



Seeds2B

Case Study on Potato Seed Regulation in Kenya

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July 2022

This Case Study is part of a series of research and policy publications co-authored by the Syngenta Foundation for Sustainable Agriculture (SFSA) and New Markets Lab (NML) on regional seed policy harmonization in Africa. The series is part of the Syngenta Foundation's Seeds2B initiative and Partnership for Seed Technology Transfer in Africa (PASTTA) and is designed to assess the process for implementing seed regulatory systems that can better deliver improved seed varieties to farmers. This work is made possible by the generous support of the American people through the United States Agency for International Development (USAID) and the U.S. Feed the Future initiative. The contents are the responsibility of the NML and SFSA under the Seeds2B initiative and do not necessarily reflect the views of USAID or the United States Government.



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The logo for New Markets Lab (NML), featuring a stylized bar chart icon composed of green and grey bars next to the acronym "NML" in large, bold, dark grey letters, with "New Markets Lab" in smaller green letters below it.

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Table of Contents

Table of Contents	2
List of Abbreviations	3
Executive Summary	4
<i>Table 1: Key Findings and Recommendations Under Each Regulatory Issue Area</i>	<i>5</i>
I. Introduction and Overview of Kenya's Potato Seed System	8
<i>Figure 1: Formal and Informal Potato Seed Systems in Kenya.....</i>	<i>9</i>
II. Potato Seed Legal and Regulatory Framework.....	11
A. Challenges in the Potato Seed Regulatory Framework.....	12
1. Potato Seed Research, Breeding, and Development	12
<i>Figure 2: Potato Seed Registrations on the National Variety List by Public and Private Sector Actors in Kenya</i>	<i>13</i>
2. Variety Registration and Release of Potato Crops.....	16
<i>Figure 4: New Markets Lab's Regulatory Systems Map on the Variety Release and Registration Process in Kenya.....</i>	<i>17</i>
<i>Table 2: Comparative Variety Release and Registration Process Requirements in Selected Countries</i>	<i>18</i>
3. Potato Seed Quality Assurance	20
<i>Table 3: Comparative Seed Quality Approaches in Selected Countries</i>	<i>21</i>
4. Plant Variety Protection (PVP)/Plant Breeders' Rights (PBR)	23
5. Potato Seed and Ware Marketing and Distribution	25
6. Cross-border Trade	25
<i>Table 4: Comparative Analysis of SPS Measures by Selected Countries.....</i>	<i>27</i>
III. Recommendations to Address Regulatory Challenges in the Potato Seed Sector	28
A. Increase Funding for Potato Seed Breeding, Research, Development, and Multiplication.....	29
B. Revise and Develop New Protocols on Potato Variety Release and Registration	29
C. Inclusive Approaches on Quality Assurance and Improved Implementation	
30	
D. Improve Potato Warehouse Receipt Systems for Better Marketing and Distribution	30
E. Streamline Rules on Plant Breeders' Rights and Their Implementation	30
F. Improved Cross-Border Trade	31
Conclusion	31
Annex 1: Potato Seed Certification Standards	32
Annex 2: Consulted Stakeholders.....	34

List of Abbreviations

ADC	Agriculture Development Corporation
BW	Bacterial wilt
CIP	International Potato Center
COMESA	Common Market for Eastern and Southern Africa
DUS	Distinctness, Uniformity, and Stability
EGS	Early Generation Seed
EU	European Union
IPMC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
ISTA	International Seed Testing Association
KALRO	Kenya Agriculture and Livestock Research Organization
KEPHIS	Kenya Plant Health Inspectorate Service
NGO	Nongovernmental Organization
NML	New Markets Lab
NPCK	National Potato Council of Kenya
NPPO	National Plant Protection Organization
NPT	National Performance Test
NPTC	National Performance Trials Committee
NVRC	National Variety Release Committee
OECD	Organisation for Economic Co-operation and Development
OIC	Orange International Certificate
PASTTA	Partnership for Seed Technology Transfer in Africa
PBR	Plant Breeders' Rights
PCN	Potato Cyst Nematode
PRA	Pest Risk Assessment
PVP	Plant Variety Protection
QDS	Quality Declared Seed
SFSA	Syngenta Foundation for Sustainable Agriculture
SPS	Sanitary and Phytosanitary Standards
STAK	Seed Traders' Association of Kenya
UNECE	United Nations Economic Commission for Europe
UPOV	Union for the Protection of New Varieties of Plants
VCU	Value for Cultivation and Use

Executive Summary

Potato, which, according to the Kenya Plant Health Inspectorate Service (KEPHIS), is Kenya's second-most-important staple crop after maize, plays an important role in Kenya's food and nutritional security. Overall, the potato industry employs millions of Kenyans and generates over USD 500 million in sales annually, yet the sector's potential is impacted by a number of factors, including legal and regulatory challenges. Stakeholder consultations conducted in the development of this case study revealed that the bulkiness and perishability of potato seed, combined with the new technologies around true seed, render it different from other crops and highlight why it should be regulated differently in a number of respects, including varietal development and registration, quality standards, and trade. Recently, Kenya's potato sector also made the news due to the importation of processed potato products such as frozen potato fries from Egypt and South Africa, despite the availability of quality local varieties for processing, reinforcing the importance of further focus on the sector.

This case study was developed by the New Markets Lab (NML) in collaboration with the Syngenta Foundation for Sustainable Agriculture (SFSA) under SFSA's Seeds2B initiative and the Partnership for Seed Technology Transfer in Africa (PASTTA) to evaluate Kenya's potato seed regulatory framework in the context of its ability to generate broad-based benefits and better deliver improved seed varieties to farmers. The authors focus in particular on regulatory aspects of the seed potato sector, taking a systemic approach spanning varietal breeding, variety registration and release, plant breeders' rights, seed certification and quality assurance, and rules on importation and exportation.

The case study's findings are based on an analysis of Kenya's legal and regulatory framework related to seed potato as well as consultations with key regulatory and industry stakeholders, including KEPHIS, the Agriculture and Food Authority (AFA), Kenya Agriculture and Livestock Research Organization (KALRO)-Tigoni, Agricultural Development Corporation, local and multinational potato seed companies, the National Potato Council of Kenya (NPCK), the Seed Trade Association of Kenya (STAK), and farmer organizations. It incorporates key stakeholder experiences in navigating the Kenyan seed potato industry and includes recommendations to address key challenges based on alternative regulatory approaches and good practices adopted by other countries. Table 1 below summarizes key findings of the Case Study, including challenges and gaps in potato seed regulation and corresponding recommendations for how to address these issues. The recommendations under each regulatory issue area are sequenced in order of priority, from short- to long-term.

Table 1: Key Findings and Recommendations Under Each Regulatory Issue Area

Key Findings: Challenges and Gaps	Recommendations
<i>Public Potato Variety Breeding</i>	
<ul style="list-style-type: none"> Limited funding goes into potato seed breeding. There is only one potato breeder in KALRO-Tigoni, and she has only recently joined. Limited popularization and marketing of new potato varieties, which has contributed to the limited market demand and knowledge of new varieties good for processing and was a factor in the importation of processed potatoes from Egypt and South Africa. 	<ul style="list-style-type: none"> Facilitate increased collaboration with international research institutions, such as the International Potato Center (CIP), through continued sharing of germplasm, and with private seed companies, through licensing arrangements to commercialize existing potato varieties that have been developed by the public sector. Technical capacity building on varietal research and breeding could also be supported through continued partnerships with CIP as the international research center focused on potato seed and development partners. Government could explore increasing funding for public research and popularization of new potato seed varieties.
<i>Potato Variety Registration and Release</i>	
<ul style="list-style-type: none"> Limited stakeholder knowledge on flexibilities for fast-tracking potato seed variety registration, leveraging on the Common Market for Eastern and Southern Africa (COMESA) Seed Trade Harmonisation Regulations. 	<ul style="list-style-type: none"> KEPHIS could build knowledge around regional registration of public varieties through capacity building workshops and involving key potato seed industry stakeholders.
<ul style="list-style-type: none"> The potato seed protocols for distinctness, uniformity, and stability (DUS) and value for cultivation and use (VCU) applied by the National Variety Release Committee (NVRC) are outdated and sometimes inapplicable, like in the case of the new true potato seed technologies. 	<ul style="list-style-type: none"> There is need to have a round table discussion with key industry stakeholders and develop new protocols for true seed testing and update the existing DUS and NPT protocols for potato seed.
<ul style="list-style-type: none"> A large percentage of unregistered varieties continue to exist and are in use in the informal sector. With the stringent disease thresholds under the national performance trials (NPT) requirements for potato seed, most local potato seed varieties, which are often disease infested, do not qualify for registration and release. 	<ul style="list-style-type: none"> KALRO could continue to work with the farmers in the informal sector to clean popular unregistered varieties and register them for formal commercialization. The regulatory framework should incorporate flexibilities aimed at integrating local unregistered varieties in the formal system.

