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Feed the Future Consortium Partners in the Feed the Future Global Supporting Seed Systems for Development activity:



Contents

ABSTRACT	1
1 INTRODUCTION	2
2 QDS GUIDELINES AND IMPLEMENTATION: REVIEW OF GLOBAL EXPERIENCES	4
3. THE PROCESS OF ADAPTING QDS IN THE ETHIOPIAN SEED SYSTEMS.....	8
4. PRACTICES AND DIVERGENCES OF QDS IN ETHIOPIA	11
4.1 ADOPTION OF QDS AND ITS DIVERGENCE.....	11
4.1.1 <i>Type of producers allowed for QDS production</i>	<i>11</i>
4.1.2 <i>Type of crops and varieties for QDS production.....</i>	<i>11</i>
4.1.3 <i>Quality standards</i>	<i>12</i>
4.1.4 <i>QDS market coverage.....</i>	<i>12</i>
4.1.5 <i>Role of QDS in the overall seed system development</i>	<i>13</i>
4.2 AWARENESS AND IMPLEMENTATION OF QDS	13
4.2.1 <i>Awareness about QDS provisions.....</i>	<i>13</i>
4.2.2 <i>Certificate of Competence</i>	<i>14</i>
4.2.3 <i>Crop and variety coverage.....</i>	<i>14</i>
4.2.4 <i>Quality certification.....</i>	<i>14</i>
4.2.5 <i>QDS marketing practices</i>	<i>15</i>
5. THE POLITICAL ECONOMY OF QDS IN ETHIOPIA AND ITS IMPLICATION	17
6. CONCLUSION AND THE WAY FORWARD.....	19
7. REFERENCES.....	20
8. ANNEXES	22
ANNEX 1. POTATO SEED STANDARDS FOR CERTIFIED AND QDS SEEDS.....	22
ANNEX 2. WHEAT SEED STANDARDS FOR CERTIFIED AND QDS SEEDS	22

Abstract

Ensuring adequate supply of quality seed in many of the developing countries has been a challenge. One of the frequently portrayed reasons is the capacity of the regulatory system to inspect and certify seed produced. In 1993, FAO developed a guideline entitled “Quality declared seed: Technical guidelines on standards and procedures”, which was further refined in 2006, with the objective of ensuring seed quality with relatively minimum resources. Ethiopia officially adopted this concept in the regulatory framework in 2013 for the first time, which was further elaborated in ministerial directive in 2015. This study looked closely into why Ethiopia adopted QDS and how it is implemented considering the political economy perspective of divergence and similarities of the different provisions indicated in the FAO guideline, the Ethiopian directive and actual implementation practices. The result indicated that as opposed to the initial intention of FAO, the main driver of adopting QDS was to legitimize the existing production and supply of seed by small farmers in addition to the seed supply by licensed seed companies with the ultimate goal to fulfill the ambitious seed production targets included in government development plans. This implies: (i) limit the producers of QDS to be farmers’ group, (ii) perceived quality of seed to be lower compared to certified seed, (iv) restricting QDS marketing to be only within the locality the seed was produced, and (v) consideration of QDS as a transitional system to formal seed system. Although neither the producers nor the marketing area was restricted in practice as indicated in the provisions, the fact that it was considered as a transition affected the proper support to strengthen the system limiting the contribution of QDS to the seed supply. Moreover, with variability across regions, the observed contribution of QDS system is highly associated to the support from projects implemented by development partners. This clearly indicate the need for further exploiting the potential role of QDS in Ethiopian seed system given the challenges prevailing with the formal seed system.

1 Introduction

The role of agricultural technology in growth and poverty reduction has been broadly discussed, in particular for low-income African countries (Odame, et al., 2013; Diao, et al., 2007). Accordingly, there has been considerable investment in agricultural technology generation and promotion through national and international agricultural research institutes and development of delivery systems especially following the success of the green revolution in Asia. The green revolution, which was associated to the high yield achievements for wheat and rice using improved varieties combined with expanded use of fertilizer and other chemical inputs, has prompted policy attention in developing countries to promote improved crop variety use and other agro-chemicals (Doss, 2006; Pinstrop and Hazell, 1985).

In effort to promote use of quality seed of improved crop varieties to ensure increased agricultural production and productivity, there has been policy and development efforts in developing seed systems in developing countries. One of the key measures to ensure quality seed use has been seed quality assurance procedures that are often established through global and regional level agreements or through nationally enacted directives and regulations at national level (Alemu, 2013; OECD, 2012; Waithaka, et al., 2011; Rohrbach, et al., 2003).

In general, seed quality control procedures cover quality follow up prior to sowing (quality of EGS), during crop growth, ripening and harvesting, and then continue on the harvested and conditioned seed in the laboratory with tests for moisture, physical and varietal purity, viability, weed content, presence of diseases (Alemu, 2013). This procedure clearly indicates the need to have adequate resources both human and physical, which generally were not available in most of the developing countries due to the under development of the respective seed industries. Given these challenges, the FAO Seed and Plant Genetic Resources Service designed a guideline entitled “Quality declared seed: Technical guidelines on standards and procedures” in 1993 that can ensure seed quality control under limited-resources conditions and in response to the need for more secure seed supply systems, which could deliver good quality seed of improved and new varieties to farmers. The implementation of the guideline widely contributed to (i) setting up of seed standards for a wide range of crop species and agro-ecologies for the development of the agricultural sector and (ii) establish seed quality standards for seed relief interventions following natural disasters or calamities (FAO, 1993). This implies that the Quality Declared Seed (QDS) initiative was only about ensuring seed quality control by setting standards and major responsibilities and participation to seed producers and dealers.

Recognizing the continued low level of quality seed use of improved crop varieties, the changing circumstances and diverse needs in the seed sector in the developing countries, FAO facilitated the critical review of the 1993 QDS guideline and a revised version entitled “Quality Declared Seed Systems” was published in 2006. The key areas of revision were in terms of how QDS can accommodate local varieties, expanding coverage of more released varieties (OPV, hybrids) and standardizing further the procedures to facilitate the easy operation of the QDS scheme (FAO, 2006).

In line with the FAO guideline, many African countries started to consider QDS systems through enacting directives and regulations. For instance, in Ethiopia, the QDS concept was introduced to the seed law in 2013 and its directive was endorsed in 2015, in Tanzania, the Control of Quality Declared Seeds Regulations was endorsed in 2020, and in Uganda, Quality Declared Seed (QDS) was added in the National Seed Policy in 2014 as the sixth class of seed to be implement in support of a vibrant, pluralistic and market oriented seed sector development. Though adapted from the FAO guidelines, the provisions in terms of crop coverage, procedures of implementation, and suggested governance are quite different across these countries.

A recent assessment of the provisions of the Ethiopian QDS directive and its implementation as part of gap analysis in operationalization of Ethiopian seed policies indicates that there is considerable divergence in terms of the coverage of different provisions compared to the FAO guideline mainly in relation to i) the overall purpose/intentions, (ii) quality assurance system, (iii) crop and their varieties for QDS production, and (iv) actors expected to engage. There are also gaps in the extent of operationalization of the directive in QDS production.

