# Seed Laws and Regulations Affecting the Development of the Private Vegetable Seed Sector in Sub-Saharan Africa

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The New Markets Lab (NML) is a center for innovation in law and economic development that applies a systems approach to the design and implementation of market rules. NML was established to leverage law and regulation as a tool for sustainable economic development and build legal capacity in an evolving global market. NML's international team of lawyers specializes in areas that hold significant potential for economic development but are also heavily regulated, such as trade, agricultural markets, services, standards, and the digital economy.

The World Vegetable Center, an international nonprofit institute for vegetable research and development, mobilizes resources from the public and private sector to realize the potential of vegetables for healthier lives and more resilient livelihoods. WorldVeg's globally important genebank, improved varieties, production, and postharvest methods help farmers increase vegetable harvests, raise incomes in poor rural and urban households, create jobs, and provide healthier, more nutritious diets for families and communities.

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*Front cover*: A trial of habanero peppers grown at the World Vegetable Center station in Abomey-Calavi, Benin 2020

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## Acronyms and Abbreviations

| | |
|---|---|
| ARIPO | African Regional Intellectual Property Organization |
| ASARECA | Association for Strengthening Agricultural Research in Eastern and Central Africa |
| ASSEMA | Seed Association, Mali |
| AU | African Union |
| BIC | Blue International Seed Sample Certificate |
| CNCSP | Comité National Consultatif des Semences et des Plants |
| CNS | Comité National de Semences |
| CNSOV | Agricultural Technology Clearing Committee |
| CNSV | Comité National des Semences Végétales |
| COC | Certificate of Competence |
| COMESA | Common Market of Eastern and Southern Africa |
| COVID 19 | Coronavirus Disease |
| CSIR | Council for Scientific and Industrial Research |
| DUS | Distinctness, Uniformity and Stability |
| EABC | Ethiopian Agricultural Business Corporation |
| EAC | East African Community |
| ECOWAS | Economic Community of West African States |
| EGS | Early Generation Seed |
| FAO | Food and Agriculture Organization of the United Nations |
| GM | Genetically Modified |
| IER | Institut d'Economie Rurale |
| INERA | Institut de l'Environnement et de Recherches Agricoles |
| IPPC | International Plant Protection Convention IPPC |
| ISTA | International Seed Testing Association |
| KALRO | Kenya Agriculture and Livestock Research Organization |
| KEPHIS | Kenya Plant Health and Inspectorate Service |
| KSC | Kenya Seed Company |
| Mil | Million |
| MNC | Multi-national Companies |
| MT | Metric Ton |
| NARO | National Agricultural Research Organization |
| NARS | National Agricultural Research System |
| NASC | National Agricultural Seeds Council |
| NDUS | Novelty, Distinctness, Uniformity and Stability |
| NML | New Markets Lab |
| NPPO | National Plant Protection Organization |
| NPT | National Performance Trials |
| NPTC | National Performance Trial Evaluation Committee |
| NSA | National Seed Authority |
| NVRC | National Variety Release Committee |

| | |
|---|---|
| NVRRC | National Variety Release and Registration Committee |
| OAPI | African Intellectual Property Organization |
| OECD | Organization for Economic Cooperation and Development |
| OIC | Orange International Seed Lot Certificate |
| OPV | Open Pollinated Variety |
| PBAK | Plants Breeders Association of Kenya |
| PBR | Plant Breeder's Rights |
| PCC | Public Complaints Committee |
| PPP | Public Private Partnerships |
| PVP | Plant Variety Protection |
| QDS | Quality Declared Seed |
| REC | Regional Economic Communities |
| SADC | Southern African Development Community |
| SCHV | Sub-Committee for the Certification of Agricultural Varieties |
| SMS | Short-Message Service |
| SPS | Sanitary and Phytosanitary |
| STAK | Seed Trade Association of Kenya |
| STAM | Seed Trade Association of Malawi |
| TAV | Traditional African Vegetables |
| UPOV | International Union for the Protection of New Varieties of Plants |
| USD | United States Dollar |
| VCU | Value for Cultivation and Use |
| WorldVeg | World Vegetable Center |
| WHO | World Health Organization |

## Executive Summary

Vegetable crops hold increasing promise across the African continent. They are viewed as a low-cost remedy to combat malnutrition,[1] as they are rich in micronutrients and have high economic viability, making them important to food and nutrition security. Their cultivation can also provide large-scale economic opportunity and employment.[2] However, in many sub-Saharan African countries, both the public and private sectors have focused mainly on the development of a narrower group of agricultural commodities, mostly field crops, with limited priority given to vegetable crops to date.[3]

This study focuses on one important aspect of vegetable crop development, namely the legal, regulatory and policy frameworks (collectively referred to as the enabling environment)[4] that impact the vegetable seed sector and affect opportunities for all stakeholders, including smallholder farmers. The study was prepared by the New Markets Lab (NML), a non-profit law and development center, in partnership with the World Vegetable Center (WorldVeg) and presents a comparative legal and regulatory analysis of factors affecting the development of the private vegetable seed sector in thirteen sub-Saharan African countries: four East African countries (Ethiopia, Kenya, Tanzania, and Uganda); three Southern African countries (Malawi, Zambia, and Zimbabwe); and six West African countries (Benin, Burkina Faso, Ghana, Mali, Nigeria and Senegal), which are collectively referred to as the "focus countries".

In the focus countries, the demand for vegetable crops can be broadly categorized in two categories, namely exotic crops, such as tomato, pepper, common cabbage, and onion, and Traditional African Vegetables (TAVs), such as amaranth, okra, and African eggplant. Seed for exotic crops is mainly sourced from the market, whereas TAV seed is primarily sourced from the informal sector, including farmers' own seed saving. In the formal sector, vegetable breeding has been minimal compared to field crops, especially within the National Agricultural Research Systems (NARS) of the focus countries; however, a few private companies (including local and multinational companies (MNCs)) are engaged in the breeding of vegetable varieties. Some of this has been in partnership with international institutions such as WorldVeg.

In terms of commercial seed production, local companies tend to use open-pollinated varieties (OPVs),[5] which can be locally produced or imported. Several OPVs are public sector varieties.[6]

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[1] *African Regional Nutritional Strategy 2005-2015*, AFRICAN UNION, WORLD HEALTH ORGANIZATION (WHO), https://www.who.int/nutrition/topics/African_Nutritional_strategy.pdf

[2] *Strengthening Vegetable Seed Systems in Central and West Africa Through Public Private Partnership Platforms*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO), http://www.fao.org/agriculture/crops/news-events-bulletins/detail/en/item/39768/icode/1/?no_cache=1; Schreinemachers, Pepijn, Emmy B. Simmons and Marco C. S. Wopereis 2018. Tapping the economic and nutritional power of vegetables. GLOBAL FOOD SECURITY 16: 36-45. https://doi.org/10.1016/j.gfs.2017.09.005

[3] *Strengthening Vegetable Seed Systems in Central and West Africa Through Public Private Partnership Platforms*, FAO; Schreinemachers, Pepijn, Julie Howard, Michael Turner, Simon N. Groot, Bhupen Dubey, Learnmore Mwadzingeni, Takemore Chagomoka, Michael Ngugi, Victor Afari-Sefa, Peter Hanson and Marco C. S. Wopereis 2021. Africa's evolving vegetable seed sector: status, policy options and lessons from Asia. FOOD SECURITY. https://doi.org/10.1007/s12571-021-01146-y

[4] Katrin Kuhlmann, *The Human Face of Trade and Food Security: Lessons on the Enabling Environment from Kenya and India*, CENTER FOR STRATEGIC INTERNATIONAL STUDIES (CSIS) (2017), https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/171206_Kuhlmann_HumanFaceFoodSecurity_Web.pdf

[5] *The Expansion Of The Commercial Seed Sector In Sub-Saharan Africa: Major Players, Key Issues And Trends*, AFRICAN CENTRE FOR BIODIVERSITY, (Nov. 2015), https://www.acbio.org.za/wp-content/uploads/2015/12/Seed-Sector-Sub-Sahara-report.pdf

[6] Pepijn Schreinemachers, Teresa Sequeros & Philipo Joseph Lukumay, 2017, *International Research On Vegetable Improvement In East And Southern Africa: Adoption, Impact, And Returns,* AGRICULTURAL ECONOMICS, 707-717, 48(6)

There is substantial local production in some focus countries such as reported for tomato and African eggplant seed in Tanzania[7] and amaranth in Kenya and Tanzania.[8] However, this is not the case for all the focus countries. Further, very few private companies appear to be doing research to develop their own vegetable varieties[9], and one of the objectives of this study is to assess how the legal and regulatory environment might affect this situation.

The study covers relevant legal and regulatory issues along the value chain (plant breeders' rights, variety registration and release, seed certification, and trade; see **Figure 1**), focusing on the impact on market development and diverse stakeholders' needs.


**Figure 1:** Relevant Stages of the Seed Regulatory Value Chain

Across these areas, the study highlights priority findings and recommendations drawn from research and stakeholder consultations. In doing so, it relies upon an approach to designing and implementing inclusive legal and regulatory systems (further elaborated below and in Section 2) to better support dynamic and equitable market growth .[10]

Overall, this study focuses on the following:

- Legal and Policy Approaches to Prioritize Development of the Vegetable Seed Sector including through incorporation of policy objectives in national seed policies and adoption of adequate implementation mechanisms to achieve these objectives.
- Hurdles in Focus Countries' Enabling Environments that Affect Diverse Stakeholders in the Vegetable Seed Sector including legal and regulatory processes that limit the participation of enterprises of all sizes in the sector and ultimately affect the availability of diverse crop

[7] Pepijn Schreinemachers, Teresa Sequeros and Philipo Joseph Lukumay, 2017, *International Research On Vegetable Improvement In East And Southern Africa: Adoption, Impact, And Returns*, AGRICULTURAL ECONOMICS 707-717, 48(6)

[8] In the case of amaranth, *see* Justus Ochieng, Pepijn Schreinemachers, Maurice Ogada, Fekadu Fufa Dinssa, William Barnos and Hassan Mndiga, 2019, *Adoption Of Improved Amaranth Varieties and Good Agricultural Practices in East Africa*, LAND USE POLICY 83, 187-194.

[9] Afari-Sefa, V., A. Tenkouano, C. O. Ojiewo, J. D. H. Keatinge and J. d'A. Hughes 2012. Vegetable breeding in Africa: constraints, complexity and contributions toward achieving food and nutritional security. FOOD SECURITY 4: 115-127. https://doi.org/10.1007/s12571-011-0158-8

[10] Katrin Kuhlmann, *Reassessing Policy Space in the Context of Sustainable Development and Vulnerabilities in International Economic Law: A Top-Down Meets Bottom-Up Research Agenda and Methodology,* AF. J. INT'L. ECON. L. Vol. 2 (forthcoming, 2021); See also Katrin Kuhlmann, *Flexibility and Innovation in International Economic Law: Enhancing Rule of Law, Inclusivity, and Resilience in the Time of COVID-19*, AFRONOMICSLAW, (2020); Katrin Kuhlmann, Planning for Scale Brief #6: Enabling Environment**,** AGPARTNERXCHANGE**,** (2013), https://cb4fec8a-9641-471c-9042-2712ac32ce3e.filesusr.com/ugd/7cb5a0_806446eacd0f4257915e206af4adc505.pdf; Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377; and the work of the New Markets Lab, available at https://www.newmarketslab.org/publications

[10] *See, e.g.,* Katrin Kuhlmann, Yuan Zhou, and Shannon Keating, *Seed Policy Harmonization in COMESA and SADC: The Case of Zambia*, NEW MARKETS LAB AND SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE (Feb. 2019), https://www.syngentafoundation.org/sites/g/files/zhg576/f/zambia_case_study_final_edit_8_march_2019_clean.pdf

varieties in the market, such as procedures for registration of crop varieties or seed certification that are not well tailored to vegetable crops.

- Adoption of Laws and Regulations that Encourage Investment and Innovation including laws and regulations on plant breeder's rights (PBR) that could be strengthened, including through effective implementation mechanisms to effectuate these rules, to encourage vegetable seed development and balance the rights and obligations of different stakeholders.
- Identification of Good Practices in the Legal and Regulatory Environments in the Focus Countries including exemption of vegetable seeds from mandatory registration and certification procedures and, if these regulatory processes are required, adoption of more flexible approaches, such as reduction of the testing burden for registering vegetable crops.

The study also covers import and export restrictions related to vegetable seed, including sanitary and phytosanitary (SPS) and quarantine measures, and enforcement of laws relating to counterfeit seed.

Several key trends emerge from the study that emphasize the importance of developing a seed regulatory system that is better suited to the vegetable sector.[11] In some countries, flexible rules or "regulatory flexibilities" exist in different legal and regulatory instruments that reflect the particular nature of vegetable crops and encourage development of the private vegetable seed sector.[12] In other cases, rules and regulations may be applied more flexibly in practice. For the vegetable seed sector, key issues and flexibilities include:

- **Variety Registration and Release Rules and Procedures**: While formal variety registration is required across sub-Saharan Africa, the application of uniform testing procedures for both vegetable crops and other field crops (like maize and rice) is not aligned with the unique characteristics of vegetable crops, which include a high number of varieties and variations in yield, color, shape, taste, and other consumer preferred traits, among other things. Additionally, the length of time needed to conduct the multi-locational trials required by many regulatory systems is not suitable for vegetable crops, which can benefit from quicker release into the market for commercialization. One of the common tests (value for cultivation and use (VCU) or national performance trials) is largely considered inappropriate for vegetable crops, due to the variability of these crops and inappropriateness of multi-locational and multi-seasonal requirements. Notably, some of the focus countries have incorporated legal or procedural flexibilities by exempting vegetable crops from VCU testing, either in law or in practice.

[11] The Study is based on a document review of primary sources (including seed policies, laws, and regulations, included in Appendix I) and secondary sources which helped contextualize the information received from primary sources. Legal and regulatory analysis was underscored by consultations with key stakeholders from both the public and private sector of the focus countries, which integrated a practical understanding of how laws, regulations, and policies are implemented in practice. It is also based on semi-structured interviews with public and private stakeholders.

[12] Katrin Kuhlmann, Flexibility and Innovation in International Economic Law: Enhancing Rule of Law, Inclusivity and Resilience in the Time of COVID-19, AFRONOMICSLAW SYMPOSIUM ON THE VULNERABILITY IN THE TRADE AND INVESTMENT REGIMES IN THE TIME OF COVID-19, (August 10, 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3694903; *See also* Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377

- **Plant Breeders' Rights (PBR):** A functional PBR system, consisting of both legal measures and effective implementation, can be important to vegetable breeding and private sector engagement in the vegetable seed sector; however, PBR systems do need to balance the needs of both commercial enterprises and smallholder farmers. Stakeholders consulted emphasized that relevant laws and regulations are either absent in the focus countries or are poorly implemented if laws do exist.
- **Rules and Regulations on Quality Assurance:** Seed quality control systems play an important role in the seed sector; however, most focus countries tend to follow formal centralized certification regimes that are procedurally complex and do not differentiate among crops. In many parts of the world, however, the best practice is to exempt vegetable seed from formal seed certification requirements or to maintain other, more flexible systems for quality control. While most African nations include vegetable seed in formal certification requirements, some countries have adopted more flexible processes for quality control, including truth in labelling (although this practice is somewhat limited) and Quality Declared Seed (QDS) systems. In the case of the latter, however, QDS tends to be focused on certain crops, which often do not include vegetables, and is mainly used to lower compliance costs for farmers distributing seeds within their own communities.
- **Trade Rules:** The focus countries tend to significantly depend upon imports of vegetable seed to meet the demand for improved varieties, although there is local private sector involvement in the production of some established varieties as indicated above. Cross-border trade is, therefore, particularly important to the supply of vegetable seed. Although local production is relatively underdeveloped, stakeholder consultations revealed that most countries' import regimes tend to work well with regard to the vegetable seed trade. The adoption of aligned regional rules may further facilitate trade, but most countries are still in the process of establishing their institutional and infrastructural capacity to fully implement regional rules and relevant international standards, and some of these requirements may present additional hurdles for the vegetable seed sector. Even with regional integration, most focus countries still retain independent systems of border controls with varying standards for risk assessment, and differentiated procedures for vegetable seed are lacking. Stakeholders have noted that this has led to challenges, such as the application of pest control measures not relevant for vegetable crops.
- **Measures to Address Counterfeit or Adulterated Seed:** Finally, counterfeit and adulterated seed remain a particular challenge for the vegetable seed sector. While a number of focus countries have adopted measures to curb the spread of counterfeit seed, cases are infrequently pursued and judgements rarely rendered. Some countries, like Kenya, are experimenting with innovative approaches like scratch-off labels, which are beginning to yield results and could have implications for broader application.

A full summary of the study's findings can be found in **Section 5**.

# 1 INTRODUCTION

To date, the growth of agricultural production within the African continent has largely been due to the expansion of cropped areas rather than increases in productivity in the areas that have been cultivated.[13] According to a study by the Food and Agriculture Organization of the United Nations (FAO),[14] this can be attributed to three broad factors: "(1) limited access to inputs and equipment (including access to quality seeds), (2) slow adoption of technology, and (3) negative supply shocks such as natural disasters and diseases." This has been exacerbated by poor infrastructure, low investment in food production, institutional deficiencies, and ineffective and unsuitable policies and regulation (or the enabling environment). As a result, local and foreign investment in agriculture have remained below potential, including in the seed sector.

Food insecurity remains an ubiquitous challenge in sub-Saharan Africa,[15] including in the study's focus countries (see **Figure 2**), with about 239 million people affected in 2019.[16] Food insecurity can be impacted by many factors, including economic downturn, adverse weather and climatic shocks, lack of diversification of crops in the food system, high food prices, pest outbreaks, and drought.[17] The situation has worsened due to the coronavirus (COVID-19) pandemic, which has exposed a number of vulnerabilities, including high price volatility in the international market and trade restrictions resulting from logistical bottlenecks which have reduced market supply of food crops and high-value food commodities such as vegetables.[18] Malnutrition is a major effect of food insecurity and can exist in many forms, including stunting, anemia, overnutrition, and undernourishment. It also leads to decreased social and economic development, as it impedes quality of life and workforce contribution, making it a very important economic development issue.

Food security constraints can be directly linked to seed security constraints. After the 2007-2008 food crisis, there was an increased focus on the supply of seed, with seed (along with fertilizers) seen as a key factor in fighting food insecurity in the African continent.[19] Because seed is an essential input for agricultural development, seed insecurity undermines the subsequent production of crops. It is important that a country's seed system facilitates access to quality seeds of diverse improved varieties that satisfy dietary and nutrition needs.[20]

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[13] Manitra A. Rakotoarisoa, Massimo Lafrate And Marianna Paschali, *Why Has Africa Become a Net Food Importer*, FAO, 41, (2011), http://www.fao.org/fileadmin/templates/est/PUBLICATIONS/Books/AFRICA_STUDY_BOOK_REVISED_low_res.pdf

[14] Manitra A. Rakotoarisoa, Massimo Lafrate And Marianna Paschali, *Why Has Africa Become a Net Food Importer*, FAO, 41, (2011), http://www.fao.org/fileadmin/templates/est/PUBLICATIONS/Books/AFRICA_STUDY_BOOK_REVISED_low_res.pdf

[15] The FAO has defined food security as "All people, at all times, having physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (see Report of the World Food Summit, FAO, (Nov. 13-17, 1996)

[16] Africa Regional Overview of Food Security and Nutrition: Containing the Damage of Economic Slowdowns and Downturns to Food Insecurity in Africa, FAO, AFRICAN UNION (AU), UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA (UNECA), 9 (2019), http://www.fao.org/3/ca7343en/CA7343EN.pdf

[17] Africa Regional Overview of Food Security and Nutrition: Containing the Damage of Economic Slowdowns and Downturns to Food Insecurity in Africa, FAO, AU, UNECA, 23 (2019), http://www.fao.org/3/ca7343en/CA7343EN.pdf

[18] Pepijn Schreinemachers et al., *Asia-Pacific Seed Trade Slow Emerges from COVID 19 Lockdowns,* ASIA AND PACIFIC SEED ASSOCIATION (APSA), (2020), https://web.apsaseed.org/asia-pacific-seed-trade-slowly-emerges-from-covid-19-lockdowns (see Maximo Torero Cullen, *COVID-19 And The Risk To Food Supply Chains: How To Respond?,* FAO, 3 (March 29, 2020), http://www.fao.org/3/ca8388en/CA8388EN.pdf

[19] Shawn McGuire and Louise Sperling, *The Links Between Food Security and Seed Security: Facts And Fiction That Guide Response,* DEVELOPMENT IN PRACTICE, 3 (June 2011), https://doi.org/10.1080/09614524.2011.562485.

[20] *Status of Seed Legislation and Policies in the Asia-Pacific Region,* FAO (2020), http://www.fao.org/3/ca7599en/CA7599EN.pdf

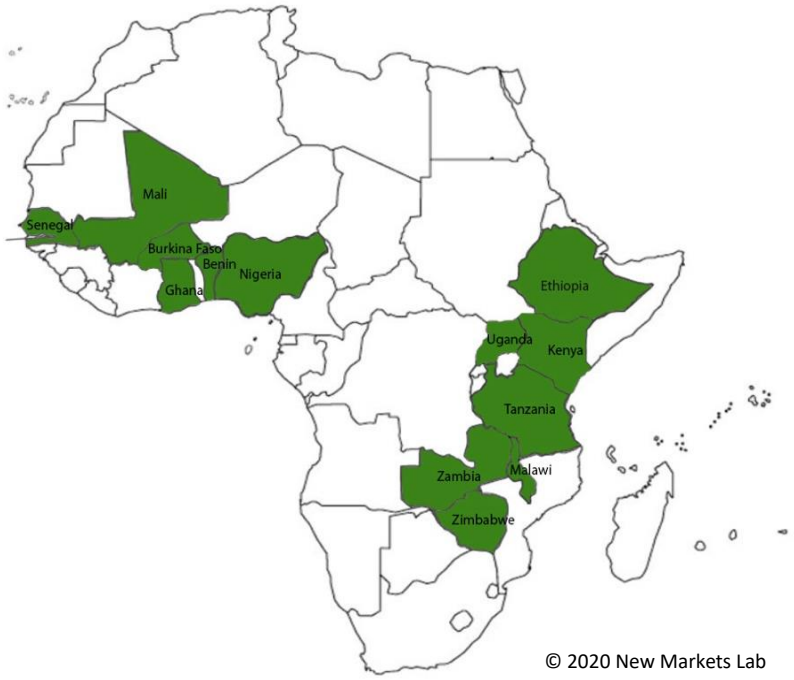


**Figure 2:** Focus Countries of the Study

Vegetable crops are very important in this context. They hold significant potential for local seed sector growth and to improve food and nutrition security.[21] For example, vegetable crops are a source of important vitamins and minerals and help achieve a balanced and healthy diet. However, staple crops like maize and rice have largely been the focus of seed sector policies and priorities in sub-Saharan African countries,[22] often leaving aside micronutrient-rich crops like vegetables. As such, there is a growing concern that the production of vegetables in the region is not sufficient to meet the nutritional needs of the population.[23] Notably, the World Health Organization (WHO) reports that the supply of fruits and vegetables in sub-Saharan Africa falls short of recommendations.[24]

Overall, the seed system in the focus countries can be divided into three systems: formal, informal, and intermediate systems (see **Figure 3**). The informal sector is prevalent in all focus countries and is comprised of farmer-managed seed activities operating based on traditional knowledge where farmers mostly sow seed saved from the previous harvest (farmer saved seed and seed from other local/community-based mechanisms). This system tends to not develop or

[21] Schreinemachers, Pepijn, Julie Howard, Michael Turner, Simon N. Groot, Bhupen Dubey, Learnmore Mwadzingeni, Takemore Chagomoka, Michael Ngugi, Victor Afari-Sefa, Peter Hanson and Marco C. S. Wopereis 2021. Africa's evolving vegetable seed sector: status, policy options and lessons from Asia. FOOD SECURITY. https://doi.org/10.1007/s12571-021-01146-y

[22] *Strengthening Vegetable Seed Systems in Central and West Africa Through Public Private Partnership Platforms*, FAO, http://www.fao.org/agriculture/crops/news-events-bulletins/detail/en/item/39768/icode/1/?no_cache=1

[23] NML Consultations with Stakeholders, September/October 2020.

