SEED SYSTEMS ANALYSIS IN THE IGAD REGION

FINAL REPORT

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Contents

Acronyms

AED	Agricultural Extension Department (Eritrea)
AFSTA	African Seed Trade Association
ARIPO	African Regional Intellectual Property Organization
ARS	Agricultural Research Services (Sudan)
ASARECA	Association of Agricultural research in Eastern and Central Africa
ASSCO	Arab Sudan Seed Company
CBSP	Community Based Seed Production
CGIAR	Consultative Group for International Agricultural Research
COAFEV	West African Catalogue of Plant Species and Varieties
COMESA	Common Market for Eastern and Southern Africa
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles
DLGs	District Local Governments (Uganda)
DUS	Distinction, Uniformity and Stability
EAC	East African Community
ECOWAS	Economic Commission of West African States
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GeRRI	Genetic Resources Research Institute (Kenya)
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority on Development
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IPPC	International Plant Protection Convention
ISSD	Integrated Seed System Development
ISTA	International Seed Testing Association
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
KALRO	Kenya Agricultural and Livestock Research Organization
KEPHIS	Kenya Plant Health Inspection Service
KII	Key Informant Interview
MLND	Maize Lethal Necrosis Disease
NPT	National Performance Test
NARI	National Agricultural Research Institute (Eritrea)
NVRC	National Variety Release Committee
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries (Uganda)
MASF	Ministry of Agriculture and Food Security (South Sudan)
MoA	Ministry of Agriculture
MoAI	Ministry of Agriculture and Irrigation Federal Government (Somalia)

MoLFR	Ministry of Livestock and Rangeland (Somalia)
NGRC	National Genetic Resources Center
NARO	National Agricultural Research Organization (Uganda)
NGO	Non-Governmental Organization
NPPO	National Plant Protection Organization
NRPs	National Resource Persons
NSA	National Seed Authority
NSAs	National Seed Associations
NVL	National Variety List
NVRC	National Variety Release Committee
OECD	Organization for Economic Cooperation and Development
OPVs	Open Pollinated Varieties
PBR	Plant Breeder's Right
PSEs	Parastatal Seed Enterprises
PVP	Plant Variety Protection
QDS	Quality Declared Seed
RARI's	Regional Agricultural Research Institutes (Ethiopia)
RECs	Regional Economic Communities
SADC	Southern Africa Development Community
SSA	Seed System Analysis
SSG	Seed Systems Group
STASS	Seed Trade Association of South Sudan
TASAI	African Seed Access Index
UPOV	International Union for the Protection of New Varieties of Plants
UPQS	Uganda Plant Quarantine Services
VCU	Value for Cultivation and Use
WTO	World Trade Organization

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Executive Summary

The IGAD region is made up of arid and semi-arid lands characterized by high rates of population growth and poverty. The Region's agricultural potential is vulnerable to climate-change impacts. The COVID-19 pandemic has further brought agriculture and food system issues to the fore by presenting a formidable threat to trade in agricultural commodities. Technological and market innovations will enhance agricultural productivity, among which seeds of improved crop varieties are key inputs to raise agricultural productivity.

The overall objective of the assignment was to assess the frameworks governing seed policies and regulatory regimes in the IGAD member states. The specific objectives were to: i) Critically review the policy and regulatory frameworks governing the national and regional seed sector in the IGAD region; Ii) identify institutions/entities producing and supplying seeds to farmers and assess their capacity for breeding, cultivar assessment, promotion and marketing, quality seed production, seed distribution, and trade; Iii) determine and describe the various types of seed production and distribution systems in the region; iv) understand and document critical bottlenecks and opportunities to improve both the formal and informal seed supply chains, including investment potential in the IGAD region; and iv) recommend future strategies for a viable harmonized regional seed system and trade development among the IGAD Member States.

This Seed System Analysis (SSA) is the [IGAD] regional component of a Project entitled '***Building Back Better: Rural Livelihoods Recovery Initiative for the Greater Horn of Africa*** (***BBB***)' implemented in partnership with the Seed Systems Group (SSG)[1], through the financial support of the International Fund for Agricultural Development (IFAD), in four countries (Djibouti, Eritrea, Somalia and South Sudan). BBB aims to deploy new, high-yielding, climate-resilient seeds, modern farming knowledge, and yield-enhancing good farming practices such as early maturing, disease-resistant varieties, and related crop management practices. Nevertheless, the region-wide system analysis would be incomplete without conducting the assessment in all the IGAD member States, therefore Ethiopia, Kenya, Sudan and Uganda (non-BBB) were included.

The Assignment was executed by a Senior Consultant supported by eight (8) National Resource Persons (NRPs), one each from the IGAD Member States. The NRPs conducted Key Informant Interviews (KII), guided by semi-structured questionnaire, with selected stakeholders and key informant groups across the seed value chain. Common assessment framework and data collection formats were developed for use by the NRPs. The NRPs visited in person or used phone calls and e-communication means, with the various organizations that include both state and non-state actors. The study analysis further explored the seed policy harmonization best practices from other Regional Economic Communities. The target crops for the study were maize, sorghum, pearl millet, beans, cowpea, groundnuts, and forage crop species.

The following were major findings from the IGAD seed sector assessment.

1) The seed system in IGAD member countries is characterized by a co-existence of the formal and informal ones. The overall contribution of the formal seed system to the seed supply in the region is low (<20%) and mostly covers hybrid maize. Therefore, while the formal sector must be

[1] SSG is an Africa-based nonprofit organization that believes that every farmer in every village should have access to high-quality seed for a wide range of crop varieties. It addresses the needs of bypassed farmers and communities from the African seed success stories and where improved seeds can make a difference. The Mission of SSG is therefore to extend the recent advances in seed systems development to farmers in countries of Africa that have so far been left behind (seedsystemsgroup.org).

expanded, there is need for a more inclusive seed sector that considers the local situation of the target crop and serve the bulk of the small-scale farmers in the IGAD region.

2) The seed companies registered in the IGAD member countries is a mix of public, local private and multinational companies. Research and development is predominantly conducted by public institutions in Eritrea and Ethiopia, by private sector in Somalia, and a mix of both in Kenya, Sudan and Uganda. In Ethiopia, the formal seed sector is dominated by parastatal (public) seed enterprises.
3) The seed policy and legislative instruments in the IGAD member States are at various levels; there is no seed policy or legal frameworks in Djibouti, Eritrea, Somalia, and South Sudan (BBB-countries). Ethiopia, Kenya, Sudan and Uganda have a stand-alone seed policy; despite having policy and regulatory instruments, challenges remain in these countries pertaining to implementation mainly because of capacity and resources. Kenya is the only IGAD member state who is a member of UPOV (International Union for the Protection of New varieties of Plants), and Sudan and Uganda are in the process of joining.
4) At regional level, there has been progress in seed policy harmonization efforts by the different RECs. The progress of the domestication process of the COMESA harmonized seed regulations indicates that IGAD countries who are also members of COMESA are at different levels; Kenya and Uganda have aligned, Sudan has yet to start the process, and the rest of the countries are somewhere in between.
5) Seed companies that have registered varieties in the COMESA variety catalogue also operate in many of the IGAD countries. Hybrid maize takes the largest share of regionally registered varieties by COMESA. However, despite the progress, movement of large seed consignments across borders with regional seed labels is yet to materialize.
6) The number of active breeders in IGAD member States for the different target crops gives the following picture: a) There are more public breeders than those working for private seed companies; only Kenya and Uganda reported breeders working for private companies; b) maize breeders take the highest numbers in all the countries, except South Sudan. c) Ethiopia and Kenya have the highest number of breeders, and the only countries to have forage-crop breeders in the region.
7) Maize dominates the varieties released, followed by beans, and sorghum. Most of the varieties grown in the last three years, except for maize, were developed by the public sector investment. At country level, varieties owned by private seed companies were high in Kenya and Sudan. Kenya is in a strong position both for the public and private seed companies, followed by Ethiopia and Sudan. It is possible that some of the varieties under different names, particularly those owned by the private sector, have same pedigrees. However, it requires further analysis to sift out such varieties that could be of relevant importance for regional testing and adoption. Generally, variety turn over (average life/age) in Africa is slow and IGAD countries are no exceptions.
8) In Eritrea and South Sudan, the variety evaluation and release system are conducted through *ad hoc* National Variety Release Committee under the oversight of Ministries of Agriculture. Ethiopia, Kenya, Sudan, and Uganda have established variety release procedures to evaluate and regulate but require capacity strengthening. These four countries also have Plant Variety Protection system, mostly in the form of Plant Breeder's Rights.
9) Certified seed demand by farmers varies by country and target crop; however, pearl millet has the lowest demand. Kenya takes the highest overall share (61.12%) of certified seed production in the region followed by Ethiopia (20.63%), Sudan (8.82%), South Sudan (4.98%) and Uganda (4.27%). Sudan takes the highest share for sorghum. Among the target crops, hybrid maize accounted more than half (52.33%) of the total certified seed production followed by beans (31.07%) and sorghum (9.83%).

10) Seed certification and quality control in the IGAD countries is generally weak, with possible exception of Kenya, in terms of institutional, human, and infrastructural capacities. South Sudan interestingly has developed seed certification standards, even in the absence of national seed legislations. These standards are like that of COMESA's regulations with minor differences. That means, although not a member of COMESA, South Sudan can still benefit from seed trade harmonization with its fellow IGAD member States that are members of COMESA.
11) Quarantine and Phytosanitary legislative measures supported by international agreements are in place in Ethiopia, Kenya, Sudan, and Uganda. Nevertheless, except for Kenya, capacity limitation is still a challenge. Therefore, the efficiency, weaknesses and strengths of the national quarantine and phytosanitary systems are yet to be tested for most of the target crops.
12) Meaningful activities of forage crops' variety development, release and seed production are found only in Kenya and Ethiopia. In both countries, regulations require that forage crop varieties undergo evaluation and official release before commercialization.

In conclusion, we have the following recommendations of strategic nature to enhance the seed sector development in the IGAD region.

The seed systems in the IGAD countries are at different stages of development requiring additional investments to converge towards regional trade through harmonized regulations. Seed policy and legislations are not yet in place in Djibouti, Eritrea, Somalia, and South Sudan, but seed activities are being carried out with interim arrangements. Therefore, they must be supported to institutionalize their seed system to a threshold functional level so that they can participate in a regional seed trade.

IGAD as a region can leverage on the COMESA harmonized seed regulations and strengths of individual member states. COMESA's regional harmonized seed regulation is the most advanced one. IGAD, instead of delving into another duplication effort, it can take advantage of the membership overlap and endorse the COMESA harmonized seed regulations to apply to all its member States. IGAD and COMESA can forge partnership to extend support for the domestication processes in Somalia, South Sudan and Sudan.

Demand creation for quality seed for crops that can do with fewer inspections such as sorghum, cowpea, and groundnuts is important. Harmonized regional seed regulation is mainly about strengthening and expanding the formal system. However, in a region where the seed system is dominated by the informal sector for most of the IGAD target crops, there is a need to put in place capacity building measures to improve farmers' access to certified seed.

Regional harmonization efforts need to encourage local seed companies to take advantage of harmonized regional regulations. From our Key Informant Interviews, one reason of local private seed companies not to fully engage and support regional harmonization is the fear of overdominance by international seed companies. Therefore, while aiming at strengthening the formal seed system for quality seed supply through harmonized policies and regulations, IGAD and its partners (SSG) need to be inclusive and continue supporting national-level efforts. To start with, widening and scaling up the works of SSG's *BBB-project* to a regional level through collaborative programs would be important. One way to support the small companies is to encourage collaboration among NARs to test, exchange data and release varieties. Identification of regionally adapted varieties from the already existing varieties in the different countries, IP arrangements for publicly owned crop varieties (mostly self-pollinated crops with less phytosanitary risks) and development of private-sector oriented viable system of EGS supply are some of

the activities that can be implemented in one or more of the countries concomitantly with the harmonization process. Such support enhances the trust among the various stakeholders.

Forage seeds could be considered as specialized targets for IGAD. Forage seeds are given little or no attention at national level and have not been part of seed harmonization processes in any of the RECs. Given the size of its large livestock population and livelihood dependency in the agro-pastoralist community, IGAD may consider forage seeds value-chain development. This is not necessarily on forage and pasture species alone, but also multi-purpose crops like cowpea, sorghum, and maize. Demand creation and value chain development for forage crops in the region is critical.

IGAD needs to build its internal capacity and establish a regional advisory entity on seed-related issues and activities: IGAD has a role to play in guiding/supporting its members states on collective and regional issues such as seed policies and implementation of programs. To fulfil its role of coordination and convening power, therefore, IGAD will have to build its capacity by establishing an entity with an advisory role. The form the seed advisory entity would take can be decided after consultation with seed stakeholders.

1. Introduction

1.1. Background

The Intergovernmental Authority on Development (IGAD) is one of the Regional Economic Communities (RECs) recognized by the African Union. The Region – with a combined population of over 290 million - stretches over an area of 5.2 million km^2 comprising the countries of Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda. Some 70 percent of the IGAD region is made up of arid and semi-arid lands, which receive an annual rainfall of less than 600 mm (Figure 1). The rest of the region has a variety of climates and landscapes including cool highlands, swamp areas, tropical rain forests, and other features typical of an equatorial region[2].