The main objective of this study is to assess the extent and reasons behind the divergence of QDS provisions and its implementation in Ethiopia by comparing with global experiences. Specifically, it documents (i) the practices and divergences of provisions in the QDS directive compared to the FAO guideline; (ii) the main drivers of divergence in formulation and implementation of QDS directive; and (iii) recommendations for ensuring better use of QDS scheme in Ethiopia.

The assessment is based on both primary and secondary data sources. The primary data were generated through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs), which targeted officials and experts engaged in the design of the policy provision in the Seed Proclamation (2013) and the QDS directive (2015) both at national and regional levels and those engaged in QDS production and regulations covering Amhara and SNNPR regions. The secondary data were generated through extensive review of published and unpublished documents related with QDS.

The paper is structured into five parts. The first part presents the review of international experience in QDS implementation followed by the process of adapting QDS in the Ethiopian seed system.

The third part presents the assessment of the key divergences of the Ethiopian QDS directive from the FAO QDS guideline, which is generally the globally adopted guideline in ensuring alternative seed quality assurance. It also documents the status of implementation of the QDS directives by comparing with what the provisions in the directive states and FAO guideline. The fourth part presents the political economy of adoption and divergence of the different provisions in the QDS directive and implications for the seed sector development as one component of enhancing the performance of the seed system in Ethiopia. The conclusion summarizes key findings and the way forward.

2 QDS Guidelines and Implementation: review of global experiences

In many developing countries, formal seed production started as a project with a vision of gradual replacement of the informal seed system by a formal system. This was anticipated because of the trend in developed world where majority of the seed is supplied from formal system. In developed economies, strict seed quality control was critical in the seed sector development. The same was anticipated in developing countries, but the trend in seed sector development in these countries was slow and could not replace the informal seed system as anticipated. While there are reasons behind the constraints in government budgets, these constraints are reported to considerably limit to run a full-fledged seed quality control in developing countries. One option to overcome the problem of resources might be to charge for all services so that the costs are covered, which is common in many industrialized countries (FAO, 2006). Regardless of increasing seed costs because of increased service charge and the administrative burdens of collecting the fees, there are geographical areas, crops and farming systems that may not be covered by the formal seed system in many developing countries. This is mainly because seed business of some of these crops and in some of these geographic areas are not attractive and thus there are already limited companies in the business. Thus, increasing cost of service may only make things worse. The other option to overcome such challenge is to reduce the cost of services and the concept of Quality Declared Seed (QDS) was introduced against this background as early as 1993 as an alternative quality assurance system with reduced costs (FAO,1993).

The concept of QDS was initiated in the 1980's and was culminated into Quality Declared Seed, Technical Guidelines for Standards and Procedures published as FAO Plant Production and Protection Paper 117 in 1993 (FAO, 1993). The QDS system is a seed-producer implemented system for production of seed that meets a minimum standard of quality with minimum formal inspection by the official seed certification system. It is an alternative quality assurance system, which can be used for those crops, areas and farming systems for which full-fledged seed quality control activities are difficult to implement or make relatively little impact on seed supply (FAO, 2006). The intent behind the QDS system is to provide farmers with the assurance of seed quality while reducing the inspection burden on government agencies responsible for seed certification. As such QDS system is considered to be part of the formal seed system, hence the initial focus was to reduce the cost and burden on regulatory system and increase seed supply, while minimizing the resources required to certify seed (Jason, 2020).

Later, it was also recognized that there are many crops, in particular traditional crops that are important in the food basket in many developing countries. Unfortunately, there is little system in place to support the seed production of these crops. Thus, the revision of initial QDS guideline is initiated to improve supply of quality seed also to accommodate the diversity of crops and farming systems, particularly those which are not addressed by well-organized seed system. As a result, QDS extended to many other crops including vegetatively propagated crops, which is named as Quality Declared Planting Material (QDPM) instead of QDS (Fajardo, et al., 2010). The revised QDS guideline in 2003 also accommodated varieties that was released without formal breeding process including local varieties and varieties identified through participatory variety selection (PVS) (FAO, 2006). Regardless of its flexibility, QDS is introduced as a quality assurance scheme for seed production, which is less demanding compared to full quality control systems and, thus, can be more easily implemented in situations where resources are limited to certify seed.

The revised FAO document emphasized that in terms of quality, the responsibility for ensuring seed quality is mainly with those who are producing and distributing the seed, and this does not mean that quality is compromised. Moreover, by providing certificate of quality, the regulatory system also provides some protection for farmers and growers against unprincipled seed traders (FAO, 2006).

Organization for Economic Cooperation and Development (OECD) scheme and International Seed Testing Association (ISTA) procedures are used to inspect and test the QDS seed, although the seed may not be internationally traded. For seed of local varieties and varieties developed through PVS, the minimum standards may be different from varieties developed through conventional plant breeding approaches. This is mainly related to genetic purity as these varieties might have not been purified to the standard during the selection process. All other seed standards (germination, physical purity, etc.) and some of the field standards (weed infestation, diseases) are similar for all types of varieties. Thus, QDS is a relatively open and flexible scheme intended to increase the supply of seed for the needy farmers, without compromising basic standards of seed quality. Given its flexibility, governments may therefore need to consider how best to provide the services of QDS to be available, and on what basis. It is also important to make clear why QDS needs to be adopted and promoted and what are gaps it can fulfill especially in relation to ensuring access and use of quality seed of preferred varieties and crops.

The FAO guideline indicates that only officially registered varieties are eligible to produce through QDS. This is in line with the common regulation that indicates only seed of registered varieties can be sold in the seed market. These are varieties that were developed through conventional breeding system, local variety and variety selected through PVS methods. All these varieties need to be registered in the variety registry to be produced in the QDS system. The idea of including local varieties and varieties selected through PVS was included during the revision of QDS document in 2003. In countries where Plant Variety Protection (PVP) law is applicable, protected varieties can also be produced through QDS system so long as there is arrangement between the producer and owner of the variety. In addition to the variety registry, countries need to list varieties that can be produced through QDS system.

According to FAO guideline, QDS producers are “any company, co-operative, individual or institution fulfilling the requirements outlined in these Guidelines” (FAO, 2006 page 12). In the FAO QDS guideline, which is often used as basic guideline, there is no specific preference to any type of seed producers, so long as they are officially registered as seed producer. However, nearly entirely all documents on QDS then after link QDS with farmers as seed producers (Mastenbroek, et al., 2021; Mghweno, 2020; Singh and Agrawal, 2018) including the Ethiopian QDS directive (MoA, 2015). In order to adapt QDS in the national seed regulation, justification is also provided related to the extent to which farmers and farmers group can produce good quality seed like the case of ISSD in Ethiopia and Uganda, which started the production of seed with farmers group with the name of Local Seed Businesses (LSBs) before the concept of QDS is included in the policy/regulation of the country (Thijssen, et al., 2013). Hence QDS is considered as policy that promotes farmers led seed production as it provides less restrictive regulatory framework creating opportunity to include farmers and farmers groups into the seed business (Mastenbroek, et al., 2021).