<i>Plant Breeders' Rights</i>	
<ul style="list-style-type: none"> Consultations revealed knowledge gaps on PVP among breeders in both the private and public sectors. None of the publicly bred varieties are protected, for instance. Enforcement of PVP for potato is quite weak compared to other field crops, and KEPHIS reportedly has never received complaints regarding violation of PBR for potato seed, even though various seed companies note that protected varieties have sometimes been commercialized by third parties without authorization. 	<ul style="list-style-type: none"> KEPHIS could consider strengthening implementation of the PVP/PBR framework and supporting building stakeholder capacity to enforce their PBR in the context of potato seed, since it is key to encouraging innovation and investment in the potato seed industry.
<ul style="list-style-type: none"> The Seeds and Plants (Plant Breeders' Rights) (Root and Tuber Crops Scheme) Regulations are yet to be revised to reflect the 2012 amendments under the Seed and Plant Varieties Act that are aligned with the International Union for the Protection of New Varieties of Plants (UPOV). 	<ul style="list-style-type: none"> KEPHIS could prioritize the process of aligning the PBR Regulations with the amended Seed and Plant Varieties Act provisions on PVP.
<i>Quality Assurance</i>	
<ul style="list-style-type: none"> The legal framework permits private seed certification, but only one potato seed inspector has been approved and has conducted official inspections. The stringent potato seed standards and requirements for producer and merchant registration cannot be met by most small-scale producers. This includes having enough land to meet the specifications on isolation and separation distances, proper storage, high producer registration fees, high field inspection fees, and costs of pathogen testing. Transportation of potato seed is a challenge considering its bulkiness and perishability. 	<ul style="list-style-type: none"> KEPHIS could also consider improving stakeholder knowledge regarding private seed inspection for potato seed. Digital seed inspection and certification schemes could also be adopted by KEPHIS to avoid delays in potato seed inspection. Prioritize drafting and approval of the new draft Seed and Plant Varieties (Vegetatively Propagated Seeds) Regulation, which include more flexible requirements for registration of small seed producers, as well as affordable inspection, laboratory testing, and registration charges for small seed producers. An efficient warehouse receipts system for potato seed, with a strong regulatory framework underpinning it could be created with the support of AFA.
<ul style="list-style-type: none"> There are promising initiatives to support local farmers in the production and sale of uncertified but quality seed (referred to as “clean seed”) from certified seed and registered varieties as a form of quality declared seed (QDS), although these are currently not provided for 	<ul style="list-style-type: none"> QDS and/or clean seed could be formally recognized by the ministry of agriculture and KEPHIS as another seed class. QDS systems could allow less rigorous and lower-cost inspection regimes, while producing quality, clean disease-free planting material from registered varieties. In addition, standards and guidelines on QDS could be

under the regulatory framework, since neither “clean seed” nor QDS is formally recognized as a seed class.	developed, with proper capacity building initiatives for farmers put in place. Support at the county and state level will also be needed to ensure that standards are observed. QDS could become a more limited approach as the potato seed industry grows.
Potato Seed Import and Export	
<ul style="list-style-type: none"> Sanitary and phytosanitary (SPS) measures for potato seed are stringent and often based on zero-tolerance, and capacity gaps exist in implementation. 	<ul style="list-style-type: none"> Implement KEPHIS’ collaboration with development partners to establish a baseline assessment of PRA for bacterial wilt (BW) and potato cyst nematode (PCN). KEPHIS could also consider better equipment in its phytosanitary laboratory and increased human resource to facilitate laboratory testing for diseases.
<ul style="list-style-type: none"> Where the imported seed is of unknown risk, KEPHIS’ process of conducting a pest risk analysis (PRA) can be long, bureaucratic, and tedious due to understaffing and absence of a separate division on PRA. 	<ul style="list-style-type: none"> Prioritize KEPHIS’ process of creation of a separate PRA division within KEPHIS, and fully equip it to enable it to operate efficiently.
Potato Ware Marketing	
<ul style="list-style-type: none"> The new Crop (Irish Potato) Regulations with rules on ware marketing are rarely enforced in practice, and some stakeholders were unaware of them entirely. 	<ul style="list-style-type: none"> AFA could Build stakeholder knowledge around the new regulations on ware marketing.

I. Introduction and Overview of Kenya's Potato Seed System

Potato plays an important role in Kenya's food and nutritional security. Irish potatoes are very high in potassium and other minerals, with the potential for addressing malnutrition problems that are rampant in most rural households in Kenya.² Potatoes can also be processed into a variety of products, the demand for which has been rapidly increasing due to rapid growth of fast food restaurants and snack bars in both rural and urban areas.³ As a result, potato has become the second most important staple crop after maize,⁴ with the potato industry employing over 2.5 million Kenyans⁵ and contributing over USD 500 million annually in sales.⁶

The potato sub-sector is dominated by small-scale farmers, estimated to be around 800,000 in 2016, located across 16 counties, with very few large-scale ware- and seed-producing farms.⁷ The main potato growing counties include Nakuru, Nyandarua, Kiambu, and Meru counties, with newly emerging potato growing counties including Bomet, Narok, and Bungoma.⁸ The industry is characterized by a few large-scale ware- and seed-producing farms.⁹ Varieties that are primarily grown in Kenya include Shangi, Dutch Robijn, Asante, Shereke, Purple Gold, Kenya Mpya, Arnova, Connect, Rudolph, Sarpo Mira, and others.

² Ministry of Agriculture, Livestock and Fisheries of Kenya, "National Root and Tuber Crops Development Strategy 2019-2022", August 2019. Available at: <https://kilimo.go.ke/wp-content/uploads/2021/04/Roots-and-Tuber-Crops-Strategy-2019-2022.pdf> (hereinafter National Root and Tuber Crops Development Strategy).

³ Id.

⁴ Kenya Plant Health Inspectorate Service (KEPHIS) Seed Potato Production and Certification Guidelines, December 2016 (hereinafter KEPHIS Guidelines), available at: <https://kephis.org/images/docs/seedpotatobooklet.pdf>. See also, S.R.M. Janssens, S.G. Wiersema, H. Goos and W. Wiersma, "The Value Chain for Seed and Ware Potatoes In Kenya; Opportunities For Development", LEI Memorandum 13-080, at 57, available at: <https://research.wur.nl/en/publications/the-value-chain-for-seed-and-ware-potatoes-in-kenya-opportunities>

⁵ Laibuni, N. M. & Omiti, J. M., « Market Structure and Price: An Empirical Analysis of Irish Potato Markets in Kenya », 2014.

⁶ Ministry of Agriculture Livestock and Fisheries of Kenya 2016. The National Potato Strategy 2016-2020. Nairobi, Kenya (hereinafter National Potato Strategy). See also, Ministry of Agriculture Livestock Fisheries and Irrigation Kenya 2018. Regulatory Impact Statement (RIS), The Crops (Irish Potato) Regulations. Nairobi Kenya.

⁷ World Bank Group, "Increasing Seed Potato Availability in Kenya: Priority Investments and Policy Actions, Kenya Seed Potato Industry Diagnostic", World Bank Group, 2019 (hereinafter World Bank Group), available at: https://www.ifc.org/wps/wcm/connect/a1483e51-b941-4da5-bbfc-577edfe00854/IFC+KSPID+Report_FINAL.pdf?MOD=AJPERES&CVID=npBxw4c

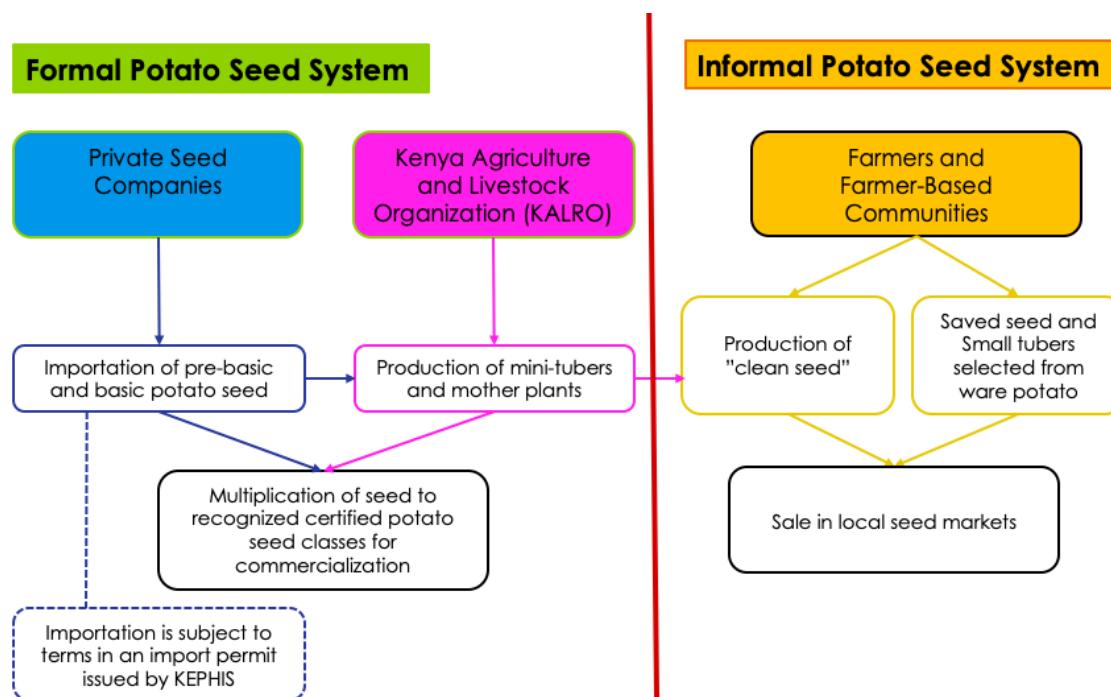
⁸ Id.

⁹ National Potato Strategy, *supra* note 6. See also, KEPHIS Guidelines, *supra* note 4, and McEwan, M.A., Spielman, D.J., Okello, J., Hareau, G., Bartle, B., Mbiri, D., Atieno, E., Omondi, B.A., Wossen, T., Cortada, L., Abdoulaye, T., and Maredia, M. (2021), "Exploring the Regulatory Space for Improving Availability, Access and Quality of Vegetatively Propagated Crop Seed: Potato in Kenya", CGIAR Research Program on Roots, Tubers and Bananas (RTB). RTB Working Paper. No. 2021-1, 2021, Lima, Peru. [Www.Rtb.Cgiar.Org](http://www.Rtb.Cgiar.Org) (hereinafter, McEwan et al. 2021).

Shangi, by far is the most dominant variety due to yield, market demand, seed availability and cooking qualities. Popular processing varieties include Markies, Manitou, Jelly, Dutch Robijn, and Destiny.

Seed potato is obtained from both the formal and informal sectors (Figure 1). In the formal sector, there are currently two supply systems of certified potato seed. First is certified seed starting from mini-tubers or healthy mother plants produced by public research institutions under KALRO and private seed companies in Kenya and second is the production of certified potato seed through the multiplication of imported potato seed. Under the second system, pre-basic and basic seed is produced in the Netherlands, Scotland, Ireland, or France by specialized seed growers guided by strict European Union and national seed certification rules and regulations and is then exported to Kenya by private seed companies based on an import permit issued by KEPHIS. The basic seed is further multiplied in Kenya into certified seed classes following KEPHIS regulations and certification standards.¹⁰

Figure 1: Formal and Informal Potato Seed Systems in Kenya



Source: New Markets Lab, 2022.