The economic mainstay of the region is agriculture (except Djibouti), both crop and livestock production, which provides the basis for food supplies and export earnings, as well as contribution to Gross Domestic Product (GDP) and employment share. Generally, however, the IGAD region is characterized by high rates of population growth and poverty (Annex 1.1). One of the main challenges in maximizing the agricultural potential of this region is its vulnerability to recurrent droughts and dry spells, making it one of the most vulnerable regions for climatic variations (Babikir et al., 2015).

Millions in the IGAD region are food insecure due to climate change impacts, political and economic instability, pests' outbreaks, and conflict. Rural, small-scale farming and pastoral communities of the Greater Horn of Africa (Djibouti, Eritrea, Somalia, and South Sudan) represent some of the most marginalized groups of people in the world in terms of access to agricultural technologies and inputs. Approximately five million farmers and agro-pastoralists in these countries who are without access to modern agricultural technologies, including improved seeds, face an ongoing struggle to produce sufficient food exacerbated by floods, and the outbreak of desert locust and Fall Army Worm.

Seed is the basis of crop production and key input for improving crop production and productivity. Key issues in analyzing the contribution of seed to agricultural output are availability, quantity, quality, and affordability, which means physical access to the right seed at the right time for the right price (Louwaars et al., 2015). Access to quality seed and farmer adoption of improved varieties remains low across many countries in Sub-Saharan Africa. Specifically, IGAD as a region has been a minor player in the seed market due to underdeveloped/absent national and regional seed systems, limited capacities, lack of adoption and implementation of harmonized regional seed regulations, standards, and procedures. Although there are differences in seed system development stages among the IGAD Member States, generally the seed sector at national and regional levels remains fragmented and weak and there is limited cross-border seed trade due to inconsistent policies, high costs for registering new varieties, and the inadequate infrastructure that underpin the seed industry. This breakdown in the seed systems and extension networks has contributed to significant and recurrent food insecurity and loss of livelihoods in the region.

To address these livelihood challenges, the Seed Systems Group (SSG), through the financial support of the International Fund for Agricultural Development (IFAD), has granted funding to IGAD to implement the regional component of a Project entitled '***Building Back Better: Rural Livelihoods Recovery Initiative for the Greater Horn of Africa***'. This Project engages national governments, IGAD, local entrepreneurs, and

[2] https://igad.int/

farmers to deploy new, high-yielding, climate-resilient seeds, modern farming knowledge, and yield-enhancing good farming practices such as early maturing, disease-resistant varieties, and related crop management practices. Targeted food crops to be addressed through this project are sorghum, pearl millet, beans, cowpea, groundnut, maize, and forage crops (SSG Project Document).

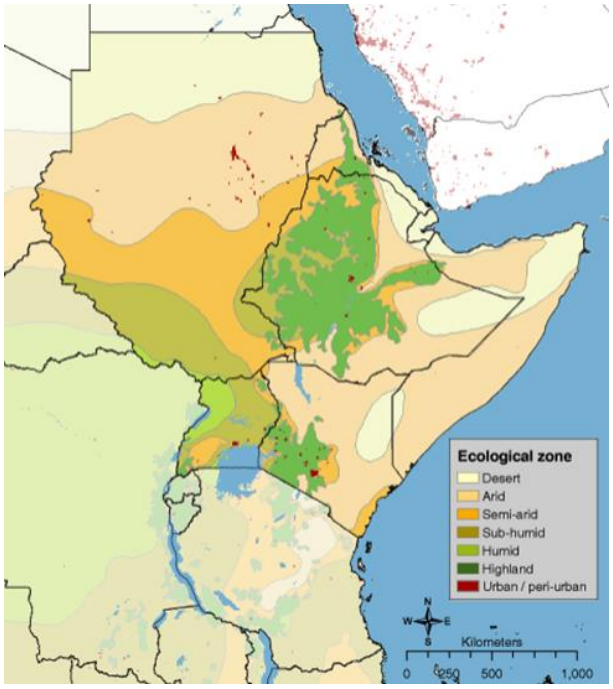

Figure 1. Agro-ecological Zones in the IGAD Region
Source: Knips 2004

This SSA-Report identifies the challenges and lessons learned to inform any futuristic furtherance of seed policy harmonization by IGAD to enhance trade. Accordingly, assessment of the status of national and regional legislations, standards, regulatory frameworks and instruments along the seed value chain is required to work towards building robust regional seed systems that is responsive and resilient to recurrent shocks. Hence, this assessment was carried out to understand the seed sector challenges and opportunities in the IGAD member countries and design tools to strengthen economic relationships and integration, promoting agricultural development and food security by boosting intra-regional seed trade. Although, the SSG project targeted the four IGAD countries, we took advantage of the opportunity to conduct the assessment in all the eight IGAD member countries for a better understanding and documentation of the region-wide seed system landscape.

1.2. What is a Seed System?

Seed system is the vehicle through which farmers get good quality seeds of new crop varieties they want and need to grow. Effective seed systems have the potential to increase production quickly and economically. When farmers have access to good seeds and knowledge of improved practices, their

productivity can rise dramatically. In an African context, seed systems encompass different versions – the formal, the informal, and other intermediaries, which can be classified as follows (Subedi et al., 2013):

a. **Formal seed system:**
   - ***Government seed companies and/or programs***: There are various (mostly public) operators in the seed value chain in this system, in which the seed is certified, and varieties are improved. In most countries of sub-Saharan Africa, governments invest their resources in the production and dissemination of crops that are important for food and nutritional security through this system; these include cereals (maize, rice, wheat, and several others), legumes, and vegetables.

   - ***Commercial seed companies***: In this seed system, commercial companies are either directly engaged in seed production on own land, through contract farming and out-grower schemes, or in importing seeds of high-value food and cash crops, which are subsequently marketed through their networks and/or agro-input dealers. Hybrid maize, vegetables, and perennial fruit trees are the main crops for which this system is operational.

   - ***Closed value chain***: This seed system usually has a short value chain, where the seed (including planting materials) and input packages are directly provided to the commercial growers. The system includes crops such as cotton, tea, coffee, tobacco, and sugarcane.

b. **Informal seed system:**
   - ***Farmer-saved seed***: The most prominent source of seed for most African farmers for many crops is a farmer-saved seed. Farmers obtain seed through both informal and formal networks. Varieties can be both local (landraces) and improved. The crops are largely for subsistence and food security, but in many cases may also be used for income-generating purposes. Non-governmental organizations (NGOs) are actively involved in supporting communities to enhance food security and reduce poverty.

c. **Intermediate seed system**
   - ***Community-based seed production***: Farmers source seeds of locally important food and cash crops through this system. A very significant amount of formal sector seed currently comes from Community Based Seed Programs (CBSP) and Local Seed Businesses (LSB) where ***f***armers multiply and sell small quantities of quality seed of improved varieties to other farmers. . often

Diagrammatic representation of a diversified seed sector model in Africa is depicted in Figure 2. The "Intermediate" system is a variant version of the formal system except that the quality control and certification standards are less stringent than the formal seed system *per se*. One form of this "intermediate" model that fits for self-pollinated target crops is the Quality Declared Seed (QDS) system (FAO, 2006). In QDS production, the seed does not undergo the full scale of the rigorous inspection and certification processes; only simple standards on crop health and hygiene are adhered to by the seed producers, provided the source of the basic seed is known and therefore traceable (mostly from research stations).

The intermediate system is useful to produce seeds of varieties of self-pollinating crops, for which farmers do not buy seed every year. While the intermediate system may increase farmers' access to improved seeds at national levels (Mastenbroek et al., 2015; Sisay et al., 2017), its utility for transboundary seed trade is not clear. Therefore, when considering regional seed harmonization, it essentially means expanding the use of certified seed through the formal system.

1.3. Rationale for Regional Seed System Analysis

In the IGAD Treaty, there are 11 "***Aims and Objectives***" of the Authority to which the legitimacy of this assignment can be directly anchored, or linked to the highest-level policy organ:

i. Harmonize policies with regard to trade, customs, transport, communications, ***agriculture***, and natural resources, and promote free movement of goods, services, and people and the establishment of residence.
ii. Create an enabling environment for foreign, ***cross-border and domestic trade and investment***.
iii. Facilitate, promote, and strengthen cooperation in ***research, development, and application*** in the fields of science and technology.

In the IGAD region, as is the case for most African countries, both the formal and informal seed systems exist; the latter is still the predominant one. The formal seed systems tend to focus on a few profitable seed crops such as hybrid maize and vegetables. The informal seed systems models are mostly used for self-pollinated crops and Open Pollinated Varieties (OPVs) of local importance. However, the formal systems are not delivering with the efficiency and effectiveness of improved new varieties to have a major impact. Therefore, the development of impact-oriented seed systems is a strategic issue, and more so in climate-vulnerable regions such as IGAD, and that will have to be informed by a regional level Seed System Analysis (SSA).

Seed Systems Analysis (SSA) is a process-oriented tool to understand the composition, distinctness, and variations within a seed sector of a specific country or geographical dimension. SSA is a crucial tool for developing seed policies, strategies and programs. SSA takes the systemic perspectives in analyzing the role of different seed systems. It helps to identify specific seed systems by their domain of operators (farmers, public, private, NGO, others), the types of crops and varieties, types of target farmers, and types of seed quality assurance and dissemination mechanisms. Based on the evidence generated through SSA development, specific intervention strategies are possible in targeted seed systems, crops, and geographical dimensions (Subedi et al., 2013).

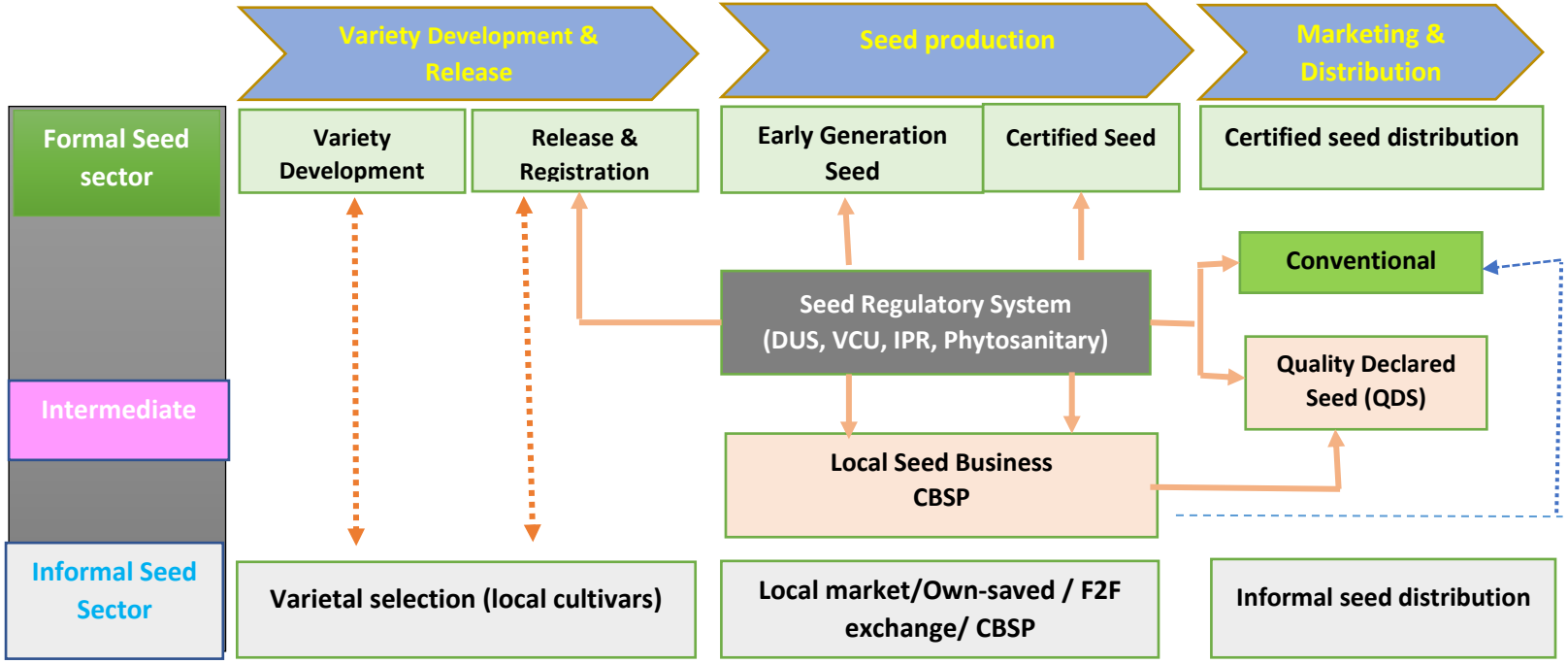

Figure 2. Diagrammatic representation of a typical seed system in an African country

Source: Adapted from Bishaw et al. (2015)

Regarding Regional Economic Communities (RECs), such as IGAD, SSA is the first step towards a harmonized regional seed system. Given the socioeconomic diversity of the IGAD region, regional level collective action is necessary for accelerated cross-border seed trade by incentivizing the private sector through reduced cost of regulation and wider market incentive. That means the "free" movement of seed from one country to another through a harmonized policy will remove the obstacles to seed trade across borders with a view that the regional markets will become more attractive.

