



EAST AFRICAN COMMUNITY



Regional Situation Analysis of the Potato Sub-Sector in the East African Community

One People. One Destiny



EAST AFRICAN COMMUNITY

Regional Situation Analysis of the Potato Sub-Sector in the East African Community

One People. One Destiny

Table of Contents

LIST OF ACRONYMS	I
LIST OF FIGURES & TABLES	II
EXECUTIVE SUMMARY	1
1. KEY FINDINGS	2
2. CHALLENGES IN THE POTATO SECTOR	3
3. OPPORTUNITIES IN THE POTATO SECTOR	3
4. RECOMMENDATIONS FOR THE SEED POTATO SECTOR	4
5. INSTITUTIONAL MAPPING OF KEY POTATO VALUE CHAIN ACTORS	6
Ware Potato Value Chain	6
Seed Potato Value Chain	7
6. WARE POTATO PRODUCTION AND MARKETING	8
Production	8
Stagnating Potato Production Volume and Decreasing Yields	9
Potato Production has been Driven by Expansion in Land Area and not Yield	9
Domestic Utilization	10
Ware Potato Marketing	10
Ware Potato Processing	11
7. SEED POTATO PRODUCTION	12
Seed Production Systems	12
Formal Seed Potato Multiplication	12
Sources of Seed Potato	13
Certified Seed Supply and Demand	14
Improved Potato Variety Released and Adopted	14
Seed Potato Production and Marketing Challenges	15
8. EAC SEED REGULATORY ENVIRONMENT	16
Membership to International Bodies and Treaties	16
Availability of Seed Policy, Seed Law, Seed Regulation and Seed Potato Protocols	16
Certification Process	17
Phytosanitary Measures	17
Import and export Process for seed potato in EAC	18
EAC Potato and Seed Potato Standards	18
9. EAC INTRA-REGIONAL TRADE	19
Ware Potato Intra-Regional Trade	19
Seed Potato Intra-Regional Trade	19
Progress made by EAC to facilitate Intra-Regional Trade	20
EAC Regional Seed Potato Trade Barriers	20
10. GENDER IN POTATO VALUE CHAIN	22
Gender Roles in Potato Value Chain in EAC	22
Constraints Affecting Men and Women Participation in Ware and Seed Potato Production	22
Existing Opportunities for Men and Women in Seed Potato Production	23
11. VALIDATION AND PRIORITIZATION OF RECOMMENDATION	24
Partner States Recommendations	24
EAC Secretariat Recommendations	25
EAC Secretariat & Partner States Recommendations	25
ANNEX: KEY POTATO VALUE CHAIN ACTORS	26
REFERENCES	27

List of Acronyms

ADC Kenya Agricultural Development Corporation	MINAGRI Ministry of Agriculture Animal Resource Development Board, Rwanda
ASARECA Association for Strengthening Agricultural Research in Eastern and Central Africa	MoA Ministry of Agriculture, Kenya
C1 Certified first generation	NARO National Agriculture Research Organization, Uganda
C2 Certified second generation	NPCK National Potato Council of Kenya
C3 Certified third generation	NPPO National Plant Protection Organization
CIP International Potato Centre	NPT National Performance Trials
COMESA Common Market for Eastern and Southern Africa	OECD Organization for Economic Co-operation and Development
COPE Centre of Phytosanitary Excellence	ONCCS National Seed Control and Certification, Burundi
DCIC Department of Crop Inspection and Certification, Uganda	OSBPs One-Stop Border Posts
DUS Distinctiveness, Uniformity, and Stability	PCN Potato Cyst Nematode
EAC East African Community	PPP Public-Private Partnership
EGS Early Generation Seed	PRA Pest Risk Analysis
ESWS Electronic Single Window System	QDPM Quality Declared Planting Materials
FAO Food and Agricultural Organization of the United Nations	QDS Quality Declared Seed
FECOPORWA Rwanda Federation of Irish Potato Growers Cooperation	RAB Rwanda Agricultural and Animal Resources Development Board
IFDC International Fertilizer Development Centre	RICA Rwanda Inspectorate Competition and Consumer Protection Authority
IPPC International Plant Protection Convention	SADC Southern African Development Community
ISABU Institute Science Agronomy of Burundi	SPS Sanitary and Phytosanitary Standards
ISPM International Standards for Phytosanitary Measures	TARI Tanzania Agricultural Research Institute
ISTA International Seed Testing Association	TASTA Tanzania Seed Trade Association
KALRO Kenya Agricultural and Livestock Research Organization	TOSCI Tanzania Official Seed Certification
KEPHIS Kenya Plant Health Inspectorate Service	UPOV International Union for the Protection of New Varieties of Plants
MAAIF Ministry of Agriculture Animal Industry and Fisheries, Uganda	VCU Value for Cultivation and Use