KEPHIS revealed that certified seed potato production continues to be very low, with less than two percent of potato seed planted certified.¹¹ Research shows that the low level of certified seed production is partly due to stringent certification requirements, as will be

¹⁰ McEwan et al. 2021, *supra* note 9.

¹¹ National Potato Strategy, *supra* note 6.

discussed in detail below, and limited certification capacities by both KEPHIS and the private sector, even with authorization of private seed inspection. As a result, potato yields in Kenya are reportedly very low, typically ranging between 8-10 tons/ha as compared to an average of 40 tons/ha in developed countries.¹²

The informal sector, comprised of farmer-saved and community-based seed systems, continues to be the main source of over 90 percent of potato seed used in Kenya.¹³ While it is illegal to sell uncertified potato seed, with limited availability of certified seed and limited enforcement capacity by KEPHIS, most smallholder farmers use uncertified potato seed from own sources, neighbors, or local open markets.¹⁴ What is usually sold as seed in the local seed markets are small-sized tubers that are not preferred by consumers due their difficult and time-consuming peeling process, or a mixture of certified potato seed with small ware tubers.¹⁵

Research shows that potato seed sold in local seed markets is often of unknown quality and health, and may have diseases that affect the quality and quantity of productivity, which can only be assessed through laboratory testing.¹⁶ Reportedly, more than 70 percent of potato seed planted in Kenya is infected with bacteria wilt (BW),¹⁷ which can remain in the soil even without a host, sometimes for years.¹⁸ Once the soil is contaminated, productivity can still be affected even when disease-free seeds are planted. For instance, 80 percent of farms producing certified seed were reportedly infected with potato cyst nematode (PCN).¹⁹ Late blight is another disease associated with poor quality seed potato, affecting some uncertified seed from local markets.²⁰ Given these dynamics, it is important that the legal and regulatory system integrate the informal potato seed sector, with some

¹² Gildemacher, P. R., Schulte-Geldermann, E., Borus, D., Demo, P., Kinyae, P., Mundia, P. & Struik, P. C. 2011, «Seed Potato Quality Improvement Through Positive Selection by Smallholder Farmers in Kenya», *Potato Research*, 54, 253-266. See also, Muthoni, J. J., Shimelis, H. & Melis, R., “Potato Production in Kenya: Farming Systems and Production Constraints”, *Journal of Agricultural Science*, 5(5) (2013) and Okello, J. J., Zhou, Y., Kwikiriza, N., Ongutu, S., Barker, I., Schulte-Geldermann, E., Atieno, E. & Ahmed, J. T., “Productivity and Food Security Effects of Using of Certified Seed Potato: The Case of Kenya’s Potato Farmers”, *Agriculture & Food Security*, 6(1), 25 (2017).

¹³ Id.

¹⁴ McEwan et al. 2021, *supra* note 9.

¹⁵ Id.

¹⁶ Kaguongo, W. P., Gildemacher, P., Demo, P., Wagoire, W., Kinyae, P., Andrade, J. & Thiele, G. 2008. “Farmer Practices and Adoption of Improved Potato Varieties in Kenya and Uganda”, Social Sciences Working Paper 2008-3. Lima, Peru: International Potato Center.

¹⁷ Muthoni, J. J., Shimelis, H. & Melis, R., “Potato Production in Kenya: Farming Systems and Production Constraints, *Journal of Agricultural Science*, 5(5) (2014).

¹⁸ McEwan et al. 2021, *supra* note 9.

¹⁹ Haukeland, S., Kinyua, Z., Cortada, L., Ngundo, G., Kariuki, G. M., Bett, R., Amata, R., Ringera, E., Otipa, M., Gachamba, S., Coyne, D., Kungu, K., Ouma, E. & Ronno, W. 2017, “Prevalence and Implications of The Potato Cyst Nematodes in Kenya”. Proc. 2017 Symposium of The Nematological Society of South Africa Durban, May 7-11 2017, 92.

²⁰ McEwan et al. 2021, *supra* note 9.

form of “regulatory flexibilities”,²¹ as not doing so will affect the market overall, including through spread of diseases.

Various efforts have and are being taken by the Ministry of Agriculture, KEPHIS, the National Potato Council of Kenya (NPCK), research organizations, and development partners to increase both production and distribution of seed potato and to improve the regulatory framework. These have included support of flexible seed quality maintenance practices to promote “clean seed” production by farmer groups and management of major pests and diseases. Breeding institutions give foundation seed to farmers, and in order not to waste the purity of that foundation seed to just produce ware potato, NGOs, MoA, and county governments help farmers to produce “clean seed” from it. Such seed could, however, satisfy a quality assurance scheme if KEPHIS was involved and less stringent requirements were put in place, including for storage prerequisites and lower fees. Production of “clean seed” is based on good practices to maintain quality and manage diseases.

II. Potato Seed Legal and Regulatory Framework

Kenya’s legal and regulatory system for seed generally does not differentiate between field crops and vegetatively propagated crops like potato, with some exceptions. Under the KEPHIS Act No. 54 of 2012, KEPHIS is mandated with regulating the seed industry, which includes all regulatory aspects related to potato seed. Potato seed breeding, variety registration and release, certification, plant variety protection, and cross-border trade are regulated under the Seed and Plant Varieties Act, Cap 326 (as amended) and its regulations, including the Seeds and Plant Varieties (Seeds) Regulations of 1991, the Seed and Plant Varieties (Variety Evaluation and Release) Regulations, Legal Notice No. 215 of 2016, and the Seeds and Plant Varieties (Plant Breeder’s Rights) (Root and Tuber Crops Scheme) Regulations of 2001. In 2019, the Crops (Irish Potato) Regulations, Legal Notice No. 17 were passed under the Crops Act of 2013 to regulate the production and trade of Irish potato at the country and county levels.

SPS issues are governed under the Plant Protection Act Cap 324 and the Plant Protection (Importation of Plants, Plant Products and Regulated Articles) Rules, Legal Notice 108 of 2009. The Plant Protection Act and its regulations are currently under review to strengthen the regulatory framework for prevention and management of plant pests and diseases in Kenya. The Plant Protection Bill, 2021 and draft regulations incorporate provisions that will impact potato seed imports, including pest risk assessment, validity of a potato seed

²¹ For a discussion of regulatory flexibilities linking the informal and formal seed sectors, see Katrin Kuhlmann and Bhramar Dey, “Using Regulatory Flexibility to Address Market Informality in Seed Systems: A Global Study”, *Agronomy* 2021, 11, 377 (hereinafter Kuhlmann and Dey), available at <https://www.mdpi.com/2073-4395/11/2/377>.

phytosanitary certificate, the process and requirements to obtain the certificate, and related costs.

The legal and regulatory framework is also guided by several policy and strategic instruments that are relevant to potato seed regulation. These include the National Seed Policy, 2010, the National Food and Nutrition Security Policy, the Potato Strategy 2016-2020, and the National Root and Tuber Crops Strategy 2019-2022.

A. Challenges in the Potato Seed Regulatory Framework

Despite the existence of a relatively strong regulatory framework for seed, challenges still exist with respect to the regulation of potato seed, which manifest either as gaps in the legal framework or in its implementation. These gaps are examined below under each key issue area of potato seed regulation, namely, potato seed research and breeding, variety registration and release, certification, plant variety protection, marketing and distribution, and cross-border trade.

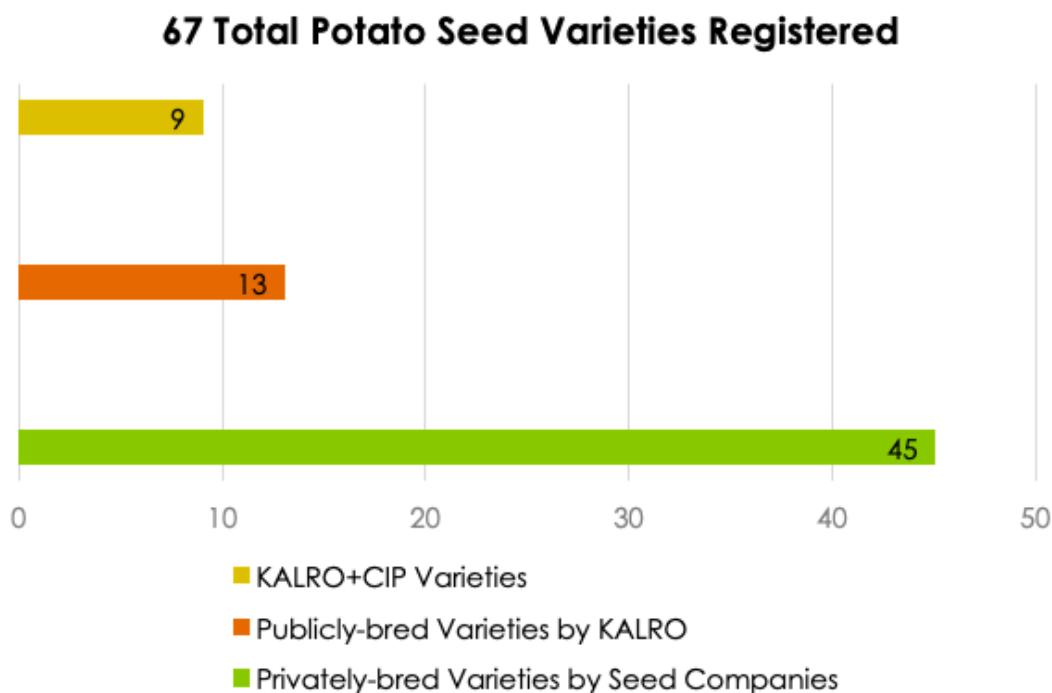
1. Potato Seed Research, Breeding, and Development

Very little breeding of potato seed is being done in Kenya compared to other crops. Public research institutions and seed companies are mostly focused on research relevant to cereals, grains, and legumes,²² with minimal investment in research and breeding of vegetatively propagated crops like potatoes. Potato breeding in Kenya is largely done by KALRO-Tigoni, which hosts the national potato breeding programme, in partnership with the International Potato Centre (CIP), from which KALRO usually selects the breeding lines. There are a total of 67 Irish potato varieties on the national variety list, 22 of which are maintained by KALRO (9 of these were developed in partnership with CIP).²³ The rest of the 45 registered potato varieties are held by private seed companies. See Figure 2 below on potato seed registrations on the national variety list by public and private sector actors in Kenya.