The COVID-19 pandemic has brought agriculture and food system issues to the fore by presenting a formidable threat to trade in agricultural commodities. Food trade disruption was one of the major impacts of COVID-19. World hunger and malnutrition increased in 2020 after remaining unchanged for the previous five years. In this same year, Africa's 21% of the population (282 million) was affected by undernourishment; 46 million more Africans were food insecure than the year before COVID-19 (FAO et al. 2021). Therefore, seed being a critical input for food production, there is a dire need of bringing the member states to come up with practical undertakings to cushion the seed sector from pandemic-related trade disruptions.

1.4. Scope of the assessment

The Report covers the eight IGAD member States - Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda. The assessment and analysis covered mainly the formal seed system. The target crops considered are important to the IGAD region with varying degrees: sorghum, pearl millet, beans, cowpea, and groundnuts (as a group represent self-pollinated crops, and more of the informal seed sector); while hybrid maize (represents the formal sector). Because of the importance of pastoralism and agropastoralism in the IGAD region, the status of forage crop seeds was considered in a separate section (Section 6).

2. Objectives of the Assessment

The overall objective of the assignment is to review/assess the frameworks governing seed policies and regulatory regimes, describing existing different seed systems and seed distribution channels along with supporting institutions, and documenting major opportunities and challenges influencing regional seed system and production, marketing, and utilization of seed for local and export markets.

The specific objectives are to:

- Critically review the policy and regulatory frameworks governing the national and regional seed sector including variety evaluation, release and registration, seed production and marketing, seed assurance and certification, plant variety protection, phytosanitarymanagement, and seed import and export procedures in the IGAD region.
- Identify institutions/entities producing and supplying seeds to farmers and assess their capacity for breeding, cultivar assessment, promotion and marketing, quality seed production, seed distribution, and trade.
- Determine and describe the various types (i.e., formal, informal, and integrated ones) of seed production and distribution systems in the region and areas of convergence.
- Understand and document critical bottlenecks and opportunities to improve both the formal and informal seed supply chains, including investment potential in the IGAD region; and
- Recommend future strategies for a viable harmonized regional seed system and trade

development among the IGAD Member States.

3. Methodology

3.1. Approaches, data management, and analysis

This Report is an assessment of the seed sector in the IGAD Member States, using different data collection tools and means. The Assignment was executed by a Senior Consultant supported by eight (8) National Resource Persons (NRPs), one each from the IGAD Member States. The Senior Consultant – with the support of the PM Agriculture and Food Security Program of IGAD – identified competent experts in the field.

The assessment exercise employed both primary and secondary data gathering methods and tools. The secondary sources included an intensive review of the available literature (e.g. published articles, working papers, policy, and program documents), Websites of relevant national institutions, regional economic communities, the Food and Agriculture Organization of the United Nations (FAO, 2011), and initiatives such as the African Seed Access Index (TASAI)[3], the Integrated Seed System Development (ISSD)[4], the African Seed Trade Association (AFSTA)[5], Seed Systems Group[6], sub-regional (e.g. ASARECA) and CGIAR (Consultative Group for International Agricultural Research) research systems were used as resources of the SSA methodology and information source.

The NRPs conducted Key Informant Interviews (KII) guided by semi-structured questionnaire with key stakeholders and informant groups across the seed value chain (Annex 3.1 – 3.3.). Common assessment framework and data collection formats were developed for use by the NRPs. Each NRP identified stakeholders for the KII, focused mainly on the role of the private seed sector. The NRPs visited in person or used phone calls and e-communication means, with the various organizations that include both state, non-state actors and private sectors such as cooperatives and cooperative unions, agro-dealer shops, markets, and agriculture offices to observe the entire seed supply chain from policy and regulatory schemes through to research (development of improved varieties), seed production, handling, and marketing practices.

Attempt was made to assess capacity of seed companies in terms of total amount of certified seed production, own land holdings, size of contact farming, seed processing capacity, warehouse capacity and financial capacity. However, because of the large number of companies, particularly the local ones, quantitative survey in all the countries was not conducted. Therefore, capacity assessments were supplemented from the discussions in qualitative terms during the KII interviews (Annex 3.2).

The analysis further explored best practices from other Regional Economic Communities (RECs), mainly the Common Market in Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Economic Commission of West African States (ECOWAS).

[3] https://tasai.org/
[4] https://issdafrica.org/
[5] https://afsta.org/
[6] seedsystemsgroup.org

3.2. Limitations of the Assessment

The sources for the data points in the different countries may create inconsistencies but we do not expect they impact the basic trends and derived conclusions. COVID-19 response compliance and budget has limited the use of full-fledged structured questionnaire to collect more data and further analysis, particularly quantification of the level of infrastructural capacity. There are plenty of SSA tools and reports at national level and for specific crops. However, to our knowledge, regional models for SSA are scarce or non-existent. A simple mechanical merger of the individual country SSAs conducted by the NRPs would not respond to the higher-level regional objective. Therefore, the conclusions and recommendations are aimed at regional collective actions keeping in mind the differences of the seed sector development among the member states.

4. The Target Crops

Several crops grow in the different agro-ecologies of the IGAD region. However, the target crops for this assessment included beans, maize, groundnut, sorghum, cowpea, and pearl millet. These crops were selected under the "*Building Back Better: Rural Livelihoods Recovery Initiative for the Greater Horn of Africa (BBB)*" Project, which has been implemented by the Seed Systems Group (SSG) in four of the IGAD countries (Djibouti, Eritrea, Somalia, and South Sudan - "***BBB-Countries***"). SSG is an Africa-based nonprofit organization that believes that every farmer in every village should have access to high-quality seed for a wide range of crop varieties. It addresses the needs of bypassed farmers and communities from the African seed success stories and where improved seeds can make a difference. The Mission of SSG is therefore to *extend the recent advances in seed systems development to farmers in countries of Africa that have so far been left behind* (seedsystemsgroup.org).

Nevertheless, the region-wide system analysis would be incomplete without conducting the assessment in all the IGAD member States. Further, there are areas like the four BBB-countries in the non-BBB Countries. That means the lessons learned from 'BBB Countries" can equally apply in similar marginal agro-ecologies of "non-BBB" countries.

The qualitative assessment of these crops on their relative importance and trends of production in the last five years indicate that, except for maize, the other crops showed variation of importance in the different countries. For instance, pearl millet was considered as important with increasing production trend in Eritrea, South Sudan, and Sudan (Annexes 4.1 & 4.2).

In Table 1 is shown the areas of production of the target crops in the IGAD member counties. Cultivation of these crops occupying more than 100,000 ha is found in the non-BBB countries. Pearl millet is grown in any meaningful hectarage only in Sudan and Kenya. Among the crops, sorghum, maize, beans, and groundnuts, in descending order of farm size, are grown in the region.

Productivity of each target crop varies in the different countries (Table 2). For maize, in all the countries, average national yields are much lower than the world average, indicating the room for further improvement. Average yields for maize in Eritrea, Kenya, Somalia, South Sudan, and Sudan are lower than even the African average. National yields for maize in Ethiopia and Uganda are higher than the regional and continental averages. For the rest of the target crops, national average yields are close to or higher than the world averages.

In conclusion, this assessment confirms the appropriateness of the selected target crops for the SSG project countries. However, there is a need for prioritization at national level as well as consideration of

region wide prospect through further yield improvement and attractiveness for private sector involvement (this is not necessarily to mean big businesses and multinational companies, but also small local seed businesses and agro-dealers).

Table 1. Area of production (000' ha) of the target crops in the IGAD member countries

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda	IGAD Region
Maize [hybrid]	0.64	2,526	2,189	0	0.07	32	390	5211
Maize [OPV]	17	N/A	N/A	20	1.45	N/A	260	281
Sorghum	254	1,679	200	3	2.70	9955	282	12122
Pear millet	54	N/A	53	<1	0.98	4095	N/A	4150
Beans	26	443*	1,148	1.75	1.01	N/A	731	1882
Cowpea	0	NA	239	0.2	0.54	405	140	785
Groundnut	4	114	16	0.84	1.12	3140	208	3480

*Common bean, Soybean and Mung bean

Table 2. Average productivity (t/ha) of target crops in the IGAD member countries

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda	East Africa	Africa	World
Maize	1.1	4.18	1.73	1.0	1.5	1.30	4.0	2.01	2.10	5.75
Sorghum	0.6	2.69	1.43	0.30	1.2	0.64	1.0	1.60	1.01	1.46
Pear millet	0.3	N/A	N/A	0.20	0.8	0.48	2.5	-	-	-
Beans, dry	0.7	1.78	0.67	0.25	1.5	-	2.0	0.86	0.84	0.79
Cowpea	N/A	N/A	1.1	0.10	1.0	0.40	0.35	0.65	0.58	0.59
Groundnut, with shell	1.0	1.81	1.0	0.28	2.0	0.56	2.5	0.74	0.97	1.7

5. Major Findings

5.1. Overview of seed systems in the IGAD region

The Seed System in IGAD member countries is characterized by a co-existence of the formal and informal seed systems. Currently there are several registered seed companies in the different IGAD countries. These companies are fully regulated and supervised by the various governmental institutions at the various stages – starting from research and development through to seed marketing (Annex 5.1.).

Membership to the various international organizations, particularly the International Union for the Protection of New varieties of Plants (UPOV) and the International Seed Testing Association (ISTA), can be

a measure of the level of advancement of the seed sector in any given country; Kenya is the only IGAD member state who is a member of UPOV, and Sudan and Uganda are in the process of joining. Most countries are members of the International Plant Protection Convention (IPPC), except Somalia and South Sudan (Annex 5.2),

The seed companies registered in the IGAD member countries is a mix of local and international companies (Table 3a-c). Some of the seed companies in Kenya are involved in a complete seed value chain of Research and Development (R4D), seed production, processing, and marketing while others just sell, import, and distribute seed. Research and development is predominantly conducted by public institutions in Eritrea and Ethiopia, by private sector in Somalia and Uganda, and a mix of both in Kenya and Sudan. In Ethiopia, although the number of private companies is seemingly high the formal seed sector is dominated by parastatal (public) seed enterprises. Except Kenya, all the available national policy, regulatory and legal regimes of the IGAD member States recognize the Quality Declared seed (QDS) system,

Despite the growth of the formal seed sector, its overall contribution to the seed supply is still limited and low (<20%) and mostly covers a few crops such as hybrid maize (Table 4). Interestingly, the use of improved certified seed from the formal seed system in non-BBB countries (policies and legal frameworks in place) is not different from those of BBB countries. Therefore, while the formal sector must be expanded, there is need for a more inclusive seed sector that considers the local situation at national level and serve the bulk of the small-scale farmers in the IGAD region.

Table 3. Number of registered seed companies dealing with the target crops in IGAD member Countries

Table 3a. Research and development

Crop	Number of active seed institutions/ companies							
	Eritrea	Ethiopia	Kenya		Somalia	Sudan		Uganda
	Public	Public	Public	Private	Private	Public	Private	Private
Maize	-	8	3	6	2	1	-	1
Sorghum	1	8	4	2	2	1	3	-
Pearl millet	1	1	1	-	1	1	-	-
Beans	1	6	4	-	2	1	-	-
Cowpea	-	1	2	-	1	1	-	-
Groundnut	-	2	1	-	1	1	1	-

Table 3b. Seed Production

Crop	Eritrea	Ethiopia		Kenya		Somalia	South Sudan	Sudan		Uganda	
	Public	Public	Private	Public	Private	Private	Private	Public	Private	Public	Private
Maize	1	5	69*	2	8	9	6	-	1	1	23
Sorghum	1	3	-	2	4	9	6	4	32	-	5
Pearl millet	1	-	-	1	0	1	6	2	8	-	-
Beans	1	5	2	4	3	8	6	-	-	-	5
Cowpea	0	-	5	2	2	8	6	-	-	-	2
Groundnut	1	1	-	1	0	1	6	4	6	-	4

*60+local private+ 7 Unions+ 2 multinationals. Companies may produce seeds of more than one crop.