[24] The intake level of fruit and vegetables recommended by the WHO is 400 grams (g)/person per day. The WHO also projects that in 2050, based on current production levels, the supply of fruits and vegetables in sub-Saharan Africa will only be 318 g/person per day. (*See* Daniel Mason-D'Croz, Jessica R Bogard, Timothy B Sulser, Nocila Cenacchi, Shahnila Dunston, Mario Herrero and Keith Wiebe, *Gaps Between Fruit And Vegetable Production, Demand, And Recommended Consumption At Global And National Levels: An Integrated Modelling Study*, ELSEVIER LIMITED, 8 (July 2019)).

produce improved varieties at a commercial scale. TAVs such as African eggplant, okra, and amaranth are mostly sourced from this informal sector and are better adapted to local agro-ecologies, whereas exotic vegetables like tomato and pepper are often imported; however, in some of the focus countries, they are also sourced from informal sector.[25] One issue with depending upon the informal sector for supply of vegetable seed, however, is that seed may not be readily available during exigencies (such as drought or the COVID-19 pandemic), which can cause severe seed insecurity amongst farmers.

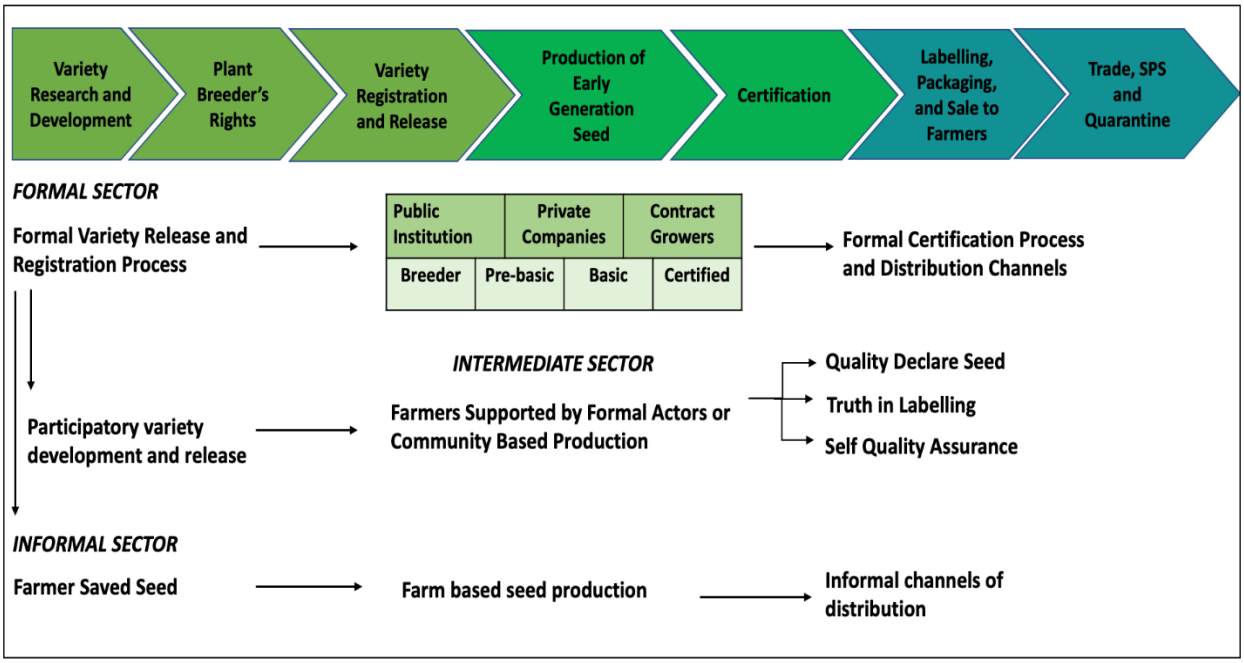


**Figure 1:** Overview of Seed Systems in Focus Countries

© 2020 New Markets Lab, adapted from New Markets Lab's *Legal Guide to Strengthen Tanzania's Seed and Input Markets*, New Markets Lab with the Southern Agricultural Growth Corridor of Tanzania Centre Ltd. for the Alliance for a Green Revolution in Africa and U.S. Agency for International Development, April 2016 and Ethiopia's Envisioned Seed System (Exhibit 4) from *Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions*, Ministry of Agriculture and Natural Resources, Ethiopian Agricultural Transformation Agency, 2016.

The formal seed sector, or regulated seed sector, is made up of the public and private sectors, with local and international private companies, and has strong regulatory oversight (**Figure 4)**.

[25] NML Stakeholder Consultations September/October 2020.

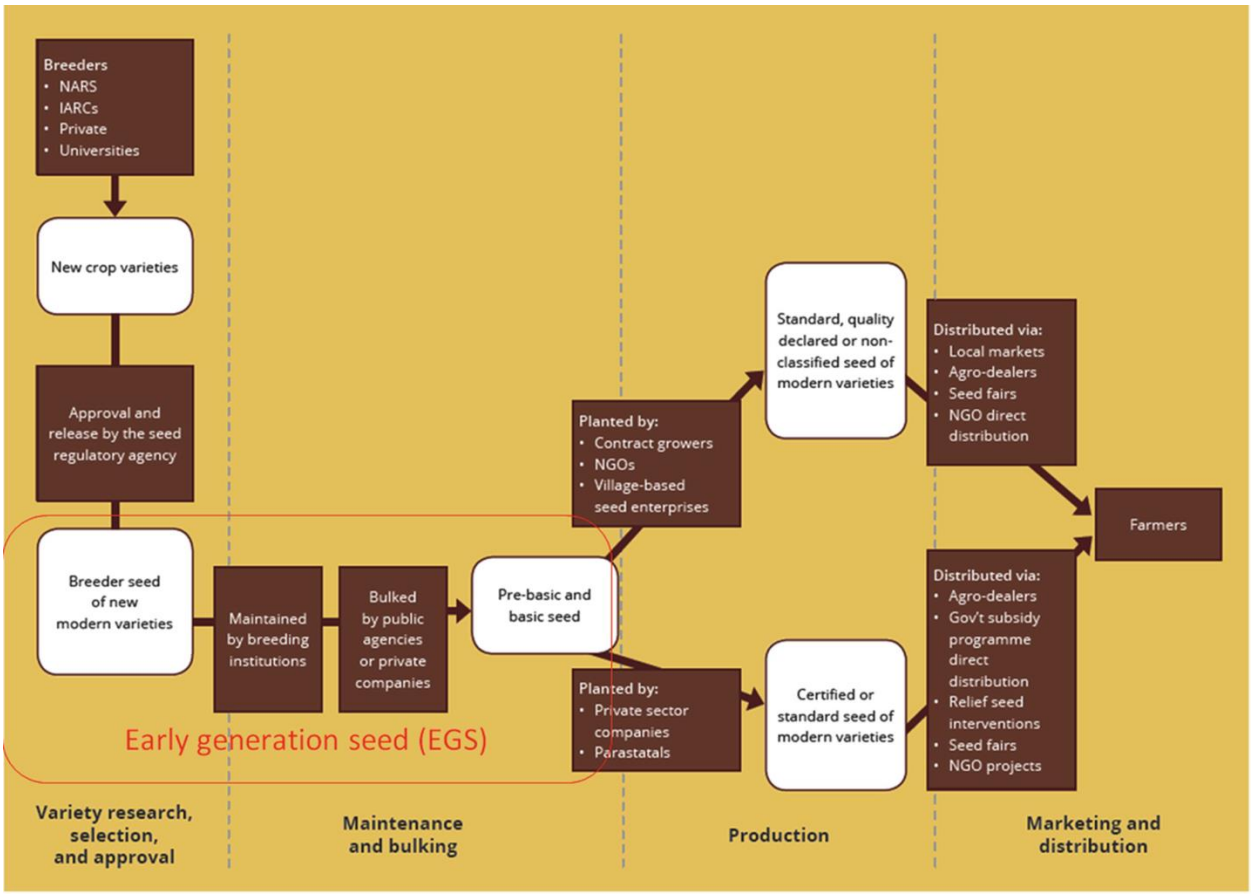


**Figure 4:** Graphical Representation of the Formal Seed System[26]

Source: Vuna & Adam Smith International, Reaching More Farmers with High Quality Seed for Drought Tolerant Crops (2016); Laura K. Cramer, Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties, CLIMATE SMART AGRICULTURE PAPERS Ch. 8, (2018).

Formal seed systems are organized and subject to regulation, which, in sub-Saharan Africa, is centered around rules for registered, certified, and labeled seed, although it is important to note that economic and social goals can often be achieved through less complex regulatory mechanisms, which may also help expand the stakeholders participating in the formal sector.[27] As part of the Green Revolution in the mid-1970s, governments placed more emphasis on the vital role of agriculture and started to promote formal seed systems in Africa by setting up technical laboratories, processing plants, and seed certification agencies.

In addition to the informal and formal sectors, an intermediate sector is evolving to varying degrees in different countries (the term has emerged from the work of the Integrated Seed Sector

[26] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch. 8, 87, 90 (2018), https://link.springer.com/chapter/10.1007/978-3-319-92798-5_8

[27] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377; (see also *What are Seed Systems?,* FAO (2019), http://www.fao.org/agriculture/crops/thematic-sitemap/theme/compendium/tools-guidelines/what-are-seed-systems/en/

Development approach),[28] which integrates aspects of both the formal and informal sectors. There are a number of policy and regulatory steps that can allow the formal system and the informal system to co-exist within the value chain. Further, and as depicted in **Figure 3**, aspects of the intermediate sector may actually be beneficial for the development of the vegetable seed sector, especially in relation to quality assurance of vegetable seed. One example is allowing for QDS schemes for seed quality assurance, instead of subjecting all seed to the formal certification process before it can enter the commercial seed value chain. However, QDS as a system was designed for staple crops, and might not be as effective in the vegetable seed sector, where a higher level of expertise is required for successful commercialization. Additionally, quality self-assurance and truth in labelling schemes adopted by the private sector actors (and further elaborated below) can be important approaches to quality assurance.

The public sector has focused on the development of high yielding varieties and their accessibility to farmers.[29] Many countries have built centralized breeding and production capacities in research institutions and state enterprises along with testing laboratories and seed quality assurance institutions. In the early 1980s and 1990s, a number of countries adopted policies to open up the agricultural sector to private companies that could focus on a more profit-oriented approach instead of the development-oriented approach pursued by the public sector.[30] However, private activity has been somewhat limited and has focused mainly on a few staple crops such as maize, although, as indicated above, in some focus countries, vegetable crops are produced by the private sector. Africa remains a net food importer in some cases,[31] yet investment is growing in some crops, and significant unmet potential remains in crops like vegetables.

Parastatal seed corporations have also been common,[32] although these have been fully or partly privatized in a number of countries. For example, Malawi's National Seed Company sold 55 percent of its share to Cargill Hybrid Seed in 1989, which was then sold to Monsanto in 1996. The Zambian government reduced its shareholding in Zambia Co-operative Federation Limited and the Zambia Seed Producers Association (Zamseed), which has its own breeding program.[33] The Kenyan government has also undertaken privatization initiatives, but it still holds a majority share in Kenya Seed Company (KSC). In 1979, KSC acquired Simpson and White Law, a vegetable seed company that trades under the brand name Simlaw Seeds[34] and is engaged in all stages of the vegetable seed value chain in Kenya. In Ethiopia, the Ethiopian Agricultural Business Corporation

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[28] Niels P. Louwaars, Walter Simon de Boef and Janet Edeme. *Integrated Seed Sector Development in Africa, A Basis for Seed Policy and Law*, JOURNAL OF CROP IMPROVEMENT, 47 (2013), https://doi.org/10.1080/15427528.2012.751472

[29] Niels P. Louwaars, Walter Simon de Boef and Janet Edeme. *Integrated Seed Sector Development in Africa, A Basis for Seed Policy and Law*, JOURNAL OF CROP IMPROVEMENT, 47 (2013), https://doi.org/10.1080/15427528.2012.751472

[30] Niels P. Louwaars, Walter Simon de Boef and Janet Edeme. *Integrated Seed Sector Development in Africa, A Basis for Seed Policy and Law*, JOURNAL OF CROP IMPROVEMENT, 47 (2013), https://doi.org/10.1080/15427528.2012.751472

[31] Manitra A. Rakotoarisoa, Massimo Lafrate And Marianna Paschali, Why Has Africa Become a Net Food Importer, FAO, 41, (2011), http://www.fao.org/fileadmin/templates/est/PUBLICATIONS/Books/AFRICA_STUDY_BOOK_REVISED_low_res.pdf

[32] Manitra A. Rakotoarisoa, Massimo Lafrate And Marianna Paschali, Why Has Africa Become a Net Food Importer, FAO, 41, (2011)

[33] *The Expansion Of The Commercial Seed Sector In Sub-Saharan Africa: Major Players, Key Issues And Trends*, AFRICAN CENTRE FOR BIODIVERSITY, (2015), https://www.acbio.org.za/wp-content/uploads/2015/12/Seed-Sector-Sub-Sahara-report.pdf

[34] *Kenyan Seed Company*, Access to Seeds Index, (last updated March 2019), https://www.accesstoseeds.org/index/eastern-southern-africa/company-scorecards/kenya-seed-company/

(EBAC) was established in 2015, following the merger of Ethiopian state-owned enterprises.[35] Stakeholders have noted that the enabling environment in these countries is still not suitable to the development of the vegetable seed sector. However, governments in Ethiopia, Kenya, and Nigeria are currently revising laws to create more inclusive formal seed sectors, which includes incorporating flexibilities for vegetable seed.[36]

The formal private vegetable seed industry is relatively well developed in countries such as Kenya, Nigeria, Malawi, Tanzania, Zambia, and Zimbabwe.[37] The study counted 16 local private seed companies engaged in the production of vegetable seed in the focus countries, many of which work across countries (see **Table 2**), with a focus on crops that include cabbage, carrot, eggplant, onion, tomato, lettuce, and peppers. MNCs such as the Bayer Group (Ethiopia, Kenya, Tanzania, and Uganda), Syngenta AG (Ethiopia, Kenya, and Tanzania), and Seed Co Limited (Ethiopia, Zimbabwe, and Ghana) are also prominent in the vegetable seed sector in the focus countries. Joint ventures exist in the sector as well; for example, Rijk Zwaan of the Netherlands and East-West Seed of Thailand entered into a joint venture "Afrisem" to develop locally adapted vegetable varieties in Tanzania. Some companies, such as Syngenta in Ethiopia, produce vegetable seed mainly for export.

The demand for vegetable varieties is established by various conditions, which can differ based on environmental factors (physical characteristics of the soil, temperature, and moisture), consumer preferences (shape, taste, color, and texture), yields, susceptibility to disease outbreaks, and availability of inputs such as water. Although the formal sector produces some vegetable seed in the focus countries, field crops, such as maize and rice, are much more prevalent. In some countries seed developed and produced by farmers (through farm saved seed and informal networks) is still the most important source of vegetable seed.[38]

Commercial vegetable seed demand has relied upon the importation of vegetable varieties (mainly exotic vegetable varieties) from Asia and Europe (see **Table 1**).[39] The dependence on imports to fulfil farmers' seed demand can be risky; even if the seed is of sufficient quality, it may not be suitable to local growing conditions or local market preferences. Imports may also be unreliable in terms of quality (as reported in some countries), quantity (due to demand fluctuations in the international market), tolerance/resistance to pests and diseases, and low productivity.[40] These dynamics have also left a gap in regulatory approaches for vegetable seed. Stakeholders have flagged a number of regulatory issues, which arise along the value chain and impact the production, commercialization, distribution, and trade of vegetable seed.

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[35] *Ethiopian Agricultural Business Corporation*, Access to Seeds Index, (last updated March 2019), https://www.accesstoseeds.org/index/eastern-southern-africa/company-scorecards/ethiopian-agriculture-business-corporation

[36] NML Stakeholder Consultations, September/October 2020.

[37] *The Expansion of the Commercial Seed Sector in sub-Saharan Africa: Major Players, Key Issues and Trends,* AFRICAN CENTRE FOR BIODIVERSITY (November 2015), https://www.acbio.org.za/wp-content/uploads/2015/12/Seed-Sector-Sub-Sahara-report.pdf

[38] NML Consultations with Stakeholders, September/October 2020.

[39] NML Consultations with Stakeholders, September/October 2020.

[40] *Strengthening Vegetable Seed Systems in Central and West Africa Through Public Private Partnership Platforms*, FAO, http://www.fao.org/agriculture/crops/news-events-bulletins/detail/en/item/39768/icode/1/?no_cache=1

**Table 1:** Volume and Value of Vegetable Seed Imports in Focus Countries

| Importing Countries | 2016 | | 2017 | | 2018 | | Country of Origin |
|---|---|---|---|---|---|---|---|
| | Qty (MT) | Value (Mil USD) | Qty (MT) | Value (Mil USD) | Qty (MT) | Value (Mil USD) | |
| Burkina Faso | 160 | 4.21 | 77 | 3.47 | 164 | 5.62 | China, France, USA |
| Benin | 230 | 7.83 | - | - | 153 | 6.50 | China, France, Italy, South Africa, USA |
| Ghana | 68 | 1.75 | 78 | 2.28 | 99 | 3.48 | Netherlands, France, USA, Japan |
| Kenya | - | - | 444 | 12.17 | 481 | 13.16 | USA, India, Japan, Italy |
| Malawi | 48 | 0.98 | 39 | 0.78 | - | - | South Africa, USA |
| Mali | 60 | 1.64 | 64 | 1.92 | - | - | France, USA, China |
| Nigeria | - | - | - | 2.16 | 126 | 1.90 | France, USA, China |
| Senegal | 228 | 8.28 | 226 | 6.63 | 223 | 8.71 | France, Netherlands, USA |
| Tanzania | 244 | 3.34 | 158 | 4.27 | 121 | 3.32 | Netherlands, Kenya, France, India |
| Uganda | 457 | 7.30 | 313 | 6.73 | 480 | 8.47 | Kenya, South Africa, USA |
| Zambia | 153 | 4.07 | 93 | 3.25 | 164 | 4.29 | South Africa, Zimbabwe, Kenya |
| Zimbabwe | 69 | 2.13 | 93 | 3.11 | 119 | 3.29 | South Africa, Netherlands, United Kingdom, Tanzania |
| TOTAL | 1,717 | 41.53 | 1,587 | 46.80 | 2,131 | 58.75 | |

Note: "-" means not available. Source: *Product: Vegetable seeds, of a kind used for sowing,* AGRI EXCHANGE, http://agriexchange.apeda.gov.in/Home.aspx

## 2 METHODS AND DATA

This study is based on a structured document review of primary and secondary sources relating to the key issue areas. It was also informed by semi-structured stakeholder consultations conducted across 13 focus countries. Primary sources consulted for this review included texts of different policies, laws, and regulations applicable to the vegetable seed sector in the countries (see Appendix I). The review also incorporated secondary sources of information, which included a wide assortment of documentary sources on seed systems, the enabling environment, and related issues which helped to contextualize the primary sources within the vegetable seed value chain in the focus countries.

Methodologically, the study is based on previous work by NML and Katrin Kuhlmann on seed law and regulation over a ten-year period, beginning with an in-depth case study in Tanzania focused on how the legal and regulatory environment impacts economic development and market

diversity.[41] NML's work has been focused in sub-Saharan Africa but has also included parts of Asia and of Latin America, with substantive on-the-ground projects and studies conducted in around twenty countries and comparative legal analysis in a number others. The methodology relied upon for the study also incorporates work done by Katrin Kuhlmann focused on regulatory aspects, including "regulatory flexibilities", that allow for rules to be tailored to the needs of different stakeholders and development priorities.[42] "Regulatory flexibilities" can allow parties to adapt to new or differentiated circumstances and integrate a country's economic and social development goals;[43] for the seed sector this flexibility can be determined through "an analysis of whether regulatory approaches are designed to adapt to diverse realities and market needs."[44] As Kuhlmann and colleagues have documented, flexibilities and other factors that affect the design and implementation of rules and regulations can be found across different legal systems and legal and regulatory instruments (including seed policies, seed laws and seed regulations), and they can provide an important topology for evaluating the ability of the legal and regulatory environment to respond to diverse stakeholder interests and untapped market potential, making this a useful lens through which to evaluate the impact of policies, laws, and regulations on development of the vegetable seed sector in the focus countries.