Many countries adopted QDS as one of the strategies to promote use of quality seeds among small-scale farmers and thus included in their regulation. Regulations in many African countries including Ethiopia restrict QDS production to farmers and farmers group. From the outset, they define QDS as a seed produced by farmers or farmers groups. The Tanzanian 2003 seed act define QDs as “seed produced by a registered smallholder farmer which conforms to the specified standards for crop species concerned and which has been subject to the quality control measures prescribed in the regulations to be made under this Act” (Tanzania, 2003). Similarly, the 2013 Ethiopian seed law define QDS as “seed produced by organized and registered smallholder farmers or registered smallholder farmers, in conformity with the required quality standards” (Ethiopia 2013). With nearly the same tone, the 2018 Ugandan seed policy define QDS as “Seed produced by a registered seed producer (individual or a group of farmers) from basic-seed and conforms to the minimum standards for variety purity and germination” (Uganda 2018). It is not yet clear why these regulations

restricted QDS to farmers and farmers' group, while the original document from FAO put it open for all producers. Report from African Union in 2021 indicate that since QDS is applicable in areas where highly developed seed quality control activities are difficult to implement, practically it is farmer groups and nongovernmental organizations (NGOs), who faced difficulty to join the seed sector because of the requirements of a full quality control process, that can pick the opportunity of using QDS (African Union Commission, 2021).

Initiations of the adoption of QDS system and its implementation in developing countries are often linked to projects supported by development partners.

a) Ethiopia

In Ethiopia, there was Farmers Seed Production and Marketing Scheme starting from 1997 supported by the World Bank, which was promoting production of seed by small farmers and marketing (Sahlu, 2008). Following this, there were also other projects particularly for potato, where the International Potato Center (CIP) was supporting the production and marketing of seed tubers. Similarly, the Integrated Seed Sector Development (ISSD) program started the LSB concept where farmers not simply produce and supply seed but consider it as a business. Having all these experiences, the concept of QDS was introduced to the seed law of Ethiopia in 2013.

b) Uganda

At almost the same time, the sister project in Uganda, ISSD Uganda, was also looking into the opportunity, but in case of Uganda, the QDS concept had to first be introduced to the policy/regulation (Thijssen, et al., 2013). Thus, ISSD Uganda pushed for the inclusion of the concept of QDS in the policy by demonstrating in parallel how QDS works in practice since 2013 (Ronnie, 2017; Mastenbroek, et al., 2021). The concept was finally included in the 2018 seed policy and regulation was also developed in 2020. In Uganda, QDS is produced by trained and registered farmers. QDS applies to self-pollinating and vegetatively propagated crops, for which the formal seed sector has little or no interest. Seed production by these trained farmers is inspected by authorized district agricultural officers and the seed is tested by the National Seed Certification Service (NSCS) for certification and its marketing is restricted in the agro-ecology where it is produced (Mastenbroek, et al., 2021). QDS is taking ground in Uganda towards sustainability, where the number of farmers group producing QDS is increasing and interventions is no more with only civil society or frontrunners. However, decentralization as well as formally accrediting the district agricultural officers for inspection still remains from the side of the ministry. Moreover, current use of QDS is limited in areas where LSBs are operating and there is a need to use QDS countrywide (Ibid).

c) Tanzania

The concept of QDS was introduced to Tanzania early 2000s' and the Seeds Act No. 18 of 2003 (Tanzania 2003) gives some space for smallholder farmers to produce and market QDS. In Tanzania, QDS is only sold in the locality where it is produced and Ronnie (2017) concluded that QDS in Tanzania is very marginalized as there is limited support to its production and marketing. Regulation on QDS was enacted in 2020 where all the provisions are indicated, and the regulation focused on the roles and responsibilities of both producers and inspectors. Important to note that TOSCI take district as unit of production and sample 10% of the QDS field in the district to inspect QDS production in the district (Tanzania 2020).

d) Zambia

Production of QDS seed started in Zambia already in 1990s' where NGOs are involved in seed production of non-hybrid and non-maize crops with small-scale farmers to supplement the formal

system (Verma and Chibsa, 1998). In Zambia, QDS function as alternative quality control mechanism alongside the formal system for varieties that meet the minimum standards of germination and purity but cannot to comply with all the formal certification requirements (Kuhlmann and Dey, 2021).

3. The process of adapting QDS in the Ethiopian seed systems

In Ethiopia, production of seed through farmers group started long before the concept of QDS was introduced into the seed law in 2013, with the Farmers Based Seed Production and Marketing Scheme in 1997, a project supported by World Bank (Sahlu, et al., 2008). In this project, farmers were trained in seed production, extension agents support farmers in seed production and there are seed inspectors who approve the quality. Finally, the seed is purchased and sold by regional state Bureaus of Agriculture. The idea was to support farmers to produce seed so that they market in their vicinity.

Similarly, CIP was involved to a great extent in the seed production of potato using the concept of QDPM, a concept that was introduced by FAO in 2007 (Fajardo, et al., 2010). In this system, farmers are trained how to produce quality potato seed tubers and the project supply disease free planting material from research centers. Researchers and experts from Bureaus of Agriculture support the production and finally the research center give a letter that the seed has been produced under their supervision and thus farmers sell the seed (Schulz, et al., 2013). In addition, ISSD also built on these experiences since 2009 and ISSD used the concept of Local Seed Business (LSB), where the trained farmers are registered as seed producers and sells the seed to other farmers. What makes the LSB concept different is that farmers consider seed as a business not as an ad hoc activity, to make seed production and supply more sustainable.

When the revision of the seed law was taking place, between late 2008 to early 2013 (Hassena 2017), there was increasing seed demand because of strong extension work and it was a big challenge for government to supply certified seed for the public demonstration sites and for farmers. Government was looking for all options to increase the supply of seed. It was during this period that three parastatals (Regional Seed Enterprises: Amhara, Oromia and South) were also established. In addition, farmer-based seed production and marketing under the supervision of regional bureau of agriculture is underway, where different generations of seed were considered as seed for self-pollinated crops. In fact, between 2011 and 2016, this account for the major part of the seed supplied and in 2014 over 272.6 thousand tons of seed was reported supplied (Figure 1). A major part of this is the farmer-to-farmer seed exchange as the seed supply from formal seed system was only about 68.5 thousand tons when reporting of farmer-to-farmer seed exchange was stopped.