Table 3c. Seed selling

Crop	Eritrea	Ethiopia		Kenya		Somalia	South Sudan	Sudan		Uganda	
	Public	Public	Private	Public	Private	Private	Private	Public	Private	Public	Private
Maize	1	5	69	2	8	8	7	-	3	1	26
Sorghum	1	11	-	2	4	5	8	4	32	-	5
Pearl millet	1	-	-	1	0	5	8	1	3	-	-
Beans	1	5	2	4	3	5	8	-	-	-	5
Cowpea	0	1	6	2	2	3	8	1	1	-	4
Groundnut	1	1	-	1	0	2	8	4	6	-	4

Table 4. Proportional estimates (%) of the formal (F) and informal (I) seed sources for the target crops in the IGAD countries

Crop	Eritrea		Ethiopia		Kenya		Somalia		South Sudan		Sudan		Uganda		Crop average	
	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I
Maize [Hybrid]	100	0	47.5	52.5	66	34	0	0	11	89	100	0	100	0	63.5	36.5
Maize [OPV]*	0	100	-	-	-	-	25	75	43	57	14	86	34	66	16.6	83.4
Sorghum	10	90	12.3	87.7	13	87	10	90	21	79	29	71	4	96	14.2	85.8
Pear millet	10	90	-	-	<1	>99	0	100	10	90	3.3	96.7	13	87	6.8	93.2
Beans	0	100	6.3	93.7	20	80	25	75	38	62	0	100	0	100	14.9	85.1
Cowpea	0	0	-	-	15	85	0	100	26	74	<1	99	1	99	6.1	93.9
Groundnuts	0	100	1.6	98.4	<1	>99	45	55	12	88	1.1	98.9	1	99	8.8	91.2
Regional average															**18.7**	**81.3**

*In Ethiopia and Kenya separating OPV and hybrid for maize especially for the informal

5.2. Seed policies and legal frameworks

5.2.1 National level

Legal frameworks are required to govern the seed sector operations in any given territory. The frameworks may include an overarching seed policy, a seed law/Act, and seed regulations and directives. A National Seed Policy is a statement of intent and principles that guides government action and allocates the roles of relevant stakeholders in the coordination, structure, functioning and development of the seed

system. The seed policy ensures that a government's vision is adequately reflected, in day-to-day operations, within the seed sector. Nevertheless, while a stand-alone seed policy is important it may not always proceed seed laws and other regulatory frameworks, strategies, plans and programs/projects.

These policy and legislative instruments in the IGAD member States are at various levels; there is no seed policy or legal frameworks in Djibouti, Eritrea, Somalia, and South Sudan. Ethiopia, Kenya and Uganda have a stand-alone seed policy (Table 5 & Annex 5.3). Despite having up-to-date policy and regulatory instruments, challenges remain in these countries pertaining to implementation mainly because of capacity and resources.

Table 5. Status of seed policy and legal frameworks in IGAD member States

	Djibouti	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
National Seed policy	No	Draft	Yes	Yes	No	Draft	Yes	Yes
National Seed Act/Law	No	Draft	Yes	Yes	Draft	Draft	Yes	Yes
Seed Regulations	No	Yes	Yes	Yes	No	No	Yes	Yes
Plant Variety Protection (PVP/PBR)	No	Draft	Yes	Yes	No	No	Yes	Yes

5.2.2. Regional Harmonization

Harmonized regulation of seeds has been an area of focus in all RECs but IGAD. Legal and regulatory reform is a significant component of regional harmonization, and the rules and standards created by RECs are providing an increasingly comprehensive framework for development of the seed sector (Kuhlman, 2015).

The goal of regional harmonization is to facilitate easy movement of seed across boarders through relatively efficient varietal release system and access to proprietary materials by legal means. Regional harmonization of seed policies and regulations has the following advantages:

- Increase in size and diversity of markets both for crop and seed producers (incentive to the private sector, and enhances competitiveness),
- Increased access to drought, heat, salinity, disease, and insect resistant varieties result in stabilisation and predictability of crop yields at farm and national level.
- Better cooperation in seeds among member-states through improved clarity and transparency on data exchange - seed availability, gaps, and harvest projections.
- Enhanced transparency and predictability on regulatory and seed movement administrative processes.
- Faster releases of varieties and reduced transaction costs.

However, while each REC is taking steps to harmonize critical aspects of seed regulation (variety release, seed certification and quality assurance, and quarantine and phytosanitary (SPS) measures, the degree of regional harmonization varies across RECs because of: (i) institutional structure and capacity within the RECs; (ii) overlap between different regional initiatives; (iii) the degree to which national level action, including further change in law and regulation, are needed to implement regional seed harmonization efforts; and (iv) inactive regulatory cooperation among countries within the RECs (Kuhlman, 2015). As a

result, despite the progress, movement of seed consignments across borders with regional seed labels is yet to materialize.

Kuhlman (2015) has documented detailed account and comparative analysis of the seed harmonization efforts by the different RECs. To this report are selected those of the COMESA and EAC harmonization efforts (because of overlap in membership with IGAD member States) and that of ECOWAS (as a best practice for its simplicity).

Common Market for Eastern and Southern Africa (COMESA): The COMESA Seed Trade Harmonization Program was initiated in 2008. In 2014, the COMESA Seed Trade Harmonized Regulations was approved and gazette. In 2015, the COMESA Seed Trade Harmonized Regulations Implementation Plan (COMSHIP) was launched.

The progress so far from the COMSHIP implementation is as follows:

- Eight COMESA Member States (Burundi, Egypt, Malawi, Rwanda, ***Kenya***, ***Uganda***, Zambia and Zimbabwe) have completely aligned their national seed laws to the COMESA Seed System with official gazette done. This means that seed companies in these countries can trade their seed consignment using the COMESA Seed Trade Harmonization Regulations in line with the COMESA Variety Catalogue, which is available online.
- ***Ethiopia*** gazette only Seed Certification Standards in December 2016 with the aligned Plant Quarantine Proclamation of the Federal Democratic Republic of Ethiopia of 2017 and the Ethiopian Seed Regulation 375/2016 is still to be gazette.
- The Member States with draft COMESA aligned laws / regulations include DR Congo, Eswatini, ***Djibouti*** and ***Eritrea***.
- Comoros, ***Sudan***, Madagascar, Seychelles, Mauritius, Tunisia, Libya, ***Somalia*** are yet to start the process of developing and aligning their seed laws / regulations to the COMESA Seed System.

The progress of the domestication process of the COMESA harmonized seed regulations indicates that IGAD countries who are also members of COMESA are at different levels in the domestication of the seed harmonization process.

At operational level:

- The online COMESA Variety catalogue has gone operational[7]: Varieties registered under this catalogue comply with requirements of a variety having been registered in two COMESA Member States. Once a variety is on the COMESA Variety Catalogue, it does not have to be tested again and can be imported, marketed and, if necessary, produced in any country in the 21 COMESA Member States. The operations of the COMESA Variety Catalogue requires that seed companies submit a variety that has been registered officially in two COMESA Member States coupled with certified data of the variety showing the Distinction Uniformity and Stability (DUS) and Value for Cultivation or Use (VCU) / National Performance Tests (NPT).
- There are currently more than 80 varieties released on the COMESA variety catalogue. Variety Catalogue covers 8 crops, namely ***maize***, ***groundnuts***, ***soyabeans***, sunflower, ***common beans***, ***pearl millet***, wheat, and Irish Potatoes. The great majority are hybrid maize varieties. Among the IGAD target crops, only cowpea is not included in the COMESA seed regulations.

[7] https://varietycatalogue.comesa.int/login

- In 2019, the COMESA Seed Labels and Certificates to facilitate regional seed trade were developed.

There are so far fifteen (15) national, regional, and international seed companies that have registered their varieties in the COMESA catalogue. Those seed companies registered varieties in the COMESA catalogue and operate in the different IGAD member States are listed in Table 6. These private seed companies operate to some degree in most of the IGAD countries except in Djibouti, Eritrea, and Somalia. The implication is that if IGAD goes for regional harmonization, because of the membership overlap, it would be same seed companies that would be expected to registering varieties.

Table 6. Presence (P)/Absence (-) of the seed companies that registered varieties in the COMESA Variety Catalogue

Name of company	Ethiopia	Kenya	South Sudan	Sudan	Uganda
Bayer	P	P	P	-	P
Seed-Co	P	P*	-	-	P*
Corteva Agriscience	P	P	P	-	-
Advanta Seed International	P	P*	-	P	P
East African Seed Company	-	P*	P	-	P*
Kenya Seed Co	-	P*	-	-	P
NASECO (Nalweyo Seed Co. Ltd)	-	P	-	-	P
MRI/Syngenta	P	P	-	P	-
Western Seed Co	-	P	-	-	P

*Deal with one or more IGAD target crops other than maize in the country they operate.

East African Community (EAC): The technical agreements among EAC Member States on seed policy harmonization are in five key areas, namely, variety evaluation and release; seed certification; plant variety protection; phytosanitary regulations; and seed import and export procedures (Kuhlman, 2015). The EAC has not yet passed centralized seed harmonization legislation as required under the EAC Treaty, but several specific aspects have been adopted. The ASARECA seed harmonization progress is more functional in Kenya, Uganda and Tanzania with Rwanda following closely. For example, the agreement on variety release and registration followed under which a variety registered in one country's catalogue would be made available in another country following only one year of VCU testing if sufficient test data was provided from previous field trials in similar agro-ecological zones has been adopted by Kenya, Uganda and Tanzania.

Economic Community of West African States (ECOWAS): ECOWAS has been working on regional seed harmonization since the mid-2000s. The most significant step in seed harmonization within ECOWAS was the 2008 regional agreement on harmonized seed regulation (Khulman, 2015). Since then, under facilitation by CORAF (Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles), the full range of the harmonization program, covering variety registration and release, seed certification and quality assurance, quarantine and phytosanitary measures has significantly advanced across the 14 Member states. Under the ECOWAS regulations, varieties registered in one country can be included in the West African Catalogue of Plant Species and Varieties (COAFEV) and may then be introduced in any ECOWAS member country without restrictions.

5.3. Variety development, evaluation, and release procedures

5.3.1. Number of active breeders

A functioning seed system needs strong and vibrant – be it public or private - breeding programs to develop improved varieties that respond to farmer and consumer needs and demands. The number of active breeders is indicative of the level of investment in research and development. To this report, an "active breeder" is a plant breeder with advanced degree (MSc^{+}) who is currently engaged in breeding/maintaining a crop variety.

The number of active breeders in IGAD member States for the different target crops are given in Table 7. The following facts emerge from these data:

a) There are more public breeders than those working for private seed companies; only Kenya and Uganda reported breeders working for private companies.
b) Maize breeders take the highest numbers in all the countries, except South Sudan.
c) Ethiopia and Kenya have the highest number of breeders, and the only forage-crop breeders in the region. However, the forage breeders in Ethiopia do not have the required training in plant breeding.

Table 7. Number of plant breeders for the target crops in IGAD member countries.

Crop	Public Institutions							Private Seed Co.	
	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda	Kenya	Uganda
Maize	1	20+5	11	1	1	3	5	7	2
Sorghum	2	7+2	6	1	1	5	1	2	0
Pearl millet	2		1	0	0	3	1	0	0
Beans	1	10+3	6	1	1	0	2	0	0
Cowpea	0		4	1	1	0	1	0	1
Groundnut	1	1	1	2	2	4	1	0	0
Forage crops	NA	6+3	4	0	0	0	0	1	0

*Some breeders may work on more than one crop.

5.3.2. Variety Development

Seed value chain begins with the development of a new variety supposedly with superior qualities to existing varieties. The number of varieties released measures crop-specific outputs from the variety development and release system. It is often asserted that the greater the number of varieties released, the higher the chances of enhancing smallholders' access to improved seed (TASAI). This may be true when new varieties carry desired traits such as climate-change adaptation, disease resistance, and nutrition enhancements. Recurrent disease resistance breakdown is the most pressing factor for frequent release and replacement of varieties. For instance, the wheat rusts are good examples. The sharp increase in the number of maize varieties released in 2016-2017 in Kenya reflects the efforts put to address the

outbreak of Maize Lethal Necrosis Disease (MLND) in 2011 and led to increased funding to maize breeding programs. On the other hand, when the differences between the new and old varieties is obscure, large number of varieties may even complicate the seed multiplication process.

The total number of varieties for the target crops released in the IGAD countries is given in Table 8. Generally, it does not appear that shortage of varieties for the target crops is a challenge for the seed system; it should rather be lack of a delivery system. Maize dominates the varieties released, followed by beans, and sorghum. Most of the varieties grown in the last three years, except for maize, were developed by the public seed sector (Annex 5.4 & 5.5). At country level, varieties owned by private seed companies were high in Kenya and Sudan. It is possible that some of the varieties under different names, particularly those owned by the private sector, have same pedigrees. However, it requires further analysis to sift out such varieties that could be of relevant importance for regional adoption. Qualitative assessment of the research and development capacity to develop new varieties corroborates that only Kenya is in a strong position both for the public and private seed companies, followed by Sudan (Table 9).

Table 8. Number of varieties released/under production for the target crops in the IGAD countries.

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Maize [Hybrid]	0	52/17	380/87	0	4/1	22/4	80
Maize [OPV]	3	35/7	16/9	0	2/1	4/2	4
Sorghum	10	60/14	45/8	5/2	2/2	63/11	11
Pear millet	6	1/0	3	4/2	0	7/2	3
Beans	2	112/16*	76/32	5/3	2/2	4/0	37
Cowpea	0	8	23/5	4/3	3/3	4/4	12
Groundnuts	0	30	6/1	5/2	3/3	13/4	17
Forage	0	68	21/11	0	0	12/3	0

*Includes Haricot Bean, Soybean and Mung Bean

5.3.3. Average life of released crop varieties

In many African countries, old varieties persist, even though newer varieties outperform older varieties as they are bred for traits that respond to demands made by farmers, consumers, and industry. A lower average age of varieties indicates higher rates of variety turnover. Table 10 shows the average varietal age by crop. The age of the variety is calculated based on the year when the variety was released for commercialization till it is out of production. It is worth noting that many crop varieties remain on the shelves after their release. The most popular maize varieties in South Sudan and Uganda - Longe 5 - is more than 20 years old (Mabaya et al., 2020).

