for this are beyond the remit of this report but it may reflect a relatively restrictive environment in which the government is still a major player, again for historical reasons. This is now changing, as evidenced by the expansion of the direct marketing initiative, and this may encourage greater private sector participation.

The delivery system for seeds and other inputs involves the woredas, unions and coops in an administrative process and makes conventional marketing difficult. This approach has legal force through Article 7 of the Proclamation entitled "Integrated Production Planning". The direct seed marketing initiative is promoted by the ATA and supported by International Food Policy Research Institute (IFPRI) in an attempt to address this issue and it is making steady progress.

The Ethiopian Seed Association exists to represent the commercial seed sector. It has about 25 members including the five public sector enterprises; but only half of its members are said to be active. It is indicated that there are more than 50 national and multinational companies operating in the country but most of these are producing only a few cereal crops (maize, wheat, teff and barley) and satisfy only a small proportion of the national requirement. These companies are not generally engaged in the production of more difficult crops such as vegetables, forage crops or legumes. The association should be more active in strengthening the commercial seed sector in order to fulfill the needs of Ethiopian farmers.

4.3 The forage seed production system

Overview of the crops

In principle, a very wide range of forage crops is available and the ILRI gene bank is a major global resource from which Ethiopia has derived great benefit over the years. In practice, the range narrows to a relatively small number of crops when agronomic and feeding attributes are taken into consideration. ILRI has produced a series of information sheets on the most useful species. The most likely candidate species for inclusion in the certification scheme are given in Table 1.

Table 1. List of candidate forage species to be considered in the certification scheme*

Grasses/cereals		Legumes	
Rhodes grass	*Chloris gayana*	Alfalfa	*Medicago sativa*
Guinea grass	*Panicum coloratum*	Vetch	*Vicia villosa*
Oats	*Avena sativa*	Lablab	*Lablab purpureus*
Brachiaria	*Brachiaria decumbens*	Pigeon pea	*Cajanus cajan*
Buffel grass	*Cenchrus ciliaris*	Cow pea	*Vigna unguiculata*

(*Prioritization to be finalized before implementation)

From a seed production perspective, the key division is between annual crops (mostly legumes and oats) and perennials, (mostly grasses and some shrubby legumes). Besides having a quicker growth cycle, the annuals present fewer technical problems and some (oats, lupin and lablab) can effectively be treated as grain crops, making on-farm seed saving easy. Therefore, they may pass into the informal seed system and be more difficult to sell on a regular basis.

The perennial grasses are more demanding in terms of seed production and often require special techniques to obtain good yield of high-quality seeds. These have greater potential for commercial sale provided that the quality can be assured, although the long cycle of production means that demand is unpredictable. Napier grass and Desho do not set seed reliably and are propagated by stem cuttings or root splits. The certification of such vegetative materials presents quite a different problem compared to seed crops and this would introduce a complication if included in the scheme initially.

Forage seed production

As already noted, forage seed production has a very long history and there has been a substantial research effort on this subject to overcome perceived constraints. The national workshop on forage seeds held by EIAR and the proceedings listed in Annex 4 show clearly the extent of this work across all regions of the country. Likewise, the report of the FeedSeed project, also listed in Annex 4, provides detailed information on this subject and should be regarded as a supporting source of information.

There are four types of forage seed producers that may be subject to, or benefit from, a seed certification scheme. These are:

National research institutes: EIAR's research stations and the regions produce a significant quantity of seed to meet the needs of their demonstrations and other outreach activities. In some cases, they may also sell seed on a semi-commercial basis, depending on land availability and official policies. The fact that this production continues in significant quantities reflects both the importance attached to forages by the institutes and the lack of true demand pull that would encourage commercial entities to take over the task. If that demand existed, the research stations would maintain their varieties and supply basic seed on request to feed a commercial multiplication and marketing chain. That should be their main function once demonstrations have stimulated sufficient interest.

ILRI: has been a significant seed supplier for the past 30 years using its seed production unit in Debre Zeit. This has been declining through the years due to the loss of irrigation facilities. Regardless of this current constraint, the role of a CGIAR centre as a regular supplier of seed is questionable, although the unit does aim to cover its costs through the price it charges. Again, the fact that ILRI has continued to act as a seed supplier shows the real interest in cultivated forages and the difficulty of shifting the task to other parties, especially to the private sector.

Semi-formal producers: GIZ's FeedSeed project implemented by ILRI from 2013–16 made a concerted effort to make forage seed production sustainable. It recruited a group of 30 interested farmers and provided intensive training in both production technology and business management. Given this highly focused approach to a well-defined problem, the project can be considered as providing maximum possible support; it was judged by the donor to have been successful and was not extended or renewed. At present, it is said that 12 of the group remain as regular producers but they still face problems of unfair competition, weak demand and lack of recognition for their product. These issues are discussed in the next section. The only dedicated forage seed company in Ethiopia—Eden Field—was a partner in this project and they have a substantial business that started with forest tree seeds and then embraced forages. Despite being market leaders in these seeds, it seems that they have not been inclined or felt the need to adopt certification. Consequently, their production must still be regarded as "semi-informal" even if it is quite substantial and organized.