List of Tables & Figures

Table 1: Rainfed potato planting (P) and harvesting (H) calendar in EAC	8
Table 2: Potato Production, Area, Yield and Number of Farmers in EAC, 2018	8
Table 3: Proportion of Potato produced and Consumed in EAC.....	10
Table 4: Volume in metric tonnes of certified seed potato produced in EAC, 2011-2019	14
Table 5: Percentage of Improved Potato Varieties Adopted by Farmers in EAC	14
Table 6: Membership to seed related International Bodies and Treaties.....	16
Table 7: Availability of Seed Policy, Seed Law, Seed Regulation and Seed Potato Protocols	17
Table 8: Total Volume of Ware Potato Traded within EAC, MT (2014-2018)	19
Table 9: Gender Roles in Potato Value Chain in each EAC Partner State	22
Figure 1: Ware Potato Value Chain Actors	6
Figure 2: Seed Potato Value Chain Actors	7
Figure 3: Potato Production and Yield in EAC, 2013-2019	9
Figure 4: Area Planted with Potato and Yield in EAC, 2013-2019	9
Figure 5: Volumes of Seed Potato Exported by Kenya, Rwanda and Uganda (in MT)	19
Figure 6: Volumes of Seed Potato Imported by Kenya and Uganda (in MT).....	20



Executive Summary

The Potato (*Solanum tuberosum*) has increasingly become an international commodity due to the urbanization in developing countries, increase in incomes in many Asian countries, and the expanding and popularity of fast-food chains, among others. This has resulted in changes of diets, with particular preference for processed food products including potato. Potato is ranked as the fourth most important staple food crop, and the number one non-grain food commodity as per the Food and Agriculture Organization of the United Nations (FAO) (2018). In developed countries, potato is regarded as a cheap staple food while it is a high-priced vegetable in developing countries. Besides that, potato is a source of income in both developed and developing countries, and is used in several end products, including fried potato products, table potatoes, mashed potatoes, ingredients for sauces and starch products.

The potato is ranked among the top 10 strategic staple crops for food and income security in the East African Community (EAC). In the last 20 years, potato production has increased from 1.6 million MT to 3.4 million MT in EAC (FAO, 2018), with the increase resulting from expansion of acreage under potato rather than from improved productivity. This indicates that innovations and technologies such as new varieties, use of high-quality seed, and good agricultural practices have either not been adopted or adoption has failed to reach the necessary threshold to increase productivity in the subsector. Low productivity and limited use of quality seed potato, by less than 4% of farmers in EAC, have remained key bottlenecks in the region. This is despite initia-

tives aimed at improving variety development and introduction, seed production and trade within the region. These initiatives include harmonization of seed regulations and standards under EAC led by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) which have been undertaken with varying degrees of success. In an effort to increase availability of improved quality seed, most of the EAC Partner States have included either the quality declared seed or standard seed in their laws and regulations.

This study analysed the current potato subsector in the East African Community, quantified the seed gap in each Partner States while highlighting the value of the seed trade opportunity in the region. The study identified key challenges and highlights areas of recommended interventions for improved production and trade of certified seed and ware potato.

Between August and November 2020, country level studies were conducted in each EAC partner state by a team of consultants with support from GIZ. Detailed, separate reports on the potato sector situation in each country were prepared and validated at country level. This report gives a high-level outlook of the regional potato sector in EAC, with recommendations to improve potato production and trade in the region.

One key point noted in most partner states was missing data due to non-existence of the data or the difficulty in accessing the data, an area needing more focused effort and support in the region.

1. Key Findings

The study identified the following issues that focus on increasing the production, quality and availability of both seed and ware potato and trade in EAC.

1. Growing ware potato market: From official government and FAO records, potato production and marketing in the EAC are on an upward trend. Similarly, the demand for potatoes has been expanding. A number of factors are responsible to the growth of the ware potato market including the growing youth population and urbanization in most of the member states. Potatoes are also deemed easy to cook in a variety of ways and highly palatable. Furthermore, potatoes are relished by higher-income urban dwellers, who consider them as a high quality and prestigious food item. This is particularly so when served in form of snacks such as potato crisps and in the fast-food industry as chips (French fries). According to FAOSTAT, 2018 the per capita consumption of potatoes in EAC stands at 35 kg per year.

2. A large supply-demand gap on some desired potato varieties: There is a wide gap between the quality of potatoes desired by large potato processors and what the farmers are able to supply. Varieties available and produced by farmers are sometimes not suitable due to inferior qualities for processing. Processing requires specific potato characteristics that determine the quality of end products as desired by consumers. Often, the available varieties do not have these qualities, or potato farmers are not aware, hence unable to deliver quality potatoes required, leading to missed opportunities.

3. Wide margin between farm-gate prices and market prices of potato: The ware potato market in EAC is characterized by a wide marketing margin of approximately 50% to 100% depending with the partner state. This has two implications: first, there is a disproportionate sharing of the benefits of potato business within the value chain, with the farmer as the most disadvantaged; and second, the potato value chain is inefficient thus imposing an unnecessarily high cost on the consumer. The former fact could discourage investment in potato farming and resulting in the observed non-adoption of new potato varieties by farmers. The latter on the other hand discourages consumption and limits the growth of the market for ware potatoes in the region.