Table 9. Status of research and development capacity in the IGAD countries to develop new varieties. Capacity = Technical, Financial, Infrastructural

IGAD Member-State	National Agricultural Research Systems (NARs)	Private seed companies
Eritrea	Medium	Weak
Ethiopia	Medium	Weak
Kenya	Strong	Strong
Somalia	Weak	Weak
South Sudan	Weak	Weak
Sudan	Medium	Medium
Uganda	Strong	Weak

Generally, crop variety turn over in Africa is slow and IGAD countries are no exceptions. Even in Kenya where the research and development capacity are relatively strong, most crop varieties remain in cultivation for decades. Therefore, unless for additional clear climate-smart trait, regional testing of the existing varieties would be important to reduce cost of product development and encourage cross-border trade. Further, while breeding of new varieties continues, it is prudent to invest on how small-scale farmers across the region access seeds of existing varieties. This is because often it is misconceived that farmers regular replacement of old varieties with new ones is taken as an indication of a vibrant seed system. As mentioned above, this may be applied to crops that succumb to frequent disease resistance breakdown like the wheat rusts. When such disease pressure are low or absent the chances of developing new varieties for extreme weather conditions in the IGAD region could even be more costly and frustrating. That means the incentives for the private sector investment are diminished; even public sector research investment may not be that high.

Table 10. Average production life (years) of a released variety in IGAD countries

Crop	Ethiopia	Kenya	Sudan	Uganda
Maize	17	19	-	12/10*
Sorghum	12	41	19	18/8*
Pearl millet	-	20	9	15
Beans	14	21	-	15/6*
Cowpea	-	20	21	15
Ground nut	12	7	26	15
Forage crops	-	45	-	-

*TASAI estimations of most popular varieties sold in 2019 (Mabaya et al., 2020).

5.3.4. Variety evaluation and release system

The purpose of a variety evaluation and release system is to ensure that varieties made available to farmers are superior in their performance and differ in their at least one characteristic than existing varieties on the market. It can also prevent the use of varieties that might have a negative impact on agriculture, such as those susceptible to major diseases that could create the risk of significant production loss (FAO, 2011). Variety release procedures usually encompass performance testing through multilocational trials as well as administrative registration procedures. Variety release procedure includes the conducting of registration after testing for distinctness, uniformity, and stability (DUS) and performance testing for value for cultivation and use (VCU). That means, a functional Variety Release system is required to follow specific procedures or guidelines at national and/or [where available] regional seed regulatory system and should meet specific criteria with respect to DUS and VCU testing, reference sample and variety denomination. A supportive variety release and registration system should therefore be affordable, rapid, and inclusive of all important crops. Once the DUS and VCU data are scrutinized, variety release approvals are often done by national variety release committees. Then follows the registration of a variety in the national catalogue, which means that the seed of the newly released variety is authorized to be produced and sold or distributed locally for farmers to grow. When new varieties are to be used, farmers must be adequately informed about their performance through extension services and offer them the opportunity to test the varieties. The extension activities can be carried out by public sector extension programs, private seed companies, NGOs, or farmers' organizations/groups. That means, a reasonably effective extension system is required to increase the adoption of new varieties.

Ethiopia, Kenya, Sudan, and Uganda have established variety release procedures to evaluate and regulate but require capacity strengthening (Annex 5.6). These four countries also have Plant Variety Protection System - mostly in the form of Plant Breeder's Rights (Annex 5.7) - although its application other than to hybrid varieties is difficult in Africa. The Kenya Plant Health Inspection Services (KEPHIS) is a model independent regulatory agency for other IGAD member States. Ethiopia has established an independent regulatory body for the conducting of the administrative variety evaluation and release procedures, while Somalia is in the process of establishing one.

In Eritrea and South Sudan, the variety evaluation and release system are conducted through *ad hoc* National Variety Release Committee (NVRC) under the oversight of Ministries of Agriculture. Variety evaluation and release system is not in place in Somalia. In the absence of variety release authority, South Sudan presents an interesting interim arrangement for variety release procedure. An NVRC composing of seed experts from research institutions, seed companies and South Sudan Union of Agriculture Producers has been formed. The breeder intending to release the variety applies to NVRC two months prior to the variety release. A release application is submitted to NVRC and hard copies of the application, detailing the research wok will be shared with the secretary and all members of the committee for critical review. Once all conditions are accepted by the NVRC, the variety release meeting is held, and the variety is released. Several new varieties of maize, millet, sorghum, rice, groundnut, cowpea, soybean among others have been developed and released in South Sudan from 2012 to 2021.

5.3.5. Seed production and commercialization

The production of quality seed requires that the breeder maintains a quantity of high-quality seed, often called nucleus or breeder seed. The multiplication of subsequent early generation seed (EGS) – also called pre-basic and basic seed - requires high technical expertise thus generally carried out under the control of the breeder. In many developing countries, including the IGAD countries, EGS multiplication, particularly for non-hybrid varieties is often undertaken by the public-sector breeding institutions. Issues

relating to delays in timely availability of adequate quantities and quality of EGS can cause major bottlenecks to produce improved seed in many developing countries (FAO, 2011).

In this assessment study, we conducted a qualitative assessment to gauge the level of farmers' seed demands (Table 11) and interests of the private seed companies in producing certified seeds of the target crops and sell it to farmers (Table 12). High certified seed demand by farmers varies by country and target crop.

Seed demands are high for maize, except in Eritrea and Sudan possibly because, sorghum rather than maize is the most important cereal cultivated in these two countries. Interestingly, maize OPVs are still in demand in Somalia, South Sudan, and Uganda. Beans are in demand in Kenya, Somalia, South Sudan, and Uganda. As a country, seed demands for all the crops (except pearl millet) are high in South Sudan and Uganda. Indeed, the Government of the Republic of South Sudan has prioritized maize, sorghum, beans, groundnut, and cowpea as the major staple crops. Seeds of these targeted crops are being produced within the country by Community Based Seed Production (CBCP) groups and with support from humanitarian agencies and local NGOs through projects (Table 14). Generally, the data indicate that there is some level of demand for each target crop in more than one country justifying that regional approach is worth trying for IGAD target crops.

The volume of certified seeds produced in the IGAD member countries for the target crops under consideration is given in Table 13. Ethiopia takes the highest overall share (61 %) followed by Kenya (30%), Sudan (4.33%), South Sudan (2.45%) and Uganda (2.09%). Sudan takes the highest share for sorghum. Among the target crops, hybrid maize accounted for 73.8% of the total certified seed production for the crops followed by beans (15.25%) and sorghum (4.82%). Hybrid maize is not produced in Somalia.

5.3.6. Seed quality assurance and certification

Seed certification entails adherence to procedures and standards as stipulated in seed law, certification schemes and regulations. The ultimate objective is to produce high-quality certified seed to the market. In Ethiopia, Kenya, Sudan and Uganda, arrangements are in place to ensure that seed production and other activities in the seed chain adhere to established rules and regulations. These rules and regulations are contained in formal seed legislation or seed laws and their ensuing regulations. An appropriate seed quality assurance program, however, needs more than legislation; it also requires an implementing and enforcing body and adequate facilities and resources, such as seed laboratories and trained staff (FAO, 2011). Therefore, certification processes should be supported by certain level of regulatory capacity in inspection, testing and certification.

Table 11. Certified seed demand by farmers for the target crops in IGAD countries

IGAD Member-State	Maize (H)	Maize (OPV)	Sorghum	Pearl Millet	Beans	Ground nuts	Cowpeas
Eritrea	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Ethiopia	High	Medium	Medium	Low	Medium	Low	Low
Kenya	High	Medium	Medium	Low	High	Low	Low

IGAD Member-State	Maize (H)	Maize (OPV)	Sorghum	Pearl Millet	Beans	Ground nuts	Cowpeas
Somalia	High	High	Low	Low	High	High	Low
South Sudan	High	High	High	Medium	High	High	High
Sudan	Low	Low	High	Low	Low	Low	Low
Uganda	High	High	High	Low	High	High	High

Table 12. Interest of private seed companies to develop varieties, produce and sell seeds of the IGAD target crops

IGAD Member-State	Maize (H)	Maize (OPV)	Sorghum	Pearl Millet	Beans	Groundnuts	Cowpeas
Eritrea	Weak	weak	weak	weak	weak	weak	weak
Ethiopia	Strong	weak	weak	weak	medium	weak	weak
Kenya	Strong	Weak	Medium	Weak	Medium	Weak	Weak
Somalia	Medium	Medium	Weak	Weak	High	High	Weak
South Sudan	Strong	Strong	Strong	Strong	Strong	Strong	Strong
Sudan	Weak	Weak	Weak	Strong	Medium	Weak	Weak
Uganda	Strong	Strong	Medium	Weak	Medium	Medium	Medium

Seed certification and quality control in the IGAD countries is generally weak, with possible exception of Kenya, in terms of institutional, human, and infrastructural capacities (Annex 5.9). As stated above, in the domestication of the regional harmonization policy, the field and laboratory standards for seed certification would have to be aligned with that of the COMESA standards.

South Sudan interestingly has developed seed certification standards, even in the absence of national seed legislations. These standards are like that of COMESA's regulations with few differences (Table 15). Kenya and Uganda were chosen for comparison here because of their relative advancement in the seed sector development and complete alignment with COMESA's harmonized regulations. Kenya does not have standards for pearl millet, while cowpea is not included in the COMESA list of crop species. Interestingly, the differences in standards are more noticeable between Kenya and Uganda than between Kenya and South Sudan. That means, although not a member of COMESA, South Sudan can still benefit from seed trade harmonization with its fellow IGAD member States that are also members of COMESA.

Table 13. Certified seed production (t) in IGAD member countries in 2019/20

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda	Total	Per Cent
Maize [Hybrid]	200	248325	63000	0	126	0	4200	315851	**73.8**
Maize [OPV]	5	11957	0	71	1811	10	2800	16583	3.89
Sorghum	120	245	1224	129	2966	15685	400	20640	4.85
Pear millet	30	0	0	0	878	121	0	1029	<1
Beans	2	675	62069	0	1764	0	730	65240	**15.25**
Cowpea	0	0	2034	28	678	0	230	2942	<1
Groundnut	0	59	0	0	2242	2712	600	5613	1.31
Total	357	261261	128327	228	10465	18528	8960	**428126**	
Per cent	<1	**61.02**	**29.97**	<1	2.45	4.33	2.09		

5.3.7. Seed import and export procedures and phytosanitary management

Addressing quarantine and phytosanitary issues is important to safeguard transboundary movements of elements that can have adverse effects on plant health and food safety. That means, a supportive legislative framework that recognizes and domesticates regional and international phytosanitary regulations related to quarantine and phytosanitary measures for seed should be put in place. Such legislative measures supported by international agreements are in place in Ethiopia, Kenya, Sudan, and Uganda. Nevertheless, except for Kenya, capacity limitation is still a challenge (Annex 5.10). Nevertheless, movement of large seed consignments across borders is still limited despite the adoption of the COMESA harmonized regulations. Therefore, the efficiency, weaknesses and strengths of the national quarantine and phytosanitary systems are yet to play facilitative role for regional seed trade.

Table 14. Major seed programs/projects/Initiatives in South Sudan

Programs/projects/ Initiatives	Duration	Major Objective	Target crops	Main outcome	Funding source
Building Back Better: Rural Livelihoods Recovery Initiative for the Greater Horn of Africa	September 2021 - June 2022	Contribute to the reduction of small-scale farmers and agro-pastoralists producers' vulnerability, in South Sudan.	Maize, sorghum, cowpea, beans, groundnut	Increased average yield (t/ha) in farmer fields. .	IFAD
South Sudan Resilient Agricultural Livelihoods Project	June 2021 – August 2026	The project development objective is to strengthen capacity of farmers and	Maize, sorghum, cowpea,	Improved food production in South Sudan	World Bank

		their organizations and improve agricultural production.	beans, groundnut		
Accelerating Agriculture and Agribusiness in South Sudan for Enhanced Economic Development (A3-SEED)	2021-2025	Commercialization of the seed sector to transition South Sudan from humanitarian relief support to a commercial, sustainable, and adaptive agriculture sector.	Maize, sorghum, cowpea, beans, groundnut	Increased income from marketable surpluses of targeted commodities, improving their livelihoods	The Embassy of the Kingdom of the Netherlands (EKN) in Juba
Food and Nutrition Security Resilience Programme (FNS-REPRO) South Sudan programme	2021-2025		Maize, sorghum, cowpea, beans, groundnut		Dutch Government
Gempalsm platform	2021	Germplasm collection	All staple crops of South Sudan	Assemble germplasm for South Sudan genetic resources base	IITA

5.3.8 Challenges and interventions for the formal seed system development: Synthesis

Key Informant Interviews were conducted to identify the challenges and have an overview of the prospects for the private seed sector regarding the formal seed development. The summarized results are separately given in Annex 5.8. Most of the key informants that participated in the assessment acknowledged the overall importance of the private seed sector in the seed system of respective countries for diversification of the seed sector through access to more and better variety and transfer of technologies of the selected crop varieties. Most of the private sectors are involved in hybrid seed production and the role of the private sector in self-pollinated crops is meagre and fragmented. In IGAD countries where seed policies, laws, regulations, directives and guidelines have been developed, it is important to improve the enabling environment for private sector participation in the seed business. The major constraints are inadequate market system, inadequate support of the government to the private sector, lack of investment incentives, inadequate policy implementation and enforcement at all levels, and inadequate access to EGS of the public-owned varieties.