²² Katrin Kuhlmann, Tara Francis, and Induleka Thomas “Seed Laws and Regulations Affecting the Development of the Private Vegetable Seed Sector in Sub-Saharan Africa”, Shanhua, TAIWAN: World Vegetable Center (WVC), Publication No. 21-1036, 2021, (hereinafter Kuhlmann et al. 2021), available at <https://worldveg.tind.io/record/74189?ln=en>.

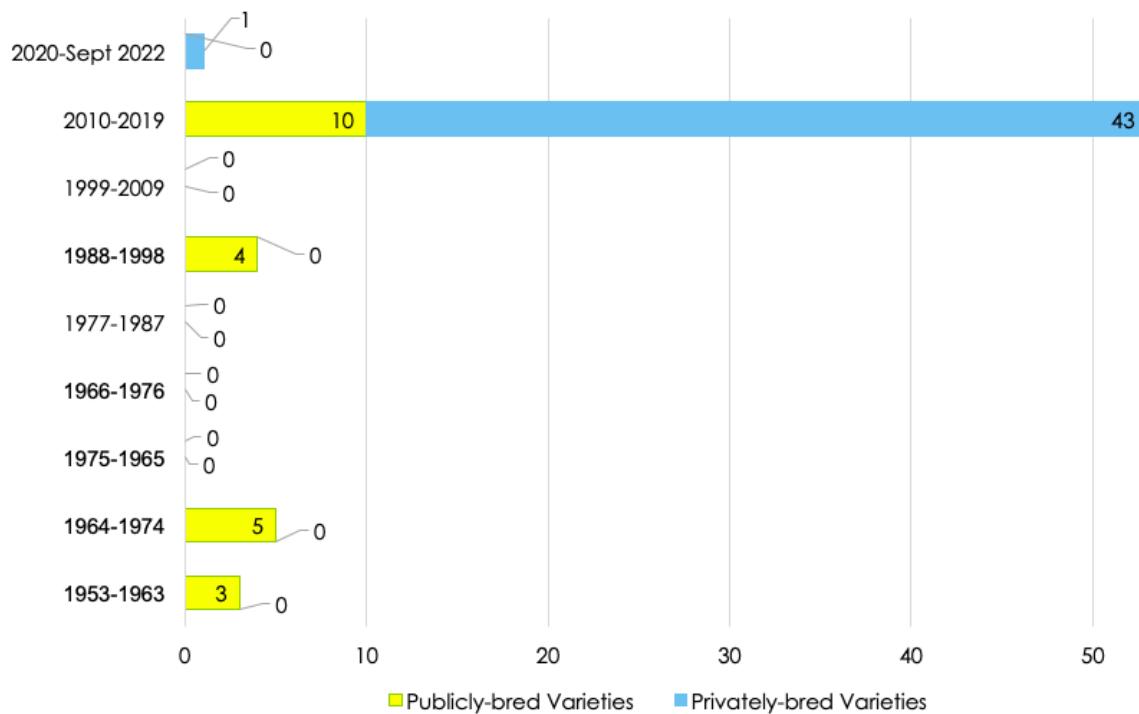
²³ KEPHIS, National Crop Variety List – Kenya. Available at: https://www.kephis.org/images/pdf-files/UPDATED_2022_JANUARY_NATIONAL_VARIETY_LIST.pdf.

Figure 2: Potato Seed Registrations on the National Variety List by Public and Private Sector Actors in Kenya



Besides there being few registered potato seed varieties, consultations revealed that majority of them were also very old varieties of over ten years, albeit varieties that are still preferred by the market. For instance, Dutch Robijn and Asante, which are some of the most popular varieties in Kenya, are over twenty years old, registered by KALRO in 1960 and 1998 respectively. Due to limited investment in research and breeding of potato varieties, there have been decades when no new potato seed varieties were released or registered on the national variety list (see Figure 3 below on Release and Registration of Potato Seed Varieties by Public and Private Sector Actors). Due to partnerships between the Ministry of Agriculture and development partners such as the Kenya Netherlands Seed Potato Development Project, several improved varieties have been registered by the private sector seed companies in the last decade, superseding the total publicly-bred registered varieties, even though public research institutions have engaged in breeding of potato seed varieties for the last 69 years. See Figure 3 below.

Figure 3: Release and Registration of Potato Seed Varieties by Public and Private Sector Actors



Breeding of potato varieties under the national potato breeding programme has been largely affected by limited resources and difficulties with retaining qualified and experienced breeders at the facility. Stakeholder consultations revealed, for instance, that there is only one technical potato seed breeder at KALRO-Tigoni, and she has just recently obtained qualifications. The other potato seed breeder recently left KALRO to move to a seed company. In recent years, however, the Ministry of Agriculture in collaboration with development partners such as the Kenya Netherlands Seed Potato Development Project, has increased financial support for the breeding programme. This has resulted in the release of over 33 new Dutch potato varieties in eight years.²⁴ There are also very few private potato breeding entities, most of which are multinational seed companies.

KALRO-Tigoni is the main provider of potato breeder and pre-basic seed to the Agricultural Development Corporation (ADC) and private seed multipliers for production of certified seed.²⁵ KALRO noted during stakeholder consultations that it has limited land, storage facilities, financial resources, equipment, and human resource capacity to meet the

²⁴ KEPHIS, National Crop Variety List – Kenya. Available at: <https://www.kephis.org/images/pdf-files/UPDATED 2022 JANUARY NATIONAL VARIETY LIST.pdf>. See also, Kenya Plant Health Inspectorate Service (KEPHIS) Seed Potato Production and Certification Guidelines, December, 2016. Available at: <https://kephis.org/images/docs/seedpotatobooklet.pdf>.

²⁵ Id.

market's demand for potato early generation seed (EGS). Due to these limitations, KALRO is sometimes not able to produce successive generations of certified seed, and the farmers to whom EGS is sold use it to produce ware potato, which is not a good use of EGS. Moreover, some stakeholders were concerned that KALRO does not have a streamlined institutional procedure for supply and access to EGS, which operates mainly on a first come–first served basis.

Due to limited popularization of some potato varieties in the market, KALRO mentioned that sometimes the EGS produced can remain unclaimed, as farmers demand varieties that are popular and preferred in the market. Stakeholder consultations revealed, for instance, that there are processing varieties that have good traits that could compete well with other popular varieties such as Shangi and Dutch Robijn, but farmers will not ask for them because the market does not know them.²⁶ Another source of EGS is from private multinational seed companies that import a considerable amount of potato seed (minitubers) from the Netherlands, Scotland, Ireland, or France for further multiplication by the private sector.²⁷

Potato end-uses, including demand for boiled, mashed potatoes and French fries, require specific varietal traits. Reportedly, most public-sector breeding in Kenya has prioritized increased yield and tackling disease problems or environmental stresses, especially drought, with less attention to market-preferred traits such as earliness, dormancy (allowing for direct planting in the subsequent season), degeneration levels, and ease of cooking. As a result, demand from Kenya's food processing industry remains largely unmet, with significant importation of processed products, such as frozen fries from South Africa and Egypt.²⁸ While government, through the Ministry of Agriculture and KEPHIS, is working with other stakeholders to increase the supply of quality seed of highly demanded processing varieties, these varieties have still not been widely adopted by farmers, since they require intensive agronomic practices and sufficient planting material.

Smallholder farmers dominate potato production in the informal sector, often relying on their own saved seed or seed secured through informal networks from neighbors and local markets. Promoting breeding efforts in the formal sector and collaboration between public research institutions such as KALRO and the informal sector to clean and register varieties developed informally could improve access to diverse varieties with market preferred traits for potato processing and strengthen resilience to pests and diseases. Enhancing quality in the formal seed sector could also be prioritized as more companies enter the market, which would create competition and raise quality standards in the potato seed industry.

²⁶ Id.

²⁷ McEwan et al. 2021, *supra* note 9.

²⁸ Ministry of Agriculture Livestock Fisheries and Irrigation Kenya 2018. Regulatory Impact Statement (RIS), The Crops (Irish Potato) Regulations. Nairobi Kenya.

2. Variety Registration and Release of Potato Crops

Seed varieties formally released in Kenya are subject to evaluation trials prior to registration and release,²⁹ namely DUS and NPT/VCU trials.³⁰ Under the Seed and Plants (Variety Evaluation and Release) Regulations, potato seed is mandatorily subject to both VCU and DUS testing for a minimum of two seasons each in at least two agro-ecological zones prior to registration and release.³¹ See Figure 4 below (New Markets Lab's Regulatory Systems Map on the Variety Release and Registration Process in Kenya).

Variety registration and release applications are made to KEPHIS, along with payment of the relevant fees, and testing is conducted by a private or public entity or institution authorized by KEPHIS,³² in accordance with UPOV standards (see Figure 4).³³ Stakeholder consultations highlighted delays in potato variety evaluation testing due to limited specialized potato inspectors within KEPHIS. The allowance of private sector variety testing eases KEPHIS' backlog of seed inspection demands by seed companies and allows the industry to leverage qualifying seed companies' specialized knowledge and expertise on potato seed. This model has worked very effectively in some countries in sub-Saharan Africa, including in South Africa and Zambia, where potato seed release and evaluation is also done by trained and certified private seed inspectors who are regularly audited and laboratories assessed for continued compliance.³⁴

Consultations revealed, however, that private seed inspection in the potato seed industry is not yet effective, as only one private seed inspector has been authorized and is active. Consultations examined KEPHIS' approaches and practices to conducting DUS and VCU tests (see Table 2 below on Comparative Variety Release and Registration Process Requirements in Selected Countries). In countries like South Africa, the variety testing and release processes for seed potato include only DUS and not VCU testing. This shortens the process and eliminates additional costs. In response to optional VCU testing for potato seed, KEPHIS mentioned that VCU/NPT testing was especially critical for potato seed to assess its performance at the national level, considering that some varieties are only good for specific agro-ecological zones.