Stakeholder consultations were used to gather information on the most pressing legal and regulatory issues facing the development of the sector. These also helped inform assessment of the implementation, or application, of legal and policy instruments in practice, which is a critical aspect of the study. Where possible, implementation challenges are broken down based on a methodology developed by NML, which includes efficiency in the system of rules (e.g., time and cost of registering vegetable seed and releasing it in the market), engagement (inclusion of private stakeholders in the rulemaking process), regulatory gateways (regulatory hurdles related to market entry and participation in the sector), and effectiveness (existence of relevant enforcement mechanisms and effective systems to address stakeholder needs).[45]

To understand these dimensions, stakeholder consultations were conducted in three interconnected steps. First, questionnaires were prepared for private companies, seed

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[41] See Katrin Kuhlmann, *Reassessing Policy Space in the Context of Sustainable Development and Vulnerabilities in International Economic Law: A Top-Down Meets Bottom-Up Research Agenda and Methodology,* AF. J. INT'L. ECON. L. Vol. 2 (forthcoming, 2021); *See also., A Legal Guide to Strengthen Tanzania's Seed and Inputs Markets*, SOUTH AGRICULTURAL GROWTH CORRIDOR OF TANZANIA AND NEW MARKETS LAB, 45 (April 2016) and a series of case studies developed with the Syngenta Foundation for Sustainable Agriculture, available at https://www.newmarketslab.org/publications. See also Katrin Kuhlmann, *Reassessing Policy Space in the Context of Sustainable Development and Vulnerabilities in International Economic Law: A Top-Down Meets Bottom-Up Research Agenda and Methodology,* AF. J. INT'L. ECON. L. Vol. 2 (forthcoming, 2021).

[42] Katrin Kuhlmann, *Planning for Scale Brief #6: Enabling Environment*, AGPARTNERXCHANGE, (2013), https://cb4fec8a-9641-471c-9042-2712ac32ce3e.filesusr.com/ugd/7cb5a0_806446eacd0f4257915e206af4adc505.pdf; and Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377; FAO, (2019), http://www.fao.org/agriculture/crops/thematic-sitemap/theme/compendium/tools-guidelines/what-are-seed-systems/en

[43] Katrin Kuhlmann, Flexibility and Innovation in International Economic Law: Enhancing Rule of Law, Inclusivity and Resilience in the Time of COVID-19, AFRONOMICSLAW SYMPOSIUM ON THE VULNERABILITY IN THE TRADE AND INVESTMENT REGIMES IN THE TIME OF COVID-19 2020, (August 10, 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3694903

[44] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377

[45] New Markets Lab, *Approach to Legal and Regulatory Reform,* 2019, https://www.newmarketslab.org/about. This approach is expanded upon in Katrin Kuhlmann, *Reassessing Policy Space in the Context of Sustainable Development and Vulnerabilities in International Economic Law: A Top-Down Meets Bottom-Up Research Agenda and Methodology,* AF. J. INT'L. ECON. L. Vol. 2 (forthcoming, 2021).

associations, and public sector actors to assess key regulatory issues within the vegetable seed value chain. These questionnaires were tailored to the type of stakeholder to ensure that differences in perspective were captured. Virtual consultations were held using the prepared questionnaires, with results collated by NML and combined with the primary and secondary research, based on elements of the methodology described above.

The legal and regulatory review that was conducted throughout the study focused on the design and implementation of legal and regulatory systems at each stage of the vegetable seed value chain (see **Figures 1** and **4**). The legal and regulatory analysis identified ways in which vegetable seed is recognized (or treated the same as all crops) in the enabling environment and associated regulatory flexibility that would affect private sector operations throughout the value chain. For example, if a legal requirement related to the importation of vegetable seed was more relaxed than the variety registration and release process, it was important to understand whether this discouraged companies from investing in the local vegetable seed production and encouraged imports instead.

For the private sector consultations, a key objective was to understand how companies have experienced regulatory issues related to vegetable seed. Consultations were held with a sample of 12 private companies (4 local and 8 global) engaged in various activities in the vegetable seed value chain across the focus countries that have firsthand experience with elements of the enabling environment related to different value chain activities (including vegetable breeding, variety registration and release, seed production, quality control, distribution, labelling requirements, enforcement of anti-counterfeiting laws, and cross-border trade). **Table 2** shows the engagement of private seed companies in the focus countries in the seed value chain.

Key stakeholders from the public sector were also consulted to contextualize experience with the legal and regulatory environment from a public sector point of view. For this purpose, stakeholders from regulatory bodies (including National Seed Authorities (NSAs), seed certification bodies, national agricultural research institutes, parastatal companies, technical and legal experts, and vegetable seed breeders were consulted. Consultations were also conducted with key personnel from various seed trade associations such as the African Seed Trade Association (AFSTA), the Seed Trade Association of Kenya (STAK), the Seed Trade Association of Malawi (STAM), and others; these associations are comprised of representatives from both the public and private sectors. In some countries (e.g., Ethiopia, Kenya, Malawi, and Nigeria), regulatory reforms are underway that will likely have relevance to vegetable seed, and these were assessed alongside existing policy, legal, and regulatory systems.

**Table 2:** Engagement of Seed Companies in the Vegetable Seed Value Chain in Focus Countries[46]

| Country | Breeding Research | Testing Locations | Seed Production | Seed Processing | Seed Sales | Farmer Extension |
|---|---|---|---|---|---|---|
| Benin | 1 | 2 | 1 | 0 | 5 | 1 |
| Burkina Faso | 2 | 3 | 4 | 0 | 11 | 2 |
| Ethiopia | 2 | 6 | 4 | 1 | 14 | 3 |
| Ghana | 1 | 4 | 2 | 1 | 12 | 2 |
| Kenya | 6 | 13 | 8 | 5 | 23 | 8 |
| Malawi | 1 | 4 | 4 | 2 | 10 | 2 |
| Mali | 2 | 5 | 3 | 2 | 15 | 4 |
| Nigeria | 3 | 8 | 4 | 4 | 19 | 6 |
| Senegal | 3 | 4 | 2 | 0 | 12 | 3 |
| Tanzania | 5 | 9 | 8 | 6 | 6 | 7 |
| Uganda | 3 | 8 | 5 | 4 | 20 | 6 |
| Zambia | 4 | 4 | 6 | 3 | 18 | 4 |
| Zimbabwe | 3 | 6 | 2 | 3 | 17 | 3 |

For this assessment, the methodological approach, substantive research, and stakeholder consultations all contributed to an understanding of whether "regulatory flexibility" exists with regard to vegetable seed, i.e., whether a country's system recognizes the unique properties of vegetable crops and has tailored the legal and regulatory system accordingly. The study's high-level findings showing "regulatory flexibility" across policy, legal, and regulatory instruments are set out in **Table 3** and elaborated upon further below. The presence of even one or more of these elements does not indicate that, in fact, the seed system in a particular country is better or more advanced than another. However, the comparative table below is set out to visually illustrate whether a particular seed system shows regulatory flexibilities in relation to vegetable seed, meaning whether specific policy objectives, rules, or guidelines particular to vegetable seed are incorporated into a country's policy, legal, and regulatory instruments.

[46] ACCESS TO SEED INDEX, Eastern and Southern Africa, Western and Central Africa, https://www.accesstoseeds.org/countries/ (last visited May 22, 2021).

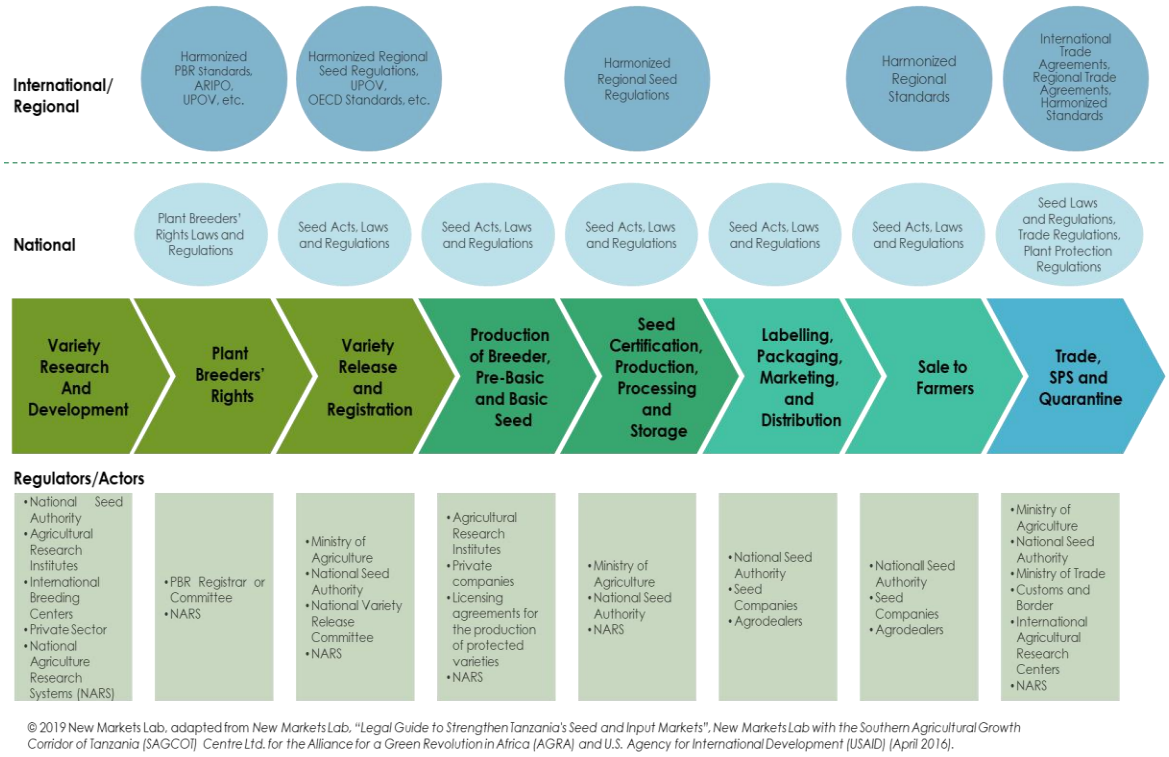
**Table 3:** High-Level Findings from Legal and Regulatory Review Showing "Regulatory Flexibility" in Policy Instruments

| Country | Specific objectives for vegetable seed incorporated into seed policy | Specific rules/ flexibilities for vegetable seed incorporated into seed law | Specific guidelines/ regulations for vegetable seeds |
|---|---|---|---|
| Benin | N/A | ✓ | |
| Burkina Faso | | | |
| Ethiopia | | ✓* | |
| Ghana | | | |
| Kenya | | ✓• | N/A |
| Malawi | ✓ | | ✓•* |
| Mali | | ✓• | N/A |
| Nigeria | ✓ | ✓•† | ✓• |
| Senegal | | | N/A |
| Tanzania | | ✓•† | ✓• |
| Uganda | ✓ | | ✓• |
| Zambia | ✓ | ✓ | N/A |
| Zimbabwe | | ✓•† | N/A |

•Rule or flexibilities exist in the testing procedures for variety release and registration
*Laws are currently under consideration and have not been implemented
†Flexibilities exist in field and lab testing standards for specific vegetable varieties
N/A: Information not available
© 2021 New Markets Lab, based on previous work on regulatory flexibilities and review of seed policies, laws and regulations in focus countries.

It is also important to note the differences in legal instruments assessed. Seed policy is not legally binding, but it provides an overall framework for the seed enabling environment and is an important instrument that helps stakeholders understand their roles and responsibilities in the operation of the seed sector. The absence of a seed policy can lead to inconsistent decision-making, which can limit the capacity of the seed system in a country to provide farmers with access to quality seed.[47] Seed law (or acts or proclamations), on the other hand, establishes the legal and institutional framework for the sector, often in line with policy objectives,[48] while regulations execute the legal framework and play a key role in setting out the procedures to be followed and standards that have to be maintained in implementing seed laws. These instruments are assessed below as they relate to different aspects of the seed value chain (see **Figure 5**).[49]

[47] Draft Guide for National Seed Policy Formulation, COMMISSION ON GENETIC RESOURCE FOR FOOD AND AGRICULTURE (2013).
[48] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, 95 (FOOD AND AGRICULTURE ORGANIZATION, 2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf
[49] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, FAO, 95, 2018, http://www.fao.org/3/CA1492EN/ca1492en.pdf




© 2019 New Markets Lab, adapted from New Markets Lab, "Legal Guide to Strengthen Tanzania's Seed and Input Markets", New Markets Lab with the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) Centre Ltd. for the Alliance for a Green Revolution in Africa (AGRA) and U.S. Agency for International Development (USAID) (April 2016).

**Figure 5:** Elements of Seed Regulation

## 3 REGIONAL REGULATORY FRAMEWORK FOR VEGETABLE SEED

Before turning to the detailed comparative assessment of the legal and regulatory framework for vegetable seed in the focus countries, a brief assessment of regional rules is warranted. Regional integration has been a major focus of Africa's development agenda for a number of years, and integration efforts already underway are being reinforced through broader agreements like the pan-African Continental Free Trade Area. Among the focus countries, Ghana, Benin, Senegal, Nigeria, Burkina Faso, and Mali are all members of the Economic Community of West African States (ECOWAS), while the countries in Eastern and Southern Africa are members of several regional economic communities (RECs) that have harmonized seed rules or are in the process of developing harmonized rules, as is the case in the East African Community (EAC). Among the focus countries, Zimbabwe, Malawi, Zambia, Kenya, Uganda and Ethiopia are all members of the Common Market for Eastern and Southern Africa (COMESA); Kenya, Uganda, and Tanzania are Partner States in the EAC; and Zimbabwe, Malawi, Zambia, and Tanzania are members of the Southern African Development Community (SADC).

Harmonization of seed regulations within these RECs will help streamline seed trade, while reducing time and cost associated with the repetition of testing procedures and regulatory checks.[50] Harmonization can thus improve access to quality seed at reduced prices and broaden

[50] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).

the market for seed, encouraging greater private investment within the region.[51] Harmonized trade standards could also foster trust within the region, leading to the removal of unnecessary hurdles at the border and contributing to regional food security. Even though most stakeholders consulted expressed support for regional harmonization, concerns also surfaced with the regulatory burden that harmonization can involve, along with ongoing capacity constraints of governments. For vegetable seed, additional rules could complicate the flow of vegetable crops across the continent if not implemented in an efficient and transparent manner.

While regional trade in vegetable seed is currently not significant, regional trade implications will become more important as the sector develops and as international companies seek access to regional markets through regional seed catalogues, which already contain some vegetable seed varieties. The COMESA Plant Variety Catalogue, which has grown more expeditiously than other regional catalogues,[52] contains various crop varieties, namely, maize, Irish potatoes, sorghum, sunflower, pearl millet, common bean, groundnut, wheat, and soybean.[53] The SADC Variety Catalogue also contains a range of crop varieties,[54] namely, maize, wheat, sorghum, Irish potatoes, beans, groundnuts, soybean, and cotton.[55]

Current regional seed rules are largely silent on vegetable seed. The 2014 COMESA Seed Trade Regulations cover 12 crops, namely, beans, cassava, cotton, groundnuts, maize, millet, potato, rice, sorghum, soybeans, sunflower, and wheat.[56] The SADC Harmonized Seed Trade System currently regulates pigeon pea, soybean, sunflower, rice, pearl millet, sorghum, wheat, cowpea, and maize, with the vegetable seed sector existing outside of the SADC system until standards can be adopted on vegetable seed. An EAC technical committee has established certification standards for maize, sorghum, sunflower, soybean, and groundnut seed, with harmonized standards to be developed for cassava, wheat, common bean, rice, and sesame.[57] A notable exception is the ECOWAS seed system, which regulates 11 crops, including cereals (maize, pearl millet, rice, and sorghum), tubers (cassava, Irish potato, and yam), pulses (cowpeas and groundnuts), and two vegetable species (onion and tomato).[58]

Hence, ECOWAS is the only REC that has accommodated some vegetable crops in its regulations by setting out testing procedure for Distinctness, Uniformity, and Stability (DUS) and Value for Cultivation and Use (VCU) testing in the ECOWAS Procedure Manual. ECOWAS seed regulations prescribe that a variety may only be released regionally after completion of successful DUS and VCU tests and registration in the West African Catalogue of Plant Species and Varieties; however,

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[51] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[52] *Manual On Regional Seed Regulations In The Common Market For Eastern And Southern Africa (COMESA)*, NEW MARKETS LAB & SYNGENTA FOUNDATION, 3 (2020), https://www.syngentafoundation.org/sites/g/files/zhg576/f/manual_on_comesa_regional_seed_regulations_final_19_february_2019.pdf
[53] *COMESA Variety Catalogue*, COMESA, https://varietycatalogue.comesa.int/varietycatalogue (last visited May 22, 2021).
[54] Katrin Kuhlmann, Yuan Zhou, and Adron Naggayi Nalinya, *Case Study on Regional Harmonization for Vegetable Crop Varieties*, (May 2021), https://www.syngentafoundation.org/sites/g/files/zhg576/f/2021/05/10/passta_vegetable_case_study_may_2021.pdf
[55] *Variety Catalogue*, SADC SEED CENTRE, https://www.sadcseedcentre.com/variety-catalog (last visited May 22, 2021).
[56] *Manual On Regional Seed Regulations In COMESA*, NEW MARKETS LAB & SYNGENTA FOUNDATION, 7 (2020), https://www.syngentafoundation.org/sites/g/files/zhg576/f/manual_on_comesa_regional_seed_regulations_final_19_february_2019.pdf
[57] Linzi Lewis & Sabrina Masinjila, Status report on the SADC, COMESA and EAC harmonised seed trade regulations: where does this leave the regions' smallholder farmers? 24 – 25 (2018), https://www.acbio.org.za/sites/default/files/documents/Harmonisation_report.pdf
[58] John Keyser et al, *Towards an Integrated Market for Seeds and Fertilizers in West Africa*, 18 (2015).

onion and tomato, are only subject to DUS testing and exempted from VCU testing.[59] DUS testing of tomato and onion should be done in one location over two growing cycles.[60]

ECOWAS prescribes mandatory seed certification distribution and marketing within the region,[61] and, in this case, vegetable seed is not treated differently than grain crops despite good practices that would suggest otherwise. ECOWAS recognizes four OECD Seed Schemes-aligned seed classes: parental material, pre-basic seed, basic seed, and certified seed.[62] However, unlike ECOWAS, the OECD also allows for 'standard seed' as a seed class for vegetable seed, where the producer has primary responsibility for quality control,[63] effectively setting the ECOWAS standard above the international standard. ECOWAS also does not provision for alternatives to certification, including truth-in-labelling, group quality assurance schemes, or QDS.[64] ECOWAS is also in the process of developing a regional pest list which would apply to the two vegetable crops. The inclusion of two regionally significant vegetables within the ambit of the ECOWAS Seed Regulation is an important step in harmonized regional trade. In ECOWAS, regional rules are automatically binding upon most countries once published in the gazette, with the exception of Ghana and Nigeria which require parliamentary ratification.[65]

Other RECs, including COMESA and SADC also have intricate regional rules on seed which include, among other things, the creation of regional variety catalogues and regional certification requirements.[66] SADC and the EAC have gone a step further in incorporating PVP at a regional level, [67] although recent changes to the EAC rules leave implementation to the Partner States. SADC contains other notable practices, such as recognition of QDS as an alternative seed quality control system[68] and development of regional pest lists (one for trade within the REC and other

[59] Procedure Manual For Variety Registration In The National Catalogue For Crop Species And Varieties In West African Countries, 2007.
[60] Procedure Manual For Variety Registration In The National Catalogue For Crop Species And Varieties In West African Countries, 2007.
[61] *Manual On Regional Seed Regulations in The Common Market For Eastern And Southern Africa (COMESA)*, NEW MARKETS LAB & SYNGENTA FOUNDATION, 15 (2020), https://www.syngentafoundation.org/sites/g/files/zhg576/f/manual_on_comesa_regional_seed_regulations_final_19_february_2019.pdf
[62] Regulation C/Reg.4/05/2008 On Harmonization Of The Rules Governing Quality Control, Certification And Marketing Of Plant Seeds And Seedlings In ECOWAS Region, Art. 22.
[63] OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade, OECD, 153, (2020), https://www.oecd.org/agriculture/seeds/documents/oecd-seed-schemes-rules-and-regulations.pdf
[64] Regulation C/Reg.4/05/2008 On Harmonization Of The Rules Governing Quality Control, Certification And Marketing Of Plant Seeds And Seedlings In ECOWAS Region, Art. 22.
[65] In the case of Ghana and Nigeria, in order to implement ECOWAS regulations, parliamentary ratification is required in addition to publication of the regulation in the respective country's gazette. *See* Katrin Kuhlmann & Yuan Zhao, *Seed Policy Harmonization in ECOWAS: The Case of Ghana*, 17 (2016) and Katrin Kuhlmann, Yuan Zhou, Adron Nalinya Naggayi, and Heather Lui, *Seed Policy Harmonization in ECOWAS: The Case of Nigeria*, 16 (2018).
[66] *Manual On Regional Seed Regulations in The Common Market for Eastern and Southern Africa (COMESA)*, NEW MARKETS LAB & SYNGENTA FOUNDATION, (2020); NEW MARKETS LAB & SYNGENTA FOUNDATION, *Manual On Regional Seed Regulations in the Southern African Development Community (SADC)*, (2020); Katrin Kuhlmann & Yuan Zhao, *Seed Policy Harmonization in the EAC and COMESA: The Case of Kenya,* (2015). EAC does not harmonize variety release and registration, although some EAC members such as Kenya, Tanzania and Uganda have taken steps to harmonize their variety release protocols through the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). ASARECA is a not for profit sub-regional organizations comprising the NARS of member countries, including Ethiopia, Kenya, Tanzania and Uganda which aims to foster collective action in agricultural research.
[67] Sabrina Masinjila, *The SADC PVP Protocol: Blueprint for uptake of UPOV 1991 in Africa* (2018), https://acbio.org.za/acbio/web/sites/default/files/documents/The%20SADC%20PVP%20Protocol-Blueprint%20for%20uptake%20of%20UPOV%201991%20in%20Africa%20REPORT_0.pdf
[68] *Manual on Regional Seed Regulations in the Southern African Development Community (SADC)*, 12 (2020), https://www.syngentafoundation.org/sites/g/files/zhg576/f/manual_on_comesa_regional_seed_regulations_final_19_february_2019.pdf

for imports into the region).[69] However, vegetable seed falls largely outside the scope of these regional regulations.