4. Unmet demand for quality seed: Certified seed can increase yield from ~8t/ha to 16-20t/ha for smallholders, but currently only ~4% of the demand for certified seed in EAC is satisfied.

5. Improving regulatory environment that support potato production: There is evidence of an improved regulatory environment in all the EAC Partner States. For example, in Kenya, the 2016 Seed and Plant Variety Act provides for authorization of private seed inspectors, similar to Tanzania, Uganda and Rwanda, albeit at different stages of implementation. Third party certification can enhance the availability of seed potatoes by improving the capacity to effectively meet the demands for seed certification. For example, the Kenya Plant Health Inspectorate Service (KEPHIS) has already developed a framework for authorization of qualified individuals or organizations, to perform seed inspection services. It also has in place a comprehensive training program, leading to the authorization of the qualified seed inspectors. This however, requires further investments. So far, 28 inspectors from private seed companies and county governments have been trained and authorized. The other EAC Partner States of Uganda, Rwanda and Tanzania are also at different levels of implementation of this provision of their seed law. Harmonized training curriculum and systems will allow private inspectors to inspect across borders where necessary. Harmonization of the inspection and certification protocols within partner states in the region will greatly increase trust and confidence between regulatory agencies, leading to increased cross border potato movement.

6. Low potato yields: Potato production in EAC has been driven primarily by the expansion of land area under potato and to a lesser degree by increased yield. From 2014 to 2019, the average area under potato has increased by 18% while average yield has decreased by 11%.

2. Challenges in the Potato Sector

1. Inadequate infrastructures including storage, Collection Centers, Cold storage chains, and storage equipment/materials. These inadequacy affects the entire supply chain, and influence pricing of seed and ware potato significantly
2. Inadequate transportation facilities (access, feeder roads, suitable transportation trucks/motorbikes, packaging materials). Considering the bulky nature of potatoes, the poor state of these facilities affect the quality and price of both ware and seed potato. This is for both domestic movement and more so cross border regional trade.
3. Insufficient Early Generation Seed potato production facilities (Conventional & aeroponic Screen houses). This affects the supply of adequate basic seed potato into the supply chain
4. Increased diseases/pest pressure in the potato production areas resulting in declining seed potato yield and production.
5. Lack of capacity to produce EGS Seeds. Low skills, facilities and capital investments required for EGS
6. Limited access to financing mechanisms offering low-interest credit for seed/ware potato production
7. Lack of technological tools/ platforms to streamline demand-supply linkage
8. Climate change and overreliance on rainfall
9. Low number of field inspectors, skills and facilities for potato certification by the regulatory agencies in partner states.
10. Lack of specific potato certification protocols including QDS where provided for in law.
11. Low capacity/ lack of national laboratory for seed testing.
12. Lack of implementation of the harmonized seed potato testing, inspections, and certification regulations in the region
13. Land fragmentation practice hinders large scale seed production, considered appropriate for mechanization.

3. Opportunities in the Potato Sector

1. Increased demand for potato in East African market
2. The possibility of three (3) cropping seasons in EAC partner states with the two main seasons having ample rains, allowing for increased engagement in seed production, trade, and all year availability and distribution.
3. The availability of seed production coordination structures (Public-Seed Committees). The existing platforms can be leveraged to enhance coordination of the production and supply chain in the region.
4. Increased number of stakeholders in the seed potato supply chain
5. Opportunities for investment of commercial private in-vitro plantlets production, will facilitate private investment for EGS including in vitro laboratories in the region
6. Emerging use of aggregation and logistics platforms to sale ware and seed potato that are existing in partner states which can be expanded to the region.
7. Opportunity to produce specific varieties on demand by the processing industries
8. Increased small scale farmer interest in production of ware and seed potato
9. Availability of arable land and suitable agro-ecological zones for potato production. There is plenty of unutilized land in area where potato can be produced. This can be utilized for production of seed and ware.
10. Ware potato importation shows that there exists a huge gap and hence the opportunity to enhance potato production within the region



4. Recommendations for the Seed Potato Sector

Based on interviews conducted in the field with potato stakeholders, the following recommendations were proposed for investment and policy reform actions, to improve the availability of seed potato in EAC. During the validation workshop, these recommendations were validated and prioritized by invited stakeholders. (see Chapter 11: Validation and Prioritization of Recommendation)