²⁹ Katrin Kuhlmann and Yuan Zhou, "Seed Policy Harmonization in the EAC and COMESA: The Case of Kenya", Syngenta Foundation for Sustainable Agriculture, Working Paper, September 2015 (hereinafter Kuhlmann and Zhou 2015), available at: https://www.syngentafoundation.org/sites/g/files/zhg576/f/seedpolicy_new_sfsa_case_study_of_kenya_september_2015_final_branded.pdf.

³⁰ Id.

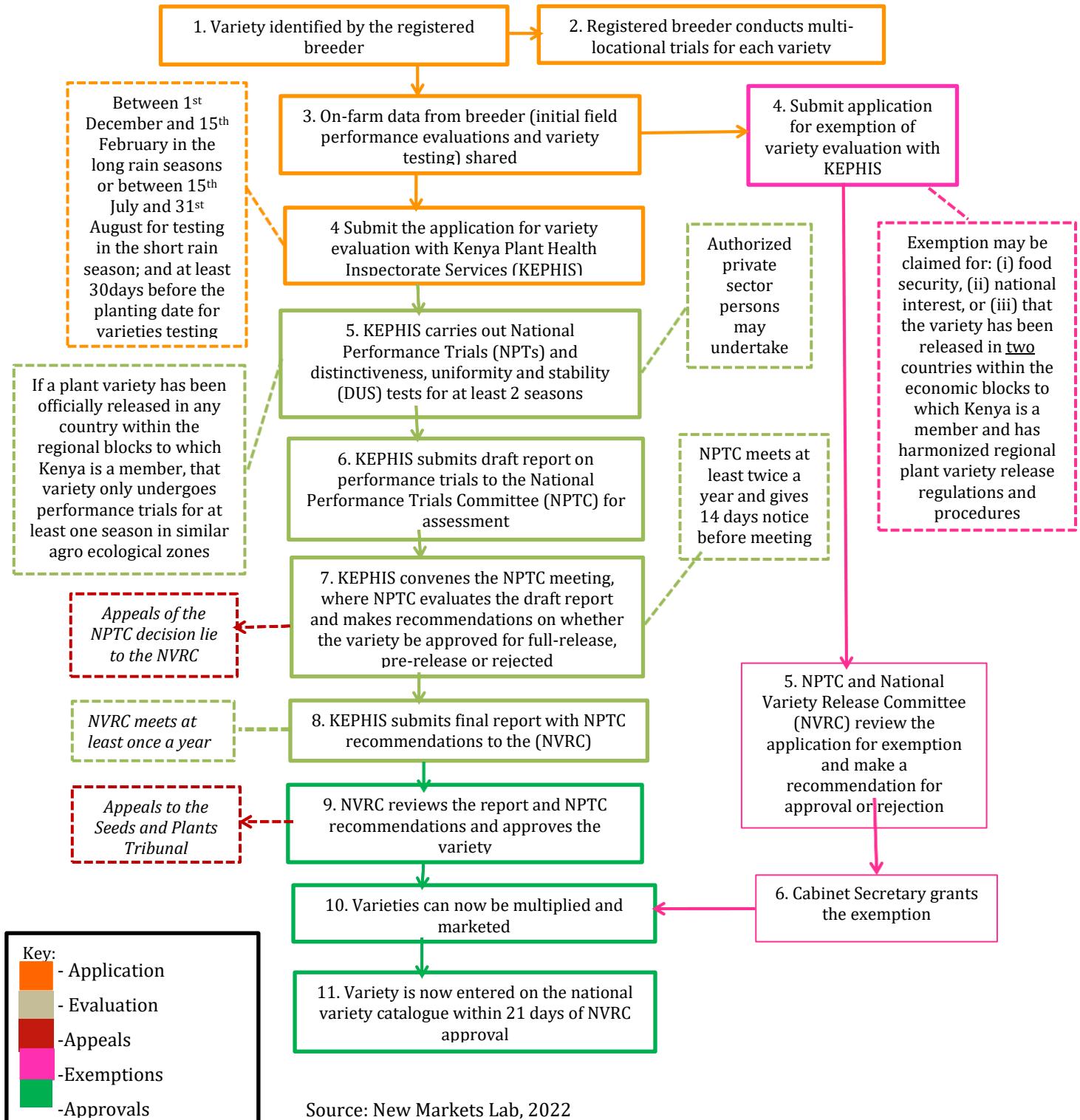
³¹ Regulation 6(2) of the Seed and Plant Varieties (Variety Evaluation and Release) Regulations, 2016.

³² Regulation 7(1) of the Seed and Plant Varieties (Variety Evaluation and Release) Regulations, 2016.

³³ Kuhlmann and Zhou 2015, *supra* note 29.

³⁴ World Bank Group, *supra* note 7.

Figure 4: New Markets Lab's Regulatory Systems Map on the Variety Release and Registration Process in Kenya.



Source: New Markets Lab, 2022

There are two exceptions to testing for two seasons of DUS and VCU:

- The first exception is when a plant variety has already been officially released in a country within the Regional Economic Communities (RECs) of which Kenya is a member. In this situation, the variety only undergoes performance trials for one season in a similar agro-ecological zone.³⁵
- The second exception is when a plant variety that has been officially released in at least two countries within the RECs of which Kenya is a member is exempted from performance trials.³⁶

Table 2: Comparative Variety Release and Registration Process Requirements in Selected Countries³⁷

Element	Kenya	Egypt	Scot-land	Mor-occo	Zam -bia	Zim- bab we	S. Af- rica	Eth- iopia	Ug- an da	Tan- zan- ia	Nether -lands	Japan
NPT/ VCU	2	2		2	2	2	N/A	2-3	1	1		
No. of Sites for VCU	2				6	5	—			3		
DUS (sea- sons)	2	2 yrs.	2		2	1-2 yrs.	1		2	2		
No. of sites DUS	2				6				4			
Variety Release Duration (from app- lication to release)	2-3 yrs.	1-2 yrs.		2 yrs.		1-2 yrs.	Foll. 1 seas. DUS	2 yrs.	2-3 yrs.	3 yrs.		

³⁵ Regulation 9(1)c) of the Seed and Plant Varieties (Variety Evaluation and Release) Regulations, 2016.

³⁶ Id.

³⁷ World Bank Group, *supra* note 7.

Use of other country data	✓	✓				✓				✓		
UPOV Member	✓	X	X	✓	X	X	✓	X	X	✓	✓	✓

These exemptions only apply if the country in which the registration was done has harmonized its variety release regulations and procedures with the regional variety regulations and procedures and the applicant provides data supporting release of the variety in that other country. These rules are consistent with the Common Market for Eastern and Southern Africa (COMESA) Seed Trade Harmonisation Regulations, 2014, since Kenya is a member of COMESA. Consultations with KEPHIS revealed that no applicant has explored these exemptions with regard to potato varieties, and consulted seed companies were unaware that such options to fast-track registration of potato varieties existed.

Stakeholder consultations revealed that the current potato seed DUS and NPT protocols applied by KEPHIS are too stringent and that local varieties that are largely preferred by farmers, who cannot meet the requirements for registration in the national variety list. Under the NPT protocols for instance, the variety must be fully disease tolerant in order to qualify for registration. As is true in other countries, most local potato varieties cannot meet this requirement, unless they have been cleaned up. With support from CIP, KALRO previously cleaned up Shangi, a popular farmer variety, and formally registered it. Without flexible potato variety release processes for farmer's varieties, however, local farmer varieties are largely excluded from the formal variety release and registration process, and they cannot be formally certified. This is exacerbated by the high cost of conducting evaluation tests.

New technologies have facilitated development of true seed for potato, but KEPHIS is yet to create new testing protocols. Consultation with KEPHIS revealed that testing requirements for tuber varieties would be used as the check for true seed, to which seed companies consulted strongly objected. While KEPHIS proposed that the true seed would be planted and the tubers used for evaluation prior to release, seed companies noted that true seed is a completely new innovation that needs new testing protocols. They also noted that the farmer would be buying the true seed and not the tubers, making the proposed practice inconsistent from a regulatory perspective.

After conducting performance trials, KEPHIS sends a draft report of the performance trial results to the National Performance Trail Committee (NPTC), and the applicants have at

least 14 days before the NPTC meeting. KEPHIS then convenes the NPTC meeting, which evaluates the data and submits a summary report to the National Variety Release Committee (NVRC). The summary report includes the DUS results and the NPTC's recommendation. The NVRC considers the NPTC report and its recommendations, as well as the DUS report, and the NVRC approves and releases qualifying varieties. After release by the NVRC, the varieties can be commercialized. The KEPHIS director publishes the names of the released varieties in the Gazette within 21 days of the NVRC meeting.

3. Potato Seed Quality Assurance

Seed certification and quality assurance fall within the purview of KEPHIS. Activities include management of seed quality through field inspection of registered seed varieties during production and laboratory testing to assess compliance with minimum purity and germination standards before commercialization. Seed certification quality standards in Kenya (see Annex 1) are based on international seed testing standards set by the International Seed Testing Association (ISTA). Kenya also recognizes international potato seed schemes set by the Organisation for Economic Co-operation and Development (OECD). Irish potatoes fall under compulsory certification.³⁸ Recognized potato seed classes are pre-basic seed, basic seed, and three generations of certified seed.³⁹

While KEPHIS has been commended for being effective in ensuring compliance with certification standards, concerns remain about the limited availability of certified potato seed that meets market demand. Only two percent of potato seed planted by farmers is certified.⁴⁰ Findings from stakeholder consultations highlight that part of the reason for the low volume of certified potato seed is the stringency of KEPHIS' seed certification requirements. Potato seed is prone to pests and diseases and with KEPHIS' stringent SPS measures prior to potato seed certification, and most seed producers cannot meet them. In countries like Egypt, zero-tolerance applies to pre-basic and basic seed,⁴¹ which are required to have greater purity and quality for multiplication (see Table 3 below for a comparative analysis of measures by selected countries). The threshold for certain pathogens is lower for certified seed classes, as some infections may be undetectable during seed testing.⁴² Stakeholder consultations revealed that some of the certification requirements in Kenya were initially designed for cereal crops, the production of which can be more readily centralised and for which inter-seasonal storage is less of an issue than it is with vegetatively propagated crops like potatoes. Moreover, the language used in the

³⁸ Second schedule, The Seeds and Plant Varieties (Seeds) Regulations.