Given that ECOWAS is the only REC that explicitly references vegetable seed, the ECOWAS system could incorporate the OECD standard seed class for vegetables and other practices, such as the operationalization of a common pest list to further streamline trade within the region. Since vegetables are included among regulated crops, allowing alternatives to formal centralized seed certification could also have an impact. The ECOWAS framework could also be expanded to include other vegetable crops, including significant indigenous crops in the region. The other RECs will increasingly need to look to facilitating vegetable seed trade as well. In 2020, the New Markets Lab conducted a parallel case study with the Syngenta Foundation for Sustainable Agriculture and its Seeds2B program focused on regional regulatory practices for vegetable seed in sub-Saharan Africa which further expand upon this dimension.[70]

# 4 COMPARATIVE ANALYSIS

The following comparative analysis is based on research, legal assessment, and consultations, as noted above. It follows the steps in the seed value chain depicted in **Figure 1** and elaborated in **Figure 5**, with a focus on regulatory flexibilities, and hurdles, relevant to the vegetable seed sector.

## 4.1 Vegetable Breeding and Commercialization

Plant breeding is one of the foundational steps in the seed value chain, and varietal development underpins the availability of improved seed in the market and resulting gains. At the national level, it is important to establish a system that encourages the development and maintenance of varieties that meet farmers' and consumers' needs. Plant breeding has made a significant impact in the delivery of quality seed to farmers through improvements in yield, resistance to biotic stress, and tolerance to abiotic stress, which have helped save millions of dollars in crop protection, provide harvest security, and improve quality traits and nutritional value.[71]

Breeding of vegetable crops often involves traits such as shelf-life, shape, color, taste, texture, tolerance to climatic constraints,[72] and resistance to pests and diseases. These factors differ country-by-country and region-by-region. In Africa, other factors may be of importance. For example, low-income countries might focus on vegetable seed that meets the nutritional requirements of its population.[73] Out of the four focus countries that have set out specific

[69] *Manual on Regional Seed Regulations in the Southern African Development Community (SADC)*, NEW MARKETS LAB & SYNGENTA FOUNDATION, 12 (2020).
[70] Katrin Kuhlmann, Yuan Zhou, and Adron Naggayi Nalinya, *Case Study on Regional Harmonization for Vegetable Crop Varieties*, (May 2021), https://www.syngentafoundation.org/sites/g/files/zhg576/f/2021/05/10/passta_vegetable_case_study_may_2021.pdf
[71] Marcel Bruins, Evolution and Contribution of Plant Breeding to Global Agriculture, 18 (2009).
[72] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, FAO, 95, (2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf.
[73] *African Vegetable Seed Market – Growth, Trends and Forecast (2020 – 2025)*, https://www.mordorintelligence.com/industry-reports/vegetable-seed-market-africa.

objectives for the vegetable seed sector in their national seed policies (see **Table 3**), none has incorporated vegetable breeding in their policy goals.

Vegetable crop demand in Africa can be broadly categorized by demand for exotic (or global) vegetables and TAVs. Exotic vegetables include crops like tomato, pepper, onion, and cabbage and much of the seed demand for these crops is met with imports. Stakeholders from some countries have stated that a few private companies have also engaged in local breeding of some of these vegetable crops (see **Table 4**).[74] A local private sector stakeholder from Ghana who is engaged in tomato breeding (and is also venturing into chili peppers and onions) noted that tomatoes that were developed locally by the company produce up to 40 tons per hectare, with the potential to produce up to 75 tons per hectare.[75] This is a welcome development, since imported vegetable seed has reportedly not performed as well due to issues such as high susceptibility to insect pests and diseases; however, this might not be true for all types of imported vegetable crops in the focus countries.[76]

TAVs also have high potential to contribute to food security in the African continent, as they are an important source of micronutrients and are more adaptable to a country's agroecology and more tolerant to climate risks.[77] TAVs that are widely used in the focus countries include crops such as amaranth, African nightshade, African eggplant, spider plant, and okra.[78] However, historically these are mainly grown from farmer saved seed and have not been prioritized for vegetable breeding by the public sector, resulting in inconsistent quality in the focus countries. This is now changing, as many TAVs like amaranth, okra, and vegetable cowpea are now being bred and released through formal channels, as seen in countries like Nigeria, Tanzania, and Kenya. In Kenya specifically, stakeholders stated that TAVs have good local productive capacity.[79] A recent study found that 6 private seed companies in Kenya and Tanzania produced 4.7 tons of amaranth seed in 2016.[80] Another study for Tanzania found that 8 private seed companies produced 3.4 tons of African eggplant and 9 seed companies produced 29.6 tons of tomato seed in 2014.[81]

NARS and public institutions from all focus countries (except Uganda and Malawi) are engaged in the breeding of vegetable varieties. This includes the breeding of both TAVs and exotic vegetables such as tomato, pepper, onion, capsicum, okra, amaranth, cowpeas, carrot, and potatoes.[82] Public-private ventures, including PPPs and joint ventures, are also engaged in

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[74] NML Consultations with Stakeholders, September/October 2020.
[75] NML Consultations with Stakeholders, September/October 2020.
[76] NML Consultations with Stakeholders, September/October 2020.
[77] Kansime, K.M. and A. Mastenbroek, Enhancing Resilience Of Farmer Seed System To Climate-Induced Stresses: Insights From A Case Study In West Nile Region, JOURNAL OF RURAL STUDIES (2016).
[78] NML Consultations with Stakeholders, September/October 2020.
[79] NML Consultations with Stakeholders, September/October 2020.
[80] Justus Ochieng, Pepijn Schreinemachers, Maurice Ogada, Fekadu Fufa Dinssa, William Barnos, Hassan Mndiga, 2019, *Adoption of Improved Amaranth Varieties and Good Agricultural Practices in East Africa*, LAND USE POLICY 83, 187-194 (2016).
[81] Pepijn Schreinemachers, Teresa Sequeros and Philipo Joseph Lukumay, P.J., 2017, *International Research on Vegetable Improvement in East and Southern Africa: Adoption, Impact, and Returns*, AGRICULTURAL ECONOMICS 707-717 (48(6)) (2017).
[82] *Crop Varieties Released and Registered in Nigeria*, NATIONAL CENTRE FOR GENETIC RESOURCES AND BIOTECHNOLOGY (as of 2016); *Zambia to Release 2 Drought Tolerant Cowpea Varieties,* INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS, (June 3, 2020), http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=18154; *Crop Research: An Overview*, ETHIOPIAN INSTITUTE OF

vegetable breeding in the focus countries, often with advanced breeding programs. Zamseed (a joint venture between the Government of Zambia and several private entities)[83] and the state-owned Simlaw Seeds in Kenya are engaged in the breeding of vegetable crops and have own breeding programs. Zamseed breeds both hybrids and OPVs, which are sourced from their own breeding programs (for okra, pumpkin, and squash).[84] Simlaw Seeds breeds vegetable seed, including cabbage, carrot, broccoli, cauliflower, green peas, okra, onion and pepper, among others. A stakeholder from Simlaw Seeds conveyed that the company has eight breeding programs and only sells vegetable varieties that they breed themselves, or varieties developed in partnership with international research organizations like WorldVeg.[85] The state-owned Ethiopian Agricultural Business Corporation (EABC) is engaged in the breeding of green peas and pepper.[86]

Local private companies are also engaged in vegetable breeding in sub-Saharan Africa, including Agri-Commercial Services Limited (in Ghana), Premier Seed Nigeria Limited, and Farm Inputs Care Centre Limited (FICA Seed) in Uganda, Société de Production de Semences Améliorées in Mali, and Nankosem in Burkina Faso. For example, Agri-Commercial Services Limited breeds tomato seed, which is now sold in the market. Among multinational companies, Syngenta AF has a significant presence in terms of vegetable breeding in the focus countries. In Zambia, stakeholders noted that breeding locations are used only for trials, and that these improved varieties are not released into the market; it is possible that companies might invest more in commercialization programs as local demand improves.[87] Value Seeds Limited (in Nigeria) also expressed interest in developing a vegetable breeding program.[88] Overall, stakeholders have noted that the development of vegetable varieties can take 5 to 8 years, and breeders need to foresee a return to their investment before they will engage in developing new varieties.[89]

Stakeholders in some focus countries shared recent developments, which show progress in relation to vegetable breeding. AFSTA and WorldVeg set up the "Africa Vegetable Breeding Consortium" in 2018 to assist private companies in obtaining locally-adapted vegetable germplasm and building capacity.[90] In Burkina Faso, the Environmental Institute for Agricultural Research (INERA) has undertaken several projects to provide improved vegetable varieties.[91] WorldVeg has also partnered with the University of Ghana and the Crop Research Institute of the Council for Scientific and Industrial Research (CSIR).[92] In Ghana, however, stakeholders indicated

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AGRICULTURAL RESEARCH, http://www.eiar.gov.et/index.php/en/crop-research; *Catalogue Béninois des Espèces et Variétés végétales*, INSTITUT NATIONAL DE RECHERCHES AGRICOLES AU BENIN, MINISTERE DE L'AGRICULTURE, L'ELEVAGE ET DE LA PECHE, 2ed (2016), http://inrab.org/wp-content/uploads/2018/01/CaBEV-interactif-2.pdf; *Senegal Catalogues de Variétés* , DIVISION DES SEMENCES, http://www.seysoo.com/GECSEM/catalogue; and Catalogue National Des Especes Et Varietes Agricoles Du Burkina Faso, COMITÉ NATIONAL DES SEMENCES (2014).

[83] Including Zambia Seed Producers' Association and the Zambia Cooperative Federation.

[84] Based on *Zamseed Seed Company Limited*, ACCESS TO SEED INDEX, https://www.accesstoseeds.org/index/eastern-southern-africa/country-profile/ethiopia/ (last updated March 2019).

[85] NML Consultations with Stakeholders, September/October 2020.

[86] Based on *Ethiopia Profile*, ACCESS TO SEED INDEX, (2019), https://www.accesstoseeds.org/index/eastern-southern-africa/country-profile/ethiopia (last updated March 2019).

[87] NML Consultations with Stakeholders, September/October 2020.

[88] NML Consultations with Stakeholders, September/October 2020.

[89] NML Consultations with Stakeholders, September/October 2020.

[90] Africa Vegetable Breeding Consortium, see: https://avrdc.org/africa-vegetable-breeding-consortium/

[91] NML Consultations with Stakeholders, September/October 2020.

[92] NML Consultations with Stakeholders, September/October 2020.

that all varieties are supposed to be registered in the national variety catalogue through public institutions like CSIR.[93] This restriction is applied in practice and is not formally included in a legal or regulatory instrument.[94] Stakeholders have stressed that the Ghanaian private sector is quite small and needs the support of public institutions like CSIR at the moment; however, the condition to register crop varieties only through public institutions could deter breeders from engaging in the development of new crops varieties as they may not be able to receive all the benefits from the commercialization of the new variety.[95] In Senegal, the Senegalese Institute of Agricultural Research (ISRA) is developing improved varieties adapted to Senegal's conditions.[96] In Mali, Faso Kaba is engaged in developing programs with several research institutions.[97] Companies like Rijk Zwaan and East-West Seed have set up research stations in Benin and Tanzania.[98] Further, WorldVeg has regional offices in Benin, Mali and Tanzania.[99]

Although vegetable breeding has been increasing in the focus countries, several challenges remain. Public institutions often lack funding to support varietal development,[100] which is especially true for vegetable varieties, as they are often neglected by the NARS. The same trend appears globally. Local private companies also lack capacity to develop improved vegetable varieties, and stakeholders conveyed that the acquisition of germplasm and training of breeding staff have not been easy.[101] This can be attributed to low funds, gaps in the legal and regulatory system, lack of infrastructure to breed vegetable seed, limited focus of NARS on vegetables as compared to staple crops, and legal restrictions limiting the involvement of private companies in breeding in some of the focus countries.

Further, elements of the regulatory framework in the focus countries pose bottlenecks to private sector involvement. For instance, in Burkina Faso, Mali, and Tanzania there are restrictions on the engagement of the private sector in EGS production.[102] In Mali, production of pre-basic and foundation seed is limited to public institutions. In Tanzania, the Agricultural Seed Agency has the exclusive mandate to produce basic seed for all public varieties.[103] In Burkina Faso, the public sector has the exclusive mandate to breed pre-basic and basic seed.[104]

In Ethiopia, any person engaged in seed production or marketing will have to be issued a certificate of competence (COC), which is essentially the equivalent of a license. Ethiopia's new draft Seed Proclamation mentions two kinds of COCs, one for the production of basic or certified seed, and another for the production of pre-basic seed either by itself or in addition to basic or certified seed.[105] Seed growers, therefore, will need a COC to engage in EGS production.[106] This

[93] NML Consultations with Stakeholders, September/October 2020.
[94] Katrin Kuhlmann & Yuan Zhao, *Seed Policy Harmonization in ECOWAS: The Case of Ghana*, 17 (2016), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_ghana_seed_case_study_jan16_0.pdf
[95] NML Consultations with Stakeholders, September/October 2020.
[96] NML Consultations with Stakeholders, September/October 2020.
[97] NML Consultations with Stakeholders, September/October 2020.
[98] NML Consultations with Stakeholders, September/October 2020.
[99] NML Consultations with Stakeholders, September/October 2020.
[100] Annotated Guide on Flexible Licensing Models and Agreements, NEW MARKETS LAB AND SFSA, publication forthcoming.
[101] NML Consultations with Stakeholders, September/October 2020.
[102] NML Consultations with Stakeholders, September/October 2020.
[103] Executive Agencies Act [Cap.245 R.E. 2002].
[104] West Africa Seed Program (WASP), 2016 Annual Report, CORAF/WECARD.
[105] Draft Proclamation s 6 (1) (a) (Ethiopia).
[106] Abebe Atilaw et al, Early Generation Seed Production and Supply in Ethiopia: Status, Challenges and Opportunities, 103 (2017).

provision for private sector participation would represent a good practice, since the Ethiopian public sector does not produce and maintain enough EGS for development of the vegetable sector;[107] however, these legal changes have not yet gone into effect. Based on current practice, COCs are issued in an ad hoc manner, which leads to a fragmented sector and locally produced seed that does not meet farmers' requirements.[108]

Further, while Ghana's Plants and Fertilizers Act 2010 permits private sector involvement in seed production, stakeholder consultations revealed that, in practice, the private sector is not involved in the production of basic seed and does not register vegetable varieties.[109] Some private companies are in talks with public sector partners for the joint development and registration of vegetable varieties, as a first step towards private sector engagement in the vegetable sector.[110]

Where the public sector is the main breeder, access to multiplication rights for commercialization is usually provided to private companies through exclusive or non-exclusive licenses. Licenses can also be a useful tool in bridging the interests of public sector breeders and private sector seed companies that can commercialize and disseminate seed more widely. Through a licensing agreement, the breeder can also "transfer the right to use, commercialize, or register a variety."[111] Licenses may be based on PBR, but many just extend the right to "use" a variety registration for commercial seed production.[112] Licensing agreements that are not based on PBR may be a good practice in focus countries that do not yet have a PBR system in place or that have a system that is not implemented fully in practice.[113] The presence of a PBR regime does strengthen the right of the breeder under a licensing agreement, as it extends protection beyond just the parties to the contract,[114] but this is dependent, of course, on effective implementation.

Because one of the issues plaguing vegetable varietal development is the lack of funding available to the public sector, licensing agreements with royalty payments can play a role and can help ensure that public varieties enter the market and establish a source of income for breeding programs.[115] However, agreements with royalty payments require both an effective system for royalty collection and the development of a high level of trust in private companies. In the interim, the public sector may prefer upfront payments.[116] It is important that licenses are commercially feasible, and royalties payable under a license should not be a barrier to market entry.[117] Licensing contracts should also avoid clauses that set mandatory minimum thresholds for seed production, since this discourages private engagement in seed production and should

[107] Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions, MINISTRY OF AGRICULTURE ETHIOPIA ETHIOPIAN AGRICULTURAL TRANSFORMATION AGENCY, (2016).
[108] Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions, MINISTRY OF AGRICULTURE ETHIOPIA ETHIOPIAN AGRICULTURAL TRANSFORMATION AGENCY, (2016).
[109] NML Stakeholder Consultations September/October 2020.
[110] NML Stakeholder Consultations September/October 2020.
[111] New Markets Lab, Annotated Guide on Flexible Licensing Models and Agreements," NEW MARKETS LAB AND SFSA (forthcoming).
[112] AVISA, Seed 2B Africa & New Markets Lab, *Tanzania Guidebook on Regulatory Aspects of Dissemination of Public Varieties*, 26 (2020), publication forthcoming.
[113] AVISA, Seed 2B Africa & New Markets Lab, *Tanzania Guidebook on Regulatory Aspects of Dissemination of Public Varieties*, 26 (2020), publication forthcoming.
[114] New Markets Lab, Annotated Guide on Flexible Licensing Models and Agreements," NEW MARKETS LAB AND SFSA (forthcoming).
[115] New Markets Lab, Annotated Guide on Flexible Licensing Models and Agreements, NEW MARKETS LAB AND SFSA, publication forthcoming.
[116] NML Consultations with Stakeholders, September/October 2020.
[117] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch. 8, 87, 96 (2018).

instead include more appropriate risk sharing in the commercialization of new varieties, rather than requiring private companies to bear the full risks of commercialization.[118] Further, while the private sector may prefer exclusive licenses in some cases, non-exclusive licenses could allow multiple companies to engage in seed production simultaneously.[119] Stakeholder consultations revealed the importance of licensing agreements in increasing the participation of the private sector and building capacity in vegetable seed systems.[120]

Licensing agreements are still not common practice, however, and many public research institutions lack the institutional infrastructure and capacity to execute and administer them. In Ethiopia, despite the development and release of many varieties by Ethiopia's NARS, including vegetable varieties, most have reportedly not been adopted or commercialized.[121] According to the Ethiopian Agricultural Transformation Agency, this is due a number of reasons, including lack of linkage between extension services and research, inapplicability of improved varieties to many agro-ecologies (majority of the varieties are produced for high yielding areas with reliable rainfall), and misalignment of improved varieties' characteristics with producer's needs.[122]

Depending upon their design, some licensing agreements can be cumbersome, costly, and unbalanced.[123] Other costs may apply in a licensing context as well. A study in Kenya indicates that while the government has recommended a 3 percent royalty, in practice, the licensee was charged additional licensing fees and costs.[124] This study also identified mandatory minimum seed production as a license term posed a significant deterrent,[125] a finding that has been corroborated by stakeholder consultations.[126]

Stakeholders in Nigeria noted that licensing agreements are used; however, stakeholders were not aware of any vegetable varieties that had been licensed.[127] In Ethiopia, changes to the seed system will reportedly allow research institutions to engage in licensing agreements, which could be beneficial to the vegetable seed sector.[128] Further in Ghana, a memorandum of understanding (MOU) is being developed between WorldVeg (which is supplying the parental lines), the West African Centre for Crop Improvement of the University of Ghana, and Agri-Commercial Services Limited for variety release.[129]

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[118] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch. 8, 87, 96 (2018).
[119] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch. 8, (2018).
[120] NML Stakeholder Consultations September/October 2020.
[121] *Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions*, MINISTRY OF AGRICULTURE ETHIOPIA ETHIOPIAN AGRICULTURAL TRANSFORMATION AGENCY, 73 (2016).
[122] *Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions*, MINISTRY OF AGRICULTURE ETHIOPIA ETHIOPIAN AGRICULTURAL TRANSFORMATION AGENCY, 27 (2016).
[123] *See* Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch. 8 (2018), https://link.springer.com/chapter/10.1007/978-3-319-92798-5_8
[124] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch.8, 96 (2018).
[125] Laura K. Cramer, *Access to Early Generation Seed: Obstacles for Delivery of Climate-Smart Varieties*, CLIMATE SMART AGRICULTURE PAPERS ch.8, 96 (2018).
[126] NML Stakeholder Consultations September/October 2020.
[127] NML Consultations with Stakeholders, September/October 2020.
[128] NML Consultations with Stakeholders, September/October 2020.
[129] NML Consultations with Stakeholders, September/October 2020.

Government efforts to promote private sector involvement have included PPPs to help build up private sector capacity and provide the necessary technical assistance. For instance, in Burkina Faso, INERA issued a regulatory framework for PPPs for the production of foundation seed.[130] In Ghana, stakeholder consultations indicated that PPPs are encouraged to develop vegetable varieties.[131] This could be a good practice, particularly if the public sector has some resources for the development and breeding of vegetable varieties and could aid in the development of the fledgling private sector (this is being done to an extent in Ghana as noted below).

An enabling framework that supports varietal development and seed commercialization should also create incentives for commercialization and remove regulatory barriers. For instance, given that limited access to finance is a significant deterrent to private sector participation, there should be efforts to provide access to credit and low-cost capital, along with risk mitigating mechanisms such as insurance to encourage private sector participation.[132]

## 4.2 Varietal Registration and Release of Vegetable Crops

Once a variety has been developed by a breeder, most African countries require by law that the variety undergoes a formal process of registration and release before it can be made available to farmers. Benin,[133] Burkina Faso,[134] Ethiopia,[135] Ghana,[136] Mali,[137] Nigeria,[138] Senegal,[139] and Tanzania have registered a total of 225 vegetable varieties.[140] Broken down by country, around 95 vegetable varieties have been released in Ethiopia, 23 in Mali, 34 in Nigeria, and 24 in Senegal. Other focus countries, on average, have released fewer than 20 vegetable varieties in their national seed catalogues, with Ghana's catalogue showing only 2 varieties of pepper. Malawi[141] and Uganda[142] have not registered or released any vegetable varieties in their seed catalogues. Consistent and reliable access to a country's national seed catalogue is an ongoing challenge, which could be addressed through publication online. Stakeholders in Kenya, Zambia, and Zimbabwe stressed that, although a number of vegetable varieties are registered in the national catalogues in all three countries, it can be difficult to access up-to-date versions,[143] raising

[130] West Africa Seed Program (WASP), 2016 Annual Report, CORAF/WECARD
[131] Executive Agencies Act [Cap.245 R.E. 2002].
[132] Vuna & Adam Smith International, *Reaching More Farmers with High Quality Seed for Drought Tolerant Crops,* 28 (2016).
[133] Based on Second Edition of Benin's Catalogue for Vegetable Species and Varieties (CaBEV Catalogue Beninois des Especes et Varietes Vegetales) (2016).
[134] Catalogue National Des Especes Et Varietes Agricoles Du Burkina Faso, COMITÉ NATIONAL DES SEMENCES, 2014.
[135] Data available from 2016 catalogue (See *Plant Variety Release, Protection and Seed Quality Control Directorate*, MINISTRY OF AGRICULTURE AND NATIONAL RESOURCES (June 2016)).
[136] *Catalogue of Crops Varieties Released and Registered in Ghana,* COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, GHANA (2019).
[137] NML Consultations with Stakeholders, September/October 2020.
[138] This is information about varieties release from 1984 to 2016 (See *Crop Varieties Released and Registered in Nigeria*, NATIONAL CENTRE FOR GENETIC RESOURCES AND BIOTECHNOLOGY, https://www.nacgrab.gov.ng/images/Varieties_Released_Catalogue.pdf
[139] NML Stakeholder Consultations September/October 2020.
[140] Data based on the latest publicly available seed catalogue in each country. Further, the vegetables include onion, tomato, garlic, shallot, amaranth, okra, eggplant and peppers and excludes roots and tubers and leafy vegetables.
[141] NML Stakeholder Consultations September/October 2020.
[142] Only catalogue accessible was from 2016. *See* National Variety Crops List for Uganda, (2016), https://tasai.org/wp-content/themes/tasai2016/info_portal/Uganda/National%20Crop%20Variety%20List%20for%20Uganda%20(2015).pdf
[143] NML Consultations with Stakeholders, September/October 2020.

important questions about the enforcement of laws on the books that could be evaluated further through field work.[144]

Focus country governments all require that all locally developed crop varieties be registered and released in the national variety catalogue prior to commercialization. One of the fundamental steps involved in the variety registration process is testing to determine whether a variety is distinct from any other varieties whose existence is of common knowledge, and that it performs in a way that is sufficiently uniform and stable, referred to as a DUS test.[145] Based on International Union for the Protection of New Varieties of Plants (UPOV) rules, the DUS test takes into consideration growing cycles, layout of the trial, number of plants to be examined, and method of observation.[146] Variety registration often hinges upon another type of test, known as VCU or national performance trials (NPT),[147] which focus on whether a variety is suitable to local conditions and use. Field crops are usually subject to both DUS and VCU testing in sub-Saharan Africa; however, VCU testing is not well suited to vegetables, which tend to span a large range of varieties, have shorter growing seasons, and be particular to consumer preference (e.g. shape, taste, color).[148] Lack of published testing protocols can make it difficult for breeders to collect information required for the DUS and VCU testing procedures.[149] **Table 4** compares DUS and VCU testing requirements for vegetables in the focus countries.