Generally, in countries like Eritrea and Ethiopia, there is a need to develop a clear national seed policy direction and guidelines and provision of support to private sector investment in the seed sector, with consistent and stable policy direction and implementation at all levels. We have identified key challenges in the different seed system components with proposals for possible interventions (Table 16). To incentivize domestic as well as foreign investments, well-designed and stepwise market liberalization is needed in Eritrea and Ethiopia. Experiences from other countries also showed that seed market liberalization has enhanced domestic and international private seed sector investment, supply and improved import export of seed. Indeed, countries like Kenya and Uganda have tried to foster a stepwise reduction of government intervention in private seed production to ensure a level playing field between the public and private sector producers to attract more private companies to the seed sector and expand farmer choice. So, to successfully implement some of the recommendations to alleviate the constraints,

a range of actors including the government, the Ministries of Agriculture, the donor community, and the private sector will need to work together to implement the various seed system components and programs.

Supporting regulatory agencies, extension services, and local private sector with credit delivery system, incentives, and digitization of the seed-trade related processes is also important in improving efficiency in the seed system, and consequently increase regional seed trade.

Table 15. Field and laboratory seed certification standards in South Sudan (S.Sud), Kenya/Uganda (Ken/Ug), and COMESA (COM) seed regulations

	Maize			Sorghum			Pearl millet		Groundnuts			Cowpea	
	S.Sud	**COM**	**Ken/Ug**	**S.Sud**	**COM**	**Ken/Ug**	**S.Sud**	**COM**	**S.Sud**	**COM**	**Ken/Ug**	**S.Sud**	**Ken/Ug**
Field Standards													
Minimum previous cropping season	1	1	1	1	1	1	1	1	1	1	1	1	1
Isolation (m)	200	200	200	200	200	200	200	200	5	5	3/5	5	25/0
Maximum off-types (%)	0.2	0.2	0.1/0.2	0.5	0.4	1/0.5	0.5	0.5	0.2	0.2	2/0.2	0.3	0/2
Minimum no. of inspections	3	3	3	3	3	2/3	3	3	2	2	2	3	2/3
Laboratory Standards													
Min germination (%)	90	90	90	80	80	80	80	80	75	75	80/75	75	80
Min pure seed (%)	99	99	99	98	98	95/98	98	98	98	98	97/98	98	98/99
Maximum moisture	13	13	13	12	13	11/12	12	12	10	10	14/10	10	12/13

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Table 16. Challenges of the [formal] seed system in the IGAD member countries and proposed interventions for enhanced regional seed trade

Component of seed system	Key challenges	Proposed interventions
Policy and Legal framework	• Seed policy and legal instruments not in place (Djibouti, Eritrea, Somalia, South Sudan) • Biased support to the public sector • Weak implementation of policies and legal frameworks (Ethiopia, Kenya, Sudan, Uganda) • Non-compliance (by seed actors) to seed laws and regulations • Limited awareness about the regulatory frame works among the stakeholders in the seed valve chain • Poor funding for implementation	• Put in place the national institutional, human and infrastructural capacity • Use regional harmonization to leapfrog countries that are lagging in the formulation of policy and legal instruments (harmonize regulations with other regional blocks). • Stepwise liberalization of the seed market (Eritrea & Ethiopia) • Create/strengthen national seed trade associations • Collaborate with regional seed actors like AFSTA • Translate regulatory framework documents into local languages • Increased funding for National Seed Authorities.
Variety improvement and development	• Weak capacity and limited resources • Dominated by public institutions • Low motivation for public breeders to develop new varieties. • Inadequate system for germplasm exchange.	• Modernize breeding programs to develop profiled products (varieties) • Capacitate breeders on maintenance breeding and establish internal quality assurance mechanism • Establish and implement strong IPR systems for publicly developed varieties • Create regional and international experience sharing platforms • Close collaborative linkages among the NARs/CGIAR in data and germplasm exchange • Incentivize participation of the private sector in R&D (enforce PVP; regional markets) • Increase national funding for variety development
Variety evaluation, registration, and release	• Inadequate human and financial resources to support variety evaluation processes • High costs of variety evaluation, registration, release and maintenance	• Improve systems and increase financial support for Variety evaluation, registration, and release processes • Create an independent (autonomous), efficient, and self-sustaining variety testing system for VCU and DUS (accreditation of private services)

	• No guidelines for deregistering non preforming varieties	• Widen the seed market and harmonize variety evaluation, registration, and release procedures (regional harmonization) • Develop IGAD variety catalogue • Establish a regional seed/reference collection/gene bank for preservation of varieties produced in the region.
Seed production, processing, and seed storage	• Lack/weak institutional, human and infrastructural capacity for seed certification • Shortage/unavailability of EGS • Land availability • Lack of favorable agricultural credit and insurance schemes	• Create a robust seed demand assessment mechanism • Decentralize/Forge PPP for EGS production and supply • Support seed quality assurance • Strengthen out grower schemes • Improve data management system (standardized data collection and analysis tools, centralizing access to information/regulations) • Devise innovative financing mechanisms for startup seed businesses and intermediate value chain actors • Designate facilities as centers of excellence (e.g. seed testing laboratories) • Study to introduce private seed inspectors • Tax exemption for seed related machinery • Reserve seed system
Seed marketing and distribution	• Prevalence of counterfeit seed in the market • Seed distribution channels not well established in rural areas • [Government] controlled seed pricing	• Build capacity and increase the understandings of seed distributors and agro-dealers on quality seed production • Allow differential seed pricing • Increase capacity of NSAs and industry associates to carry out surveillance on seed quality for quality assurance including use of ICT for reporting/authentication. • Promotion of small-pack seed
Extension	• Limited in scope and outreach • Dominated by public sector • Disincentivized extension staff leading to high attrition rates	• Decentralized/pluralistic agricultural extension services near the farming community • Modernize the extension services (ICT4Extension) • Increase funding

Collaboration and partnership	• Weak institutional collaboration and partnership	• Foster collaborative institutional linkages within and among IGAD countries • Encourage seed industry investment by promoting business cases • Share infrastructure (e.g., ISTA accredited laboratories) and human capital providing inspection services and conduct of National Performance Trials (NPTs) • Support and encourage member states to be members of international organisations (ISTA, OECD, UPOV)
Capacity building	• Inadequate human and physical resources • Different IGAD states are at different levels of infrastructure development, which may slow down the implementation of harmonized seed regulations	• Build the capacity of member states (including policy circle) to implement the process. • Training programs and experience sharing visits • Strengthen/improve infrastructure

6. Status of seed systems for forage crops

Livestock are an important part of the economies of the IGAD countries; they are not only a means of income but also a way of life. Excluding Somalia, livestock make up approximately 15% of the GDP of the IGAD countries (Sandford and Ashely, 2008). Ethiopia and Sudan have the highest livestock populations in the region (Table 17).

Table 17. Estimated Numbers (millions) of Livestock in IGAD countries

IGAD Country	Cattle	Sheep	Goats	Camels	Country Total
Djibouti	0.23	0.47	0.52	0.072	1.29
Eritrea	2.5	2.5	5.7	0.4	11.1
Ethiopia	65.4	39.9	50.3	48.9	205
Kenya	21.7	25.3	36.0	4.7	88
Somalia	5.5	13.0	3,5	6.6	25
Sudan	31.8	41.0	32.2	4.9	110
South Sudan	12	13	14	N/A	39
Uganda	11.4	3.4	12.4	ND	27
Total	148	136	145	65	

The IGAD member states have significant pastoral and agro-pastoral populations with around 17% of the population in pasture-based production systems Djibouti and Somalia have the greatest proportion of their populations in pasture-based production systems (71% and 76% of the populations, respectively) (Sandford and Ashely, 2008). Somalia and South Sudan have the largest pastoral and agro-pastoral populations (Annex 1).

Knip (2004) states that the importance of the livestock sector in the IGAD countries can partly be explained by the fact that the major proportion of the land area in the region is classified as arid (Figure 1), with highly variable rainfall [exacerbated by climate change] making it unsuitable for crop production. In agro-ecological zones where crop production is possible, it is practiced in mixed systems with livestock providing important inputs into the farming system.

The importance of forage crops in the IGAD region increases with the increasing demand for animal products because of increased demand changes in lifestyle. That brings the importance of expanding availability of forage and pasture seeds. Nevertheless, meaningful activities of forage crops' variety development, release and seed production are found only in Kenya and Ethiopia. In both Ethiopia and Kenya, regulations require that forage crop varieties undergo evaluation, official release and registration before commercialization.

In Ethiopia, 68 forage crops and fodder tree varieties have been registered for production and use from 23 species (Table 8). An increase in the number of high yielding varieties with the desired quality is an indicator for a reasonable performance of forage seed systems. In Kenya, there are 21 varieties of 10 forage species listed in the National Variety List (NVL). However, volumes of certified seed of forage crop varieties have remained low. Informally, farmers use farm saved seed for their own planting or sell to other farmers. A few institutions such as KALRO, ILRI and private seed companies are involved in development and deployment of forage crop varieties. There is increased interest in forage species as

most of the varieties were released in the last six years. These include five varieties of rangeland grasses, intended for cultivation in arid and semi-arid areas. Generally, however, the forage seed system in IGAD countries is more underdeveloped than the crop species. In Ethiopia, for instance, forage seed marketing structure is dominated by governmental, and donor supported projects than real demand from individual farmers. Further, these efforts by individual states are inadequate to satisfy both local and emerging regional demand for forage and pasture seed. This is attributed to limited focus and low prioritization of development and production of forage seed resulting to inadequate research, human and infrastructure capacity, and low funding for forage seed programs.

7. Conclusions and Recommendations

In conclusion, we have the following recommendations of strategic nature to enhance the seed sector development in the IGAD region. The recommendations are geared towards regional harmonization and other collective actions that can be supported by IGAD and its partners to enhance access of small-scale farmers to quality and affordable seed.

The seed systems in the IGAD countries are at different stages of development requiring additional investments to converge towards regional trade through harmonized regulations. A sustainable seed system will ensure that high quality seeds of a wide range of crops and varieties are produced and fully available in time and affordable to farmers and other stakeholders[8]. Seed legislations are not yet in place in Djibouti, Eritrea, Somalia, and South Sudan, but seed activities are being carried out with interim arrangements. These member States without policy and legislations will have to be supported to institutionalize their seed system to a threshold functional level so that they can participate in a regional seed trade. Otherwise, intra-regional seed trade can be hampered because of different import requirements and phytosanitary standards. It is worth noting that there is a continental-level guidelines for seed sector development, which the IGAD member countries can adopt in formulating their policies and legislations.

IGAD as a region can leverage on COMESA's harmonized seed regulations and strengths of individual member states. Regional seed harmonization is a lengthy and complex process, which is still evolving in Africa. Different RECs have been trying to harmonize seed regulations with the goal of encouraging investment and facilitate trade within their blocks. IGAD in this regard should come to the fore and play a more active role in guiding its member states on harmonization issues since enhancing the formal seed system is the future of modern agriculture in the region. The ECOWAS model of harmonization – a variety released in one country is automatically registered in another member country – could have been the simplest model to adopt. However, learning from the COMESA, SADC and EAC seed harmonization experiences, the ECOWAS model is unlikely to be supported by IGAD member States at this stage. Considering the membership overlaps, despite the challenges of implementation, COMESA's regional harmonized seed regulation is the most advanced to fit for IGAD countries. That means, if IGAD delves into regional seed harmonization process afresh, it would be duplication of what COMESA has achieved thus far. This is not a worthwhile endeavor as most of the IGAD member (except South Sudan) countries are also members of COMESA. Therefore, what IGAD can do instead is to officially endorse the COMESA harmonized seed regulations for domestication by all its member States, that is including South Sudan. Even with IGAD's endorsement, there is a need to deepen the implementation of the COMESA Seed Regulations through domestication into the national legislations, building and mentoring country

[8] https://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/seed-sys/en/

certification teams, strengthening certification facilities and establishing cost-effective certification procedures. Improved knowledge of national and regional rules related to transboundary seed trade are important and the ability of diverse stakeholders to benefit from the formal seed system should be enhanced. IGAD and COMESA can forge strategic partnership to extend support for the domestication processes in Somalia, South Sudan and Sudan, where COMESA did not start supporting the domestication process. Supporting countries to formulate policies, enact legislations and establish/designate basic institutions, such as National Plant Protection Organizations (NPPOs), National Seed Authorities (NSAs) and national seed associations is part of this strategic first step. The harmonization is for variety release and seed certification systems, phytosanitary standards, quarantine pest list and eventually Plant Variety Protection.