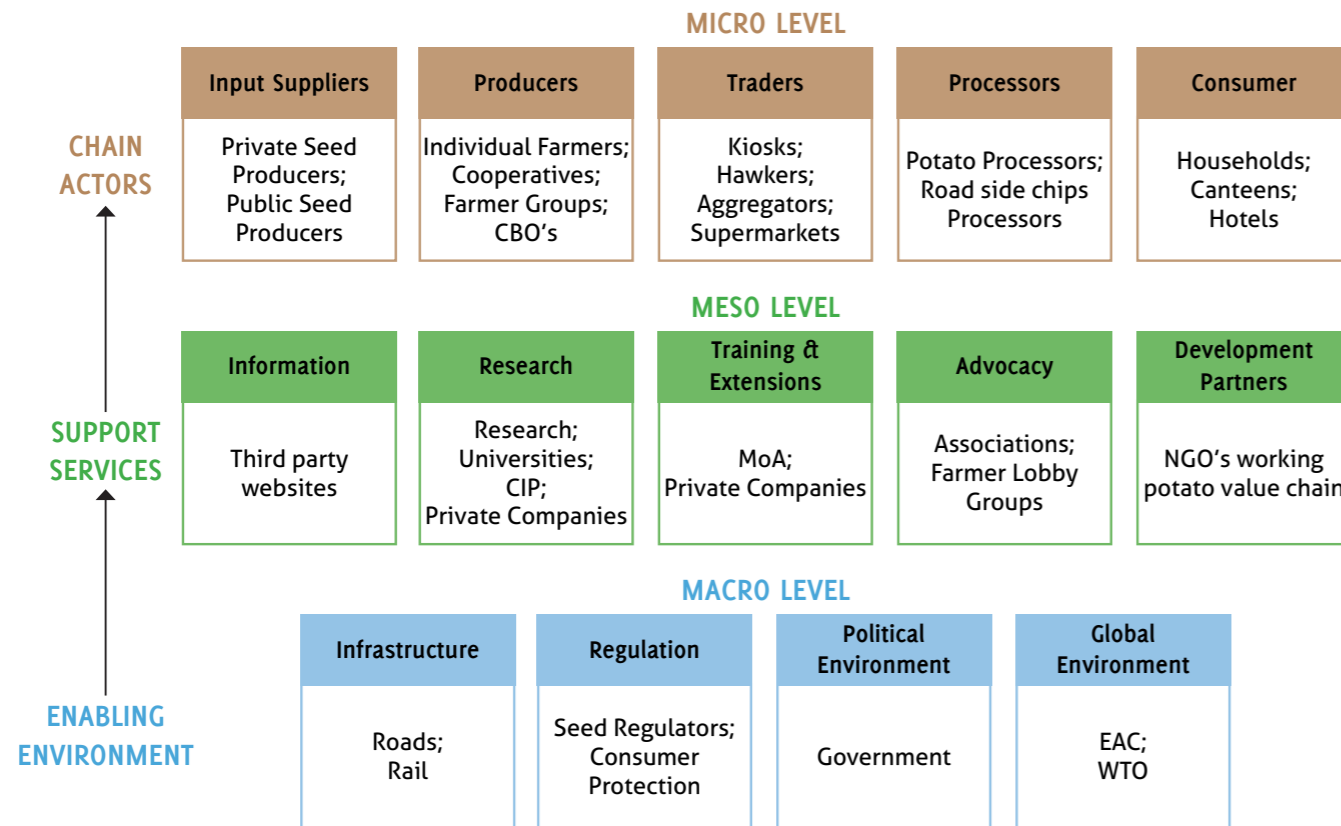
- 1. Strengthen new and existing seed potato producers:** Most seed multiplier groups lack access to finance, technical trainings and support, a key constraint in seed potato production. Most small scale producers still rely on the use of traditional seed production methods and have not professionalized seed production, mechanization and marketing. Seed potato production is capital intensive, particularly the early generation seed (EGS), whose returns only come after several generations of multiplication. Access to affordable finance and technical training in good agricultural practices (GAP) will be key to strengthen their capacity to produce adequate quality seed
- 2. Support the use of rooted apical cuttings and other rapid multiplication technologies for seed:** The use of mini tubers and apical cuttings are being promoted by CIP to increase the availability of seed potatoes in EAC. Use of apical cuttings reduces the generations required from 7 to 5, before the farmer gets the seed. Additionally, it provides better disease-free material, which the farmer can further save for one or two seasons. The national research institutions in partner states, have similar programs to produce cuttings which are multiplied by seed producers and seed entities, to certified seed.
- 3. Encourage Public-Private Partnerships to unlock land for large-scale seed production to increase the availability of seed potato of appropriate varieties:** EAC partner states such as Kenya and Uganda import ware potato that are in-demand by processors from Egypt and South Africa, yet these could be grown locally. It is estimated that only 5% of varieties registered and released in EAC are suitable for processing. However accessing adequate quantities of seed for these varieties, is a major challenge, given the inability of the public institutions to produce seed adequately. The private sector can effectively fill this gap through leveraging on financial, research, technical and development capabilities to multiply these public sector owned varieties.
- 4. Explore and scale the use of agritech aggregation and logistics platforms:** To bypass brokers, seed and ware potato sellers should explore the use of agritech platforms such as Viasi Soko hosted by NCPK in Kenya to reduce the cost of seed to farmers and ware potato retail price. These platforms also provide market information and dissemination. Similar initiatives are under development in Rwanda and should be emulated in the other member states and explore the possibility of regional platform. The member states will need support to establish these.
- 5. Focus on implementation of EAC seed potato standards for regional Trade:** From the industry experience, it is evident that cross-border trade can be a major challenge in practice. Border inspectors need to be conversant with requirements of regional harmonized seed regulations and Sanitary and Phytosanitary (SPS) requirements, for seed movement. Import and export requirements should also be built into trade facilitation efforts including, for example, the creation of information technology (IT) platforms. Additionally, commitment on implementation of the regulation by partner states is crucial.