Overall, the focus countries display a fair amount of heterogeneity and unpredictability in the variety registration and release process, especially in relation to vegetable seed. Out of the 13 focus countries, Uganda, Malawi, Ghana, and Zambia[150] do not require that vegetable crops undergo variety registration in practice, even though it is mandated by law, likely due to the fact that the public sector does not have sufficient capacity to administer the laws.[151] This applies to both locally produced vegetable varieties as well as imported vegetable varieties. While these practices signal a de facto flexibility, this is not the same as a de jure flexibility.

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[144] See Katrin Kuhlmann, *Reassessing Policy Space in the Context of Sustainable Development and Vulnerabilities in International Economic Law: A Top-Down Meets Bottom-Up Research Agenda and Methodology,* AF. J. INT'L. ECON. L. Vol. 2 (forthcoming, 2021).

[145] General Instruction to the Examination of Distinctness, Uniformity and Stability and the Development of Harmonized Description of New Varieties of Plant, International Union for Protection of New Varieties of Plant, 6 (April 29, 2002), https://www.upov.int/export/sites/upov/resource/en/tg_1_3.pdf

[146] General Instruction to the Examination of Distinctness, Uniformity and Stability and the Development of Harmonized Description of New Varieties of Plant, International Union for Protection of New Varieties of Plant, 6 (April 29, 2002).

[147] Status of Seed Legislation and Policies in the Asia Pacific Region, FAO, 20 (2020), http://www.fao.org/3/ca7599en/CA7599EN.pdf; and A Legal Guide to Strengthen Tanzania's Seed and Inputs Markets, SOUTH AGRICULTURAL GROWTH CORRIDOR OF TANZANIA AND NEW MARKETS LAB, 45 (April 2016), https://cb4fec8a-9641-471c-9042-2712ac32ce3e.filesusr.com/ugd/7cb5a0_1f412c57810140ee8fcfbf96a402ea83.pdf

[148] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, FAO, 34 (2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf.

[149] Katrin Kuhlmann, Yuan Zhou, and Shannon Keating, *Seed Policy Harmonization in COMESA and SADC: The Case of Zambia,* 36 (Feb. 2019), https://www.syngentafoundation.org/sites/g/files/zhg576/f/zambia_case_study_final_edit_8_march_2019_clean.pdf

[150] NML Stakeholder Consultations, September/October 2020.

[151] NML Stakeholder Consultations, September/October 2020.

**Table 4:** Testing Requirements for Vegetable Crop Varieties under Seed Laws in Focus Countries

| Country | DUS required? | Duration | VCU/NPT required? | Duration |
|---|---|---|---|---|
| Benin[152] | Yes | 2 seasons in 1 location | Yes | 2 seasons in 3 locations |
| Burkina Faso | Yes | 2 seasons in 1 location[153] | Yes[154] | 2 seasons in 2 locations[155] |
| Ethiopia[156] | Yes | 2 seasons in 3 locations[157] | Yes | 2 seasons in 3 locations[158] |
| Ghana | Yes | 2 seasons of on-station testing<br>2 seasons of on-farm testing | Yes | 2 seasons of on-station testing<br>2 seasons of on-farm testing |
| Kenya | Yes | Minimum of 2 seasons under rain fed conditions or 2 cropping cycles under irrigated conditions | No | - |
| Malawi | Yes | Agriculture Technology Clearing Committee Guidelines state: "Technologies to be released should be from experiments or projects conducted over a period of time with adequate replication of treatments as well as sites. Field trials should have at least 3 seasons or cycles of consistent data with extensive site replication"[159] | Yes | Field trials should have at least 3 seasons or cycles of consistent data with extensive site replication[160] |
| Mali | Yes, reported to follow | Varies per crop[161] | Reported to follow ECOWAS Procedural Manual | It should be noted that Decree No. 2019-0756/P-RM of 30 Sept. on the creation of a National |

[152] The Manual on the Procedures for the Registration and Certification of Seeds and Plants includes general and specific requirements for all varieties. General requirements are as set out in table 5 above. Specific Requirement for each vegetable crop variety are as follows: (a) Tomato; DUS: 10 grams or 25000 grains per variety. Seeds or plants can be submitted; VCU: Seed quantity in each fruit, texture, color, etc. (b) Onion; DUS: 60 grams of seeds for varieties to be multiplied through plantation, 500 bulbils for varieties to be multiplied vegetatively; VCU: Taste, texture, color etc. (c) Red Pepper: 10 grams or 25000 grains per variety. Only seeds can be submitted; VCU: Capsaicin content, seed quantity in each fruit, color, etc.

[153] NML Stakeholder Consultations September/October 2020, Law No. 010-2006 (Burkina Faso) and ECOWAS Regulations.

[154] Stakeholder has indicated that the testing is done as per ECOWAS Regulation even though VCU testing is performed on all vegetable crops (contrary to the VCU testing exemption applied for vegetable crops tomato and onion under ECOWAS).

[155] NML Stakeholder Consultations September/October 2020, Law No. 010-2006 (Burkina Faso) and ECOWAS Regulations.

[156] Stakeholder have indicated that the new draft proclamation may do away with VCU testing for vegetable varieties.

[157] Only 1 season is required if the variety has been released outside the country.

[158] Only 1 season is required if the variety has been released outside the country.

[159] Clause 7.2 of the ATCC Guidelines. The ATCC has wide discretion in setting up the guidelines for release and registration of a variety. TASAI reported that in 2016, it took an average of 24-36 months to register a variety (*See Legal and Regulatory Requirement for New Variety Performance in Malawi*, SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE AND NML (2019)).

[159] NML Stakeholder Consultations September/October 2020.

[160] Clause 7.2 ATCC Guidelines (*See also Legal and Regulatory Requirement for New Variety Performance in Malawi*, SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE AND NML (2019)).

[161] *Legal and Regulatory Requirement for New Variety Performance in Mali*, SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE AND NML, 9 (2019).

| Country | DUS required? | Duration | VCU/NPT required? | Duration |
|---|---|---|---|---|
| | ECOWAS Regulation | | | Catalogue of Vegetable Seed Varieties exempts vegetables from VCU trials |
| Nigeria | Yes | 2 years of on-station trials of the candidate variety with the relevant National Agricultural Research Institute[162] | Yes | Multi-locational VCU trials must be conducted in 10 locations for at least 2 years. On-farm field trials have to be conducted in 10 locations over 1 year/growing season[163] |
| Senegal | Yes, reported to follow ECOWAS Regulation [164] | Varies per crop | Reported to follow ECOWAS Regulations | A stakeholder indicated that VCU testing is performed on all vegetables (contrary to the testing requirements for tomato and onion under ECOWAS) |
| Tanzania | Yes | Minimum 2 seasons in at least 3 sites | No | - |
| Uganda | Yes | Two seasons in agro-ecological zones recommended by the National Seed Certification Service[165] | Yes | 2 seasons in accordance with VCU protocols[166] |
| Zambia | Yes | Minimum 2 growing seasons | Yes | Minimum 2 sites and 2 growing seasons |
| Zimbabwe | Yes | Minimum 1 season in 1 location | Yes | 2 seasons in 5 locations |

[162] As per National Center for Genetic Resources and Biotechnology (NACGRAB) 2016 Guidelines. These trials have to be conducted as per UPOV guidelines. *See* Katrin Kuhlmann, Yuan Zhou, Adron Nalinya Naggayi and Heather Lui, *Seed Policy Harmonization in ECOWAS: The Case of Nigeria*, 12 (2018), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seed_policy_harmonization_in_ecowas_the_case_of_nigeria_2019.pdf

[163] As per National Center for Genetic Resources and Biotechnology (NACGRAB) 2016 Guidelines. These trials have to be conducted as per UPOV guidelines (*See* Katrin Kuhlmann, Yuan Zhou, Adron Nalinya Naggayi and Heather Lui, *Seed Policy Harmonization in ECOWAS: The Case of Nigeria*, 12 (2018)

[164] *Legal and Regulatory Requirement for New Variety Performance in Senegal*, SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE AND NML, 9 (2019).

[165] Regulation 5(4) of the Seeds and Plant Regulations, 2016.

[166] Regulation 5(2) and (3) of the Seeds and Plant Regulations, 2016.

Regulatory flexibilities do exist with respect to the variety registration and release procedures in a number of countries. These range from guidelines tailored to vegetable crops to exemptions for vegetable crops from VCU testing procedures. For example, some countries outside of the African continent, notably China and India, do not mandate that vegetable crops go through the variety registration process; however, in India, companies and organizations can opt to undergo a voluntary VCU testing process. Additionally, Thailand does not require VCU trials.[167]

In West Africa (with the exceptions of Ghana and Nigeria), the formal seed system, particularly the vegetable seed system, is at a nascent stage. As noted earlier, the ECOWAS Procedure Manual exempts vegetable varieties from VCU testing. In Senegal, however, even though VCU testing is not mandated under the ECOWAS Procedure Manual, stakeholders stated that they were not aware of this exemption and that both DUS and VCU testing are applied in practice for all vegetable varieties.[168] Further, contrary to the ECOWAS Procedure Manual, the Beninese Catalogue of Species and Seedlings, specifies guidelines for DUS and VCU testing of vegetable crops (tomato, onion and pepper).[169] This illustrates that these national guidelines are not aligned with the ECOWAS Procedure Manual. However, stakeholders from Benin conveyed that regulatory changes are underway that would potentially exempt tomato and onion from VCU testing.[170]

In Ethiopia and Zimbabwe, the rules mandate that vegetable crops undergo both DUS and VCU testing. Ethiopia has relatively strict testing requirements; however, Ethiopia is currently overhauling its seed regulatory system, and stakeholder consultations indicated that it is possible that the new seed proclamation may require only DUS testing for vegetables;[171] however, language to this effect does not appear in the most recent Draft Seed Proclamation. With respect to Kenya and Tanzania,[172] while the rules carve out vegetable crops from VCU testing requirements, stakeholders stated that, in practice, the NSA does not give distinct treatment to vegetable varieties and subjects them to both DUS and VCU testing. In Tanzania, the rules were recently changed to incorporate this flexibility (Tanzania's 2017 Seed (Amendment) Regulation exempts vegetable seed from VCU testing),[173] although stakeholders seem to be unaware that this flexibility exists.[174] In Kenya, the current system also exempts vegetable seed from VCU testing, but this exemption is reportedly not applied consistently in practice.[175] However, the Kenyan Government is developing a new regulation on vegetable crops, which will provide differential treatment for vegetable varieties based on nutrition, storage, shelf life, and ability to perform under low rainfall, as these are factors that are more specific to vegetable seed.[176] While this could be a notable recognition of the different nature of vegetable seed, the extensive list of criteria could create challenges in implementation. In order to study this development more

[167] *Summary of Seed Related Laws in Thailand, India, and China*, AGCONASIA AGRICULTURE CONSULTING, (2017), https://agconasia.com/projects/seed-law-2/
[168] NML Stakeholder Consultations September/October 2020.
[169] NML Stakeholder Consultations September/October 2020.
[170] NML Stakeholder Consultations September/October 2020.
[171] NML Stakeholder Consultations September/October 2020.
[172] The Seed (Amendment) Regulations, 2017, Amendment of Regulation 4 (Tanzania).
[173] The Seed (Amendment) Regulations, 2017, Amendment of Regulation 4 (Tanzania).
[174] NML Stakeholder Consultations September/October 2020.
[175] NML Stakeholder Consultations September/October 2020.
[176] NML Stakeholder Consultations September/October 2020.

closely, the New Markets Lab and Syngenta Foundation for Sustainable Agriculture are conducting a case study focused on changes to Kenya's regulations regarding vegetable seed and issues that may arise in their implementation.

Nigeria's variety registration process has also recently changed, and, notably, Nigeria's system now provides an easier route for registration by informal actors, registered foreign-bred vegetable varieties, genetically modified vegetable seed, and varieties included in the regional variety release system. The implementing regulations for Nigeria's National Agricultural Seeds Council (NASC) Act of 2019 (NASC Act) are still being developed, however, and, therefore, old testing guidelines are still in place. Stakeholders in Nigeria have stated that an alternate variety release and registration process for varieties from the informal sector is being established whereby vegetable varieties that are already prevalent in the market can be registered in the national variety catalogue (but not released for commercialization) by going through less complicated station trials.[177] This could be beneficial for development of the vegetable seed sector in Nigeria and presents good practices that could perhaps be adopted elsewhere.

Vegetable crops that go through the national variety registration and release processes tend to be either locally produced varieties or varieties bred by companies that wish to commercialize seed locally. While some stakeholders stated that they would prefer that vegetables go through the variety registration process, they also emphasized that it would be preferable if they were not subject to the guidelines applicable to other staple crops.[178] Most countries apply different rules to imported varieties as discussed below; however, in some cases, such as Ethiopia and Tanzania, all varieties tend to be subject to some degree of testing. In Tanzania, even though in practice vegetable seed is subject to the mandatory variety registration and release process, based on the procedures discussed above, companies can start to trade vegetable seed in the market once an application has been made to the NSA for registration and release.[179] At present, stakeholders note that in Ethiopia, companies have to go through the entire variety registration and release process before a variety can be used in the market;[180] however, there is some flexibility in the variety registration process in Ethiopia, as smallholder farmers are exempt from the registration process when selling farm saved seed.[181]

The process of variety release and registration can take an average of 2 to 3 years (or longer) in the focus countries,[182] as it involves conducting multi-season trials for DUS and, sometimes, multi-location VCU testing, also often over several seasons. Here, institutional and regulatory structures play a central role. The composition of the national variety release committees (NVRCs) and technical sub-committees, their financial and institutional capacity, and the representation of private and public stakeholders in these committees are key factors in how well variety registration and release processes work in practice. Budgetary and capacity issues are also paramount. For example, stakeholders in Ethiopia and Nigeria reported that, due to

[177] NML Stakeholder Consultations September/October 2020.
[178] NML Stakeholder Consultations September/October 2020.
[179] NML Stakeholder Consultations September/October 2020
[180] NML Stakeholder Consultations September/October 2020
[181] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377
[182] NML Stakeholder Consultations September/October 2020.

capacity constraints and limited funding, the NVRCs have not been able to meet the number of times mandated under law.[183] In such cases, the NVRCs may cancel meetings and ask donors, research institutions, or seed companies to cover the costs of testing procedures.[184] In Kenya, stakeholders stated that applicants can request ad hoc NVRC committee meetings if they cover the meeting expenses.[185] This can prove to be helpful for vegetable varieties, which may have to be released into the market more quickly,[186] but it can also create conflicts of interest. This is also practiced in Tanzania and is under discussion in Nigeria.[187]

In some of the focus countries, one or more technical sub-committees advise the NVRC on technical aspects of the variety testing procedures. These committees and sub-committees generally include experts who are familiar with the technicalities of certain crop varieties and may include breeders, farmers, pathologists, seed technologists, and agronomists. However, the representation of these sub-committees is often focused on certain crops and may not include experts in vegetable crops. It would be useful to have vegetable seed experts on these technical sub-committees who can speak to the unique qualities of vegetable seed. Stakeholders in Ghana and Kenya noted that private companies have been able to raise relevant factors and market considerations with the NSAs and NVRCs.[188] Private sector representation in the NVRCs has also helped integrate input on vegetable crops into new draft regulations in Kenya. [189]

Some countries have established other good practices to address capacity constraints. In Zimbabwe and Zambia, breeders can provide VCU testing data,[190] which reduces the time and cost for the variety registration process. In some countries, practices such as these can reduce the time required for the registration and release process to less than a year, rather than the 2-3-year average that is common.[191]

However, despite notable developments, capacity challenges are pervasive. In Kenya, stakeholders have recommended that scientists be engaged in the testing process, yet the main regulator, the Kenya Plant Health Inspectorate Service (KEPHIS), has not implemented this change.[192] Further, KEPHIS reportedly charges USD 100 for testing in addition to the application fee.[193] In Ethiopia, stakeholders noted that the absence of an independent NSA is a challenge, as it has led to capacity constraints within the Ministry of Agriculture. Due to these constraints, research institutions often need to be engaged to conduct variety testing; however, this has led to a dynamic whereby research institutions sometimes conducts NPT tests on varieties that they are competing against, which can cause a conflict of interest and influence the testing results.[194] Under Ethiopia's new draft Seed Proclamation, an independent NSA will be created, which will

[183] NML Stakeholder Consultations September/October 2020.
[184] NML Stakeholder Consultations September/October 2020.
[185] NML Stakeholder Consultations September/October 2020.
[186] NML Stakeholder Consultations September/October 2020.
[187] NML Stakeholder Consultations September/October 2020.
[188] NML Stakeholder Consultations September/October 2020
[189] NML Stakeholder Consultations September/October 2020.
[190] Yuan Zhou & Katrin Kuhlmann, *Seed Policy Harmonization in SADC and COMESA: The Case of Zimbabwe*, 5-6(2015), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_zimbabwe_case_study_sept15.pdf
[191] NML Stakeholder Consultations September/October 2020.
[192] NML Stakeholder Consultations September/October 2020.
[193] NML Stakeholder Consultations September/October 2020.
[194] *IM&NA Ethiopia Public Seed Sector Services*, MINISTRY OF FOREIGN AFFAIRS ETHIOPIA, 12 (2020) https://www.rvo.nl/sites/default/files/2020/03/IMNA-Ethiopia-Public-Seed-Sector-Services.pdf

hopefully resolve these issues.[195] Similar issues, however, have arisen in other countries such as Ghana.[196]

### 4.3 Plant Breeder's Rights and Plant Variety Protection

Intellectual property rights (IPR) for seed are often established through PBR and granted through plant variety protection (PVP) laws that allow the breeder to claim protection over developed varieties.[197] To claim PBR, a breeder must establish novelty of a plant variety along with DUS, following UPOV rules. Once conferred, PBR covers rights and obligations in relation to breeding, registration, commercialization, and marketing of vegetable varieties.[198] Private sector stakeholders often note the importance of PVP laws and their enforcement in investment, including in the vegetable sector.