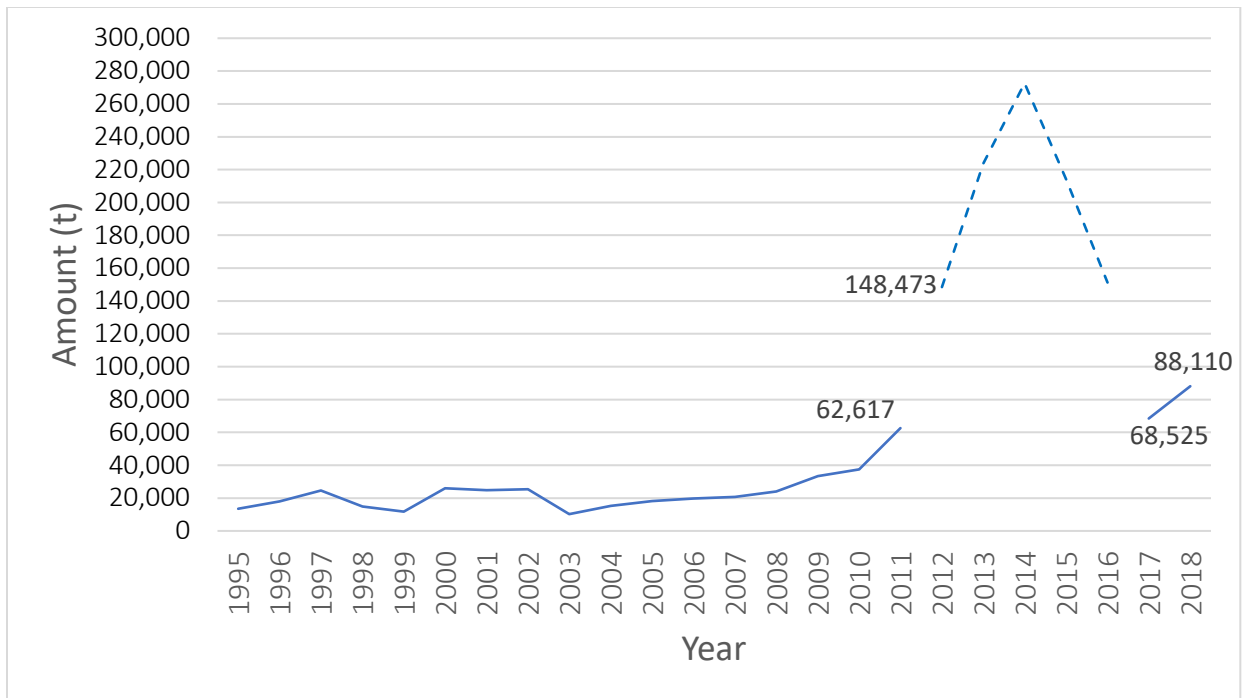


Figure 1. Trend in seed supply in Ethiopia (1995 – 2018).

Source: Unpublished data from MoA at different time

Given all the challenges of supplying enough amounts of seed and the experiences of using different sources of seed, the concept of QDS was introduced in the Ethiopian seed regulatory framework in 2013. What was actually introduced in the seed law was the definition, article 2.13, and article 13, which indicates that regional authorities give certification for QDS. At that early stage, where the concept of QDS was not well known, it was the first entry point to only legitimize the system, pending the detail to the development of the directive .

As the seed law was enacted, in late 2013, the CIP team in Ethiopia recognized that the law supports what they have already been doing and were happy with the new development. As such they brought the idea to the MoA to formalize what they have been doing informally with the research system. The initial reaction of the MoA was to develop standards, which is actually domesticating the QDPM that the CIP team was using. As a result, the MoA in collaboration with CIP started developing standards for both Irish potato and sweet potato in early 2014. While this was in progress, the Agricultural Transformation Agency (ATA), also planned to develop a directive¹ for QDS. This was partly because there was increasing demand for seed including emergency seed and shortage of supply and developing QDS directive was expected to solve the problem. Before developing the directive, ATA organized a workshop to create common understanding about the concept of QDS in October 2014. In this workshop, the concept of QDS as well as the experiences in the country were presented and final agreement was to develop the directive. One of the major discussions was how to minimize the side effects of QDS on the formal seed sector development and was agreed to minimizing its risk by making sure that it does not overlap with the formal seed certification system. This will be through identifying a crop/variety for which there is no supply from the formal seed producers; assigning specific agro-ecologies; and assigning different producers.

¹ This was the high time for ATA to look into different regulatory document and revise including the seed regulation, seed regulatory service fee

The process of developing standards for Irish potato and sweet potato was kept on hold until the directive was developed, as a logical procedure. A team of experts was organized by ATA in collaboration with MoA to develop the directive and the developed draft directive was approved as directive mid-2015. Most of the key informants feel that there was little effort to enrich the draft directive as MoA officials decided to approve the directive regardless of the content. As a result, some additional documents were also developed supporting the implementation of the QDS directive. The next activity was to finalize the QDS standards that were kept on hold and standards were developed for more than 30 crops to be used for QDS seed certification. In order to ensure its implementation, there was training for stakeholders, particularly the regulatory staff in different regions. Currently, QDS is common for potato and seedlings, but not for grain crops although there is a critical shortage.

The 2015 QDS directive has four parts. The first part with five articles provides terminology definitions, scope and objectives of the directive. The second part with three articles is about provisions related with principles, procedures for QDS preparation and quality control. The third part with four articles presents the provisions for local variety registration, QDS quality requirements and certification process, and QDS distribution and the last fourth part with one article provides expected roles and responsibilities of different mainly public actors including The national Variety Release Committee, the National Agricultural Research System, the Federal MoA and Regional BoA up to Kebele offices of Agriculture, Regional Agricultural Marketing Quality Control offices, Regional Plant Seed laboratories, Cooperative promotion agencies, and Non-Governmental Organizations (NGOs). This part also presents provisions about complaint management along with penalties.

4. Practices and divergences of QDS in Ethiopia

The assessment made indicates that there are provisions in the Ethiopia QDS directive that are not in line with FAO guideline. FAO guidelines consider QDS as an alternative quality assurance mechanism, which can be used if resources are limited for regulatory authorities. However, in addition to quality assurance systems, the Ethiopian QDS directive provides provisions that deviate from the provisions in the FAO QDS guideline related with (i) the type of producers that can engaged in QDS production, (ii) the need for QDS variety registration, (iii) limits the variety and crop coverage, and (iv) sets target markets for QDS. In addition, implementation is not perfectly inline with the directive. The divergences in both cases are presented in the following sections. The summary of comparison for the key provisions between FAO QDS guideline and Ethiopian QDS directive and extent of implementation is presented in Table 1.

4.1 Adoption of QDS and its divergence

4.1.1 Type of producers allowed for QDS production

The provision in terms of the eligibility to engage as producers of QDS differs between the FAO guideline and the Ethiopian directive. The Ethiopian directive limits QDS producers to be farmers and farmers groups (Articles 3.5, 4.2, and 5.2(b)), while the FAO guideline is open for all producers that include any company, co-operative, individual or institution that fulfill the requirements. The decision to limit the type of producers to be only farmers and farmers groups in the QDS directive was related with article 2.13 of the seed law, which clearly states the type of producers to engage in the QDS production.

During the revision of the seed law, farmers have been one of the major suppliers of seed either directly by selling to their neighbors or by selling to the formal system as an out-grower and thus they are well recognized in the seed sector. The respondents indicate that these experiences have dominated the discussion during the revision of the seed law, and it was easy to fix the QDS producers to farmers and farmers groups. Those who drafted the directive also confirm the same by also adding that QDS is considered a scheme to ensure the supply of seed of relatively lower quality, and there is no reason that companies producing relatively better quality will be allowed to produce lower quality. In fact, the intention during the development of the directive is to upgrade QDS producers towards certified seed producers by strengthening their technical and managerial capacity to produce quality seed. Although the producers are farmers and farmers groups, some of the requirements for CoC seem stringent. For instance, the producer needs to have access to a laboratory (either its own or someone who can provide the service); they need to have a moisture tester, GPS and other facilities. The question is that such equipment will be difficult to be owned by smallholders or their organization. However, the assumption among those who drafted the directive is that this will be applicable to cooperative and inclusion of individual farmers as a producer is only a formality, but not in reality. As such, those who drafted the directive did so with cooperatives in mind, who can easily purchase this equipment.