- 6. Regulatory collaboration:** The partner states of EAC differ vastly in technical capacity and abilities to implement technical agreements and regional regulatory requirements. The effectiveness of regional harmonization efforts will depend upon the degree to which regulators from the various partner states are willing to work together, share best practices, and recognize each other's procedures and results.
- 7. Increasing awareness of EAC Regional Frameworks:** While a number of the respondents interviewed noted the importance of EAC regional harmonization, many market participants know little about the specific content of these initiatives. Raising awareness of regional frameworks and the opportunities they provide to market participants is necessary. This can be done, for example through legal guides outlining different various regulations, how to implement to take advantage of them in practice, or through in-country platforms that are focused on opportunities concerning potato.
- 8. Increase the use of certified seed by farmers:** Productive and profitable seed system relies on the skills and capacities of farmers to benefit from high quality seed. Farmer training will help farmers get the best out of their quality seed. For example, if farmers understand that virus diseases are transmitted by aphids, and that aphids acquire virus from other sources, they can readily see the value of removing virus-infected solanum weeds from hedge rows. Farmers can also avoid planting quality seed in soil infested with bacterial wilt, if they understand the contamination routes of the bacteria and other pests.
- 9. Improve seed distribution:** A network of decentralized seed producers will need to be established in order to make seed available locally. This network needs strong linkages and coordination with the specialized seed producers (G2 and G3) to source seed, with seed movement logistics facilitated—for instance, by the district extension offices or equivalents and seed traders in each member state.
- 10. Create and support policy advocacy platforms of seed potato actors:** To overcome the lack of information flow on seed business, seed potato stakeholder platforms should be formed with appropriate linkages to the wider potato value chain at each location. Functional platforms will facilitate the flow of technical and market-related information for the seed business as well as advocacy for the industry. Major gaps in the information pipeline and stakeholder decision support concern (1) demand versus supply of quality seed, (2) guarantee and traceability of seed quality, and (3) new trends in terms of varieties and production technologies. Principles of agile and user-friendly information systems can be better exploited for the benefit of seed businesses. Strengthening of existing platforms in member states or establishing them where nonexistent will be important. A regional umbrella platform should be considered for regional potato development.