Demand creation for quality seed of crops such as sorghum, cowpea, and groundnuts is important. Seed is produced at the national level before it moves across borders. That means, boosting seed production at national level would be important to enhance regional trade. Putting in place a well-structured formal seed system with elaborate processes of variety development, evaluation and release, seed production certification and marketing system alone does not guarantee the increased availability of quality seed for all crops. In a region where the seed system is dominated by the informal sector for most of the IGAD target crops, there is a need to put in place capacity building measures to improve farmers' access to certified seed. Therefore, demand creation for quality seed, particularly self-pollinated crops such as sorghum, cowpea and groundnut becomes an integral component of the regional harmonization activity. Identifying the players and building their capacity for them to progress towards forming businesses that produce and sell formal seed would be important. That in turn requires the integration of extension, research, and the private sector and the strengthening of the seed value chains of the target crops to establish a robust basis on which the seed industry thrives. The seed sellers can serve as points of contact with farmers (as extension agents) if empowered with knowledge on seed quality and agromonic practices. Most importantly, there is need to adopt measures towards increasing farmer awareness and production of EGS for publicly owned varieties, especially for the self-pollinated crops.

Regional harmonization efforts need to encourage local seed companies to take advantage of regional regulations. Local seed companies are often smaller in size, weaker in capacity and limited in resources than the international companies***.*** Experience from registration of regional varieties in the COMESA Variety Catalogue indicates that most of the varieties are that of hybrid maize owned by international seed companies (Table 5). The interest of the international seed companies in crops like hybrid maize is mainly because of the market size and PVP application, which is inherent to the reproductive biology of the varieties. The lack of interest by international seed companies in non-hybrid crops is more so in climate-change vulnerable arears like the Eastern Africa region (Westengen et al., 2019). From our KII results, one reason of local private seed companies not to fully engage and support regional harmonization is the fear of overdominance by international seed companies. Therefore, while aiming at strengthening the formal seed system for quality seed supply through harmonized policies and regulations, IGAD and its partners need to be inclusive and continue supporting national-level efforts. To start with, this could be achieved through programs and projects, with the support of governments, development partners and philanthropic donors. This simply means widening and scaling up the works of SSG's *BBB-project* to a regional level through collaborative programs. One way to support the small companies is to encourage collaboration among NARs to test, exchange data and release varieties. Identification of regionally adapted varieties from the already existing ones in the different countries, IP arrangements for publicly owned crop varieties (mostly self-pollinated crops with less phytosanitary risks) and development of private-sector oriented viable system of EGS supply are some of the activities that can be implemented in one or more of the countries concomitantly with the harmonization process. Such support and inclusive beneficiation enhances the trust among the various stakeholders.

Forage seeds could be considered as specialized focus for IGAD. Forage seeds are given little or no attention at national level and have not been part of seed harmonization processes in any of the Regional Economic Communities. Given the size of its large livestock population and livelihood dependency in the agro-pastoralist community, IGAD may consider forage seeds value-chain development, crucially important to the region and establish systems and a lead institution to coordinate its development. This is not necessarily on forage and pasture species alone, but also multi-purpose crops like cowpea, sorghum and maize. Demand creation and value chain development for forage crops in the region is critical.

IGAD needs to build its internal capacity and establish a regional advisory entity on seed-related issues and activities: IGAD has a role to play in guiding/supporting its members states on collective and regional issues such as seed policies and implementation of programs. To fulfil its role of coordination and convening power, therefore, IGAD will have to build its capacity by establishing an entity with an advisory role. The form the seed advisory entity would take can be decided after consultation with seed stakeholders.

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9. Annexes

Annex 1.1. Country profiles of IGAD member States

Country	Population (Million)	Population growth rate (%)	Population in Agriculture (%)	Population in pastoralism (%)	Agriculture share of GDP (%)	Employment share of agriculture (%)	Women in agriculture (%)	Poverty rate (%)
Djibouti	1.0	1.5	0.6	25	4.0	0.6	0.4	42
Eritrea	4.4	2.5	67	-	11.6	65	-	69
Ethiopia	117.9	2.6	80	14	40	65	75	24
Kenya	47.6	2.21	80	20	27	40	59	46
Somalia	15.9	2.9	40	60	75	83	87	73
South Sudan	11.2	1.2	40	60	36	80	46	80
Sudan	45.4	2.4	39.7	20	20	40	49	53
Uganda	47.8	3.3	80	10	24	70	76	11.4

Annex 3.1. Semi-structured questionnaire for seed stakeholder

Assessment and Identification of Constraints to Private Seed Sector Development in [country]

Semi –structure questionnaire for KII
with
Selected stakeholders across the seed value chain (with focus on the target crops)

1. What is the overall importance of Private Seed sector in the seed system of [country]?
2. Are there clear policy directions about the role of Private Seed sector development? If yes, what are these directions?
3. Are there any policy related challenges that hinder in seed business? If yes, what are these challenges?
4. What are the linkages between Private Seed sector development and agricultural policy?
5. What are the key linkages of the private seed sector with the public seed sector?
6. What is the overall performance of the private seed sector on seed production?
7. What are the main constraints to private seed sector development?
8. What could be done to improve private seed sector investment?
9. How far the government/donors support the development of competitive private seed sector in the [country].
10. Is there any hindrance for domestic or international seed companies to actively contribute to the national seed industry? If yes, what are these hindrances? What are your suggestions to overcome with this hindrance?

Annex 3.2. Semi-structured questionnaire for private seed companies.

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Assessment and Identification of Constraints to Private Seed Sector Development in [country]

Semi-structured questionnaire for KII with Executives of private seed companies (with focus on the target crops)

1. Do you think that private seed sector a feasible business for your Company? If yes, why?
2. How and from whom your Company gets access to source seed? Are there any challenges of access? If yes, what do you suggest?
3. Do you think that your Company have the required capacity in seed production? If yes, what are these capacities?
4. Do you think that your Company has the required seed production and marketing facilities? If no, how you access to these facilities?
5. What are the main seed marketing related challenges for participating farmers/seed growers and your Company in general?
6. What are the main constraints related with seed production? What do you suggest?

Annex 3.3. Checklist for observations during visits/interviews of seed companies and/or agro-dealer shops

1. Which among the target crops are being sold by companies and/or in agro-dealer shops?
2. What is the amount of sale for the last cropping season?
3. Has the seed certification passed through the full circle of the seed regulation/inspection process?
4. Which institution is the source of Early Generation Seed?
5. Are there private companies selling seeds of forage crops? If so, which forage crops? Who are the seed buyers?

Annex 4.1. Relative importance of the selected target crops in the IGAD member States

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Maize [hybrid]	H	H	H	H	H	M	H
Maize [OPV]	H	H	L	M	H	M	H
Sorghum	H	H	M	M	H	H	H
Pear millet	H	L	L	L	H	H	L
Beans	H	M-H	H	M	H	H	H
Cowpea	H	L	M	L	H	M	H
Groundnut	M	L	L	M	H	H	H
Forage crops	H	H	M	L	M	H	M

H=High, M=Medium, L=Low

Annex 4.2. Trends of production of the target crops in the last five years (Increasing [I]/Decreasing [D])

Crop	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Maize [hybrid]	I	I	D	D	I	I	I
Maize [OPV]	N/A	N/A	D	D	I	N/A	I
Sorghum	I	D	I	D	I	I	I
Pear millet	I	N/A	D	D	I	I	D
Beans	N/A	I	D	D	I	N/A	I
Cowpea	N/A	N/A	I	D	I	N/A	I
Groundnut	N/A	I	D	D	I	I	I

Annex 5.1: Institutional roles and linkages for seed system chain in IGAD countries

Component	Djibouti	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Biodiversity conservation	N/A	NARI	IBC	GeRRI-KARLO	MOLFR	MAFS	ARC	NARO/ NGRC
Research and variety development	N/A	NARI	EIAR, RARIs, Universities	KALRO, CGIARS, Universities, Seed companies	Seed companies, universities	MAFS	ARC/ Universities/ Private Seed Companies	NARO, Universities
Variety release	Plant Protection Service	NVRC	NVRC	NPTC, NVRC	MOLFR		VRC	NARO, NVRC
Early Generation Seed & Variety maintenance	N/A	NARI	EIAR, RARIs, Universities, PSEs (EABC)	KALRO, Universities, Seed companies	Seed companies, universities	MAFS, Seed companies	ARC Seed Unit, ASSCO, PSCs, Seed companies agents	NARO, Universities
Certified seed production, processing, and storage	N/A	AED	PSEs (EABC, ASE, OSE, SSE, SoSFE), private sector (FCU, companies)	Seed companies	Private companies	Seed companies	ARC Seed Unit, ASSCO, PSCs, Seed companies agents	Seed companies, NSCS
Seed marketing and distribution	Plant Protection Service	AED	PSEs (EABC, ASE, OSE, SSE, SoSFE, ,RABs), private sector (FCU, companies)	Seed companies, Seed Agents/Sub-agents	Private companies and agro dealers	MAFS, Seed companies, agro-dealers, NGOs	Seed companies, ARC, State Ministries of Agric. Schemes and Corporations, Agrodealers	Seed companies, NSCS
Farmer-based seed production and marketing	N/A	N/A	PSEs (EABC, ASE, OSE, SSE, SoSFE), NGOs	NGOs	NGO	NGOs	N/A	ISSD, Farmer groups, DLGs, NSCS
Seed import/export	Plant Protection Service	AED	PSEs, private sector	Seed companies	Seed companies with permission from MoAI-FGS		PSCs, private sector	Seed companies, UPQS
Overall coordination, regulation, and linkages	Ministry of Agriculture, Livestock and Sea		MoA	KEPHIS	MOAI	MAFS, STASS	NSC	MAAIF

Annex 5.2. Membership/party to/ signatory of IGAD member Countries to international organizations/agreements/protocol that are related to the seed sector (Yes /No /In process)

Organization	Djibouti	Eritrea	Ethiopia	Kenya	Somalia	South Sudan	Sudan	Uganda
Common Market for Eastern and Southern Africa (COMESA)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
East African Community (EAC)	No	No	No	Yes	No	Yes	No	Yes
World Trade Organization (WTO)	Yes	No	In process	Yes	Yes	No	In process	Yes
Organization for Economic Cooperation and Development (OECD)	No	No	No	Yes	No	No	No	Yes
International Seed Testing Association (ISTA)	No	Yes	Yes	Yes	No	No	In process	In process
The International Union for the Protection of New Varieties of Plants (UPOV)	No	No	No	Yes	No	No	In process	In process
International Plant Protection Convention	Yes	Yes	Yes	Yes	No	No	In process	Yes
Cartagena Protocol on Biosafety	Yes	Yes	Yes	Yes	No	No	Yes	Yes
International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)	No	No	Yes	Yes	No	No	Yes	Yes
African Regional Intellectual Property Organization (ARIPO)	No	No	No	Yes	No	No	Yes	Yes

Annex 5.3. Status of seed policy, laws/acts/bills and regulations

IGAD Member State	Presence/Name of Seed policy	Presence/National Seed Law/Act/Bill	Implementing (Apex) Body
Djibouti	No	No	No
Eritrea	Seed Policy of the State of Eritrea	No	Ministry of Agriculture
Ethiopia	National plant seed policy	Seed proclamation	Ministry of Agriculture
Kenya	National Seed Policy	Seeds and Plant Varieties Act	Ministry of Agriculture Livestock, Fisheries and Cooperatives - function delegated to KEPHIS
Somalia	No	No	No
South Sudan	National Seed Policy (Draft)	National Seed Bill 2021 (Draft)	Ministry of Agriculture and Food Security
Sudan	National Seed Policy	Seed Act 2010	Seed Admin/Ministry of Agriculture
Uganda	National Seed Policy	Seed and Plant Act	Ministry of Agriculture, Animal Industry and Fisheries

Annex 5.4: List of top [up to] five released varieties released/owned by NARs and grown in the last three years for each target crop