A PBR holder has the right to produce, multiply, sell, export, and license the protected variety for a number of years (usually 15-20 years) and also can exclude access to the variety and prohibit specific unauthorized use, including its propagating and harvesting materials. A breeder can also license the new variety; however, licenses need not always be based on PBR as noted above. Two important exceptions to PBR exist. First, protected varieties may be used for research and experimental services; and second, farmers may use farm saved seeds (called farmer's exception).[199]

The framework for PVP relies heavily upon international and regional agreements. At the international level, this includes the World Trade Organization (WTO) Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement), which calls for patent protection or *sui generis* protection of plant varieties, or both.[200] The UPOV Acts of 1978 and 1991 establish a *sui generis* system of protection adapted to the needs of plant breeders. Members of UPOV can either adhere to UPOV 1991 or UPOV 1978; the scope of PBR conferred (and farmers' privilege) varies based on the convention.[201] UPOV protects production for purposes of commercial marketing, offering for sale, marketing, importation, exportation, conditioning for purpose of propagation, and stocking for any of the purposes mentioned above.[202]

In West Africa, PVP is the mandate of the African Intellectual Property Organization (OAPI), and in Eastern and Southern Africa, a number of countries are party to the African Regional Intellectual Property Organization (ARIPO). The PVP frameworks of both OAPI and ARIPO are based on the *sui generis* framework called for under the TRIPS Agreement. The Arusha Protocol for the Protection of New Varieties of Plants under ARIPO confers PBR on a breeder for the

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[195] NML Stakeholder Consultations September/October 2020.
[196] NML Stakeholder Consultations September/October 2020.
[197] Vikram Naik, *Session 3: Harmonizing an Intellectual Property Rights Regulatory Regime in the Seed Industry*, NEW MARKETS LAB PRESENTING AT SEED WORLD 2019, (2019), http://www.seedworld.in/ppts/VIKRAM-NAYAK.pdf
[198] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, FAO, 24, (2018).
[199] A Legal Guide to Strengthen Tanzania's Seed and Inputs Markets, SOUTH AGRICULTURAL GROWTH CORRIDOR OF TANZANIA AND NEW MARKETS LAB, 45 (April 2016)/
[200] Under the WTO TRIPS Agreement, Member states can protect new plant varieties using patent rights, a *sui generis system,* or some combination of both.
[201] Annotated Guide on Flexible Licensing Models and Agreements, NEW MARKETS LAB AND SFSA, (forthcoming).
[202] Decree No. 100/55 in 2013 on PVP to grant and protect plant breeders' rights, Art. 39.

production, multiplication, sale, export, and licensing of the protected variety for a minimum of twenty years. As of 2019, only Rwanda has deposited its instrument of accession, and the protocol will come into force once four other member states[203] deposit their instrument of ratification or accede.[204] The OAPI operates differently than ARIPO, insofar that a common regional authority serves as the national IPR protection office for each country, and sets up a unitary system wherein the Annex on PVP of the OAPI serves as national legislation for member states.[205] The provisions of agreement apply to all OAPI states and set out the criteria for applying PBR (i.e., novelty plus DUS), application procedures and corresponding fees, scope of PBR, exceptions to breeder's rights, and provisions for restriction, nullification, invalidation, and infringement of PBR. Regional rules also include the SADC Protocol for Protection of New Varieties of Plants[206] and the draft EAC Seed and Plant Varieties Bill (EAC Seed Bill), which also references PBR, although action is largely left to the EAC Partner States.[207]

**Table 5** summarizes the focus countries' membership in these international organizations, along with the status of PVP Laws in the countries. Among the focus countries, Benin, Senegal, and Ghana have not enacted a domestic PVP Law, although Ghana's draft law is at an advanced stage in the legislative process. Both Benin and Senegal are part of the Annex on PVP of OAPI, so some regional rules apply. In Senegal, stakeholder consultations have highlighted that a few varieties (such as of peanut) have been registered under OAPI, but none of these are vegetable varieties.[208] Stakeholders have further highlighted that the OAPI PBR system is not very successful in Senegal, since, due to non-payment of annual maintenance fees to OAPI, protected varieties have fallen into the public domain.[209] In Benin, stakeholders have stated that PVP Laws are being developed and that these are expected to align with OAPI.[210]

Tanzania has both a PVP Law and regulations, and the institutional structure for PBR is relatively well established. Tanzania is also a member of UPOV. In Malawi, a PVP Law is in place, but its enforcement has been weak.[211] In Kenya, stakeholders have noted that even though PBR protection is provided to some crop varieties, it is not strictly enforced for vegetables, and once a vegetable variety has been released it becomes public domain material, which discourages the development of vegetable varieties, especially TAVs.[212] Ethiopia has also adopted a comprehensive domestic PVP Law (based on UPOV 1991), but regulations are not yet in place.[213] In Uganda, regulations are also needed to implement the PVP Act.[214]

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[203] These four countries include Gambia, Ghana, Mozambique and São Tomé and Príncipe.
[204] *Rwanda Takes the Lead in Joining the Arusha Protocol for Protection of New Varieties of Plant Within the Framework of ARIPO*, ARIPO, (June 2019), https://www.aripo.org/rwanda-takes-the-lead-in-joining-the-arusha-protocol-for-the-protection-of-new-varieties-of-plants-within-the-framework-of-aripo/
[205] Vikram Naik, *Session 3: Harmonizing an Intellectual Property Rights Regulatory Regime in the Seed Industry*, NEW MARKETS LAB PRESENTING AT SEED WORLD 2019, (2019), http://www.seedworld.in/ppts/VIKRAM-NAYAK.pdf
[206] This bill has been adopted but not implemented (*see* Vikram Naik, *Session 3: Harmonizing an Intellectual Property Rights Regulatory Regime in the Seed Industry*, NEW MARKETS LAB PRESENTING AT SEED WORLD 2019, 11 (2019), http://www.seedworld.in/ppts/VIKRAM-NAYAK.pdf
[207] As of November 2020, the EAC Seed and Plant Varieties Bill remains in draft form and has not yet been passed.
[208] NML Consultations with Stakeholders, September/October 2020.
[209] NML Consultations with Stakeholders, September/October 2020.
[210] NML Consultations with Stakeholders, September/October 2020.
[211] NML Consultations with Stakeholders, September/October 2020.
[212] NML Consultations with Stakeholders, September/October 2020.
[213] NML Consultations with Stakeholders, September/October 2020.
[214] NML Consultations with Stakeholders, September/October 2020.

Nigeria enacted a new PVP Law in late 2020, and regulations are under development. Nigeria has also initiated the process of joining UPOV.[215] Stakeholders in Nigeria stated that the draft PVP law is based on best practices observed in Kenya, Tanzania, South Africa, and other countries.[216] In Ghana, a new PVP Law is before the parliament and is expected to strengthen the country's seed system; however, the draft PVP law has become a highly political issue in Ghana over farmer's rights.[217]

**Table 5:** Status of PVP Laws in the Focus Countries and Membership of International Organizations Protecting Plant Breeder's Rights.

| Country | National Law | ARIPO | UPOV | OAPI |
|---|---|---|---|---|
| Benin | None[218] | No | No | Yes |
| Burkina Faso | Law No. 010-2006 | No | No | Yes |
| Ethiopia | Proclamation No. 481/2006[219] | No | No | No |
| Ghana | Plant Breeders Bill, 2013[220] | Yes | No | No |
| Kenya | Seed and Plant Varieties Act, 2012 | Yes | Yes | No |
| Malawi | Plant Breeder's Right Act, 2018 | Yes | No | No |
| Mali | Law No. 10-032-12 July 2010 | No | No | Yes |
| Nigeria | Plant Variety Protection Bill, 2021[221] | No | No | No |
| Senegal | None | No | No | Yes |
| Tanzania | Plant Breeder's Rights Act, 2012 | Yes | Yes | No |
| Uganda | PVP Act, 2014[222] | Yes | No | No |
| Zambia | Plant Breeder Right Act No 18 of 2007 | Yes | No | No |
| Zimbabwe | Plant Breeders' Rights Act of 1976 (revised in 2001) | Yes | No | No |

As most of vegetable seed is produced by the informal sector in the focus countries, it is important to protect farmers' rights to use varieties so that they can meet their needs. UPOV rules allow countries to limit PBR in order to permit farmers to use protected varieties for propagation and exchange. The Arusha Protocol has adopted this flexibility as well. Farmer's rights are a question of subjective interpretation by countries based on national practice, and domestic legislation can address these practices, provided these do not deviate from international obligations such as UPOV and the Arusha Protocol. Ethiopia is an example of a

[215] *Status in Relation to UPOV*, UPOV, (as of April 28, 2020), https://www.upov.int/export/sites/upov/members/en/pdf/status.pdf
[216] NML Consultations with Stakeholders, September/October 2020.
[217] *Status of Seed Legislation and Policies in the Asia Pacific Region,* FAO, 1 (2020), http://www.fao.org/3/ca7599en/CA7599EN.pdf.; and NML Consultations with Stakeholders, September/October 2020.
[218] The PVP Law is currently being developed.
[219] The regulations are currently being developed.
[220] The PVP Law is currently being developed.
[221] The PVP Bill was passed by the Senate in March of 2021 but is still awaiting presidential assent; regulations are being developed.
[222] The regulations are currently being developed.

flexible approach to balance PBR and farmer's rights in that it provides exemptions on enforcement of PBR, including an exemption for communities to grow and use farm saved seed. However, under this law farmers cannot use the protected variety for commercial purposes.[223] In Uganda, the PVP Act preserves the protection of farmer's privilege to use farm saved seed; however, it does not include protection of indigenous varieties, which represent 95 percent of seed in Uganda.[224]

### 4.4 Seed Quality Assurance

Ensuring the quality of seed supplied in the market is an important aspect of mature seed systems. There are several quality control options available to governments, ranging from government-driven mandatory seed certification to more market-driven mechanisms. The latter category encompasses quality assurance schemes including 'truth in labelling', self-certification, group quality assurance, and hybrid approaches where the relevant breeder or group or association of breeders will bear primary responsibility for quality assurance, subject to the oversight and enforcement of the concerned government body.[225]

Formal certification is common across Africa and is carried out under the aegis of a centralized government body that acts as the certifying authority responsible for ensuring seed quality. Certified seed is given a seed class and must be labelled with class and other specifications, and most of the focus countries maintain a labelling system for successive generations of seed, which is largely based on standards set for variables such as number of inspections, minimum isolation distance, percentage of off-types,[226] and other factors.[227]

Compliance with international standards such as the OECD Seed Schemes will become increasingly important as national systems evolve.[228] The OECD Seed Schemes for vegetables recognizes the following categories of seed: basic, pre-basic, and certified seed; it also allows for standard seed for vegetables.[229] Most of the focus countries use the seed classes set out by the OECD Seed Schemes, although there are some variations. For instance, Ethiopia[230] Ghana,[231] Tanzania,[232] Uganda,[233] and Zambia[234] expressly recognize QDS as a seed class. While seed classes have largely been harmonized in the focus countries in accordance with the RECs (as discussed in Section 4), some of the focus countries have more permissive seed classes, like "standard"

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[223] Proclamation No. 481/2006: Plant Breeder's Right Proclamation, s27.
[224] *Economic Impact Assessment and Legal Review and Analysis of the East African Community Seed and Fertilizer Legislation*, NEW MARKET LAB, EAST AFRICAN COMMUNITY SECRETARIAT AND EMERGE CENTRE FOR INNOVATIONS AFRICA, (forthcoming).
[225] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377.
[226] Off-type, in this context means seeds which deviate from one or more described characteristics of the variety. See *Definition of Terms*, Montana Certification Program, 1, (2017), https://mtseedgrowers.org/wp-content/uploads/2015/08/definition-of-terms.pdf
[227] John C Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[228] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION, 36 (2015)
[229] *OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade*, OECD, 152, (2020)
[230] Abebe Atilaw et al, Early Generation Seed Production and Supply in Ethiopia: Status, Challenges and Opportunities, 113 (2017).
[231] Seed Policy 2013, 51 (Ghana).
[232] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY 18 (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377.
[233] Seed and Plants Regulations, 2016, r 18(1)(f) (Uganda).
[234] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY 18 (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377.

seed in Kenya, Zimbabwe, Ethiopia, Uganda, Benin, Mali and Malawi. Establishment of a standard seed class can be an important regulatory flexibility, as such seed is declared by the supplier as true to a particular variety and of sufficient purity.[235]

Formal seed certification is the default in sub-Saharan Africa, although some countries have created exceptions (**Table 6**). For vegetable seed, formal certification may not be needed in the same way that governments may perceive a need for assuring seed quality of field crops. If certification is mandated, vegetable seed has to go through the time consuming and costly certification process to be eligible for commercial distribution. This is concerning given that vegetables are not priority crops in most of the focus countries, and capacity constraints are likely to lead to delays in addition to high costs.

Some of the focus countries, including Nigeria[236] and Ethiopia,[237] mandate seed certification for formal distribution, with few exceptions. Based on Nigeria's NASC Act, registered vegetable varieties produced in the informal sector in Nigeria will not be subject to mandatory certification and will only be subject to minimum standards, which will need to be developed.[238] Further, Ethiopia is in the process of reforming its Seed Proclamation, following a new Seed Policy in 2020, and stakeholders anticipate a departure from mandatory certification for vegetable seed.[239] Zimbabwe[240] and Kenya[241] exempt vegetable seed from mandatory certification, which is helpful in reducing the costs inherent in the formal process.

There is a need for some form of quality assurance for vegetable seed produced for commercial distribution. An alternative to centralized certification is to subject vegetable seed to minimum standards, subject to random inspections by governmental authorities.[242] This is the case in Zimbabwe, where vegetable seed is subject to minimum standards.[243] The OECD Seed Schemes for vegetable seed allows seed suppliers to be primarily responsible for the purity and quality of 'standard seed' under government oversight and control.[244] Tanzania and Uganda follow this.[245]

In addition, the OECD Seed Schemes for vegetables recognizes 'standard seed' which is not subject to formal certification. Standard seed is designated as being of a particular variety by the supplier who also ensures purity, subject to the overall control of the relevant national authority.

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[235] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377; see also *OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade*, OECD, 161, (2020)

[236] Sections 16 and 17 of the NASC Act, 2019.

[237] This is under the Proclamation No. 782/2013 (Ethiopia) however this is currently under review. A new draft seed proclamation has been drafted that also includes provisions on QDS.

[238] Section 35(2) of the NASC Act, 2019.

[239] NML Stakeholder Consultations September/October 2020.

[240] Yuan Zhou & Katrin Kuhlmann, *Seed Policy Harmonization in SADC and COMESA: The Case of Zimbabwe*, 8 (2015), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_zimbabwe_case_study_sept15.pdf

[241] Seed and Plant Varieties (Seeds) Regulations, sch. 2 (Kenya).

[242] *Voluntary Guide for National Seed Policy Formulation*, FAO, 35 (2015), http://www.fao.org/3/a-i4916e.pdf

[243] Claid Mujaju, *Zimbabwe Seed Sector: A Baseline Study/Survey* (2010), https://www.afsta.org/wp-content/uploads/2015/12/ZAMBABWE-SEED-SECTOR-BASELINE-STUDY.pdf

[244] OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade, OECD, 152, (2020), https://www.oecd.org/agriculture/seeds/documents/oecd-seed-schemes-rules-and-regulations.pdf

[245] List of countries participating in the OECD Seed Schemes / Liste des pays participant aux Systèmes des semences de l'OCDE, https://www.oecd.org/agriculture/seeds/documents/list-of-countries-participating-in-the-oecd-seed-schemes.pdf

Countries such as Kenya, Senegal, Tanzania, Uganda, Zimbabwe, and Zambia already participate in the OECD Seed Schemes, with Tanzania and Uganda following it for vegetable seed.[246]

**Table 6:** Key Factors and Regulatory Flexibilities for Vegetable Seed Certification in the Focus Countries

| Country | Mandatory Certification for Vegetable Seed | Specific Guidelines/ Regulation for Vegetable Seed Certification | Quality Declared Seed Mechanism | Other Alternatives to Formal Certification | Private Sector Involvement in Testing and Inspection | ISTA Accredited Laboratories |
|---|---|---|---|---|---|---|
| Benin | ✓• | ✓• | | | | |
| Burkina Faso | | ✓* | | | | |
| Ethiopia | ✓ | | ✓• | ✓• | | |
| Ghana | | | ✓* | | ✓* | |
| Kenya | | | | | ✓ | ✓ |
| Malawi | ✓ | ✓ | | | | ✓ |
| Mali | ✓ | ✓* | | | | |
| Nigeria | ✓† | | | | ✓ | |
| Senegal | ✓ | | | | | ✓ |
| Tanzania | | ✓ | ✓ | | | ✓ |
| Uganda | | | ✓ | | ✓ | ✓ |
| Zambia | | | ✓ | | ✓ | ✓ |
| Zimbabwe | | | | | ✓ | ✓ |

[#] Includes self-certification and group quality assurance schemes.
* Provided for in the relevant legislation/policy although its working in practice is unclear.
• Set out in proposed amendment.
† Qualified by exceptions
Source: based on an analysis of focus country regulations.

Another alternative to formal certification would be to allow for voluntary seed certification or self-certification by the private sector to enhance the value of their product.[247] Some countries provide for voluntary seed certification through private organizations, farmer groups and cooperatives, and other independent entities.[248] Bangladesh, South Africa, the United States, New Zealand, and Australia have all adopted voluntary seed certification mechanisms.[249] Some countries, such as India and Nepal, maintain a "mixed" quality assurance system that provides for some form of self-certification alongside formal certification.[250]

[246] List of countries participating in the OECD Seed Schemes / Liste des pays participant aux Systèmes des semences de l'OCDE, https://www.oecd.org/agriculture/seeds/documents/list-of-countries-participating-in-the-oecd-seed-schemes.pdf
[247] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, 96 (FOOD AND AGRICULTURE ORGANIZATION, 2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf
[248] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, 95-96 (FOOD AND AGRICULTURE ORGANIZATION, 2018).
[249] *Module 3: Seed Quality Assurance*, *in* SEEDS TOOLKIT, 95-96 (FOOD AND AGRICULTURE ORGANIZATION, 2018).
[250] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377

In regions where the government lacks the capacity to implement an effective centralized certification system, and the high costs of the certification exclude a large swath of producers (especially small farmers), the QDS system has gained popularity. QDS was neither intended to supplant formal certification nor act as a substitute but provides an accessible option for quality assurance to seed producers who are unable to competitively use the formal certification scheme. Under QDS, producers have primary responsibility for ensuring the quality of their stock, with the government maintaining limited monitoring.[251] It could be suitable for the focus countries where the informal sector is prevalent, where the certifying agency has low capacity, and where there is a lack of vegetable seed-specific regulations in the formal certification system. However, while QDS standards have been set for vegetable seed,[252] the system is mainly intended for staple crop seed. The adaptation of QDS to vegetable seed, therefore, remains in question and could be a subject of future study.

Some focus countries allow for QDS, including Tanzania,[253] Uganda,[254] Ethiopia,[255] Zambia,[256] and Ghana;[257] however, QDS is not common for vegetable crops. Given the current revisions to seed laws and policies underway in some of the focus countries and the variability in implementation, the practical availability of QDS as an alternative quality assurance mechanism remains a question. For instance, while Ghana's National Seed Policy allows for QDS in certain circumstances, there is considerable opacity with regard to the nature of these circumstances and the type of crops for which QDS can be used.[258] Stakeholder consultations in Ghana revealed that small vegetable seed producers do not use the QDS system.[259] On the other hand, in Nigeria QDS is reportedly being used by smaller farmers for some varieties.[260] In Ethiopia, the Draft Seed Proclamation recognizes QDS, and stakeholders have indicated that the next few years will see a notable change in the use of quality assurance systems such as QDS for vegetable seed, and the details will only become clear with time as the new seed regulatory framework is finalized and implemented.[261] However, stakeholder indicated that there has been very limited use of such alternatives by small farmers.[262]

In more advanced markets, private sector-based mechanisms exist to assure seed quality. Such mechanisms include truth-in-labelling and group quality assurance schemes. Under a truth-in-labelling regime, producers are not subject to government mandated standards and are required only to ensure that the label accurately lists quality and ingredient information of the contents of the package.[263] Consumers can choose the right products for their needs based on the

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[251] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 35 (2015), http://www.fao.org/3/a-i4916e.pdf

[252] *See Quality Declared Seed System*, FAO PLANT PRODUCTION AND PROTECTION PAPER 185 (2006), http://www.fao.org/3/a0503e/a0503e00.pdf

[253] Seeds (Control of Quality Declared Seeds) Regulations 2020.

[254] Seeds and Plant Regulations, 2016, r.18(1)f) (Uganda).

[255] Seed System Development Strategy, Vision, Systemic Challenges, and Prioritized Interventions, MINISTRY OF AGRICULTURE ETHIOPIA ETHIOPIAN AGRICULTURAL TRANSFORMATION AGENCY, 74 (2016).

[256] Plant Variety and Seeds Act, s66 (Zambia).

[257] Seed Policy 2013, 51 (Ghana).

[258] Seed Policy 2013, 51 (Ghana).

[259] NML Stakeholder Consultations September/October 2020.

[260] NML Stakeholder Consultations September/October 2020.

[261] NML Stakeholder Consultations September/October 2020.

[262] NML Stakeholder Consultations September/October 2020.

[263] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION, 35 (2015), http://www.fao.org/3/a-i4916e.pdf

descriptions provided by the producers,[264] with government involvement mainly in oversight and enforcement. If the quality differs from what is specified on the label, legal redress is available and the government can take action.[265] This envisages governmental involvement in seed quality monitoring, drawing upon legal frameworks for enforcement, dispute settlement, and other mechanisms.[266] Nevertheless, the effectiveness of the approach depends upon a high degree of sophistication on the part of both seed producers and farmers.[267] Countries such as South Africa, the United States, and India use truth-in-labelling, although India has a mixed system as the government also sets minimum quality standards and does provide for formal certification.[268] The changes underway in Ethiopia through the new Draft Seed Proclamation allow for self-certification (seed quality self-assurance) and authorized private or cooperative seed quality assurance schemes,[269] which may become prevalent elsewhere.

Many countries that aim for a high level of government control in seed quality assurance often lack the institutional capacity to carry out such functions effectively. There is scope for involvement of the private sector in the certification process, in particular through the provision of laboratory testing and inspection services, which can strengthen systems and supplement government capacity. For instance, Kenya and Zimbabwe have been quite successful in encouraging private sector participation in seed certification services, which helps in alleviating the capacity constraints of the public sector.[270] This can contribute to the high institutional capacity required to carry out a full-fledged certification process in a timely manner.[271]

In some countries, such as Burkina Faso, Benin, Malawi, Mali, and Senegal only the designated national certification authority can offer inspection and testing services. This becomes a major challenge for timely certification, given the inadequate institutional capacity of these certifying authorities in the focus countries. However, the relevant rules in some countries, including Kenya, Nigeria,[272] Zimbabwe,[273] Zambia,[274] Uganda,[275] and Ghana[276] do permit the private sector to provide these services under the supervision of the central certifying body. This is a notable good practice, allowing for faster and more efficient seed certification, and, in some cases like

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[264] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION, 35 (2015).
[265] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION, 35 (2015).
[266] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377
[267] *Voluntary Guide for National Seed Policy Formulation*, FOOD AND AGRICULTURE ORGANIZATION, 35 (2015).
[268] *Module 3: Seed quality assurance*, *in* SEEDS TOOLKIT, 97 (FOOD AND AGRICULTURE ORGANIZATION, 2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf
[269] Draft Proclamation s 12 (1) (Ethiopia).
[270] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377
[271] Katrin Kuhlmann, Yuan Zhou, and Shannon Keating, *Seed Policy Harmonization in COMESA AND SADC: The Case of* Zambia, 34 (2019); Katrin Kuhlmann and Yuan Zhou, *Seed Policy Harmonization in the EAC and COMESA: The Case of Kenya*, (2015).
[272] Section 23, NASC Act, 2019; Katrin Kuhlmann, Yuan Zhou, Adron Nalinya Naggayi & Heather Lui, *Seed Policy Harmonization in ECOWAS: The Case of Nigeria* (2018).
[273] Yuan Zhou & Katrin Kuhlmann, *Seed Policy Harmonization in SADC and COMESA: The Case of Zimbabwe,* 9-10 (2015), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_zimbabwe_case_study_sept15.pdf
274 Katrin Kuhlmann, Yuan Zhou, and Shannon Keating, *Seed Policy Harmonization in COMESA AND SADC: The Case of Zambia*, 9 (2019), https://www.syngentafoundation.org/sites/g/files/zhg576/f/zambia_case_study_final_edit_8_march_2019_clean.pdf
[275] Regulation 49 of the Seed and Plants Regulations, 2016.
[276] Katrin Kuhlmann & Yuan Zhao, *Seed Policy Harmonization in ECOWAS: The Case of Ghana*, 17 (2016), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_ghana_seed_case_study_jan16_0.pdf

Zimbabwe, there are more private inspectors than government inspectors,[277] although they tend to be focused on certain crops. In other cases, however (Ghana, for example), while the private sector is allowed to provide testing and inspection services, in practice the public sector continues to be the only (or dominant) source of testing and inspections.[278]

Even with private sector participation in seed quality assurance systems, capacity constraints can be a major bottleneck in the certification process. Inadequate public inspectors, lack of transport and logistical support, limited laboratory facilities, and knowledge gaps among personnel are all major constraints. For instance, in Ethiopia, the limited capacity of the regional branches of the Ministry of Agriculture make inspection difficult, especially due to the large number of smallholder farmers and geographically dispersed farm locations.[279] Inadequate laboratory facilities also contribute to the prioritization of high demand crops (and the consequent exclusion of a large number of vegetable varieties), which are compounded by a lack of basic infrastructure including reliable power supply.[280] The certification process is generally costly in the focus countries and is often subject to considerable delays, especially in the case of vegetable seed. For instance, in Kenya, the cost of field inspections, sampling, and sealing is much higher for vegetable seed than for other crops.[281] The costs of inspections in Tanzania are also higher for vegetable seed than for other crops.[282]

### 4.5 Rules on Cross-Border Trade of Vegetable Seed

Seeds are generally considered to be high phytosanitary risk material.[283] Their movement across borders require permits, certification documentation, pre-inspection or pre-clearance, designated entry ports, and post-entry quarantine.[284] Most of the focus countries are members of the International Plant Protection Convention (IPPC), resulting in some similarity in the requirements for border phytosanitary control and common formats for the issue of permits. IPPC rules require a phytosanitary certificate from the exporting country, issued after the requisite inspections and testing.[285] There may be further phytosanitary checks at the border of the importing country.[286]

Harmonized cross-border seed trade has also been a priority at the regional level, which has led to the adoption of standards and procedures set by international bodies such as OECD and the International Seed Testing Association (ISTA). In addition to permits and phytosanitary certificates, many of the focus countries require that consignments be accompanied by the Orange International Seed Lot Certificate (OIC) or the Blue International Seed Sample Certificate

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[277] Yuan Zhou & Katrin Kuhlmann, *Seed Policy Harmonization in SADC and COMESA: The Case of Zimbabwe*, 10 (2015), https://www.syngentafoundation.org/sites/g/files/zhg576/f/seeds_policy_zimbabwe_case_study_sept15.pdf
[278] Katrin Kuhlmann & Yuan Zhao, *Seed Policy Harmonization in ECOWAS: The Case of Ghana*, 17 (2016).
[279] Ministry of Foreign Affairs Ethiopia, IM&NA Ethiopia Public Seed Sector Services, 2020, https://www.rvo.nl/sites/default/files/2020/03/IMNA-Ethiopia-Public-Seed-Sector-Services.pdf
[280] Ministry of Foreign Affairs Ethiopia, IM&NA Ethiopia Public Seed Sector Services, 2020.
[281] Seeds and Plant Varieties (Seeds) Regulations, ch. 5 (Kenya).
[282] Seeds Regulations, 2007, ch. 6 (Tanzania).
[283] Jeffrey Jones, *Phytosanitary Measures and the International Seed Trade*, 213, https://www.upov.int/edocs/pubdocs/en/upov_pub_354.pdf
[284] Jeffrey Jones, *Phytosanitary Measures and the International Seed Trade*, 213-214.
[285] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[286] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).