5. Institutional Mapping of Key Potato Value Chain Actors

Ware Potato Value Chain

A value chain in this context refers to a range of activities required to bring a product from conception through the different stages of production to final delivery to consumers (Kaplinsky 1999; Kaplinsky and Morris 2001; Bammann, 2007; Wanene 2011; and Kirimi et al, 2011). The potato value chain in the East African Community can be summarized into three broad levels of actors (micro, meso, and macro) and the requisite support system as shown in Figure 1.

Figure 1: Ware Potato Value Chain Actors



The micro-level of value chain actors includes input suppliers, farmers (producers), traders (retailers and wholesalers), processors and consumers. The micro-level actors provide or modify a product either as an input (e.g., fertilizer, seed potato) or as product (such as ware potato). The farmers within the context of this study produce the potato while at the end of the value chain are the consumers of potatoes or processed potato products. The middle section of the micro-level consists of a number of actors, each performing a unique function on the chain (i.e., buying, grading, packaging, transporting, storing, selling and processing), each making decisions to support the flow of the produced potato to the consumer.

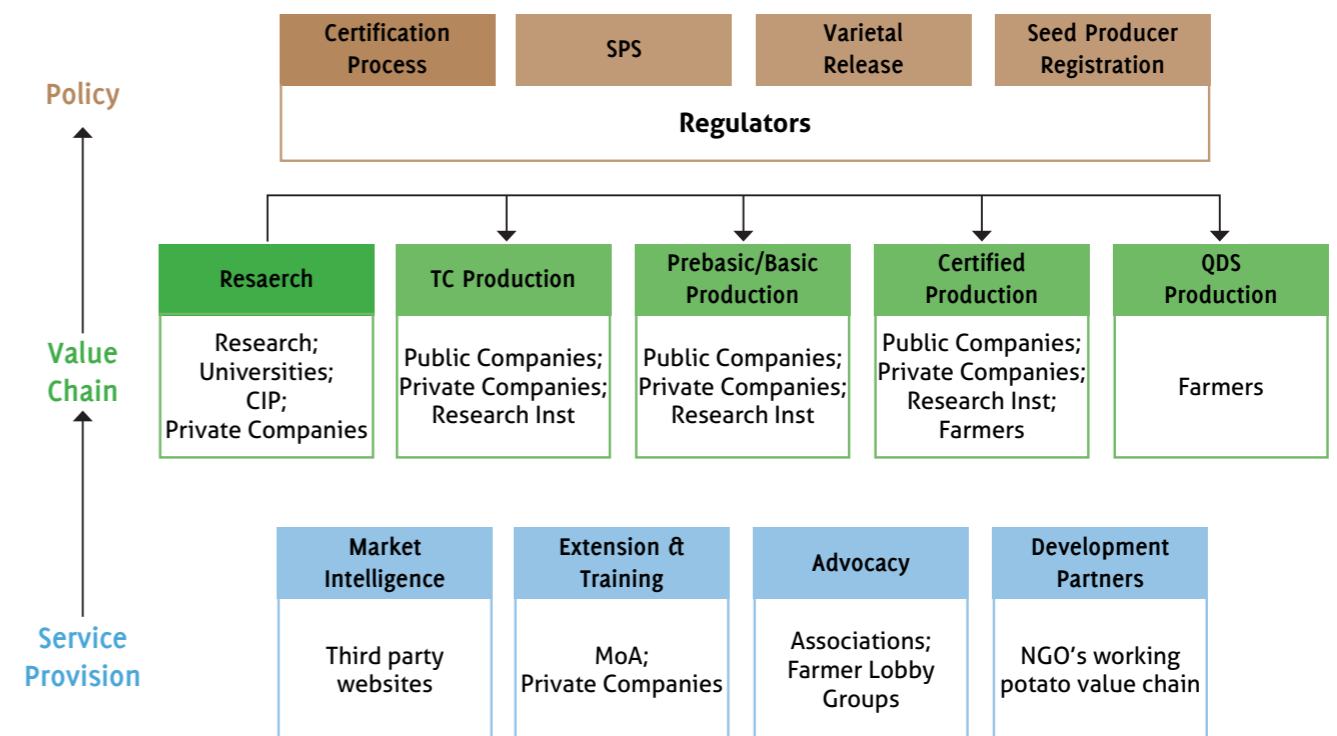
The meso level of the chain includes actors that provide a range of services to the potato value chain actors (i.e., extension, research, finance, transport, innovation, and communication, etc.).

The macro-level of the value chain framework is composed of the enablers, which primarily include institutions such as national and local governments, regulatory bodies, and international organizations such as the World Trade Organization (WTO), among others. These provide an enabling environment for effective operations along the value chain. The East African community and the member states will be part of the key macro level actors.

Seed Potato Value Chain

In the value chain for quality seed potato (Figure 2), linked actors produce seed potato of different generations, starting with pathogen-free seed from the laboratory and ending with use by ware producers. As seed moves from one actor to other across the chain as the output, each generation of seed provides the input to the next generation. Conversely money for purchase of the seed moves in the opposite direction. A well-functioning value chain will have a high level of coordination as the supply of seed by each group of actors in the chain closely matches the requirements of the next group's demand. Coordinated information flow in both directions along the value chain, is critical to ensure timely access to adequate quantities and quality of seed, of preferred varieties. The value chain should be able to continuously innovate in response to changing opportunities and demand

Figure 2: Seed Potato Value Chain Actors



The seed value chain is supported by a series of services. Quality control and assurance, a critical service, is usually implemented by government agencies responsible for formal certification process. The provision of new varieties to the value chain is another important service, as the diffusion of new varieties is an important function of a seed system. Ultimately, the costs of all actors in the value chain, including service provision, must be covered by the additional value generated by use of quality seed in ware potato production. The seed potato value chain forms the starting point for the ware potato value chain. Therefore, market opportunities, demands and profitability of the ware potato value chain drives the seed value chain.

Additionally, the policy environment shapes functioning of the seed value chain and service provision. The success of policies largely depend on the implementation and the facilitative nature of the policies. For instance policies supporting mandatory use of certified seed favor increased use of quality seed and ultimately yield and production. However, if production, accessibility and affordability is not facilitated such policy will be detrimental and punitive to disadvantaged farmers with no alternative seed source.

A list of potato value chain actors and their roles for each partner state given in Annex 1

6. Ware Potato Production and Marketing

Production

Potato (*Solanum tuberosum* L.) is a major food crop contributing to food security in East Africa. It is also an important cash crop, mainly produced by small-scale farmers in the highlands at elevations ranging from 1300 to 3000 meters above sea level in the member states. The production of the crop in the East African Community has more than doubled in the last 20 years. With the support of the International Potato Center (CIP) together with private sector seed companies, several cultivars have been introduced and are currently under production.

In EAC, there are two main seasons with ample rainfall for potato cultivation. The length of the seasons depends on the country. Potatoes are mainly grown from April to June and October to December (see Table 1). During these growing periods, the potato supply in the market is usually low and prices consequently high. Harvesting of potato occurs in the months of January to March and July to September, when the market is flooded with potato and prices are low.