Theoretically limiting producers to only farmers and farmers cooperatives will reduce the opportunity that formal licensed seed producers (public and private) to engage in quality seed production for less commercially viable crops and varieties through QDS.

4.1.2 Type of crops and varieties for QDS production

The FAO guideline states the consideration of three categories of varieties in QDS production, which are (i) varieties developed through conventional breeding methodologies, (ii) varieties developed through alternative plant breeding approaches such as participatory plant breeding, and (iii) local varieties. The FAO guideline does not limit the type of crops and varieties to be considered

under QDS scheme. Whereas the Ethiopian QDS directive indicates that hybrid varieties, varieties produced by the formal seed producers (both public and private seed producers) and forest seed cannot be produced under QDS scheme (Article 4.3). In addition, the provision of the directive (Article 6.3) states that the QDS system will engage with seed production for crops that are not adequately covered by the formal seed producers.

Similar to the FAO guideline, the Ethiopian QDS guideline allows the use of local varieties that are registered (QDS variety registration) under the QDS scheme to ensure access to quality seed. It is important to note that one of the presentations during the synthezation workshop was on farmers seed exchange, which surfaced the importance of farmers' variety and the role of farmers in seed systems. This presentation was instrumental in giving attention to farmers' variety in the QDS system. As a result, there was high emphasis for farmers' variety in the directive and thus the directive also included a system of releasing and registering farmers' variety as there is no other system in place. The discussion with those who were involved in the drafting of the directive indicates that the initial intention was to have a list of varieties that can be produced under QDS covering both formally released and farmers varieties.

As a result, the text in article 4 of the directive limits the varieties to be used for QDS production to those varieties registered in the QDS system. However, since there was no system in place to register farmers' varieties, the directive included details of the process of farmers' variety registration under (Article 9). With regards to status of implementation following the enacting of the directive, there is no variety registered in the QDS system so far, although there was an intention to register varieties for QDS production. In reality and in conflict with the directive, practically registration was not necessary as the varieties used so far for QDS production are those that are already registered through the formal variety registration process.

In line with the overall intention of the development of the directive, which was to boost the volume of quality seed production, most of the interviewees didn't recognize that the provisions in the directive only refer to farmers' variety registered under QDS system. Even so, the intention according to those who were in the process of drafting the directive was to make sure that farmers' varieties are also considered for QDS production in addition to other varieties that are formally registered. However, it is important to note that there was a fear by the team that drafted the directive and also the officials at the MoA that the QDS system may compete with the formal seed system. Limiting varieties to only 'QDS registered varieties' is to make sure that the formal seed system is protected from the competition of the QDS system. This is clear with the provision of Article 5.2(a) in the directive, which states that the QDS system will not compete with the formal seed system. As a result, the directive limited formal seed producers not to engage in QDS production.

4.1.3 Quality standards

FAO guidelines indicate QDS as an alternative quality assurance mechanism without compromising quality standards. Although standards are indicated for many crops in the FAO guideline, there is no indication that QDS seed quality standards are lower than that of certified seed standards. The Ethiopian QDS standards for some of the parameters are set lower, although may not be significant, compared to certified seed (see Annex 1 and Annex 2). This is related to the fact that QDS seed is produced by farmers and farmers' organizations .

4.1.4 QDS market coverage

The Ethiopian QDS directive limits the market coverage for QDS to the surrounding areas where the QDS is produced (Article 12 a&b). If at all it has to move outside the limited area, this has to be through a government control system. On the other hand, the provisions in the FAO guideline even

extend its marketing to a trade between countries so long as the principles of the QDS scheme are accepted by countries or regional groups. Such limitation in the Ethiopian case is mainly to minimize the level of competition with the formal system, and there is also a general understanding that QDS seed is relatively a low-quality seed. While the objective in the directive is to boost quality seed supply, which is as good as certified seed for those crops and varieties for which there is limited commercial interest by formal seed producers, the limitation of market coverage to local farmers diminishes the importance of QDS to boost seed supply. This implies the limited consideration of the QDS system as an alternative for low-cost seed quality assurance.

4.1.5 Role of QDS in the overall seed system development

The FAO guideline clearly considers QDS as an alternative quality assurance system that operates in parallel with the formal seed system. In the case of Ethiopia, QDS is considered as a short-term solution to overcome the problem of availability of quality seed. When the QDS producers develop their capacity, they are expected to grow towards certified seed producers. The provisions for limiting the engagement of private and public seed companies for QDS production in the directive targeted protection of the formal seed system from a competition from QDS. Since QDS was not intended to grow as a system, its role in the seed sector development can only be seen in terms of its contribution to the development of the formal seed system.

4.2 Awareness and implementation of QDS

Regardless of the divergence between FAO guideline and the Ethiopian directive, there is no guarantee that the directive is implemented as written on the paper, which is not necessarily specific to the issue of QDS. The results indicate that there are considerable differences across regions in the extent of awareness and implementation practices.

4.2.1 Awareness about QDS provisions

All inspectors interviewed are very much aware and know the directive about QDS. In fact, they all have in their smartphone the copy of the directive for reference as observed during the interview. However, it is also important to note that the interviewed inspectors indicated that some of the junior staff have limited knowledge about QDS, which is related to the practical engagement of these staff in many of the cases. As indicated by one of the inspectors, activities about QDS have reduced very much in recent years and the new inspector has little exposure to the details. On the contrary, the interview of the seed producers in SNNPR reveals that none of the producers interviewed has the knowledge about QDS in general, let alone the content of the specific directive. To some extent some of those producers in Amhara have some information about QDS, which is through the NGO that is currently supporting QDS production for target commodities like potato and onion.

Inspectors are aware of the crops for which QDS producers are allowed to produce. These are crops for which there is no adequate supply of seed, in which case the regional office of agriculture decides which crop to be produced through the QDS system. While the forage and potato producers indicated that they are producing seeds of released variety, the onion producers are not aware of the variety they are producing. They simply bought the bulb from one area, being informed that that is a quality bulb, and produced seed. That already reflects the extent to which the QDS producers are neither professional, nor do are they following the regulations. Those engaged in forage seed production were in the business since 2015, which is also related to the time that the directive is approved. While most of those engaged in potato are relatively new, 0-5 years. Similarly, those

engaged in onion production have varied experience in the seed sector (2-9 years). In general, there is diversity in terms of seed production experience.