Informal producers: there are a number of traders who carry out opportunistic seed production with farmers, often on a substantial scale. It is understood that they have no quality control system and do not comply with any of the regulations. Despite these legal and professional shortcomings, their business model must be considered as

sustainable. Their key strength is the ability to offer large quantities of seed to development projects and NGOs who put out tenders and offer good prices. It is also reported that the regional bureaus also purchase these seeds in order to address short-term needs. Complaints about the quality of forage seeds may well be due to the activities of these traders and the absence of any control in the supply chain, which provides many opportunities for malpractice. It was not possible to visit any of these producers during the mission and the information about them is secondhand, but they are well known within the regions and to NGOs who buy the seeds.

The total amount of seeds supplied annually through the above channel is difficult to quantify because the contribution of the informal producers is not known. However, there clearly is demand for these seeds as shown by the suppliers listed above. Calculation of the demand for the period 2014–18 was made in the GTPII and LMP, but these are theoretical and have not been achieved. The FeedSeed project report also presents data on production by its participants and other market information.

4.4 Policy context

The seed sector in Ethiopia has been subject to much analysis. A seed system development strategy (Annex 4) was prepared for the period 2013–17 as a consultation document but this made little reference to forage seeds. It is assumed that the policy will serve all seeds, including forage seed. A new policy document is under active consideration at present.

Given that there is a substantial and recognized need for forage seeds but little effective demand, it would be appropriate for the new policy to address this inherent contradiction. Banning free seed distribution would be a possible step but is probably too controversial. However, it would be reasonable and equitable for the NGOs to accept a code of conduct for their activities, so they do not prejudice the emergence of a viable trade in forage seeds.

The National Seed Advisory Group serves as an apex body for the seed sector and should be the guardian of the policy. Since the promotion of cultivated forages and increasing seed supply is a strategic concern in the rural sector, this group should address the issue and reflect it in the revised policy.

5. Design and implementation of the scheme

5.1 Constraints in the present system

Against the background of the three preceding sections, we now come to the key challenge of how to design a certification scheme that will achieve its intended purpose and be sustainable.

Contrary to expectations, there is a forage seed certification scheme in Ethiopia. It is not specifically described or defined as a scheme, but all the components are there in the regulations and standards; just as they are for the major arable crops like maize, teff and wheat, which are certified on a routine basis. The regulatory framework is in place, but it is simply not used. Although production is a problem in some crops, this is not a major impediment because several actors are producing seed and they could produce more. The obstacles lie in three main areas: uncertainty about demand, technical capacity for conducting quality assurance and bureaucratic complexity in the seed delivery system. These are discussed below.

Demand for forage seeds

Everyone consulted during the mission agrees that there is a need for forage seeds. This is why various actors are trying to satisfy that need for their respective clients at subsidized prices and, in some cases, free of charge. However, this does not translate into a consistent demand from customers who are prepared to pay a real market price and support a viable commercial trade. This uncertainty about demand has a deterrent effect on producers because they may simply prefer other uses of their land that give a quicker and more reliable return. The case of alfalfa is less clear because the seed price is relatively high and there appears to be real demand, even for expensive imported material. A more serious intervention by the private sector might be expected in this crop.

NGOs are a perverse force in this arena because they pay a good price to informal producers but undermine the development of a real market by their subsidized distribution of this material in their projects. It is widely stated that farmers are conditioned to receive this cheap or free seed and are therefore, reluctant to pay for it, certainly not a commercial price. This is a serious problem that may be difficult to overcome because the NGO activities provide poor smallholder farmers and incur no cost to the government, but these farmers do not continue cultivating forage crops when projects phase out. They and their suppliers are presumably tolerated by the official system for that reason, even though they do not undertake proper quality assurance or comply with the regulations. Regardless of the benefits to poor farmers who are the immediate beneficiaries, in the long term, Ethiopia will need a market-based forage seed supply system to support the development of a commercial livestock sector and reduce pressure on the environment.

The fact that grass crops are perennial removes the need for farmers to repurchase in any particular season and these fields may be kept for many years, albeit with declining productivity. This makes demand inconsistent, a scenario that is familiar to herbage seed suppliers in other countries. The herbaceous legume species, as well as oats, can be maintained through seed saving on farm. Seed of browse shrubs would be required in small quantities and can probably be sourced within the community.

Farmers must feel confident that the investment they make in purchasing seed will be repaid in the yield and quality of the crop they grow. In the case of forage seeds, yield (or overall value) is a more complex parameter because of the different ways in which forage can be fed to stock, the relationship between biomass yield and feed quality, and the perennial nature of some crops. Husbandry techniques can strongly influence the optimization of feeding value of the crop and this is yet another factor that may affect the readiness of farmers to purchase forage seeds unless they have been trained. It is probably only under conditions of good management that the benefits of cultivated forages become sufficiently evident to encourage regular seed purchase.

It would seem that the typical Ethiopian smallholders with one or two cattle are subsistence farmers and despite having a significant asset in these animals, they have limited participation in the cash economy. In the field of mainstream seeds, it is clearly understood that one cannot sell seeds on a regular basis to subsistence farmers because they don't relate the cost of seed purchase to cash return. It is only when farmers become connected to a market and regularly sell their surplus that they are willing to purchase seed regularly. This is the classic story of hybrid maize in Kenya.