³⁹ Third schedule, The Seeds and Plant Varieties (Seeds) Regulations.

⁴⁰ National Potato Strategy, *supra* note 6 and KEPHIS Guidelines, *supra* note 4. See also, Kaguongo, W., Maingi, G., Barker, I., Nganga, N. & Guenthner, J. 2014. The Value of Seed Potatoes from Four Systems in Kenya. Am. J. Potato Res., 91, 109–118 and McEwan et al., *supra* note 9.

⁴¹ World Bank Group, *supra* note 7.

⁴² Id.

potato seed production and certification standards and guidelines and the Seed Regulations often refers to “moisture content”, “seed lots”, and “germination tests” that are appropriate for maize and other cereal crops but not as suited to potato.⁴³

Table 3: Comparative Seed Quality Approaches in Selected Countries.⁴⁴

Measure	Kenya	Egypt	Scot-la nd	Mor- occo	Zam- bia	Zim- bab we	South Africa	Eth- iopia	Ugan- da	Tan- zan ia	Neth- erlands	Japan
Seed Generations	5	4	7	7	8		8	6			10	
Certified Classes	3	1	—	2	4		2				3	
QDS System?	X	X	X	X	X	✓	Standard seed	✓	✓	✓	X	X
Private Cert-ification	✓	X			✓	✓	✓	X	X	X		
Observes OECD Schemes	✓	✓	X	✓	✓	✓	✓	X	✓	✓	✓	✓
Member of OECD	X	X	X	X	X	X	X	X	X	X	✓	✓

Due to these challenges and limited supply, certified potato seeds are highly-priced,⁴⁵ putting the informal sector in the lead for potato seed production. Farmers source 98 percent of potato seed from neighbors, local markets, or from their own saved seed.⁴⁶ Such seed is usually of questionable quality and the biggest cause of the spread of pests and diseases. To address this and improve the quality of recycled seed, departments of agriculture at both the state and county levels, KALRO, NGOs, CIP, charitable

⁴³ Id. at 40.

⁴⁴ Id.

⁴⁵ Id.

⁴⁶ Id.

foundations, and donor-funded projects have and continue to support production and sale of uncertified “clean seed” by local farmers, as a form of QDS. This is technically in violation of the regulatory framework; however, QDS is not recognized as a seed class, which could be done through modification to the regulatory framework (as has been the case in other countries). See Table 3 on comparative seed quality approaches in selected countries, with comparison to other African countries as well as countries in Europe and Asia, which are relevant as major origin countries for potato seed imports.

Research and stakeholder consultation findings show a conflicting range of options of how to include the informal sector, which is the largest producer of potato seed, in formal potato seed production, in order to reduce the gap between potato seed demand and supply. These include:

- Introduction of QDS as a seed class for potato seed in order to serve as a bridge between informal and formal seed producers and facilitate access to quality seed for smallholder farmers while serving as a basis for creation of future certified seed demand.⁴⁷
- Allowing for more generations of certified potato seed with some level of quality assurance in order to reduce the price of certified seed, rather than promoting “clean seed”, which is currently not covered under the regulatory system.⁴⁸
- Redefining “standard seed” under the Seed Regulations to include potato, with some relaxation of disease and pest thresholds.⁴⁹

KEPHIS has also been criticized for delays in getting inspections conducted in time, mainly due to shortage of staff and vehicles to transport inspectors to the field. As a good regulatory practice aimed at reducing the capacity burden to conduct certification tests, Kenya involves the private sector in the seed certification process through authorization of private seed inspectors to provide certification services with the supervision of KEPHIS, in accordance with internationally recognized seed testing standards under ISTA.⁵⁰ Since the only laboratory testing done for potato seed is for pests and diseases and under the restricted purview of KEPHIS, having an appropriate laboratory is not as strict a requirement for private potato seed inspectors as it is for cereals and legumes. However, while private seed inspectors have been authorized and gazetted by KEPHIS, stakeholder findings showed that only one potato seed inspector is authorized and active.

The high cost associated with seed certification was also noted as a challenge to formal potato seed certification. As part of seed quality assurance, seed producers and merchants

⁴⁷ Id.

⁴⁸ McEwan et al. 2021, *supra* note 9.

⁴⁹ Id.

⁵⁰ Kuhlmann and Dey, *supra* note 21.

are required to be registered by KEPHIS. An application can be submitted following payment of a prescribed fee of Ksh75,000 (approximately USD 750) with an annual renewal of Ksh10,000 (approximately USD 100).⁵¹ Before planting, soil samples are collected by KEPHIS to test for PCN and BW, at Ksh1,000 (approximately USD 10) and Ksh3,000 (approximately USD 30) respectively. After planting, a minimum of two field inspections are done by KEPHIS, first during flowering and second during tuber development. Each field inspection costs Ksh430 (approximately USD 4) per hectare (Ha) and a minimum fee of Ksh1, 935 (proximately USD 20) per seed field, plus a mileage fee of Ksh58.50 (approximately 0.5 cents) per km.⁵² After dehaulming and before harvest, KEPHIS does another inspection to collect samples of tubers to test for BW and PCN, at the cost noted above. Post-harvest, KEPHIS does another inspection to ensure that grading has been done properly and that the tubers are disease free. If the grading is found to be in order, the seed producer applies for labels from KEPHIS, each at a cost of Ksh15 (approximately 0.12 cents) per label with a minimum cost of Ksh990 (approximately 10 dollars).

Stakeholder consultations revealed that some of the requirements for registration as a seed producer or merchant are difficult for small-scale seed producers to meet, including having enough land to meet the specifications on isolation and separation distances, proper storage, payment for registration and inspection, and meeting the costs of pathogen testing. Regulatory approaches designed to encourage small-scale seed production could be prioritized, including more affordable charges for small seed producers and exploration of warehouse receipt systems (WRS) for potato seed. Stakeholder consultations showed that to encourage serious small-scale potato seed producers, some large-scale license holders like KALRO and ADC have allowed some producers to use their licenses at a small fee. Some small-scale producers also aggregate farms within the same area so that KEPHIS can inspect them all together, which reduces inspection mileage fees.

Scratch cards are incorporated into labelling/packaging for certified potato seed to aid traceability and quality assurance. Stakeholder consultations revealed that these are efficiently used in practice, especially because most large-scale sellers of potato seed only accept on-farm purchases and work on a limited basis through authorized dealers.

4. Plant Variety Protection (PVP)/Plant Breeders' Rights (PBR)

⁵¹ KEPHIS, Seed Potato Production and Certification Process, available at: <https://npck.org/Books/SeedPotatoCertificationProcess.pdf>.

⁵² KEPHIS Guidelines, *supra* note 4.

A PVP/PBR regulatory framework for potato seed exists in Kenya under the Seeds and Plants Act Cap 326 (1972, rev. 1998, 2002, and 2012) and the Seeds and Plant Varieties (Plant Breeder's Rights) (Root and Tuber Crops Scheme) Regulations of 2001. The PVP framework is based on the UPOV Convention, protecting varieties that are novel and meet DUS and denomination requirements.⁵³ A PBR holder has the right to produce, multiply, sell, export, and license protected variety for up to twenty-five years, as well as to prohibit unauthorized use of a variety, including propagating and harvesting materials.⁵⁴

While the existence of a legal framework on PVP is critical, ultimately its success will depend upon effective implementation. In Kenya, the regulatory framework on PVP for potato seed is quite weak. Under the Seeds and Plant Varieties (Plant Breeder's Rights) (Root and Tuber Crops Scheme) Regulations, potato seed is only accorded 15 years of protection,⁵⁵ contrary to the 20 years afforded under the Seed and Plant Varieties Act and as recommended under UPOV, with which Kenya should be aligned as a UPOV member.⁵⁶ Moreover, the penalty for violation of PVP for potato seed under the PBR Regulations is less than USD 30,⁵⁷ contrary to the approximately two hundred dollars (USD 200) specified in the Seed and Plant Varieties Act. The conflict between the Act and PBR Regulations related to potato seed affects implementation and market development.

Stakeholder consultations also revealed significant weaknesses in the enforcement of the PBR rules, which undermines breeding, research, and varietal development efforts and discourages investment in the potato seed industry.⁵⁸ Some companies mentioned various instances in which their protected varieties were commercialized by unauthorized persons, yet KEPHIS noted that it had not received any complaints on PVP violations for potato seed, neither have any court cases been filed. Consultations indicated that seed companies were unfamiliar with the process of lodging complaints with KEPHIS against alleged PVP violators as well as with which remedies KEPHIS could provide. Some seed companies also considered that filing suits against violators would be a lengthy and bureaucratic process.

⁵³ Part II of the fourth Schedule of the Seeds and Plant Act.

⁵⁴ Sections 19 and 20 of the Seed and Plant Varieties Act.

⁵⁵ Second column of the Schedule to the Seeds and Plant Varieties (Plant Breeder's Rights) (Root and Tuber Crops Scheme) Regulations of 2001.

⁵⁶ Under Article 19 of the UPOV Convention, PVP/PBR protection should not be shorter than 20 years from the date of the grant of the breeder's right. See, UPOV Convention, WIPO/IP/BIS/GE/03/11. Available at: https://www.upov.int/edocs/pubdocs/en/upov_pub_221.pdf.

⁵⁷ Regulation 6 and the Schedule to the Seeds and Plant Varieties (Plant Breeder's Rights) (Root and Tuber Crops Scheme) Regulations of 2001.

⁵⁸ Kuhlmann et al. 2021, *supra* note 22, at 47. See also, Katrin Kuhlmann, Yuan Zhou, and Adron Naggayi Nalinya, Case Study on Regulation of Vegetable Crops in Kenya, December 2021.

5. Potato Seed and Ware Marketing and Distribution

Stakeholder consultations revealed that there is a ready market for certified potato seed in Kenya, which is impacted by limited supply. To maintain good reputation and ensure that quality is maintained, certified potato seed producers require on-farm purchases, mostly on a first come-first served basis. The farms visited during consultations are located remotely, thus purchasing seed on-farm increases transport costs and the price of seed by extension, which is exacerbated by the perishability and bulkiness of potato seed. Stakeholders also noted that it is expensive to provide the appropriate cold storage for potato seed. It was thus recommended that a proper warehouse receipt system (WRS) be established for potato seed, supported with an appropriate regulatory framework.