Table 1: Rainfed potato planting (P) and harvesting (H) calendar in EAC

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
H	H	H	P	P	P	H	H	H	P	P	P

High Supply / Low Prices
 Low Supply / High Prices

Source: Author's analysis based on primary data collected for the study

The total potato production and area in EAC (excluding South Sudan due to lack of data) was over 4,949,000 MT and 563,000 HA respectively in 2018. Kenya (2,000,000 MT) and Tanzania (1,013,000 MT) contribute the highest potato volume in terms of production than the rest of the EAC countries. Cumulatively, over two (2) million smallholder farmers engage in potato production in EAC region. However the average yield is eight (8) MT /ha which is two (2) times lower than the global average of 17 MT/ha (FAO, 2018) as shown in Table 2.

Table 2: Potato Production, Area, Yield and Number of Farmers in EAC, 2018

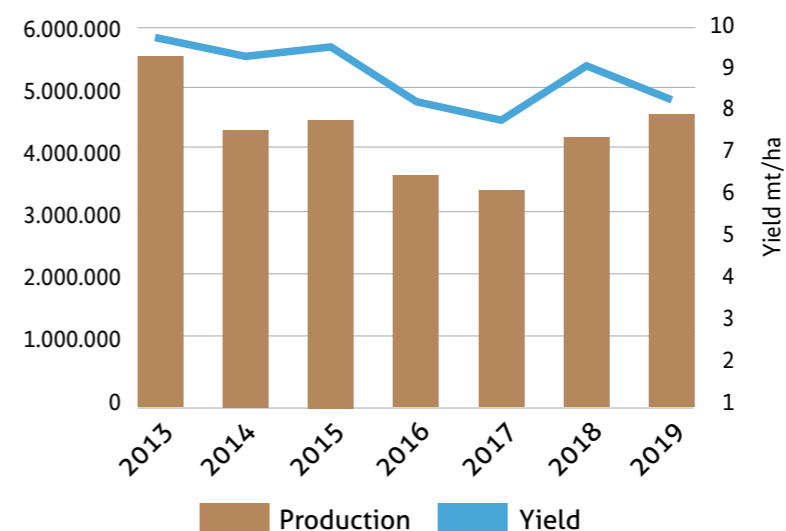
Indicator	Units	Burundi	Kenya	Rwanda	South Sudan*	Tanzania	Uganda	EAC
Production	10 ³ MT	376	2,000	973	No data	1,013	181	4,545
Cultivation Area	10 ³ ha	27	217	92	No data	190	37	563
Yield	MT/ha	11	8.6	9	6	9.3	4.2	8.01
Number of Farmers	10 ³	420	1,000	720	No data	426	240	2,186
Income	Millions	No data	500	4.4	No data	No data	No data	No data

Source: FAO, 2018

Stagnating Potato Production Volume and Decreasing Yields

As indicated in Figure 3 the average potato yield in EAC has decreased from 9 MT/ha in 2013 to 7 MT/ha in 2019. Production has equally decreased by 17% during the same period.

Figure 3: Potato Production and Yield in EAC, 2013-2019 (Production, mt)

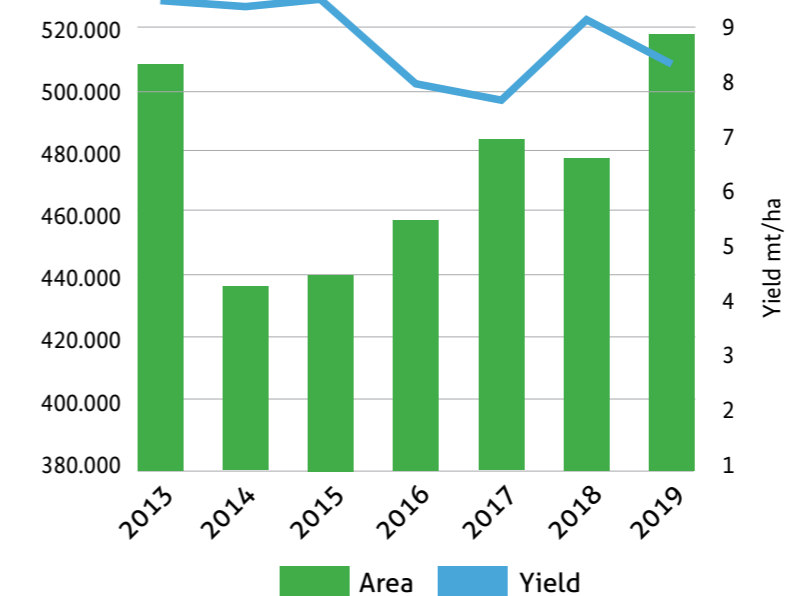


Source: FAO, 2019

Potato Production has been driven by Expansion in Land Area and not Yield

Potato production in EAC has been driven primarily by an expansion of land area under potato and to a lesser degree by increased yield. From 2014 to 2019 as depicted in Figure 4. The average area under potato increased by 18% while yield decreased by 11% during the same period.