NGOs are probably improving the livelihoods of their subsistence clients, but this will not lead to regular demand for seed. That will only come when commercial livestock enterprises have to decide on their preferred source of feed and select cut forage as a viable option. They should then become regular buyers and forage may also become a cash crop for other farmers to grow. Taking all the above factors into consideration, it is not surprising that real seed demand remains weak.

Technical issues in quality control

The seed testing laboratories of regional bureaus and enterprises have little/no experience in testing seeds of forage species and are probably reluctant to get involved in this work. They are geared up to a throughput of the main cereal crops and prefer to keep it that way. In principle, this should not be a problem because seed analysts could easily learn how to handle these seeds and ILRI has all the background experience to provide additional training if that is needed.

The same would apply to crop inspection, which may be unfamiliar to staff of regulatory authorities but does not involve fundamentally different work to that which they normally do. Both of these issues are probably a matter of management that could be overcome if the motivation was there but enterprises are risk averse given the uncertainty on demand, and the requirement for the enterprises to break-even. The regional authorities will not become involved until there is seed being produced but as already explained, all the technical information and regulatory framework is in place for them to do that work if required.

Complexity of the seed supply system

As noted in section 4.2, the channel for seed delivery is not straightforward, although the situation may be easing as direct seed marketing expands. The present system involves the woredas, unions and coops in a bureaucratic process of reconciling demand and supply, with the intention of facilitating the overall system and (hopefully) ensuring equitable allocation. There is much anecdotal evidence that this system does not work well but it is long-established and probably has its supporters. It is geared to seeds of major grain crops that are produced and required in large quantities. Therefore, it is not surprising that niche crops like forages are difficult to accommodate, both from the supply and demand side. Another negative factor is that the present system requires certificates for the seed lots it handles and since forage seeds remain uncertified, they may not be accepted. One company specifically mentioned this as a marketing problem.

For all of the above reasons, the DSM model of seed supply would be a more effective approach if it can connect producers and forage growers directly without any bureaucratic intervention. It would also enable producers to benefit from the reputation of their product if it is clearly identifiable to the buyer through the label and/or logo.

5.2 Quality declared seed (QDS)

QDS was prepared and promoted by FAO as a way to reduce the burden of full certification. It places more responsibility on the producer to carry out quality assurance and monitors compliance through random or systematic inspection. FAO documentation provides a framework of principles with details that can be adapted to local circumstances and needs. QDS may be regarded either as a steppingstone to certification or as a permanent solution when certification is too expensive or too difficult to implement. The success of QDS depends very much on the resolve of producers to follow the correct procedures and maintain high standards. If a member fails to do this, the scheme may lose credibility and jeopardize the sales prospects for all.

The Seed Proclamation recognizes Quality Declared Seed and defines it as "seed produced by organized and registered smallholder farmers or registered small farmers, in conformity with the required standards". Guidelines for implementing QDS have been prepared but only in Amharic and it is not known to what extent they are being used by regular seed producers[8]. It is assumed that the required standards are still those from the ESA specifications but that some other aspects of production, especially crop inspection, would be left in the hands of the producer or an overall coordinator. It would still be necessary to have some mechanism for assessing seed quality; otherwise it will not be distinguished from seed produced by informal producers.

The QDS approach could clearly be relevant to forage seeds if a producer group could be formed and organized. This could hold the "certificate of competence" but the members would still have to be registered and it is not known what this would involve. It is essential to obtain a copy of these guidelines and study their implications. It is interesting to note in Annex 2 that a QDS standard has been prepared for lablab recently. This implies that ESA and the technical committee are prepared to take account of the QDS model. Seed produced by farmers supported by ISSD may effectively be considered as QDS and their experience in this connection may be relevant.

5.3 Ownership and sustainability of the scheme

It is clear that there is no ownership of forage seed certification at present because no entity has shown sufficient interest to use what already exists in the regulations. This may be due to lack of awareness but more likely because the other impediments listed in section 5.1 have deterred anyone from investigating the opportunities. An existing seed company would be the most likely new entrant, but members of the seed association must already be aware of Eden Field and they have decided not to diversify and compete in that business area. Considering the high priority attached to forages and the depth of experience in ILRI and the regional research institutions, it is surprising that none of the regional enterprises have made a greater effort to drive the seed production chain. The scheme proposed here will have to involve the research centres as suppliers of breeder/basic seed for multiplication. It will also need the support of regional authorities for seed quality testing, unless some other body can take on that specialized task, which is unlikely in the short term.

Simply declaring the details of a scheme will have little impact unless some other actions are taken to give it an identity in the market and provide some initial momentum to encourage production and facilitate marketing. There is sufficient experience on production, particularly among the FeedSeed growers, but it requires too much effort for them to do quality control and marketing individually. If these burdens could be taken over by an umbrella body, then production may be more attractive. It would be logical for the group to use the QDS model rather than full certification since it allows more flexibility in the quality assurance system. The group could hold the certificate of competence and assist individual members if they need to be registered as growers. These details need to be worked out when the scheme is being designed and launched.

Marketing arrangements should be coordinated and must involve direct selling to livestock enterprises or individual farmers who produce forage for sale as the business develops. The involvement of bureaucratic intermediaries will be a

8. It is reported that QDS was developed partly to meet the needs of potato seed production but that is a very different activity.

handicap to an embryonic scheme, unless a coop or union has a special interest in promoting cultivated forages among its members. Regional research centres have ample experience in promoting cultivated forages through demonstrations and they probably also know the more organized livestock producers who would be potential customers.