(BIC) issued in accordance with ISTA guidelines by an ISTA accredited laboratory.[287] The OIC is issued when the seed sample or consignment has officially been drawn from a seed lot that has been tested by an ISTA accredited laboratory.[288] The BIC is issued when the sample is drawn from a lot that has been tested by an ISTA accredited laboratory, where the laboratory accredits only the sample and not the full seed lot.[289] Among the focus countries, Uganda,[290] Malawi,[291] and Zimbabwe[292] require that all seed batches be accompanied by the OIC. In Malawi, however, seed from other COMESA or SADC countries are exempt from OIC.[293] Stakeholder consultations revealed that the requirement for an ISTA certificate can be a significant hurdle, as procuring an ISTA certificate is an added cost at the time of importation, which is ultimately passed down to the local farmers who purchase the seed.[294] Requiring an ISTA certificate also often imposes hurdles for exporters, since not all of the focus countries have an ISTA accredited laboratory (**Table 6**). Pre-packed seed in small units are also problematic for sampling, which can represent a significant cost for high-value seed.

The NPPOs of the focus countries usually have some discretion in granting import permits. For instance, obtaining an import permit in Ghana is reportedly simpler for vegetable seed than for field crops.[295] In Kenya, the National Plant Protection Organization (NPPO) undertakes pest risk analysis for those seeds where the associated risk is unknown.[296] If the risk is minimal, an import permit is granted.[297] If high, an import permit is granted after quarantine procedures are observed.[298] If the risk is very high, importation is prohibited except for essential scientific research, experimentation, or education.[299] In some cases, such discretion leads to delays in the process. For instance, a stakeholder pointed out that Zimbabwe, which has a well-developed local vegetable industry, generally imposes lengthy importation timelines, with import permits being one significant source of delay.[300]

Some focus countries have specific import guidelines for vegetable seed. For instance, Senegal has issued a phytosanitary booklet setting out specific procedures for the importation of vegetable seed and prohibiting the import of some vegetable seed material.[301] Further, vegetable seeds are usually included in the list of plant and plant products subject to phytosanitary control. However, many of the focus countries set out lower compliance requirements for imported vegetable seed, mainly because of their reliance on vegetable seed imports. For instance,

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[287] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[288] *International Seed Testing Association (ISTA) certificates*, SOUTH AFRICAN GOVERNMENT, https://www.gov.za/services/plant-production/international-seed-testing-association-ista-certificate
[289] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[290] Seed and Plants Regulations, 2016, r. 45(4) (Uganda).
[291] NML Stakeholder Consultations September/October 2020
[292] Claid Mujaju, Zimbabwe Seed Sector: A baseline study/survey (2010), https://www.afsta.org/wp-content/uploads/2015/12/ZAMBABWE-SEED-SECTOR-BASELINE-STUDY.pdf
[293] Seed Regulation 2018, r68 (Malawi).
[294] NML Stakeholder Consultations September/October 2020
[295] NML Stakeholder Consultations September/October 2020
[296] Plant Protection Act (Importation of Plants, Plant Products and Regulated Articles) Rules, s11, 2009.
[297] Importation of Plants, Plant Products and Regulated Articles Rules, s12, 2009
[298] Importation of Plants, Plant Products and Regulated Articles Rules, s12, 2009
[299] Importation of Plants, Plant Products and Regulated Articles Rules, s12, 2009
[300] NML Stakeholder Consultations September/October 2020
[301] Livret phytosanitaire du Sénégal, 12 Mars 2017, MINISTERE DE L'AGRICULTURE ET DE L'EQUIPEMENT RURAL, DIRECTION DE LA PROTECTION DES VEGETAUX, https://www.ippc.int/en/countries/senegal/reportingobligation/2017/03/livret-phytosanitaire-du-senegal

vegetable seed imports into Ghana are reportedly not subject to local registration and certification requirements,[302] unlike domestically produced seed. This is unlike the field crop importation regime, which is stricter in order to promote local production.[303] This can be beneficial in meeting the demand for vegetable seed that local production cannot yet meet; however, in some instances, such as the case of Kenya, the low priority afforded to vegetable seed results in unpredictability in imports.[304] A more liberal import scheme for vegetable seed could act to discourage local production, since local producers must incur additional costs during the domestic variety registration and release process.

Stakeholder consultations revealed that SPS measures and plant risk assessment are the most significant hurdles to importation.[305] This is especially so when there is no formal regulatory distinction between field crops and vegetables.[306] Several stakeholders stressed that SPS measures form a barrier to imports in sub-Saharan Africa, with inspection and testing undertaken for diseases that do not pose a threat in a country.[307] Stakeholder consultations also revealed that local regulatory capacity constraints and lack of necessary infrastructure often impede the growth of the local vegetable seed sector more than specific import measures/restrictions.[308] However, country specific challenges also affect cross-border trade in vegetable seed. For instance, Tanzania requires a certificate of quality issued by a recognized certification agency for imported seed.[309] In Mali, stakeholder consultations indicated that imported vegetable seed is subject to an 18 percent tariff,[310] which leads to cross-border smuggling of vegetable seed. Further, despite its membership in the IPPC, Benin does not have a pest list, which is problematic as this leads to a lack of transparency in the importation process.[311] In the case of exportation, the new draft Seed Proclamation in Ethiopia will allow for unregistered varieties to enter the market if they are exclusively intended for re-export, which will provide an exception to the general requirement that only registered varieties be imported and may reduce the incentive for export-focused companies to invest.[312]

The focus countries are members of one or more RECs (see Section 4), which have established regulations for the cross-border movement of seed. COMESA and SADC have both established common pest lists.[313] SADC has established two lists, one applicable to seed trade within the SADC region and another for seed trade outside the region.[314] The lists are intended to help limit phytosanitary control measures to pests and diseases common to the region.[315]

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[302] NML Stakeholder Consultations September/October 2020
[303] NML Stakeholder Consultations September/October 2020
[304] NML Stakeholder Consultations September/October 2020
[305] NML Stakeholder Consultations September/October 2020
[306] NML Stakeholder Consultations September/October 2020
[307] NML Stakeholder Consultations September/October 2020
[308] NML Stakeholder Consultations September/October 2020
[309] The Seed Regulations 2007, s33(5).
[310] NML Stakeholder Consultations September/October 2020
[311] Benin Country Profile, National Reporting Obligations, https://www.ippc.int/en/countries/benin/
[312] *IM&NA Ethiopia Public Seed Sector Services*, MINISTRY OF FOREIGN AFFAIRS ETHIOPIA pg. 19 (2020)
[313] *Manual On Regional Seed Regulations In The Common Market For Eastern And Southern Africa (COMESA)*, NEW MARKETS LAB & SYNGENTA FOUNDATION, 15 (2020); NEW MARKETS LAB & SYNGENTA FOUNDATION, *Manual On Regional Seed Regulations in the Southern African Development Community (SADC)*, (2020).
[314] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013); NEW MARKETS LAB & SYNGENTA FOUNDATION, *Manual On Regional Seed Regulations in the Southern African Development Community (SADC)*, 11 (2020).
[315] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).

Further, with the harmonization of regulatory requirements within RECs, testing and border inspections can be minimized.[316] For instance, in Uganda, seed of varieties registered in the COMESA Catalogue are exempt from mandatory local registration and release requirement for imports.[317] In Ethiopia, varieties that appear in the COMESA Plant Variety Catalogue will be cross-listed in Ethiopia's national seed catalogue, although Ethiopia's rules still require DUS and VCU test for all varieties entering the local market. Although Ethiopia is currently making changes to its laws to more fully align with COMESA regulations, this requirement does indicate a departure from COMESA rules.

In West Africa, under ECOWAS regulations, any variety released in any of the member countries and entered in the West African Catalogue of Plant Species and Varieties can be traded freely throughout the region.[318] However, according to stakeholder consultations, this level of harmonization is not observed in practice, and each ECOWAS Member State continues to follow its own regulations.[319] However, countries are taking additional steps to harmonize trade within ECOWAS. For instance, in Nigeria, seed imported from ECOWAS Member States is exempt from the requirement that all imported seed must be registered and released in Nigeria.[320]

Capacity constraints in specific countries do continue to impede harmonization at the regional level. For instance, stakeholders in many of the focus countries explained that the absence of PVP regulations deters the importation of new vegetable varieties, for which intellectual property protection may be important.[321] The lack of updated pest lists is also an issue, which, in turn, hinders the implementation of common pest lists at the REC level.[322]

### 4.6 Counterfeit and Adulterated Seed

The proliferation of counterfeit and adulterated seed is a significant problem in each of the focus countries. Counterfeiting and adulteration undermines all actors in the vegetable seed value chain, as it interferes in business operations and viability and negatively impacts farmers. Counterfeit seed or fake seed implies "a deliberate effort to misrepresent the identity of the seed,"[323] wherein the seed has been "mislabeled or repackaged in a fraudulent way,"[324] but seed can be adulterated in other ways that are also detrimental to seed enterprises and farmers. For example, stakeholders reported that adulterated vegetable seed is often found in mislabeled or loose packages, and small farmers are unable to detect authenticity.[325] Vegetable seed can also

[316] John C. Keyser, *Opening Up the Markets for Seed Trade in Africa*, AFRICA TRADE PRACTICE WORKING PAPER 2 (2013).
[317] Seed and Plants Regulations, 2016, r. 43(1)c) (Uganda).
[318] John Keyser et al, *Towards an Integrated Market for Seeds and Fertilizers in West Africa*, 18 (2015).
[319] NML Stakeholder Consultations September/October 2020.
[320] New Markets Lab Consultations with NASC and NACGRAB, 2020; *See also* National Agricultural Seeds Council (NASC) Act of 2019, s. 11 (Nigeria).
[321] NML Stakeholder Consultations September/October 2020.
[322] John Keyser et al, *Towards an Integrated Market for Seeds and Fertilizers in West Africa*, 20 (2015).
[323] *Module 4: Seed Sector Regulatory Framework*, *in* SEEDS TOOLKIT, 21 (FAO, 2018), http://www.fao.org/3/CA1492EN/ca1492en.pdf
[324] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377; (*See also* de Boef, Walter Simon, Abishkar Subedi, Nivaldo Peroni, Marja Thijssen and Elizabeth O'Keeffe, *Community biodiversity management: promoting resilience, the conservation of plant genetic resources*, Routledge (2013)).
[325] NML Stakeholder Consultations September/October 2020

be dyed/colored to deceive farmers.[326] Farmers who have suffered from counterfeit seed may be unwilling to pay more for improved varieties in the future.

As highlighted throughout this study, the demand for vegetables is steadily increasing, with much of this demand met through imports (see **Table 2**). In most of the focus countries, imported vegetable seed is not well traced as it moves through the market, which can make it susceptible to adulteration. A number of other factors also contribute to the prevalence of adulterated and counterfeit vegetable seed in the focus countries, including absence of awareness amongst farmers on how to spot fake or adulterated seed; difficulty tracing the actual source of the seed (for example, in East Africa it is reported that seed may be sold 3 to 4 times before it reaches the farmer);[327] lack of institutional capacity and funding constraints (e.g., Ghana); and weak enforcement of laws and regulations applicable to counterfeit seed, amongst others.

Stakeholders in the focus countries reported that the presence of counterfeit and adulterated seed poses significant challenges in conducting business. For example, in Uganda[328] and Tanzania,[329] 25 to 30 percent of all seed found in the market is reportedly counterfeit. According to a recent expert study,[330] seed companies in Malawi and Ethiopia received a number of reports of fake seed in 2016 (20 and 11, respectively);[331] however, this figure likely underestimates the actual prevalence of counterfeit seed in the market, as fake seed sales are not reported in most countries. Stakeholders from Senegal, Kenya, Mali, Zambia, and Nigeria also expressed that the presence of counterfeit seed in the market is a significant challenge;[332] again, reliable data is not available for counterfeit and adulterated vegetable seed. Stakeholders have been quick to note that the magnitude of the impact of counterfeit and adulterated vegetable seed in the market is not well documented.[333]

One of the most common ways to deal with counterfeit seed has been to incorporate a catch-all provision in a country's seed law for infringement of obligations; in some cases, more specific provisions have been incorporated. Penalties may take the form of fines and possibly imprisonment.[334] Nigeria's NASC Act imposes penalties for misleading or fraudulent packaging and labelling of seed amounting to USD 2,500 or imprisonment for a first-time offender and approximately USD 5,000 or imprisonment for two years for repeat offenders. Stakeholders reported cases where offenders were sentenced and fined.[335] In Ethiopia, any person who commits fraud could be punished with a fine of about USD 1,350 and imprisonment of 5-10

[326] NML Stakeholder Consultations September/October 2020
[327] Development of Anti-Counterfeiting Program in East Africa: Summary of Project and Next Steps, Bill and Melinda Gates Foundation, (2014), https://www.agrilinks.org/sites/default/files/resource/files/BMGF_Addressing%20Counterfeit%20Ag%20%20Inputs_Research%20Read-out%20%282%29%20%281%29.pdf
[328] Counterfeit Seed, Access to Seeds Index – Eastern and Southern Africa, (2019) https://www.accesstoseeds.org/index/eastern-southern-africa/key-findings/counterfeit-seed/
[329] African Center for Biodiversity, *Implications for Farmer Managed Seed Systems and Smallholder Farmers*, at 6, (2016).
[330] Edward Mabaya, Richard Kachule, and Mainza Mugoya, *Ethiopia Brief 2017,* The Access to Seed Access Index (Dec. 2017).
[331] Edward Mabaya, Bezabih Emana, Fikre Mulugeta, and Mainza Mugoya, *Malawi Brief 2017,* The Access to Seed Access Index, (Dec. 2017).
[332] NML Stakeholder Consultations September/October 2020
[333] NML Stakeholder Consultations September/October 2020
[334] Ethiopia, Burkina Faso, Ghana, Kenya, Malawi, Mali, Nigeria, Senegal, Tanzania, Uganda and Zimbabwe have set out such provisions.
[335] NML Consultations with Stakeholders, September/October 2020.

years.[336] These are quite hefty penalties compared to fines imposed by other focus countries; however, it is reported that fake seed can still be found in the Ethiopian seed market.[337]

The African Seed Access Index (TASAI) reported an abundance of fake seed in the Zimbabwean market.[338] Incidence of fake seed is to be reported to the national seed authority[339]; according to Section 24 of Zimbabwe's Seed Act, 1965 (reprinted in 2001), tampering with a sample with fraudulent intent, using a certificate issued in connection with other seed, and selling/supplying any seed which does not possess the properties attributed to it, are punishable. Under this provision, the prescribed penalty is a fine not exceeding USD 400, or imprisonment for a period not exceeding 12 months, or both. [340] Private sector stakeholders viewed the retail level as the main source of fake seed, with sellers manipulating seed packaging.[341] It was also reported that while fake seed tends to be destroyed, the culprits often do not undergo punishment. While harsher penalties could be one way of addressing this, stronger institutional structures to support enforcement, awareness building, and better tailored penalties could also help.

Further, the focus countries also face issues of law enforcement due to delays in court proceedings and absence of a regulatory authority that can effectuate the laws. In Ghana, there are hefty penalties imposed under law, but stakeholders report that these are ineffective,[342] most likely because the Ghana Seed Inspectorate Division (GSID) lacks the resources to adequately monitor formal seed distribution.[343] No formalized mechanism has been established in Ghana to deal with complaints of counterfeiting.[344] Further, a 2018 study on quality control for maize seed indicated that the standard packaging provided by GSID is easy and inexpensive to imitate.[345] In Malawi, stakeholders stated that although penalties are established for counterfeit seed, they are very low and therefore ineffective.[346]

Kenya has been a trailblazer in taking on counterfeit seed under multiple approaches. In 2008, parliament passed the Anti-Counterfeiting Act (2008 Act),[347] which established the Anti-Counterfeit Agency with the function of "combating counterfeiting trade and other dealings in counterfeit goods in Kenya," among other things.[348] The 2008 Act prohibits indulging in production, packaging, re-packaging, labelling and making any goods that would result in an imitation of the original product (made to look identical or could be attributed to the owner of the original good). However, in case of seed, an action will only amount to "counterfeiting" if PBR

[336] Proclamation No. 782/2013 (Ethiopia), s26.
[337] NML Stakeholder Consultations September/October 2020.
[338] Edward Mabaya et al, *Zimbabwe Brief 2017 - The African Seed Access Index* 7 (2017), https://tasai.org/wp-content/themes/tasai2016/img/tasai_brief_2017_zimbabwe_final_lr.pdf
[339] Edward Mabaya et al, *Zimbabwe Brief 2017 - The African Seed Access Index* 7 (2017).
[340] Edward Mabaya et al, *Zimbabwe Brief 2017 - The African Seed Access Index* 7 (2017).
[341] Edward Mabaya et al, *Zimbabwe Brief 2017 - The African Seed Access Index* 7 (2017).
[342] NML Stakeholder Consultations September/October 2020
[343] *Managing Seed Quality Control: Overcoming the governance challenges of seed certification in Ghana,* BIOMASSWEB, POLICY BRIEF NO. 1 (March 2018), https://biomassweb.org/publication/view/managing-seed-quality-control-overcoming-the-governance-challenges-of-seed-certification-in-ghana
[344] *Managing Seed Quality Control: Overcoming the governance challenges of seed certification in Ghana,* BIOMASSWEB, POLICY BRIEF NO. 1 (March 2018).
[345] *Managing Seed Quality Control: Overcoming the governance challenges of seed certification in Ghana,* BIOMASSWEB, POLICY BRIEF NO. 1 (March 2018).
[346] NML Stakeholder Consultations September/October 2020
[347] Anti-Counterfeiting Act, 2008, s3 (Kenya).
[348] Anti-Counterfeiting Act, 2008, s5 (Kenya)

exists and has been infringed (based on the Seeds and Plant Varieties Act, Kenya). The process for registering a complaint is quite straightforward and efficient, with a public complaints committee at the Anti-Counterfeit Agency required to respond with their findings within four weeks of a complaint. The penalties are quite harsh, as the 2008 Act sets out both imprisonment and/or fines as punishment depending upon the number of times an offence is committed and the value of the goods. However, stakeholders mentioned that its enforcement in Kenya has not been effective for vegetable seed.[349]

In addition, KEPHIS, in collaboration with the Ministry of Agriculture, Livestock, and Fisheries, has developed a system whereby all seed packages under 10 kilograms are accompanied by scratch-off labels.[350] The labels reveal a code which farmers can use to ascertain the legitimacy of the seed by sending a message by Short-Message Service (SMS) through an initiative known as *Mulika Mbegu Mbovu* (stop bad seed).[351] If the seed is genuine than the return message will show the company name, seed type, species, variety, class, and testing date.[352] Otherwise the farmer is requested to report the matter to KEPHIS.[353] The Seed Trade Association of Kenya accepts complaints from private companies and registers them with KEPHIS, which can impose a significant fine.[354] Stakeholders stated that this approach has been quite effective, although not all farmers are aware of the initiative.[355]

In Nigeria, reforms are underway to protect seed from counterfeiting from the point of production throughout the value chain through an electronic scratch label (similar to the one in Kenya).[356] NASC has established a Seed Inspectorate under the NASC Act to lead the effort to combat fake seed. NASC has developed two IT-based solutions, one is the seed tracker for traceability, and the other is the electronic authentication system called SEEDCODEX, which allows farmers to authenticate seed through SMS.[357] Some private company stakeholders stated that the SEEDCODEX system has been effective, but they also noted that it is costly,[358] which may deter small local companies from adopting it. In Nigeria, stakeholders also mentioned that NASC sometimes raids the seed market to catch offenders; but offenders keep returning.[359]

In Malawi, a barcoding system is used to trace seed in the market. However, stakeholders have relayed that this is not done on a large scale, and companies mostly use in-house safety mechanisms.[360] Further, stakeholders noted that that they are not aware of complaints received with respect to vegetable seed, which could be because the informal sector is the main source of vegetable seed in Malawi.[361] The Tanzania Official Seed Certification Institute (TOSCI) has also

[349] NML Stakeholder Consultations September/October 2020.
[350] Farmbiz Africa, *How to Spot Fake Seeds in the Market*, 2020. https://farmbizafrica.com/markets/216-how-to-spot-fake-seeds-in-the market#:~:text=The%20Kenya%20Plant%20Health%20Inspectorate,resulted%20to%20losses%20among%20farmers
[351] Farmbiz Africa, *How to Spot Fake Seeds in the Market*, 2020.
[352] Farmbiz Africa, *How to Spot Fake Seeds in the Market*, 2020.
[353] Farmbiz Africa, *How to Spot Fake Seeds in the Market*, 2020.
[354] NML Stakeholder Consultations September/October 2020.
[355] NML Stakeholder Consultations September/October 2020
[356] NML Stakeholder Consultations September/October 2020
[357] Michael Waithaka, Mainza Mugoya, Adesola Ajayi, Folarin Okelola, and Crisztina Tinhanyi, *Nigeria Brief 2018: The African Seed Access Index*, https://tasai.org/wp-content/themes/tasai2016/img/tasai_nigeria_brief_2018_lr.pdf
[358] NML Consultations with Stakeholders, September/October 2020.
[359] NML Consultations with Stakeholders, September/October 2020.
[360] NML Consultations with Stakeholders, September/October 2020.
[361] NML Consultations with Stakeholders, September/October 2020.

introduced serialized labels for seed packages weighing two kilograms or more, with information about the crop such as type, variety, and test date that can be traced.