Crop	Ethiopia	Kenya	South Sudan	Sudan	Uganda
Maize (Hybrid)	BH-661, BH-660, BH-540	**Medium maturity** – KH500-43A, KH500-31A, KH500-22A, KH500-44A, KH500-33A **Late maturity** –H614D1, KH600-23A, H6251, KH600-15A, KH600-20A, **Overall** - H614D1, KH500-43A, KH600-23A, H6251, KH600-15A,	Palotaka1	-	H 10 H, UH 5051, UH 5052, UH 5053; UH 5402
Maize (OPV)	Melkassa-2, Melkasa-1, Gusaw-1, Melkassa-4, Gibe-1	KDV1, KDV3, KDV3, KSD-01, HAC, Coast composite	NARD1	-	Longe 4, Longe 5, MM3 (Myezi Mitatu)
Sorghum	Melkam, Gambella-1107, Gubiye, Teshale, Girana-1	Gadam, KARI Mtama 1, Seredo, E1291,	SESO3, Wad Ahmed	Tabat, Wad Ahmed, Yarwasha Arfagadamk (AG8) ASARECA	Sekedo, Seso 1, Seso 2, Seso 3, NAROSORG1
Pearl millet	-	Kat/PM	-	Ashana, Wadelbasheir Ombadir, Faris, Biuda	ICMV 225
Beans	**Haricot Bean**: Nasir, Hawassa Dume, Awash-1, Ebado, Awash Melka.	Kat B1, Nyota(KAD02), KATX 56, Chelalang, KK8	MAAG191, MAAG192	-	NABE 16, NABE 17, NABE 18, NABE 19, NABE 20
Cowpeas	-	K80, KVU 27-1, M66	AGRAC 116, AGRAC 216, AGRAC 316	Ain El gazal, Dhab El goz Gamardourin, Hidob	SEPI 1, SEPI 2
Forage crops	Oats, Cowpeas, Pigeon pea, Panicum, Lablab	Boma Rhodes, Elmba Rhodes, Silver Leaf Desmodium, Coloured Guinea Grass, Nandi Setaria	-	PAN12 (forage hybrid - Yellw) Hytech 2031(forage hybrid -white) Kambal(Fodder) Hageen garawia	-

Annex 5.5. List of top [up to] five released varieties released/owned by private seed companies grown in the last three years for each target crop

Crop	Ethiopia	Kenya	South Sudan	Sudan	Uganda
Maize (Hybrid)	Limu, Shone, Kortu	**Coast** – PH1, PH4 **Early/Transitional (Dryland)** – Duma 43, DH04, DK 8031, DH02, Sungura (SC 301) **Medium maturity** – H513, H624, H505, H507, H403 **Late maturity –** H6213, H614D, H628, H629, H6218 **Overall** - H6213, Duma 43, H614D, H513, H624,	Longe 7H, Longe 10H	Simon PL71 PL712 PL508	FH 5160, FH 6150, MH 501 (HODARI), MH 502 (FAIDA), UH 5054 (Bazooka)
Maize (OPV)	-	KDV1, KDV2, KDV3,	Longe 5	Hudeiba 1, Hudeiba 2	-
Sorghum	-	SC Sila, SC Smile,	-	Tabat, Wad Ahmed Ajeeb Arfagadamk (AG8) Dindir	-
Pearl millet	-	-	-	Ashana	-
Beans	-	-	-	-	-
Cowpeas	-	Kenkude 1(KK1), Kunde Mboga	-	Ain El gazal Dhab El goz Gamardourin Hidob	-
Forage crops	-	-	-	PAN12 (forage hybrid - Yellw) Hytech 2031(forage hybrid -white) Kambal(Fodder) Hageen garawia	-

Annex 5.6. Status of Variety Release Systems in IGAD countries

COMESA Member-State	Member-State Legislation on Seed Variety Release	Presence/Name of Variety Release Body	Institutional Capacity	Human Capacity in Variety Release	Variety Release Infra-Structure
Djibouti	Not in place	Ministry of Agriculture, dept. of agriculture	Inadequate	Inadequate	Not in place
Eritrea	Not in place	MoA/NVRC	Inadequate	Inadequate	Not in place
Ethiopia	Operational (Seed Proclamation No. 782/ 2013) seed regulations 385/2016 and Fee for seed competence and related services (361/2015), Plant Breeders' Rights Proclamation (1069/2017) Plant Breeders' Rights regulations, guidelines	MoA, (Newly established Ethiopian Agricultural Authority) Variety Release Protection and Seed Quality Control, National Variety Release Committee in Place.	Inadequate,	Inadequate	Not in Place
Kenya	Operational 1975, Revised 1991, Current 2012 (Seeds and Plant Varieties Act (Cap 326) 2012), National Seed Policy in Place	National Variety Release Committee, Chaired by the Ministry of Agriculture Livestock, Fisheries and Cooperatives with KEPHIS as the Secretariat. National Performance Committee handles Technical matters on variety release. ,	adequate	Adequate	Adequate
Somalia	Not in place	Not in place	Not in place	Inadequate	Not in place
South Sudan	Not in place	Not in place	Inadequate	Inadequate	Not in place
Sudan	Seed Act 1990 Reviewed 2009, Issued and operational 2010	Min of Ag, Seed Administration National Variety Release Committee in Place under MoA	Inadequate	Inadequate	Inadequate
Uganda	Operational (Seeds and Plant Act 2006) Seed Law 2006, Regulations still in draft	MoA, Dept. of Crop Protection, National Seed Certification Service	Intermediate	inadequate	Adequate, needs harmonized

Annex 5.7. Status of IGAD-member states on Plant Variety Protection (PVP) system

COMESA Member-State	Member-State Legislation On PVP	Presence/Name of PVP Body
Djibouti	Not in Place	Not in place
Eritrea	Draft Plant Variety Protection and Intellectual Property Right Act	National Agricultural Research Institute
Ethiopia	Plant Breeders' Rights Proclamation (1069/2017), Plant Breeders' Rights regulation	Variety Release Protection and Seed Quality Control. (EAA)
Kenya	Seeds and Plant Varieties Act (UPOV 1991). Plant Breeders Rights Regulations 2009. Once granted then can give authority and get royalty. Can sell rights. KEPHIS can assist in MOU for licensing (though not their mandate).	Kenya Plant Health Inspectorate Service (KEPHIS)
Somalia	**Not in Place**	Not in place
South Sudan	**Not in Place**	Not in place
Sudan	Seed and Plant variety Protection Act (2010) also Seed and Plant variety Protection Regulations 2012	Seed Administration under Seed Council
Uganda	PVP Law 2013, Regulations being drafted,	Plant genetic Resources Centre (PGRC) under MofAg

Annex 5.8: Summarized Results from Key Informant Interviews

1. What is the overall importance of the Private Seed sector in the seed system?
    a. Diversifies the seed source to farmers
    b. More varieties available, so more choices
    c. Acts as a linkage between research who generates new seed varieties and farmers that take up the improved seed
2. Are there clear policy directions about the role of Private Seed sector development? If yes, what are these directions?
    a. There is no policy (Eritrea)
    b. There is no policy, but there are statutory arrangements (Somalia, South Sudan)
    c. There is policy but implementation is difficult (Ethiopia).
    d. There is clear policy (Kenya and Uganda)
3. Are there any policy-related challenges that hinder seed business? If yes, what are these challenges?
    a. Absence of seed policy
    b. Lack of level playing field with public sector (subsidy)
    c. Fixed seed pricing (Ethiopia)
    d. Difficulty in implementing harmonized COMESA Seed Regulations (Kenya)
    e. Counterfeit seeds
    f. Insufficient resources including finance
4. What are the key linkages of the private seed sector with the public seed sector?
    a. Germplasm sharing
    b. Access to EGS
    c. Extension service
    d. Quality assurance
    e. Common platforms (seed associations)
5. How do you evaluate the overall performance of the private seed sector on seed production?
    a. Interested in the formal seed production
    b. Hybrid maize is the focus
    c. Formal sector takes much lower share than the informal
6. What are the main constraints to private seed sector development?
    a. Absence of or proper implementation of policy and regulatory frameworks
    b. Limited access to markets
    c. Mistrust with public sector service including IP
    d. Land availability
    e. EGS availability
    f. Inadequate capacity for regulatory compliance
7. What could be done to improve private seed sector investment?
    a. Put in place national seed policy and regulatory system
    b. Enforce Plant Variety Protection
    c. Harmonized regional seed regulations and standards
    d. Funding support

8. How far the government/donors support the development of competitive private seed sector?
    a. Arranging credit loans
    b. EGS supply from public research institutes
    c. Supporting regional harmonization
    d. Project supports
    e. Training of private seed inspectors
9. Is there any hindrance for domestic or international seed companies to actively contribute to the national seed industry? If yes, what are these hindrances?
    a. Absence of policy
    b. Meeting land requirements
    c. Weak or absent regulatory capacity
    d. Non-functional PVP
    e. Controlled seed prices
    f. Political instability
10. What are your suggestions to overcome these hindrances?
    a. Clear, consistent, and stable policy direction
    b. Enhance seed trade harmonization, operationalize PVP
    c. Commercialize EGS production and supply
    d. Allow private seed regulatory services
    e. Land policy to avail and protect large parcels of land
    f. Digitization of services for ease of operations, and
    g. Financial support
11. What is your experience in regional harmonization efforts so far, and what do you think are the benefits and challenges?

    Benefits

    a. Short-circuiting national legislations
    b. Creates wider market incentives
    c. Cheaper variety release and registration.
    d. Strengthens engagement of seed companies in policy dialogue

    Challenges

    e. Domestication at variable stage and slow implementation
    f. Fear that harmonization might disadvantage and oppress local players especially in member's counties (multinational takeover).
    g. Some countries are more developed in seeds trade than others thus causing imbalance
    h. Policy implementation inconsistency/unpredictability
    i. High cost of variety registration and annual renewal for local seed companies (compared to the multinationals).

Annex 5.9. Status of seed certification system in IGAD countries

IGAD Member-State	Presence/Name of Seed Certification Body	National Legislation on Seed Certification	Institutional Capacity	Human Capacity in Seed Certification	Seed Certification Infra-Structure
Djibouti	MoA, Dept. of Ag and Forestry, SPV Service of Plant Protection	Not in place yet	Inadequate	Inadequate	Not in place
Eritrea	Not in place	Not in place	Inadequate	Inadequate	Not in place
Ethiopia	Newly Established Ethiopian Agricultural Authority (Variety Release, Protection and Seed Quality Control Directorate Certification) is responsibility of regional state.	Operational (Seed Proclamation No. 782/ 2013 (It is under revision) Seed Regulations 375/2016 Fee for seed competence and related services (361/2015) Plant Breeders' Rights Proclamation (1069/2017) Plant Breeders' Rights regulations	Inadequate	Inadequate	Intermediate—under construction
Kenya	KEPHIS, ISTA membership, UPOV, OECD Seed Schemes, IPPC, ISTA.	Operational 1975 (Seeds and Plant Varieties Act, 1972, Revised 1991, Revised 2012 including issues of harmonisation and authorization of private inspectors for inspection of some seed certification activities (Cap 326) 2012). Amended in 2016 to provide for protection and indigenous plant varieties.	Adequate	Adequate	Adequate
Somalia	Not in place	Not in place	Inadequate	Inadequate	Not in place
South Sudan	Participating in Dialog	Not in place	Inadequate	Inadequate	Not in place
Sudan	MoA, Seed Administration Unit	National Seed Law 1990, revised 2009, Seed Law 2012. National Biosafety Law 2010,	Intermediate Revised composition of National Variety Release Committee, Inadequate	Inadequate	Seed Lab but Inadequate equip.
Uganda	Dept. of Plant Protection, National Seed Certification Service	Operational (Seeds and Plant Act 2006) Regs. underway with Solicitor Gen for Legal review Plant protection and Health Bill under review by Parliament Plant Protection Act 1962 PVP Act 2013 IPPC, OECD, not ISTA	Adequate	Adequate need resources	Have a lab, going toward ISTA certification

Annex 5.10. Status of Quarantine and Phytosanitary System

COMESA Member-State	Member-State Legislation on Quarantine And Phytosanitary Measures for Seed Import / Export	Presence/Name of Quarantine and Phytosanitary Measures for Seed Import/ Export Body	Institutional Capacity	Human Capacity in Quarantine and Phytosanitary Measures for Seed Import/ Export	Quarantine and Phytosanitary Measures for Seed Import/ Export Release Infra-Structure
Djibouti	Not In Place	Dept. Of Plant Protection Nppo	Inadequate	Intermediate	Inadequate
Eritrea	Not In Place	Regulatory Services Department	Inadequate	Inadequate	Inadequate
Ethiopia	Plant Protection Decree No. 56/71, Plant Quarantine Proclamation No.56/197. Plant Quarantine Regulations No.4/1992. Member of IPPC 1996. the Inter-African Phytosanitary Council of 1967, of the OAU	Plant Health Quality Control Directorate, EAA.	Inadequate	Inadequate	Inadequate
Kenya	Operate Phyto Services In The Plant Protection Act (Cap 324) Operational (Seeds And Plant Varieties Act (Cap 326) 2012) (Same As Previous) National Biosafety Act creates National Biosafety Authorit	KEPHIS	Adequate	Adequate	Adequate
Somalia	Draft	Not in Place	Inadequate	Inadequate	Not in place
South Sudan	Not In Place	Not In Place	Inadequate	Inadequate	Inadequate
Sudan	Plant Protection Regulations 1928 Ippc Plant Protection Convention	Plant Protection Directorate.	Intermediate	Intermediate	Intermediate
Uganda	Operational (Plant Protection Act 1962), New Plant Protection And Health Bill In Process.	Moa, Dept. Of Crop Protection. Phytosanitary And Quarantine Unit Nppo In Charge	Inadequate	Inadequate	Inadequate