The guideline presented in Annex 5 describes the key aspects of this approach, although it is not exactly a certification scheme as originally foreseen. Instead, it is a quality assurance scheme that is sufficiently robust to meet regulatory requirements and, with motivation of members, to maintain high standards. As mentioned in section 3.1, this was the origin of many voluntary certification schemes, which were initiated by committed farmers or groups to promote their seeds within the farming community.

The portfolio of crops and varieties must be chosen carefully, reflecting both the production aspects and the income stream from annuals and perennials. Seed enterprises commonly live with a situation in which several products make little or no profit, while one or two keep the business running. In Ethiopia, alfalfa seems to be the most promising crop in the portfolio and efforts should be made to exploit this as much as possible by securing the best varieties and maximizing seed yield by growing in optimum locations. Pricing will be critical and market information can be collected but the selling price must cover production costs and a margin for overheads and risks. This will need some financial analysis and must start with a reasonably robust model that can tolerate the expected market fluctuations. Reports of the FeedSeed project may have relevant information on this, although now four years out of date.

A stand-alone seed enterprise is always vulnerable to cash flow problems because of the strong seasonality of production and sales. This is true even in the main cereal crops; forages have additional problems, especially their perennial habit which removes the need for annual purchase. One solution is to link the seeds with other businesses that have the same general interest but more consistent or different cyclical cash flow. This can provide synergy in the product range and greater financial security. These suggestions go beyond the remit of designing a certification scheme, but they reflect the need to place the quality assurance scheme in a commercial context and achieve better prospects of sustainability through a viable business model. This was a key objective in the FeedSeed project (see Annex 4) but it was not followed through to implementation and momentum was lost after the project ended. Local stakeholders may be able to identify possible options, and this can be discussed in more detail prior to implementation.

5.4 Role of imported varieties

This study is predicated on the use of material/varieties coming originally from ILRI via various regional research stations that have carried out adaptive trials. However, the ultimate goal is to improve livestock feeding and productivity, and the door should be open to any variety that can help to achieve that goal. ILRI has long experience in the procedures for secure variety introduction and can continue to provide that service but it must be done with the clear expectation that other parties will handle the following stages of evaluation, maintenance, multiplication and sales.

Most market-focused plant breeding activities now take place in the private sector and the products are usually protected by breeder's rights. This may present problems for developing countries with smallholder agriculture where variety protection laws are weak or absent. However, this should not be regarded as a complete obstacle. Companies may be willing to accept an agreement with a reliable partner in exchange for good research results and favorable publicity. Development partners may be willing to facilitate such arrangements.

The Napier grass variety Maralfalfa may be mentioned in this connection. It was introduced from a private company in Spain through EIAR and is now being evaluated, with promising results. Being vegetatively propagated, it will be very difficult to maintain any control of the material once it is out in the farming community; it will simply be diffused through the informal system. If its merits are confirmed, an agreement for the use of this variety within Ethiopia should be made even though it will not generate direct revenue for the breeder via PBR. The precise status of this variety should be confirmed although it is not a candidate for inclusion in the current scheme.

5.5 Proposed quality assurance schemes

Annex 5 provides the framework for a guideline[9] summarizing the elements that should be covered and it can be used as a checklist of the issues that need to be considered in finalizing the scheme. Consultation will be required among the parties to decide the best course of action and allocation of responsibilities at each stage. Since the technical standards for the selected crops already exist, consultations should focus on procedures for implementing those standards and the overall management of the scheme that will provide administrative coordination and market identity.

The term "scheme" implies an operational entity of some kind that uses existing regulatory frameworks, or a modified version, to provide additional coordination and focus to make it work in practice. The institutional arrangements needed to achieve this key step will require careful consideration by the parties, and if possible, policy support to encourage the participation of the main public sector actors, especially the regulatory authorities. Given that the key physical activities of the seed supply chain now take place in the regions, it would be logical to organize this scheme at a regional level initially and perhaps to regard one region as a pilot to commission the system.

The adoption and implementation of this scheme will depend on the willingness of interested parties to support it so that it becomes a viable entity. It may be regarded as a community of practice with a shared interest in achieving goals that should bring important social benefits. Although some modest support may be required initially, it should not be highly subsidized leading to failure when the subsidy is withdrawn.

It is hoped that existing producers (both formal and informal) will join the scheme and align their production processes with it. However, seed analysis is a specialized skill and requires some basic facilities; it will be essential for existing regional laboratories to participate and provide quality assurance for the product.

9 MoA has published guidelines for the certification of hybrid maize and self-pollinating crops. The format of these documents could be taken as model or template.