The Seed Control and Certification Institute (SCCI) of Zambia has worked with private companies and local stakeholders to address fake seed through various approaches, such as regular inspections and information sessions to raise awareness.[362] A novel feature is Zambia's online certification system for the registration of seed growers and the issuance of licenses.[363] This allows for cost-effective verifiable information regarding seed and their corresponding features, which can help to reduce the incidence of fake seed.

# 5 FINDINGS, RECOMMENDATIONS, AND KEY LEGAL, REGULATORY, AND POLICY OPTIONS

The vegetable seed sector plays an important role in the development of seed systems, contributing directly to food and nutrition security, and this study has highlighted the policy, legal, and regulatory issues affecting countries' ability to develop a local vegetable seed sector that meets the demands of the population. Given the range of issues that impact the vegetable seed sector, it may not be possible to address all gaps in a short period of time. In this context, key regulatory flexibilities and options are summarized below, categorized as short-, medium-, and long-term options based on needs, practicability, and feasibility.

## 5.1 The Enabling Environment for Vegetable Breeding and Commercialization

To improve the quality of vegetable varieties that are available in the market, countries should strengthen local vegetable breeding programs. Some options include:

*Short-Term Options*

**PBR systems should be strengthened across focus countries**, along with implementation and enforcement capabilities, which many stakeholders noted will be essential for the development of vegetable breeding and EGS production.

Some focus countries like Tanzania have PBR systems in place, but others, namely Benin, Senegal, and Ghana do not (NB: Ghana does have a draft law that is at an advanced stage in the legislative process, but there has been contention over provisions relating to farmer's rights). In addition, at the time of publication, Nigeria's PBR law had passed Parliament but was awaiting presidential signature. While Benin and Senegal are both part of OAPI, which establishes regional PBR, Senegal has not been able to protect the varieties it has registered with OAPI, because the country has not paid its annual dues. Stakeholders stated that a PVP Law is being developed in Benin that is expected to align with OAPI's Annex on PVP. Ethiopia, Nigeria, and Uganda all have PVP laws but do not yet have the regulations needed to make them operational.

[362] Katrin Kuhlmann, Yuan Zhou, and Shannon Keating, *Seed Policy Harmonization in COMESA AND SADC: The Case of Zambia,* February 2019.
[363] USAID, *Reducing Costs for Certification in the Zambian Seed Industry*. https://www.satradehub.org/food-safety-and-production/230-reducing-costs-for-certification-in-the-zambian-seed-industry

Focus countries should prioritize better implementation of PBR for vegetable varieties. For example, in Kenya and Malawi, the PVP Laws are not as effectively enforced for vegetable varieties as for other crop varieties. In countries like Ghana, Nigeria, Ethiopia, and Uganda, where elements of the PVP regulatory regime are under review, policymakers should take into consideration the adoption of enforcement mechanisms that are more suited to vegetable crops.

**Funding constraints need to be addressed across focus countries.** Public sector vegetable breeding programs suffer from insufficient resources. Licensing agreements with the private sector for commercialization purposes could help generate revenue for breeding programs, particularly if the funds are allowed to stay with breeding programs instead of flowing back into the national treasury. However, royalty-based licensing agreements require a high level of trust between parties as well as a system for administration and implementation. Licensing agreements are not dependent on whether a country has an effective PBR regime or not, although PBR does strengthen the rights of the breeder, both within the license and with respect to third parties. Licensing agreements could also be beneficial for countries that are developing vegetable varieties but do not have the productive capacity to release them in the market (e.g., Ethiopia).

Stakeholders noted that public breeding institutions (both national and international) could expand work with the private vegetable seed sector in countries where it is still at nascent stages (e.g., countries in West Africa). Some partnerships have already been developed between international institutions and the private sector, which could provide examples for the vegetable seed sector. WorldVeg has been working with stakeholders to develop vegetable varieties in some of the focus countries. Further, MNCs like Klein Karoo Africa, Rijk Zwaan, Technisem, Syngenta, and East West Seed, along with several local companies, have set up breeding locations for vegetable crops in the focus countries; however, these breeding locations are not always used for local seed production.

**Licenses should be balanced and cost effective.** Licensing models should be designed to ensure greater access to multiplication rights and should avoid provisions such as mandated seed production minimums and minimum purchase requirements, instead aiming to balance the risk of seed commercialization more evenly between the public and private sectors.

**PPPs should be encouraged to harness the competitive advantages of diverse stakeholders.** While the public sector has traditionally been involved in seed breeding, private companies are better equipped to commercialize seed. PPPs can help build capacity and facilitate the transfer of rights from public to private stakeholders.

*Medium-Term Option*

**Rules should be designed and implemented so that private companies can participate in EGS production.** Burkina Faso, Mali, and Tanzania have laws that effectively establish a public sector monopoly on the production of EGS. These limit opportunities for private companies to invest in varietal development and seed production. Laws and regulations should be assessed from the perspective of encouraging greater private sector participation in EGS production in order to spur the development of the industry.

*Long Term Options*

**Vegetable breeding should be prioritized in focus countries' seed policies, along with strategic implementation.** Only Malawi, Nigeria, Uganda, and Zambia emphasize the vegetable sector in their seed policies, and none prioritize vegetable breeding. Addressing this gap in seed policies could raise the profile of the vegetable sector and help advance development of vegetable seed.

Other interventions could include expanding breeding programs for new and improved TAV varieties. TAVs have not been integrated into formal channels in the focus countries, with the exception of Ethiopia, Nigeria, and Kenya, where a few TAVs appear in the national variety catalogues. NARS and public institutions could focus on new and improved varieties of TAVs (instead of TAVs acquired from informal channels). Further, practices to expand local productive capacity for TAVs in countries like Kenya could also be used to encourage its development in other countries.

## 5.2 Options for Variety Registration and Release

Focus countries' variety registration and release procedures have, to date, been largely developed and applied with a focus on field crops. Options to tailor them to vegetables include:

*Short-Term Options*

**Flexibilities applied to testing of vegetable crops should be enforced and expanded.** Focus countries should consider adopting flexibilities for vegetable varieties such as exempting them from VCU testing, which is not well-suited or meaningful for vegetable crops. Some countries have already incorporated flexibilities in laws and regulations but have not implemented these in practice (e.g., Kenya and Tanzania). Other countries do not incorporate relevant flexibilities in the rules, and vegetable crops are obligated to go through VCU testing procedures (Ethiopia and Zimbabwe).

Stakeholder knowledge should be increased in order to expand use of flexibilities available for testing of vegetable crops. Even where regulatory flexibilities exist (such as exemption from VCU testing), few stakeholders seem to be aware of these flexibilities in the rules at the national and regional levels (e.g., Kenya and Tanzania under national rules and Senegal and Ghana under ECOWAS Procedure Manual). Kenya is developing a new regulation on vegetable crops, but it will incorporate specific conditions based on nutrition, storage, shelf life, and ability to perform under low rainfall which may be difficult to meet. In Nigeria, developments are underway to provide an easier route for registration of informal varieties. In many countries imported vegetable crops are not subject to variety testing procedures in practice (e.g., Uganda, Malawi, Ghana, Zambia, Senegal, and Benin), even though this appears to be required by law. Steps should be taken to raise awareness about such flexibilities so that stakeholders can work with regulators to implement them. Further, instruments such as the national variety catalogue must be made publicly available in an easily accessible manner, with the catalogue available online and updated regularly.

Vegetable seed experts should be included in technical committees and sub-committees related to seed testing. Focus countries should consider adding experts to relevant committees and sub-committees in order to integrate expertise on the crops that are being considered for registration and release into the market. Further, to make the process of testing more efficient for vegetable

varieties, these experts could speak to the technicalities of vegetable seed, which presents important considerations throughout the regulatory process.

*Medium-Term Options*

**Regular NVRC meetings should be held to expedite variety registration and release applications of vegetable varieties.** It takes an average of 2 to 3 years for a new variety to be registered in the focus countries, and this process is often impacted by budgetary constraints, which, for example, may make it difficult for NVRC to meet as often as mandated (this was reported to be the case in Ethiopia and Nigeria, for example). This is not suitable for vegetable crops, which need to be released into the market quickly.

Stakeholders stressed that certain vegetable varieties need to be released more urgently than other crops, such as field crops. In Kenya, stakeholders noted that the NVRC has allowed for ad hoc meetings with fees covered by the private sector in the event that there is a need to release the variety immediately into the market, although this practice can cause a conflict of interest. Public and private stakeholders could possibly work together to draft guidelines for administering additional NVRC meetings in order to ensure transparent and consistent procedures.

*Long-Term Options*

**Arrangements between the public and private sectors to leverage testing facilities could be explored and expanded.** In many of the focus countries, variety testing is only conducted by public institutions. Engaging the private sector in the variety testing process by leveraging existing institutional capacity could prove to be cost effective and efficient. These tests could be performed under the supervision of the NSAs, and operational mechanisms could be put in place to ensure that these tests are done in a transparent manner (e.g., appoint a government official to supervise the testing process). In Zimbabwe and Zambia, breeders' premises have already been used for conducting VCU testing, which has reduced the time needed for testing; this could be a good practice to spread elsewhere, particularly if based on voluntary VCU.

### 5.3 Flexible Options for Seed Quality Control

Focus country governments mainly rely on centralized certification systems for seed quality control. However, formal seed certification regimes require extensive capacity to properly implement and may leave out smaller businesses and crops that are deemed of lesser priority. Regulatory options for ensuring seed quality while encouraging commercial dissemination include:

*Short-Term options*

**Minimum seed quality standards should be developed.** Reassessing mandatory certification requirements for vegetable seed would help facilitate the development of the sector and bring focus countries' practices in line with global good practices, including the practices of some countries (e.g., India and Nepal) to differentiate between formal certification and self-certification based on stakeholders and circumstances. An approach such as minimum seed quality standards could provide quality assurance while aligning countries' systems with global good practices.

**The private sector should be more involved in activities like inspection and testing in order allow for more efficient and affordable services.** In many of the focus countries, the central certifying agency manages all aspects of the certification process. Such countries often face significant capacity constraints that prevent certification of crops in a timely manner. Capacity constraints are also exacerbated when certification is the exclusive mandate of the central regulatory body, as is the case in Burkina Faso, Benin, Malawi, Mali, and Senegal. Among the focus countries, Kenya, Nigeria, Ghana, Uganda, Zambia, and Zimbabwe allow for the authorization of private seed inspectors to work alongside government inspectors. Ethiopia has taken a step in this direction with the draft Seed Proclamation, which also recognizes certification by foreign certification agencies.

Countries such as Kenya, Nigeria, Ghana, Uganda, Zambia, and Zimbabwe have begun to move toward private sector participation in testing and inspection, whereby private inspectors are authorized to provide field inspections and offer services through private laboratories accredited to provide testing services, subject to government oversight. Extending these flexibilities to vegetable seed certification could also strengthen a country's capacity in maintaining an effective seed quality control system.

Other aspects of the enabling environment related to seed commercialization should be reassessed in order to encourage development of the vegetable sector. Seed companies should have access to adequate capital, low-cost financing options, risk mitigation mechanisms, and land to allow for commercialization, bearing in mind other public and community priorities.

*Long-Term options*

**Alternative systems for quality assurance should be considered, which could better respond to the particular nature of the vegetable sector and could also help integrate small farmers and the informal sector.** Stakeholder consultations revealed that small businesses and informal stakeholders are virtually shut out of the commercialization and distribution process for vegetable seed. Alternative quality assurance systems could allow farmers to commercialize their seed and maintain quality in an affordable manner. However, some of these models, like QDS, were developed for staple crops, and use for vegetable seed needs further study. QDS is currently available in Tanzania, Nigeria, Uganda, Zambia, Ethiopia, and Ghana. However, it should be noted that QDS is generally limited to local markets and tends to be most commonly applied to a limited range of crops, largely excluding vegetable crops. Exempting vegetable crops from mandatory certification, as permitted by the OECD Seed Schemes for vegetable seed and adopted in countries including South Africa, Brazil, India, and Mexico should also be considered.

## 5.4 Regulatory Options for Cross-Border Trade

The focus countries are members of various RECs that have taken steps to streamline and integrate procedures at the borders. Countries do still retain their own systems of phytosanitary control, which show a degree of variance. In some countries where local vegetable seed production is nascent or non-existent, border control measures are more liberal to facilitate imports. Regulatory options to ensure efficient and cost-effective cross-border trade include:

*Short-Term options*

**RECs should focus on developing common pest lists and streamlining phytosanitary controls.** Creating common pest lists would be a significant step towards more efficient movement of seed across borders. However, one bottleneck in the development of pest lists at the REC level is the lack of updated pest lists at the national level, which should be a priority for the national authorities although some stakeholders did express reservation regarding additional harmonized seed trade regulations specific to vegetable seed, because this would require additional capacity on the part of the focus countries. However, stakeholders noted that regional harmonization efforts could be particularly helpful if there was greater clarity in the rules and their implementation.

**National governments should ensure that their SPS measures are science-based, based on risk assessment, and tailored to the vegetable seed sector.** A common problem that stakeholders identified is that SPS measure are often excessive and redundant. Often this problem arises when phytosanitary controls are not adequately tailored to the needs of the vegetable seed sector. For instance, stakeholders point out that SPS measures imposed are not relevant to vegetable crops and focus on pests/diseases that are not threats. Developing procedure that take into account the specific characteristics and requirements of the sector will be important, particularly given the reliance on the vegetable seed trade. To prevent redundant border control procedures, pest lists should be prepared by informed experts and periodically updated; pest lists should also be aligned at the regional level.

*Medium-Term Options*

**Capacity building focused on compliance with international and regional standards should be a priority.** Most RECs base their harmonized rules on IPPC, OECD, and ISTA standards. Without adequate capacity to implement these at the national level, focus countries will not be able to take advantage of integrated markets and vegetable seed trade. For instance, Uganda, Malawi, and Zimbabwe require an OIC for all crops; however, these are often not required for vegetable crops in exporting countries and regions (like Europe).

### 5.5 Options for Laws Relating to Counterfeit and Adulterated Seed

Counterfeiting is a significant challenge in the seed sector in sub-Saharan Africa, and vegetable seed is particularly vulnerable to counterfeiting due to its high value. Measures to address seed counterfeiting can include:

*Short-Term Options*

**Stakeholders should consider adopting an internal quality check and tracing system.** Stakeholders expressed that this is an effective way to curb the spread of counterfeit seed in the market. These can include scratch-off labels (Kenya and Nigeria), an online certification system (Zambia), a barcoding system (Malawi), and serialized labels (Tanzania).

**Farmers and dealers should be sensitized and trained on how to use anti-counterfeiting systems and spot fake seed.** While existing systems are mainly focused on cereal crops, they could perhaps be adapted to vegetables. It was noted that companies conduct training for farmers; however, farmers are often still not aware of how to use the new technology. This was

also highlighted as a challenge in Nigeria and other countries where new mechanisms have been put in place to minimize the spread of counterfeit seed. Training could be conducted by government agencies (e.g., KEPHIS in Kenya) or by private companies.

*Medium-Term Options*

**Governments should increase enforcement to curb the proliferation of counterfeit vegetable seed.** In many instances, anti-counterfeiting cases are not resolved through administrative or judicial proceedings, in part due to weak institutional capacity. One example of enhanced institutional capacity among the focus countries is the Kenya Anti-Counterfeiting Agency model; however, Kenya's definition of counterfeiting hinges on PBR, so this model would also require a strong PBR system for vegetable breeders. Another model is the provision of remedies under consumer protection laws, which could increase standing to bring counterfeiting claims and also provide recourse for aggrieved farmers. For example, in India, farmers can claim action against offenders under consumer protection laws; however, such an approach must also include mechanisms that discourage the proliferation of frivolous lawsuits. Such a model could be applied if a country has a robust consumer protection framework.[364] A deeper analysis of procedures that are beginning to show promising signs in focus countries such as Kenya, Nigeria, and Zambia would be warranted.

[364] Katrin Kuhlmann and Bhramar Dey, *Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study,* AGRONOMY *11* (2) 377 (2021), https://www.mdpi.com/2073-4395/11/2/377

## ANNEX I: LAWS AND REGULATIONS CONSULTED FOR THE ASSESSMENT

**Kenya**

The Standards (Verification Of Conformity to Standards and Other Applicable Regulations of Imports) Order, 2020

Plant Protection Act Cap 324 1971 [rev 2012]

Plant Protection (Importation) Order Cap 324 1988 [rev 2012]

Plant Protection (Importation Of Plants, Plant Products and Regulated Articles) Rules, 2009 Cap 324 [rev 2012]

Seed and Plant Varieties Act Cap 326 [rev 2012]

Seed and Plant Varieties (Seeds) Regulations

Seed and Plant Varieties (Plant Breeder's Rights) Regulations Cap 326 1994 [Rev 2012]

The Seeds and Plant Varieties (Variety Evaluation and Release) Regulations, 2016

The Seed and Plant Varieties (Plant Breeder's Rights) (Vegetables Scheme) Cap 326, 2001

**Tanzania**

Plant Protection Act 1997

Plant Protection Regulations 1998

Plant Breeder's Rights Act 2012

Amendment of the Seeds Act Cap 308 2014

The Seeds Act. 2003

The Seeds Regulations 2007

The Seeds (Amendment) Regulations, 2017

**Zambia**

The Plant Breeder's Rights Act, No 18 of 2007

Plant Variety and Seeds Act

The Plant Variety and Seeds Regulations 2018

**Senegal**

Law no. 94-81 relating to the registration of varieties, to the production, certification and trade of seeds or plants;

Decree No. 97-616 regulating the production, certification and trade of seeds and plants;

Decree No. 97-602 establishing a catalog of plant species and varieties;

Decree No. 99-259 relating to the quality control of horticultural products;

Order No. 005192 / MDR on the organization of the management of seed production and control

**Burkina Faso**

Law n ° 010-2006 regulating plant seeds in Burkina Faso

Decree n ° 348-PRES-ECNA of August 16, 1961

Joint Order No. 2014-108-MASA-MEF of 07-29-2014

**Mali**

Law 10-032 of July 12, 2010 relating to seeds of plant origin;

Law n ° 02-013 of June 03, 2002 Establishing phytosanitary control in the Republic of Mali;

Decree n ° 2019-0756 / P-RM of September 30, 2019 establishing the national catalog of plant species and varieties;
Decree 10-428 P-RM of August 9, 2010 fixing the modalities of application of the law relating to seeds of plant origin;
Decree No. 02-305-P-RM of June 3, 2002 setting the terms of application of the law establishing phytosanitary control in the Republic of Mali
*Only if applicable to vegetable seeds*:
Decree n ° 77-80 / PG-RM of 26 May 1977 establishing the operation for the production of selected seeds (OPS)
Order n ° 324-MP-JER-DAR of April 26, 1971 relating to the transfer of selected seeds

**Benin**

Law No. 91-004 on phytosanitary regulations;
Decree nº 92-258 fixing the modalities of application of Law nº 91-004 of February 11, 1991 relating to phytosanitary regulations;
Inter-ministerial Order No. 128 MDR / MF / DC / CC / CP relating to the phytosanitary control of plants and plant products for import and export; Decree No. 87-302 on the creation, composition and functioning of the national seed committee

**Zimbabwe**

Seeds Act (Chapter 19:13) 1971, revised 2001;
Seeds (Amendment) Regulations;
Seed Regulations and Seeds (Certification Scheme) Notice 2000;
Plant Breeders' Rights Act (Chapter 18:16) 1979, revised 2001;
Plant Pests and Diseases Act (Chapter 19:08);
Plant Pests and Diseases (Importation) Regulations;
Plant Pests and Diseases (Pest Control) (Amendment) Regulations 1973; and
Plant Pests and Diseases (Pests and Alternate Hosts) (Amendment) Order 1988.

**Ethiopia**

Ethiopian Seed Proclamation No. 782/2013
2016 Ethiopian Seed Regulation No. 375/2016
Council of Ministers Regulation No. 375/2016
Plant Breeder's Rights Proclamation, No. 1068/2017
Plant Quarantine Regulations No. 4/2002
Rates of Fees for Seed Competency and Related Services Seed Regulation No. 361/2015

**Ghana**

Ghana Plants and Fertilizers Act, 2010.
Seed (Certification and Standards) Act of 1972
The Seed (Certification and Standards) draft Regulations

**Nigeria**

National Agricultural Seeds Council (NASC) Act of 2019
National Agricultural Seeds Council (NASC) Guidelines for Registration of Seed Producers or Companies and Seed Fields in Nigeria, 2017

**Uganda**

Seeds and Plants Act of 2006
Seeds and Plant Variety Regulations, 2019
Plant Variety Protection Act, 2014
Plant Variety Protection Draft Regulations
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