In 2019, the Crops (Irish Potato) Regulations, Legal Notice No. 17 were passed under the Crops Act of 2013 to regulate the production and trade of ware at the country and county levels. It includes provisions for farmers to belong to a farmer's group before selling ware potato to a registered trader in 50kg bags. The registered trader can only store the ware potato in a registered storage or warehouse and must obtain a permit before transporting the ware potato to the market. Enforcement of the regulations, including registrations, are by AFA. Consultations revealed that most stakeholders did not see the relevance or rationale of these regulations, leading to weak implementation; further, many were completely unaware of them. Consultations revealed that AFA has taken various initiatives to popularize and implement the regulations, including issuing various operational tools,⁵⁹ however, vast implementation gaps still exist.

6. Cross-border Trade

KEPHIS is the National Plant Protection Organization (NPPO), an authority that regulates the importation and exportation of potato seed. An importer of seed is required to have an import permit issued by KEPHIS, a phytosanitary certificate issued by the NPPO in the country of origin complying with the conditions in the import permit, and an Orange International Seed Lot Certificate (OIC) or a Blue International Seed Sample Certificate (BIC). For potato seed exports, the exporter must have an export permit issued by KEPHIS in accordance with the Plant Protection Act, Cap 324 and regulations.⁶⁰ These requirements

⁵⁹ AFA has developed the Potato Implementation Manual, the Potato Self-Assessment Manual, and the Training Manual for Potato Regulations. Available at: <http://food.agricultureauthority.go.ke/index.php/our-services/licensing-regulation#regulatory-services>.

⁶⁰ Plant Protection Rules, Plant Protection (Fines) Rules, 1948, Plant Protection (Potatoes) Rules, 1968, Plant Protection (Importation) Order, Plant Protection (Prohibition of Importation) Order, Plant Protection (Fees and Charges) Rules, 2009, Plant Protection (Importation of Plants, Plant Products and Regulated Articles) Rules, 2009, among others. All available at: http://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/PlantProtectionAct_Cap324.pdf.

are aligned with the International Plant Protection Convention (IPPC), of which Kenya is a member.

To apply for an import permit, a registered seed merchant shall submit a notice of intention to import, which can be submitted to KEPHIS online.⁶¹ Once KEPHIS approves the notice of intention to import, it issues the applicant an import permit valid for the consignment for which it is issued,⁶² specifying the requirements that must be met by the importer.⁶³ The online import permitting portal contains a dropdown list for the applicant to select the desired crop intended for importation and country from which the import originates, along with detailed SPS requirements listed by crop. The phytosanitary certificate to be issued by the importing country must comply with these conditions.

Considering the high susceptibility of potato to pests and diseases, phytosanitary control is vital. Once the potato seed consignment arrives at the port of entry or border post, KEPHIS inspects it and collects random samples for checking whether the seed is disease free. The samples are tested from KEPHIS' laboratories, which usually takes a few days to a week. Stakeholder consultations confirmed that KEPHIS has a zero tolerance towards diseases and pests (see Annex 1). While Kenya's SPS measures for potato seed are among the most stringent in the world, there are other countries that have some form of zero-tolerance SPS measures for certain potato seed pests and diseases. See Table 4 below with a comparative analysis of SPS Measures by selected countries. Egypt, Morocco, Scotland, and the European Union, under the United National Commission for Europe (UNECE) guidelines for pest-free areas,⁶⁴ have zero-tolerance potato seed pests and disease standards that are similar to Kenya's, as well as more stringent requirements in relation to some diseases (see Table 4).

⁶¹ Regulation 23 (1) (b-c) Seeds and Plant Varieties Act (Seeds) Regulations. The application is made via www.infotradekenya.go.ke.

⁶² Regulation 23 (1) (c) Seeds and Plant Varieties Act (Seeds) Regulations, 2016, http://kenyalaw.org/kl/fileadmin/pdfdownloads/LegalNotices/2016/LN220_2016.pdf

⁶³ Sikinyi Evans, "Seed Certification, Import and Export for Kenya", Seed Trade Association of Kenya (STAK), 33 (September 2012) <http://erepository.uonbi.ac.ke/bitstream/handle/11295/106884/Sikinyi%20E-%20Seed%20Certification%2C%20Import%20%26%20Export%20For%20Kenya.pdf?sequence=1&isAllowed=y>.

⁶⁴ United Nations Economic Commission for Europe (UNECE). (2014). UNECE Standards S-1 concerning the marketing and commercial quality control of seed potatoes. New York and Geneva: United Nations. Retrieved from https://www.unece.org/fileadmin/DAM/trade/agr/promotion/Brochures/SeedPotatoes/HighResolution_English.pdf. These guidelines are aligned with the International Standards for Phytosanitary Measures (ISPM) on pest free potato micro-propagative material and mini-tubers intended for international trade.

Table 4: Comparative Analysis of SPS Measures by Selected Countries.⁶⁵

SPS Measure	Kenya	Egypt	UK/Scotland ⁶⁶	Morocco	Zambia	Zimbabwe	South Africa	Ethiopia	Uganda	Tanzania	Netherlands	Japan
Zero-tolerance Policies for Imports	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National ISTA Accredited Labs	✓	✓	✓	X	✓	✓	✓	X	X	✓	✓	✓
Observe ISTA Standards	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Have a Pest Free Zones/Sites	X	✓	✓								✓	

Disease	Kenya	UNEC E	Egypt	Scotland *	Morocco
Bacterial wilt or Brown rot (<i>Ralstonia solanacearum</i>)	✓	✓	✓	✓	✓
Wart disease (<i>Synchytrium endobioticum</i>)	✓	✓	✓	✓	✓
Golden nematode (<i>Globodera rostochiensis</i>)	✓	✓	✓	✓	✓
Ring Rot (<i>Clavibacter michiganensis</i>)	✓	✓	✓	✓	✓
Potato Spindle Tuber Viroid	✓	✓	✓	✓	✓
Mycoplasma	✓	✓	✓	✓	✓
Root rot nematode (<i>Ditylenchus destructor</i>)		✓		✓	✓
Root knot nematode (<i>Meloidogyne spp</i>)		✓		✓	✓
Potato Tuber Moth (<i>Phthorimaea operculella</i>)		✓		✓	✓
Potato Cyst Nematode - PCN (<i>Globodera spp</i>)	✓	✓	✓	✓	✓

⁶⁵ World Bank Group, *supra* note 7.

⁶⁶ Scotland observes zero-tolerance during seed potato production and is restrictive on imports. Scotland is the only seed exporting country in Europe where potato brown rot has never been found. Id.

(in production land)				
Colorado Beetle (<i>Leptinotarsa decemlineata</i>)				
Potato Tuber Eelworm (<i>Meloidogyne chitwoodi</i> , <i>M. fallax</i>)				

As a result, stakeholders reported that the main challenge to importation of potato seed is compliance with SPS measures. There have been instances in which several potato seed consignments have been rejected by KEPHIS for imports where a slight percentage is found diseased. Notably, only KEPHIS is allowed to conduct laboratory testing for potato pests and diseases. The option to authorize private laboratories to conduct such tests was proposed under the current Plant Protection Bill but was later removed and rejected with seed industry preference for KEPHIS to retain such power for fear that companies would be prejudiced.

Where the associated risk of the potato seed to be imported is not on KEPHIS' record or unknown to it, the importer applies to KEPHIS for a pest risk assessment (PRA).⁶⁷ The import permit can only be issued by KEPHIS after it conducts the PRA and finds that there is no associated pest risk or a very minimal risk.⁶⁸ Consultations showed that the process of KEPHIS conducting a PRA can be long, bureaucratic, and tedious due to understaffing.⁶⁹ For instance, KEPHIS currently has only one staff member responsible for PRA.⁷⁰ There are reports however, that KEPHIS is in the process of creating a separate division on PRA and is collaborating with development partners to establish a baseline assessment of PRA for bacterial wilt and PCN.

III. Recommendations to Address Regulatory Challenges in the Potato Seed Sector

While there is a comprehensive legal and regulatory framework for seed in Kenya, including potato seed, significant gaps in the seed rules and their implementation remain that could be addressed in order to create an enabling environment for trade and development of the potato seed industry. The recommendations below are designed to incorporate stakeholder findings and good regulatory practices to address some of the challenges identified in the case study.

⁶⁷ Plant Protection Act (Importation of Plants, Plant Products and Regulated Articles) Rules, s11, 2009. See also, Kuhlmann et al. 2021, *supra* note xx.

⁶⁸ Importation of Plants, Plant Products and Regulated Articles Rules, s12, 2009.

⁶⁹ Katrin Kuhlmann, Yuan Zhou, and Adron Naggayi Nalinya, "Case Study on Regulation of Vegetable Crops in Kenya", December 2021.

⁷⁰ Id.

A. Increase Funding for Potato Seed Breeding, Research, Development, and Multiplication

Facilitating increased collaboration with private seed companies in potato seed production will help expand participation in the sector. This could be done in part through legal frameworks like licensing arrangements to commercialize existing potato varieties that have been developed by the public sector. KALRO has, for instance, been licensing some of its potato varieties to private seed companies on a non-exclusive basis, although stakeholder consultations revealed that exclusive licenses are also used, particularly with multinational seed companies. These licensing approaches could be expanded to enable wider production and supply of potato seed EGS and certified seed.

As one recommendation, exempting payment of royalties by small seed producers on fewer than 10 hectares and on varieties older than 20 years could positively impact potato seed prices. Research shows that potato seed prices could be reduced by up to 30 percent if this option is explored.⁷¹

The government could explore increasing funding for public research for potato seed, which could be used to hire qualified breeders and obtain required equipment for breeding. Technical capacity building could also be supported through continued partnerships with CIP and development partners.

B. Revise and Develop New Protocols on Potato Variety Release and Registration

A large percentage of unregistered varieties continue to exist and be used in the informal sector. KALRO could continue to adopt these varieties and clean them up for registration so that they can be formally commercialized by farmers. In addition, the regulatory framework could be revised to incorporate provisions with flexibilities aimed at integrating local varieties in the formal system. Otherwise, there will continue to be a threat to the potato plant health system, as farmers continue to use unregistered varieties.