6. Conclusion and recommendations

6.1 Conclusion

- The need to increase the production of cultivated forages has been recognized for many years and been the subject of much research. This will improve the productivity of livestock and reduce the pressure on natural grazing lands (both are high priorities). There may be other environmental benefits in terms of soil management and crop rotation. To realize these benefits, there must be a source of quality seeds so that farmers and livestock keepers can assimilate these crops into their production systems.
- In practice, it has proven very difficult to translate this clear justification into a consistent demand for quality seed at a market price. For this reason, several actors have continued to supply subsidized seeds, even though this is not their true role. However, supply push alone is not sufficient to stimulate a commercial market.
- Subsistence/smallholder farmers may understand the value of cultivated forages but are unlikely to purchase seed on a regular basis. Many have benefitted from seed distribution by NGOs further inhibiting the development of a real market.
- The breakthrough to a demand-driven market will depend on the emergence of a more commercial livestock sector for dairying or fattening, and there are signs that this is happening. These producers cannot rely on traditional feed sources and will have to compare the cost of alternatives, especially manufactured feeds, which are expensive. The irrigation of cultivated forages to increase productivity and the emergence of forages as an alternative cash crop for arable farmers may be key steps in this process.
- In principle, a certification scheme for forages already exists within the regulatory framework but it is not being used by any of the potential actors. Establishing such a scheme may give greater confidence to buyers but is unlikely to transform the market unless other steps are taken to link producers directly to users. The missing element that needs to be addressed is to bring producers together in a way that strengthens their marketing opportunities. To this extent, the scheme is as much about production and marketing as it is about quality assurance.
- The wider acceptance of direct seed marketing will facilitate these arrangements by enabling recognized producers to gain a reputation for their products and benefit from that. Here again, the existence of a trusted label, logo or brand would be a strong support to these marketing initiatives.

6.2 Recommendations and follow up

- A quality assurance scheme based on the QDS model should be adopted initially as this will provide greater flexibility. The precise conditions and requirements for implementing QDS should be confirmed with the MoA and regional authorities since they will still have to validate the scheme and its participants. A checklist of action points to implement QDS should be prepared for discussion with all stakeholders since their commitment will be essential for the success of the scheme.

- Given the high priority attached to cultivated forages and the need to improve seed supply, any policy issues or regulatory changes required to facilitate this scheme should be addressed by the National Seed Advisory Group, and if possible, be reflected in the reviews/revisions of policy and law that are currently in progress.
- The scale and mechanisms of the informal seed trade promoted by NGOs should be investigated to assess its merits and limitations. The possibility of regulating this trade should also be considered in order to recruit/embrace the key producers and enhance its quality status. This is a policy issue because it appears that there is significant informal production which is unregulated and; therefore, a source of risk to purchasers.

7. Annexes

Annex 1: Forage crop varieties released and registered by the Ministry of Agriculture

No	Botanical name	Variety	Common name	Year registered	Institute	Breeder/ centre
	Grasses					
1	Avena sativa	CI-8237	Oats	1976	EIAR	Holetta
2	Avena sativa	CI-8251	Oats	2013	EIAR	Holetta
3	Avena sativa	Bonsa	Oats	2011	EIAR	Sinnana
4	Avena sativa	Bona-bas	Oats	2011	EIAR	Sinnana
5	Avena sativa	SRCPX80Ab2806	Oats	2015	EIAR	Holetta
6	Avena sativa	SRCPX80Ab2291	Oats	2015	EIAR	Holetta
7	Pennisetum purpureum	ILCA-14984	Elephant grass/ Napier grass	1984	EIAR	Holetta
8	Phalaris aquatica	Sirossa	Phalaris	1982	EIAR	Holetta
9	Chloris gayana	Massaba	Rhodes grass	1984	EIAR	Holetta
10	Panicum coloratum	Blue grass	Colo Guinea	1984	EIAR	Holetta
11	Andropogon gayanus	Dirki Ayifera	Andropogon	2009	EIAR	Pawe
12	Panicum maximum	Local panicum	Guinea grass	2014	EIAR	Pawe
13	Penisetum polystachion	Nech Sar	Netch sar	2014	EIAR	Pawe
14	Penisetum sphacelatum	Shebela Sar	Bebeqa sar	2014	EIAR	Debre Zeit
15	Cynodon aethiopicus	DZF-265	Qola serdo	2015	EIAR	Debre Zeit
16	Brachiaria mutica	DZF-483	Para grass	2015	EIAR	Debre Zeit
17	Pennisetum purpureum	ILRI–16791	Zehone 02	2017	EIAR	Holetta
18	Pennisetum purpureum	ILRI–16819	Zehone 03	2017	EIAR	Holetta
19	Pennisetum glaucifolium	Areka	Desho grass	2017	EIAR	DZ, H, WG, K,
20	Pennisetum glaucifolium	Kindu Kosha	Desho grass	2017	EIAR	DZ, H, WG, K,
21	Pennisetum glaucifolium	Kulumsa	Desho grass	2017	EIAR	DZ, H, WG, K,
22	Avena sativa (grain type)	Soratаf	Oats	2017	EIAR	Holetta
23	Brachiaria hybrid	Mulatto II	Signal grass	2018	EIAR	Melkassa
	Herbaceous legumes					
24	Vicia dasycarpa	Lana	Vetch	1976	EIAR	Holetta
25	Vicia sativa	ICA-61509	Vetch	2012	EIAR	Holetta