4.2.2 Certificate of Competence

While the companies are not aware of QDS in general and the directive in particular, they are aware of the requirements to get the license, and according to most of them this is limited to land, storage and in few cases expert, which is often assigned by woreda office of agriculture. It is also important to note that some of the producers are not aware of the requirement as such, but assisted by projects to get the license. Similarly, if the producer has the license to produce certified seed, having CoC is not a requirement and they can continue to produce QDS. There is similar reflection from the inspectors, where they focus on land and storage, which shows the practical exercise but on the theoretical notes some of the inspectors also list other requirements. Hence in some regions the government office has to support the producers until they develop some capacity, after which the CoC is provided. As a result, some of the requirements are not met, including laboratory facility, internal quality control, and machinery to get CoC. Major reason behind the difference is that QDS producers are perceived by the regulatory authority that they are farmers who do not have capacity and similarly, they produce seed for that particular area, in fact with the request of the office of agriculture. The quality of seed produced through QDS is generally perceived low, so the regulatory is less serious to ensure the producers fulfil the requirement, rather support them to produce, although they do not fulfil the requirement according to the directive.

Since the producers do not know what QDS is, they have not opted to be neither QDS nor certified seed producer. The whole idea of the producers, whether that is guided by externals or not, is to engage in seed production and generate some income. The decision as to which license the producer gets is made rather by the regional regulatory authority as they give the license.

4.2.3 Crop and variety coverage

Even though the directive provides wider coverage for crops and varieties, the assessment indicates that the existing experience in QDS production in the country is mainly for potato, vegetables (onion), forage, spices (ginger), and fruit seedlings (apple and mango). Though there is limited experience and coverage, standards were developed for 34 crops so far. The assessment indicates that the crops currently covered by QDS are highly associated with the project support and in case of onion seed, it was due to the market incentive that guided them to engage in QDS production.

4.2.4 Quality certification

In terms of field inspection, the producers do not know what the directive says, but their observation is consistent in that the inspectors inspect the whole field, which is mainly because the field is small and thus it doesn't cost much in terms of time to inspect the whole field. In terms of laboratory tests, inspectors only evaluate in the store for potatoes; while they take samples and test that of onion. In the case of forage, it depends on the request of the producer, as this is affecting the available market. In some cases when they want the certificate for auction, they request the laboratory to test it for them. In recent years since the market for forage is declining, related to the budget shortage of different projects, they do not request certification in general.

There are both inspection and laboratory test service fees fixed by the government. The standard is ETB 100 for application; ETB 40 per hectare for inspection; ETB 105 /sample for laboratory test (sampling, purity, germination and moisture); and ETB 100 for certification. The service fee is the

same for QDS and certified seed (regulation 361/2015). If the service is provided and they have to pay, then the producers pay the amount indicated, but most of the producers don't recognize that they are paying it as this is a very small amount. In most cases, the producers pay the service fee, but in some cases, they do not pay as the government wants to encourage the newly starting producers, some of which may not have the CoC. The indicated fees are in general the same as for the service fee for certified seed production.

4.2.5 QDS marketing practices

None of the interviewed producers know about the existing regulation about marketing of seed and thus they practice their own way. Marketing of QDS differs from one crop to the other. In case of forage, producers mainly sell in bulk to projects, NGOs and government, which is then distributed to farmers mainly free in their project areas. They usually put in sacks so that it is suitable for transport. In the past, budgets were allocated for the purchase of forage seed by projects and NGOs and there are different auctions in which the producers participate to sell their seed. As a result, sellers have a strong network particularly across regional states also helping each other in supplying the required seed. In fact, they try to get information about budget allocation in the government offices and NGOs through their network. Recently, there is limited budget allocated for forage seed from different projects and NGOs making the business of forage seed more difficult. The producers nearly do not sell forage seed to smallholder farmers directly, as there is no such demand, which is partly because some farmers may have seed as this is a production area and most farmers have no experience of producing forage.

In the case of potatoes, seed tubers are sold to anyone who wants to buy them. There is a regional difference in terms of their priority customers. In the case of Amhara, where the producers are cooperative, the majority of the buyers are members of the cooperative. Very limited amount is sold outside the cooperative. In the case of SNNPR, major buyers are from different areas, which are mainly institutional buyers, like projects and NGOs. Farmers also buy seed tubers, but often from distant places. Only in limited cases the surrounding farmers buy seed tubers from producers. In the case of cooperatives as a producer in SNNPR, members are a major buyer, particularly when there is less demand from outside. In such cases, the cooperative sells to their members at reduced prices. The proportion of seed tubers sold to the surrounding farmers in SNNPR ranges from 10-30%. When there is less demand from other areas, the proportion sold to members often increases significantly. As opposed to both forage and potato, buyers for onion seed are mainly the surrounding farmers.

There is no standard packaging size for all the three crops (forage, potato and onion) considered in this study. In the case of potatoes, they often put in 100 kg sacks; while the forage producers put in any size the buyers want. In the case of onions, there is some effort to pre-pack in some cases, but in most cases the amount that the customers want will be given by immediately weighing the seed. Moreover, there is no labeling at all on the containers regardless of their size, except one onion producer, who tries to label the bag. This producer used to be a maize producer and used his experience in maize to label the onion seed bag. There is no practice in general and the regulatory authorities also didn't force the producers to sell in standard size and with labels. In fact, unlike the certified seed, for which they provide the label, the regulators do not provide a label for QDS seed in general. Inspectors from the authority indicated that there is no reason for not providing the labels. This is also related to the perception about QDS that it is simply a transition to the formal seed production.

Table 1. Summary comparison of provisions between FAO QDS guideline and Ethiopian QDS directive and extent of implementation.

Regulatory aspect	FAO QDS Guideline	Ethiopia QDS Directive	Implementation in Practice
Who can produce QDS?	Any seed company, cooperative, individual or institution fulfilling the requirements in the guideline and registered	Farmers, farmers group, cooperatives fulfilling the requirements in the guideline and registered	Farmers' group, cooperatives, unions and private
Which crop varieties?	major crop production groups and varieties that are developed through (i) conventional breeding, (ii) PVS, and (iii) local varieties.	Limited to crops with limited formal seed system coverage, and farmers' varieties registered	Any crop except hybrid where the bureau of agriculture feels that the formal production cannot cover. But, the practices is only for few crops (potato, forage, onion, spices, fruit seedlings)
Territory of marketing	No limit within a country and allows QDS seed movement between countries if the principles of the scheme are accepted by countries or regional groups	Limits to the surrounding areas where the QDS is produced	No practical territory. Producers are selling to any buyers from any part of the country, although if it goes through formal channel, there is limitation
Actors that can market	Any company, cooperative, individual or institution	QDS producers, cooperatives	The producer
Inspection requirements and frequency	Field inspection required and frequency vary by crop type from one to three times	Field inspection required as per the set standards, only 10% of the field inspected The criteria are the same as for certified seed	For forage crops, there is less inspection as the producers often do not request. In case of potato, inspection frequency sometimes higher than indicated
Inspection fees			Inspection fee is not well recognized by the producers that they are paying.
Labeling requirements	Labeling required	Labeling required	No labeling at all and authorities are not requiring and thus producers are not labeling the bag
Packaging details	Packaging required with required labeling	Packaging required with required labeling	There is no standard packaging for QDS products and no packaging practice
Penalties	National governments shall provide that person found to be using the term QDS wrongly shall be guilty of an offence and subject to an appropriate Penalty	Clear provision of penalties (Article 13.12)	No experience of penalizing those operating against the directive Onion QDS producers are highly challenged with seed produced without any quality assurance

Source: Authors' compilation from FAO (2006), MoA (2015), and primary data sources.