With regard to variety testing protocols for true potato seed, KEPHIS noted the need for roundtable discussions with key industry stakeholders and development of new protocols for true seed testing, as well as updating of existing DUS and NPT protocols for potato seed.

⁷¹ World Bank Group, *supra* note 7.

C. Inclusive Approaches on Quality Assurance and Improved Implementation

In order to create a bridge between informal and formal seed production systems and improve access to quality and disease-free potato seed by smallholder farmers, QDS and/or clean seed could be formally recognised by the Ministry of Agriculture and KEPHIS as another seed class. QDS systems can allow for less rigorous and low-cost inspection regimes while producing quality, clean disease-free planting material from registered varieties. In addition, standards and guidelines on QDS could be developed, with proper capacity building initiatives for farmers put in place. Support at the county and state level will also be needed to ensure that standards are observed.

Regulatory approaches designed to encourage small-scale seed production could be explored, including more flexible requirements for registration of small seed producers, as well as affordable inspection, laboratory testing, and registration charges for small seed producers.⁷² KEPHIS mentioned that the Seeds and Plant Varieties (Vegetatively Propagated Crops) Regulations were being developed to include flexibilities to make potato seed production more affordable to small-scale producers, but the process has been stalled due to limited funding to facilitate stakeholder consultations.

KEPHIS could also consider enhancement of private seed inspection for potato seed. There is currently only one authorized private potato seed inspector, and most of the consulted seed companies were unaware of the option to become authorized. Digital seed inspection and certification schemes could also be adopted by KEPHIS to avoid delays in potato seed inspection.⁷³

D. Improve Potato Warehouse Receipt Systems for Better Marketing and Distribution

Storage and transportation of potato seed remain among the main challenges to potato seed marketing, resulting in increased costs. Stakeholders proposed creating an efficient WRS for potato seed, with a strong regulatory framework underpinning it. While WRS are used for cereals and legumes, stakeholder consultations revealed that none exist for potato seed, yet storage is a major challenge.

E. Streamline Rules on Plant Breeders' Rights and Their Implementation

With regard to PVP/PBR, stakeholder consultations revealed that KEPHIS is in the process of aligning the PBR Regulations with the amended Seed and Plant Varieties Act provisions

⁷² Kuhlmann and Dey, *supra* note 21.

⁷³ Id.

on PVP. This process could be prioritized, and KEPHIS could also consider strengthening implementation of the PVP/PBR framework in the context of seed potato, since it is key to encouraging innovation and investment in the potato seed industry.

F. Improved Cross-Border Trade

KEPHIS is reportedly working to enhance seed inspection and pest risk assessment capabilities for imported seed potato through the creation of a separate PRA division within KEPHIS, which will need to be fully equipped in order to enable it to operate efficiently. KEPHIS could also consider better equipment in its phytosanitary laboratory and increased human resource to facilitate laboratory testing for diseases. There have also been reports of KEPHIS' collaboration with development partners to establish a baseline assessment of PRA for BW and PCN. This process could be prioritized and implemented.

Conclusion

The potato seed industry has immense market potential that has barely been realized, partly due to gaps in the legal and regulatory environment that complicate market entry and development. Stakeholder consultations revealed that seed companies, including multinational companies, have faced challenges in Kenya's potato seed market due to complicated regulatory frameworks, and the current system does not adequately integrate informal producers of potato seed. These challenges will have to be addressed moving forward, including through flexibilities aimed at bridging the informal sector, which is the largest player, and the formal potato industry.

Annex 1: Potato Seed Certification Standards

Fourth Schedule

Field Standards													
Isolational, Meters (Minimum)													
BR	PB	B	CL	C2-C4	BR	BR	BI	CI	C2-C				
100	100	100	50	50	0	1	2	2	3				
Disease					Tolerance								
Bacterial wilt or Brown rot (Pseudomonas solanacearum)					Nil during any inspection								
Wart disease (Synchytrium endobioticum)					Nil during any inspection								
Golden nematode (Heterodera rostoch- ionsis)					Nil during any inspection								
Ring rot (Corynebacterium sepeclonicum)					Nil during any inspection								
Potato spindle viroid Mycoplasma					Nil during any inspection Plants per thousand								
Processing Standards													
Screens* (bottom sleeve) (mm)				Screenings Allowed				Grades					
28.0-45.0				-----				(5 tubers per 50 bag)					
46.0-60.0				-----				Allowed					
Diseases/abnormalities will be permitted up to the stated tolerances:													
Disease Abnormality					Tolerance (Tubers Per 50 Kg. Bag)								
					Basic			Certified					
Scab (Streptomyces spp., Spongospora subterraria) No more than 50% tuber covered)					25%			50%					
Rhizoctonia (Rhizoctonia solani)					10%			30%					
Pink rot (Phytophthora erythroseptica) Soft rot (Erwinia spp)					0%			1%					
Severe tuber moth					2%			5%					
Mis-shapen and damaged tubers					0%			5%					
Laboratory Standards													
Minimum Parity % by weight		Maximum other crops seed % by number			Maximum Weed Seeds % by weight		Minimum Germination Capacity %		Maximum Moisture Content %				
99		---			---		---		---				

Field Inspection Fees (KSh.)

Crop Under Inspection	Inspection per Hectare	Minimum per Field	Re-Inspection on Appeal or at Owner's Request	
			Per Hectare	Min. per Field
Certified	100	450	165	575
Standard	100	300	165	575

Sampling and Sealing Fees (KSh.)

Crop Under Certification	Sampling and Lot Examination	Labelling and Sealing per 100 Kg.	Re-Sampling Seed Lots		Re-Sealing per 100 Kg
			Min. per Lot	Per 100 kg	
Certified	7	7	230	3.5	3.5
Standard	17	17	230	3.5	3.5
Sampling and Pre-Controlling of Imported Seeds					
Crop Under Certification	Minimum fees (500 kg)	Fees per (100 kg)	Fee per (1,000 kg.)		
Certified			170		

Laboratory Seed Testing Fees (Ksh.) Per Sample

Crop Under Certification	Purity, Germination Moisture Content and Seed Health	Resampling and Re-Testing
Certified	125	----
Standard	125	----

Annex 2: Consulted Stakeholders

No.	Institution/ Company	County	Contact
Nairobi			
1.	KALRO	Nairobi	<p>Dr. Eliud Kireger - Director (Crops) - eliud.kireger@kalro.org Benjamin Kivuva - Assistance Director, Crop Production and Seed Systems - benmusem@yahoo.com/ benjamin.kivuva@kalro.org</p> <p>Felister Makini - Ag. Deputy Director, Crops - felister.makini@kalro.org</p>
2.	KEPHIS		<p>James Kefa Oganda - Technical Manager - chipolejames@yahoo.com koganda@kephis.org</p> <p>Simon Maina - Head Seed Certification and Plant Variety Protection - smaina@kephis.org</p> <p>Gentrix Juma - Senior Seed Inspector- gjuma@kephis.org</p>
3.	National Potato Council of Kenya	Nairobi	npck@npck.org +254 712 338633/ +254 799739578
4.	GTIL (Apical cuttings and minitubers only)	Nairobi, Lower Kabete	0729852403 kae@africaonline.co.ke
5.	Kenya Highland Seeds (Royal seed)	Nairobi	Peter 0706 825555 Peter.francome@khs.co.ke
6.	Kenya National Potato Farmers' Association	Nairobi	
7.	Starlight Cooperative society	Nakuru-Molo	0721109200
8.	Mahindra and Mahindra S.Africa Ltd	Nairobi	P.O. Box 14596-00800 Nairobi 0734282818
9.	Fresh Crop Ltd		chrisgasperi1@gmail.com
10.	Stet Holland B.V		Henk.Holtslag@stet-potato.com
11.	EuroPlant Aardappel B.V		jjanse@europplant.biz
Nakuru			
12.	KALRO-Tigoni	Kiambu, Limuru	0712456653/733834675 karitigoni@yahoo.com

13.	ADC-Molo	Nakuru, Molo	0721202565 Judith, adcmolo@gmail.com
14.	Agrico East Africa (under Potato Services Africa Ltd.)	Nakuru, Kabarak	0741788380-Ruth info@agrico.co.ke
15.	FreshCrop Limited	Nakuru, Narok, Nyandarua	Chris Gasperi (Founder and CEO) freshcroplimited@gmail.com, 0727230484 0795122648,
16.	Singus Enterprises	Nakuru- Molo	Ann Mbugua 0722691245,
17.	Egerton University Seed Unit	Nakuru, Njoro	P.O.Box 536-20115, Prof. Kibe 0721402957 or John Nganga 0723079623
18.	Clabham Investment limited - Frontier farm	Nakuru, Mau Narok	0710607935 Boniface, bonifacetoday@yahoo.com
19.	Baraka Agricultural College (Nakuru)	Nakuru, Molo	Antony Majanga 0724775769
20.	Agripom Kenya Limited	Nakuru Molo	0723111205 rkimanya@agripom.com
21	Agriculture and Food Authority	Nakuru	Antonina Luta akeya@afa.go.ke
Meru			
22.	Kisima Farm	Meru, Timau	Oliver Fancombe - 0789458376 potatoes@kisima.co.ke
23.	Savannah Fresh Hort. Farmers' Cooperative Society Ltd	Meru	Patrick 0708347959
Nyandarua			
24.	Jancota Limited	Nyandarua, Olkalou	Jancota, 0743317508 info@jancota.com
25.	Utopian Supplies Kenya Limited	Nyandarua, Rironi	Stephen, 0725240133 Stephen@utopiangroup.co.ke
26.	Flomsa Limited	Nyandarua & Nakuru	Florence Kairu flomsalimited@gmail.com 0707848750
27.	Rosenbelt Kenya Ltd	Nyandarua	Eric Wachira eric@rosenbelt.co.ke 0799992952
28.	Suera Farm	Nyandarua, Oljoro'orok	0706-186579 Suera.flowers@gmail.com
29.	Kimingi Farm (Kalro Tigoni grower)	Nyandarua	John 781431222, 0726107722
30.	NYS Tumaini	Nyandarua, Olkalou	Kennedy Nyakango, 0720036271