No	Botanical name	Variety	Common name	Year registered	Institute	Breeder/ centre
26	Vicia sativa	Gebisa	Vetch	2011	OARI	Sinnana
27	Vicia villosa	Lalisa	Vetch	2011	OARI	Sinnana
28	Vicia narbonensis	Abdeta	Narbon vetch	2011	OARI	Sinnana
29	Trifolium quartinianum	(Native)	Clover	1976	EIAR	Holetta
30	Lablab purpureus	-	Lablab	1984	EIAR	Holetta
31	Vigna unguiculata	Sewinet	Cowpea	2009	EIAR	Pawe
32	Vigna unguiculata	Temesgen	Cowpea	2014	TARI	Humera
33	Medicago sativa	DZF-552	Alfalfa	2014	EIAR	Debre Zeit
34	Lupinus angustifolius	Sanbor	Sweet blue Lupin	2014	ARARI	Andassa
35	Lupinus nangustifolius	Vitabor	Sweet blue Lupin	2014	EIAR	Andassa
36	Medicago sativa	Alfalfa-1086	Alfalfa	2015	EIAR	Holetta
37	Medicago sativa	ML-99	Alfalfa	2015	EIAR	Holetta
38	Lablab purpureus	Gebisa, ILRI-14417	Lablab	2016	OARI	Bako
39	Lablab purpureus	Beresa, ILRI-14455	Lablab	2016	OARI	Bako
40	Lupinus angustifolius	Welela	Sweet Lupin	2016	EIAR	Holetta
41	Medicago sativa	Alfalfa-1086	Alfalfa	2016	EIAR	ELFORA/ Holetta
42	Medicago sativa	Alfalfa-ML-99	Alfalfa	2016	EIAR	ELFORA/ Holetta
	Browse trees/shrubs					
43	Chamaecytisus palmensis	MoA	Tagasaste	1992	EIAR	Holetta
44	Sesbania macrantha	DZF-092	Sesbania	2012	EIAR	Debre Zeit
45	Cajanus cajan	Dursa	Pigeon pea	2009	EIAR	Melkassa
46	Cajanus cajan	Kibret	Pigeon pea	2014	TARI	Humera
47	Cajanus cajan	Tsigab	Pigeon pea	2014	TARI	Humera
48	Cajanus cajan	ILRI–11575	Pigeon pea	2017	TARI	Maitsebri–Bako
49	Cajanus cajan	ILRI–16527	Pigeon pea	2017	OARI	Bako

Source: MoA. 2017. Plant Variety Release, Protection and Seed Quality Control Directorate. Crop Variety Register No. 20. Addis Ababa, Ethiopia.
Note: The next edition of the register will be published later in 2019 and there may be some additions to this list at that time.

Annex 2: List of relevant standards published by the Ethiopian Standards Agency

	Seed standards		
	Ref no.	Crop name	Botanical name
1	ES 421:2000	Oats	§ *Avena sativa, A. byzantina*
2	ES 426:2012	Cowpea	§ Vigna *unguiculata*
3	ES 442:2000	Sesbania	*Sesbania sesban, S. goetzei*
4	ES 443:2000	Leucaena	*Leuceana leucocephala, L. diversifolia*
5	ES 444:2000	Tree lucerne	*Chamaecytisus palmensis*
6	ES 445:2012	Vetch	§ *Vicia dasycarpa, V. villosa, V atropurpurea, V. sativa*
7	ES 446:2000	Stylo	§ *Stylosanthes hamata, S. scabra, S. guianensis*
8	ES 447:2000	Siratro	§ *Macroptilium atropurpureum*
9	ES 448:2000	Buffel grass	§ *Cenchrus ciliaris*
10	ES 449:2017	Lablab purpureus	§ *Lablab purpureus* (see note 3 below)
11	ES 450:2000	Alfalfa (bean)	§ Medicago sativa
12	ES 451:2000	Fodder beet	§ Beta vulgaris
13	ES 452:2000	Green leaf desmodium	§ *Desmodium intortum*
14	ES 453:2000	Phalaries	§ *Phalaris aquatica*
15	ES 454:2000	Rhodes	§ Chloris *gayana*
16	ES 499:2000	Coloured guinea	§ Panicum *coloratum*
17	ES 500:2000	Guinea grass	§ Panicum maximum
18	ES 501:2000	Setaria	§ *Setaria sphacelata; S.anceps*
19	ES 502:2000	Napier grass	*Pennisetum purpureum*
20	ES 503:2000	Rye grass	§ *Lolium perenne; L.multiflorum*
21	ES 504:2000	Columbus (Sudan) grass	§ Sorghum *almum; S. x sudanense*
22	ES 505:2000	Silver leaf desmodium	§ *Desmodium uncinatum*
23	ES 506:2000	Clover	§ *Trifolium spp.*
24	ES 507:2000	Axellaris	§ *Macrotyloma axillare*
25	ES 508:2000	Pigeon pea	§ *Cajanus cajan*
	§ indicates that seed testing procedures are available in the ISTA Rules		
	Standards related to quality control procedures		
1	ES 413:2000	Seeds – terminology	
2	ES 471:2016	Seed sampling	
3	ES 472:2016	Seeds – purity analysis	
4	ES 473:2016	Seeds – determination of other seeds by number	
5	ES 474:2016	Seed – germination test	
6	ES 475:2000	Seeds – biochemical test for viability (topographical tetrazolium test)	
7	ES 476:2000	Seeds – health testing	
8	ES 477:2016	Seed – variety purity testing using control plot test	

	Seed standards	
9	ES 478:2016	Seeds – determination of moisture content
10	ES 479:2000	Seeds – weight determination
11	ES 480:2000	Testing coated seeds
12	ES 481:2000	Labeling and marking of seeds containers
13	ES 482:2000	Certificates for tested seeds
14	ES 483:2000	Germination paper – specification
15	ES 484 - 489	Provide further standards for testing germination papers (detail not relevant)
16	ES 490 - 492	Provide standards for sand used in germination tests (detail not relevant)

Notes

1 The reference number indicates the date of publication, or revision in cases where this has been done. All specification dating from 2000 were reaffirmed in 2012 or 2018.