5. The political economy of QDS in Ethiopia and its implication

The rediscovery of the importance of political economy in the 1980s as part of a broader movement of rethinking development guided the consideration of both politics and technical questions and solutions (Fritz, et al., 2014). This has led to recognition that institutions (the rules of the game) matter as behind institutions there is politics. In this regard, relevant and effective institutional and policy reform are highly dependent on political underpinnings and the drivers that shape them (De Schutter, 2019; Fritz, et al., 2014). Actors in the policy making process make sure that policies reflect their interest and objectives. In the process they use frames to provide structured narrative and discursive tools that can help to legitimize certain policy measures or governance solutions, and delegitimize and neglect others (Laws and Rein 2003). In this section, we analyze the political economy of QDS in Ethiopia targeting the identification of political and technical drivers for the current status of QDS.

The key driver for adopting the QDS system in Ethiopia was the considerable mismatch between supply and demand for seed and the huge political will to narrow the gap. During that period, the government was using the production and supply of 2nd to 4th generation of seed for self-pollinated crops, without a proper certification system. In fact, this was reported as seed supply by the government as an achievement in terms of seed supply, although some have reservations if it can be considered as seed, just simply because it was not certified. Governments and professionals have to think how such seed can be certified and be part of the seed supply. QDS is the available concept that can potentially be used to certify seed produced by smallholder farmers.

The FAO concept of QDS is framed around an alternative quality assurance system, which emanates from the fact that in developing countries there is no capacity for regulatory authority to go through all certification processes and there is a need to minimize the burden, while supplying quality seed. The definition of QDS in the Ethiopian seed law of 2013 states that ‘quality declared seed means seed produced by organized and registered smallholder farmers or registered smallholder farmers, in conformity with the required quality standards.’ This framing is clearly set in such a way that QDS is all about seed produced by smallholder farmers. That was how the government made sure that seed produced and exchanged among farmers was officially considered and thus achieved the high supply target. Once this is introduced into the Ethiopian regulatory framework, the directive is all about how quality is assured, which can then be linked to the original concept of QDS.

Unlike many of the policy and regulatory documents that take many rounds of edition and discussion, the QDS directive was nearly approved with one go. The initial discussion led to drafting of the directive, which was then approved by the ministry without having further discussion and inputs from different stakeholders. Informants involved in the process indicated that approving a directive with such speed is unusual. Important to look closely why and how such an unusually fast decision was made by the ministry. During the initial workshop in October 2014, it was discussed that QDS is not a system that competes with the formal system and stressed to separate the two. This helped to frame QDS further as a transitional system towards a formal system from the outset. This is to re-affirm the definition of QDS in the seed law and make sure that technocrats do not take QDS as an alternative quality assurance system only based on FAO concept. For officials of the ministry, making sure that QDS is about seed produced by smallholder farmers is critical as it accommodates the existing scheme of farmers-based seed multiplication and exchange among farmers, which is often reported as seed supply. Once this is affirmed, the directive is all about how farmers produced seed is certified – which is more technical and it is easy to approve the directive regardless of the actual content. The overarching political intention of adopting QDS in the Ethiopian seed system is thus not to address the limitation in capacity for seed quality assurance as

per the original intention of FAO document. The FAO QDS guideline indicates that QDS is an alternative approach for quality seed supply that works as one part of the formal seed certification system (FAO, 2006). Rather it was adopted as a means to achieve the target of seed supply by legitimizing the existing practice as an additional seed supply to the formal one. Since developing a directive for QDS was seen as an opportunity to legitimize the already existing operation, as well as it is within the context of article 2(13) of the seed law, the ministry approved the directive without making critical evaluation.

This framing, by already limiting the production to farmers, has implied a number of things. The framework not only legitimizes smallholder farmers, but also does not allow others to take part in the production of QDS, which is about protecting the formal seed system. This is further strengthened by article 13(4) that what to be produced will be determined by the office of agriculture depending on the shortage of seed. In addition, limiting to farmers implies that QDS is relatively low quality seed, opening a door for further limitation in the directive to restrict the marketing in the area where it is produced. Moreover, QDS production is considered as an entry point for legitimizing the existing informal seed production at farmers level and once licensed as QDS producers and gain experience in seed production, they are expected to transit to certified seed producer level. The whole perceptions and thinking behind QDS have limited its development and thus contribution to seed sector development.

6. Conclusion and the way forward

This article presented an overview of the QDS system in Ethiopia along with its divergence not only to the FAO guideline, but also the divergence of what is indicated in the different provisions of the directive and the actual practices of its implementation. The main drivers for the identified divergences are documented using a political economy perspective.

In general, the QDS adoption in Ethiopia was not targeted as one of the alternative approaches for seed quality assurance, rather targeted as optional means to reduce the shortage of seed supply in the country. This was driven by the factors related with the need to achieve the set goals of the national seed production target indicated in the different strategic documents mainly in the Growth and Transformation Plan (2010 – 2020). The QDS was adopted when there was an attempt to consider different classes of seed from C2 to C4 in the estimation of seed produced in the country.

Subsequently, the QDS approach was adopted as a means to legitimize these classes of seed.

Ethiopia has not used the potential of QDS to reduce the gap between seed supply and demand.

Currently, about 85% of the total seed production is only wheat and maize and farmers are not getting quality seed for most other crops. For the QDS system to be vibrant, the directive indicated the role of different stakeholders to support the system. While the government sees QDS as transitioning to a formal seed system, there is little effort to support the QDS system to expand and solve the problem of seed supply in Ethiopia. Had the directive been implemented as intended, particularly with regards to the support of different stakeholders for the development of the QDS system, farmers would have had better access to quality seed.

The trends and experiences elsewhere in the world indicate that QDS has huge potential in complementing and boosting the performance of the national seed system especially for crops and varieties for which there is limited commercial incentive for actors of the formal seed system. This implies the need to address the different narratives that emanated from the political economy perspective of the design and implementation of the QDS directives. These are:

- a) The need to ensure QDS implementation as one alternative approach of seed quality assurance;
- b) QDS should not be considered as a risk to, but as a complement to the formal seed system;
- c) QDS is a quality seed that can be marketed outside of the locality where it was produced where there is demand;
- d) The need to ensure that actors of the formal seed system can engage in QDS production;
- e) The need to consider QDS as part of the formal seed system and the perception that QDS is a transition needs to be changed, and;
- f) The need to provide equal attention to the QDS system in any seed sector interventions.