2 Crop names and botanical names are presented as shown in the specification. Current taxonomy has not been checked.

3 Standard 449:2017 for Lablab refers specifically to Quality Declared Seed, confirming this category exists and can be given a special standard.

4 All standards can be purchased from ESA at a nominal cost or obtained free of charge by special request.

Annex 3: List of institutions and persons consulted

Organization	Name/title
Ministry of Agriculture	Daniel Mekonnen, Plant Variety Release, Protection and Seed Quality Control Directorate
Ethiopian Institute of Agricultural Research (EIAR)	Fekede Feyissa, Livestock Director
Agricultural Transformation Agency (ATA)	Tekeyohanesse Berhanu, Forage researcher, Debre Zeit Research Center Yitbarek Semeane, Director Inputs Programme
Ethiopian Standards Agency (ESA) Agriculture Standards Unit	Solomon Wubshet
Ethiopian Biodiversity Institute (EBI)	Abayneh Legesse and Aberra Seyoum
Amhara Region, Agricultural Research Institute, Bahir Dar	Tilaye Teklewold, Director General
Amhara Seed Enterprise, Bahir Dar	Likawent Yeheyis, Director Livestock Research Fentahun Ameshe
ACDI/VOCA, Feed III project	Aseneka Tarekegn, Quality Control Addis Belay, Quality control Mekuria Asefaw, Director, Seed processing centre Carl Birkelo, Chief of Party, Country Representative
Private seed companies	Abdo Jemal, Eden Field Agro Seed Enterprise
ILRI	Tesfaye Kumsa, Manager, Anno AgriSeed Co. Chris Jones, Program Leader, Feed and Forages
ICARDA	Michael Blummel, Team Leader, Feed and Forages Alieu Sartie, Gene bank manager Jean Hanson, Genetic Resources Consultant (former Genebank Manager) Asebe Abdena, Seed Production Specialist Tesfaye Tadesse, Debre Zeit forage seed unit Zewdie Bishaw, Seed specialist
BENEFIT-Integrated Seed System Development Program (ISSD)	Amsalu Ayana, Program Manager

Annex 4: List of key documents relating to forage seeds

1 Forage Seed Research and Development in Ethiopia, 2012 (https://hdl.handle.net/10568/32799)

2 Livestock Master Plan, 2015 (https://hdl.handle.net/10568/68037)

3 Seed System Development Strategy, 2013–2018 (http://www.ata.gov.et/download/seed-system-development-strategy/)

4 Seed Proclamation No. 782/2013 (https://chilot.files.wordpress.com/2014/09/proclamation-no-782-2013-seed-proclamation.pdf)

5 Forage seed supply in Ethiopia–how to address quality issues: report on the stakeholder engagement events held at ILRI Campus, Addis Ababa (https://hdl.handle.net/10568/106281)

Annex 5. Guidelines for a forage seed quality assurance scheme

5.1 Options for implementation

The long-term goal should be for forage seeds to be handled in the same way as cereal seeds and subject to the key elements of certification as set out in section 3.3 of this report. In principle, there are currently no regulatory impediments to do this. The production processes, quality standards and labeling requirements all exist and are known to the relevant stakeholders, including the seed enterprises and regulatory authorities. In practice however, they have not taken the initiative to extend certification to forage crops for the various reasons explained in section 5.1. Therefore, it is proposed to launch the scheme initially as Quality Declared Seed with a view to progress to full certification in due course. This will require that a group of interested and experienced producers are encouraged and supported to join the scheme and commit to it, with improved marketing prospects as the benefit. This will still probably need the participation of regional authorities to carry out key quality control functions.

5.2 Implementing a QDS scheme

- *Status*: the scheme will be established and managed by a group of interested parties who wish to promote the production and use of improved forage seeds. It must have official recognition at the federal and/or regional levels sufficient to support its objectives and facilitate its activities.
- *Management*: the coordinating body should have terms of reference in order to define their responsibilities. The terms of reference should include both technical supervision of the production process and promotion of the product, preferably with a brand identity. The existence of a quality assurance system would be a key element in maintaining the reputation and integrity of the brand/logo.
- *Eligible varieties*: in consultation with stakeholders, the group will agree an initial list of six to eight priority crops/varieties that will be grown under the scheme. Only seed-propagated crops will be eligible initially, so Napier and Desho will not be included. The list can be expanded upon request and according to need.
- *Variety maintenance*: the institute identified in the register of varieties will agree to act as the maintainer and establish a nucleus stock of the variety from which breeder seed or basic seed will be generated. It will be the responsibility of the institute to hold a stock of the breeder or basic seed sufficient to meet the expected annual demand. The actual quantity will be agreed between the parties taking account of recent production experience and other practical matters such as storage facilities.
- *Variety descriptions*: the responsible institute shall prepare a brief description of each variety in the scheme indicating its key characteristics that will enable it to be identified in the field. This will not need to be a full DUS style description but should be sufficient to distinguish the variety from others of the same crop that might be in use. In practice, the number of varieties of each species in current use is quite small.
- *Nucleus material*: a growing plot of the nucleus material or breeders seed shall be inspected by a technical group to confirm the genetic purity of the stock and the key characters noted in the description. This will be the source material for each eligible variety and it must be validated as such by the concerned parties.
- *Generation control*: the multiplication from breeder/pre-basic seed through one or two generations shall be done according to the relevant specification published by ESA for the crop and is subject to any variations that are agreed to facilitate the scheme. For the candidate crops, two multiplications should be sufficient initially, but perhaps three eventually in the case of legumes and oats. The naming of these generations will be pre-basic seed, basic seed and quality seed. Only quality seed will be sold to farmers. The pre-basic and basic generations will be under the control or supervision of the relevant research institute.

- *Seed multiplication*: this will be undertaken either by members of the group or under contract by farmers. Certificates of competence or other registration procedures will be handled by the regional authority in consultation with group members. The procedures for arranging and managing contracts with seed growers will follow existing practices for cereal crops as far as possible. Seed multiplication may be easier to manage if it is organized and managed initially on a regional basis rather than nationally. In this case, the regional research stations should be the nodal points of the scheme. This would not prevent sales between regions and the quality standards adopted must be the same for all regions to facilitate such movement.

- *Documentation and record keeping*: the entry of crops into the scheme shall be done using the standard forms used by the regional authority but with any agreed modifications that are required for the particular crop. The numbering system for crops and seed lots shall broadly follow that currently used by the regional authority, unless any special modifications are required. The seed lot number for quality seed should make the generation status clear. The institute shall maintain a record of seed stocks it holds of each eligible variety, indicating their reference number and generational status.

- *Field inspection*: inspection of fields before and during the growing season shall be done either by the regional authority or by persons delegated to do this work under the scheme based on their knowledge and experience of the crops. Report forms will follow the standard format but with any minor adjustments as required.

- *Crop management*: detailed procedures for managing seed crops during the growing season and at harvest time will be set out in an information sheet attached to the contract/agreement with growers and taking account of the relevant ESA specification.

- *Processing*: this will be done by companies or individuals who hold a certificate of competence or are registered in some other way to confirm that they have the necessary facilities and skills.

- *Sampling*: taking good representative sample is fundamental to seed quality control. For this reason, training in sampling techniques for field staff will be absolutely essential. Likewise, the procedures for handling samples in the laboratory should be documented. These procedures are described in the ISTA rules.

- *Seed quality standards*: these will cover only the physical purity and germination standards as set out in the ESA specification for each crop. If either of these standards are believed to be difficult to achieve under normal production conditions, then a somewhat lower quality seed standard should be agreed with ESA and regional authorities. ILRI's seed laboratory may advise on this based on its long experience with these seeds.

- *Seed quality testing*: the only laboratories able to carry out seed analysis at present are those in the seed enterprises, the regional authorities and at ILRI. It may be assumed that regional research stations also have some seed testing facilities since they are active producers. Since these stations will be closely involved in the scheme, it would be helpful if they could accept responsibility for taking seed samples and testing them initially.

- *Labeling of seed containers*: this will follow the requirements of ESA 481 but if a brand or logo is created to represent the scheme, then this could be the main label under a validated QDS scheme. The label for quality seed should be clearly distinct from the official certification labels.

- *Marketing*: those who sell the seed, and intermediaries in the marketing chain, should have recognized status within the scheme and will be expected to conform to an agreed code of conduct for managing their seed stocks and providing information to customers. The size of containers to be used requires careful consideration so that it matches the expected requirement for a standard/known unit of land area. A distinctive design or color printed on the sack should be considered. This will have to be coordinated in order to serve all participants in the scheme.

- *Monitoring*: the group will agree a system of monitoring of the key activities in order to maintain standards along the production chain and protect the reputation of the brand/logo.

- *Documentation*: if the approach proposed here is accepted, then all of the above points should be assimilated into a guideline for the scheme which should be endorsed and/or validated by all the concerned parties to give it official status. MoA already has guidelines for production of certain crops and that model could be followed or adapted as necessary.

5.3 Transition to seed certification

Most of the points listed above apply to both quality declared seed and certified seed. Therefore, putting these various elements into practice lays the foundation for a certification scheme. The key differences are:

- simple quality standards that will make it easier for seed lots to be tested and approved for sale.
- ownership of the scheme by a group of experienced producers who are committed to maintain the quality of the product.
- delegation of responsibilities for crop inspection (and probably sampling) to members of this group who have been trained in these tasks.
- establishment of closer links between producers and customers so that the benefits of good quality seed lead to increased sales and the development of a reputation. This is also consistent with current move towards direct seed marketing.

ISBN: 92–9146–590–5

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

The International Livestock Research Institute (ILRI) works to improve food security and reduce poverty in developing countries through research for better and more sustainable use of livestock. ILRI is a member of the CGIAR Consortium, a global research partnership of 15 centres working with many partners for a food-secure future. ILRI has two main campuses in East Africa and other hubs in East, West and Southern Africa and South, Southeast and East Asia. ilri.org

CGIAR

CGIAR is a global agricultural research partnership for a food-secure future. Its science is carried out by 15 research centres that are members of the CGIAR Consortium in collaboration with hundreds of partner organizations. cgiar.org