7. References

- African Union Commission, 2021. The Seed Sector in Africa. Status Report and Ten-year Action Plan (2020-2030)
- Alemu D. (2013) Seed Certification in Ethiopia: Issues, experience, and improvement options. Capacity to Improve Agriculture and Food Security (USAID-CIAFS) Project, Addis Ababa, Ethiopia
- De Schutter, Olivier (2019) The Political Economy Approach to Food Systems Reform. PP 13 – 26. In: Harris j., M. Anderson, C. Clément and. N Nisbett (eds) The Political Economy of Food. IDS Bulletin Volume 50, Number 2. Institute of Development Studies
- Diao X. and Nin Pratt A (2007) growth options and poverty reduction in Ethiopia- An economic-wide model analysis. *Food Policy* 32(2): 205 – 208
- Doss C. R. (2006) Analyzing technology adoption using micro-studies: limitations, challenges, and opportunities for improvement. *Agricultural Economics* 34 207–219.
- Doss, C.R. 2003. Understanding Farm Level Technology Adoption: Lessons Learned from CIMMYT's Micro Surveys in Eastern Africa. CIMMYT Economics Working Paper 03-07. Mexico, D.F. CIMMYT
- FAO (1993) Quality declared seed: technical guidelines for standards and procedures. Plant Production and Protection Paper No. 117. Food and Agriculture Organization of the United Nations. Rome, Italy.
- FAO (2006). Quality Declared Seed System. FAO Plant Production and Protection Paper 185.
- Fritz, Verena, Brian Levy, and Rachel Ort (2014). Problem-Driven Political Economy Analysis: The World Bank's Experience. *Directions in Development*. Washington, DC: World Bank. doi:10.1596/978-1-4648-0121-1. License
- Jason Nickerson. 2020. Seed system definition. <https://www.agrilinks.org/post/seed-system-definitions>)
- Juan Fajardo, NeBambi Lutaladio, Michael Larinde and Cadmo Rosell. 2010. Quality declared planting material: Protocols and standards for vegetatively propagated crops. FAO Plant Production and Protection Paper 195
- Hassena M. Seed of Change: the making and implementation of seed policies in Ethiopia. PhD thesis, Wageningen University, Wageningen, the Netherlands. DOI: <https://doi.org/10.18174/421204>
- Kuhlmann, K.; Dey, B. Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study. *Agronomy* 2021, 11, 377. <https://doi.org/10.3390/agronomy11020377>
- Sahlu, et al., 2008
- Marja H. Thijssen, Gareth Borman, Karen Verhoosel, Astrid Mastenbroek and Willem Heemskerk. 2013. Local Seed Business in the Context of Integrated Seed Sector Development In: Ojiewo C.O., S. Kugbei, Z. Bishaw and J.C. Rubyogo (eds) community Seed Production. Workshop Proceeding 9-11 December 2013. Addis Ababa, Ethiopia
- Mastenbroek, A.; Otim, G.; Ntare, B.R. Institutionalizing Quality Declared Seed in Uganda. *Agronomy* 2021, 11, 1475. <https://doi.org/10.3390/agronomy11081475>
- MoA (2015) Quality Declared Seed Implementation Directive. No 1/2015. Ministry of Agriculture, Addis Ababa, Ethiopia
- Laws, D. and M. Rein. 2003. Reframing practice. In: Haijer, M.A. and H. Wagenaar (eds.) *Deliberative policy analysis: understanding governance in the network society*: 172-206. Cambridge, NY: Cambridge University Press.
- Mohammed Hassena, Dawit Alemu and Bhramar Dey. 2022 Seed policy provisions and operational challenges in Ethiopia. Unpublished

- Odame H., L. Kimenye, C. Kabutha, D. Alemu and L.H. Oduori (2013) Why the low adoption of agricultural technologies in Eastern and Central Africa? Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). Entebbe, Uganda
- OECD (2012) OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade. ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD), Paris. France.
- Pinstrup-Anderson P. and P.B. Hazell (1985) The impact of the green revolution and prospects for the future. International Food Policy Institute (IFPRI), Washington DC.
- Rohrbach D.D., I.J. Minde, and J. Howard (2003) Looking beyond national boundaries: regional harmonization of seed policies, laws and regulations. *Food Policy* 28 (2003) 317–333
- Ronnie, Vernoooy. 2017. Options for national governments to support smallholder farmers seed systems: the cases of Kenya, Tanzania and Uganda.
- Schulz, S.; Woldegiorgis, G.; Hailemariam, G.; Aliyi, A.; Haar, J. van de; Shiferaw, W. 2013. Sustainable seed potato production in Ethiopia: from farm-saved to quality declared seed. In: Woldegiorgis, G.; Schulz, S.; Berihun, B. (eds.). Seed potato tuber production and dissemination, experiences, challenges and prospects: Proceedings. National Workshop on Seed Potato Tuber Production and Dissemination. Bahir Dar (Ethiopia). 12-14 Mar 2012. (Ethiopia). Ethiopian Institute of Agricultural Research (EIAR); Amhara Regional Agricultural Research Institute (ARARI); International Potato Center pp. 60-71
- Singh and Agrawal, 2018; Improving efficiency of seed system by appropriating farmer's rights in India through adoption and implementation of policy of quality declared seed schemes in parallel. *MOJ Ecology & Environmental Sciences*. Vol 3(6)
- United Republic of Tanzania 2020. THE SEEDS (CONTROL OF QUALITY DECLARED SEEDS) REGULATIONS, 2020
- United Republic of Tanzania. 2003. Seed Act 2003.
- URT (2020) Control of Quality Declared Seeds Regulations, 2020. The Gazette of The United Republic of Tanzania No.17. Vol.101 Dated 24th April, 2020.
- Verma B.N. and Chibsa, W.M. 1998. *Zambian Seed Industry – History and Experience*. In: Axtel, et al., *Proceeding of the West African Hybrid Sorghum and Pearl Millet Seed Workshop*. Niamey, Niger.
- Waithaka M., J. Nzuma, M. Kyotalimye, and O. Nyachae (2011) Impacts of an improved seed policy environment in Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). Entebbe, Uganda

8. Annexes

Annex 1. Potato seed standards for certified and QDS seeds

Indicators	Measure	Certified potato seed (C1)	QDS potato seed (QDS1)
Rotation	Min number of seasons	3	3
Isolation Distance	Min meters	5	5
off-type / other cultivar	Max Number /100m2	2	2
Bacterial wilt	Max %	0	0
Potato virus Y (PVY)	Max %	1	5
Potato virus X (PVX)	Max %	2	5
Potato leaf roll virus (PLRV)	Max %	1	5
Verticillium wilt	Max %	0.5	5
Fusarium wilt	Max %	0.002	5
Clavibacter spp. (ring rot)	Max %	0	5
Black leg	Max %	0	0

Source: Ethiopian Standards Agency: ES 3924-17:2015 and ES 0494:2016

Annex 2. Wheat seed standards for certified and QDS seeds

Indicators	Measure	Certified wheat seed (C1)	QDS wheat seed (QDS1)
Rotation	Min number of seasons	1	1
Isolation	Min meters	5	3
Fields of wheat with infection of Loose smut	Min meter	150	150
Off types	Max %	0.05	0.5
Off-type and other cultivars	Max %	0.1	0.5
Field inspection	Min number	2	1
Plants affected by Seed borne diseases (<i>Ustilago tritici</i>)	Max %	0.1	0.5
Pure seed	Min %	98	97
Other crop seed	Max %	0.1	0.25
Noxious seed	Max %	0	0.2
Infected/infested seed	Max %	0	0.05
Inert matter	Max %	1.9	2.5
Germination	Min %	85	85
Moisture content	Max %	13	13

Source: Ethiopian Standards Agency: ES 3924-12:2015 and ES 0414:2017