Figure 4: Area Planted with Potato and Yield in EAC, 2013-2019 (Area, ha)



Source: FAO, 2019

Domestic Utilization

Based on 2018 production (Local production plus imports and subtracting exports) and population data, the average per capita consumption of potatoes in EAC is about 28.40 kg (see Table 3). This is relatively low compared with Europe (87.8 kg) but double the average for all of Africa (13.9 kg) (FAO 2018).

Table 3: Proportion of Potato produced and Consumed in EAC

Indicator	Units	Burundi	Kenya	Rwanda	South Sudan*	Tanzania	Uganda	EAC
Local Production	10 ³ MT	302	1,870	847	No data	1,768	162	4,949
Consumption as Food	10 ³ MT	No data	1,834	1,118	No data	1,074	179	4,205
Consumption per Capita	Kg/Year	27.4	39.7	67.1	No data	31.5	4.37	28.40

Source: FAO, 2019

Ware Potato Marketing

The marketing of ware potatoes in EAC is not well organized. Potato commodity changes hands at least three to four times before it reaches the end consumer. There are 2-3 layers of brokers, traders, wholesalers before the retail level, with each taking some margin while increasing the retailer price, and reducing the farmer profits.

In a market-based economy, it is the competition between and among buyers and sellers that leads to the equilibrium price. Buyers competing with one another for goods in short supply raise price to capture the scarce goods. As price increases, demand falls and supply rises. This process continues until the price equates with the equilibrium price and quantity supplied equals quantity demanded, as expected in a free market economy. Higher prices raise farm income enabling farmers to buy other items and farm inputs (Campenhout et al., 2012). Price therefore, plays an important role in ensuring efficient distribution of resources and signaling shortages and surpluses. Information on market price helps farmers and other value chain actors to respond to changing market conditions and make investment decisions.

In EAC, potato is produced twice a year during rainy seasons resulting in excess supply during harvest periods (January, June, July, August, and December) and shortage in supply on the market (March, April, May, September, October, and November) when the crop is in the field. High postharvest losses, lack of value addition technologies, little bargaining power of producers, and failure to access timely market information increase transaction costs, reduce the quality and volume of marketed products. The consequence is to limit market performance along the ware potato value chain.

Market performance is undermined when ware potato price is low and volatile. According to the findings of the study in EAC, the farm-gate price for ware potato can drop to as low as \$0.08 per kg during glut periods, which hardly covers production costs, while in periods of scarcity, farm-gate prices rise to about \$0.44 per kg. Value chain actors have the potential to benefit from better markets when they choose to among others: operate within organized groups that encourage collective marketing on time, adopt some value-adding activities, and engage in the processing of potato products to prevent postharvest losses.

The underlying poor linkages (e.g., lack of contract production) and poor coordination among value chain actors significantly reduce market performance and profit margins attained by each of the actors in ware potato value chains. This calls for a deliberate effort to embrace collective marketing, appropriate postharvest handling practices, strong leadership within organized groups of VC actors, and continuous learning of new skills and innovations, all of which help to increase and maintain a supply of high-quality ware potato throughout the year.

Ware Potato Processing

Potato farmers generally do not add value to the produce at the farm level (cleaning, sorting, grading and packaging) which could increase the farm gate prices considerably. In urban settings some form of processing in restaurants and factories is done. These include peeling, slicing, chips making, crisps, powder and starch making among others. Processing add value to the produce, increases shelf life, produces products acceptable by the market and reduces wastage. The changing lifestyles will certainly result into more processing of the potato both in quantity and the range of products.

The majority of farmers in EAC sell their ware potato at the nearest local market as fresh potatoes. Due to lack of a stable supply of high-quality potato, only 2% is processed as chips or fries by small processing plants.

Comparing availability of processors in EAC partner states, the study found out that there are more processing plants in developed seed system partner states (Kenya, Uganda and Tanzania) compared to emerging seed potato systems partner states (Rwanda and Burundi) and underdeveloped potato seed system partner state (South Sudan)



7. Seed Potato Production

Seed Production Systems

There are three recognized potato seed systems in EAC: formal, informal, and semi-formal, as elaborated below:

Formal seed system

The formal seed system involves a chain of activities leading to certified seed of officially released varieties. This is guided by scientific methodologies for plant breeding. Multiplication is controlled and operated by public or private sector specialists, with significant investments having been made throughout the process.

In the formal system, production of basic seed is mainly a responsibility of public research institutions. The basic seed is then passed on to public and private sector seed multipliers for bulking and distribution as certified seed. The regulator is responsible for the inspection and certification function.

Informal seed system

The informal seed system in EAC context is defined as seed production and distribution practices where there is no legal seed certification. The system constitutes many individual small-scale farmers, who save or exchange seed at the local level. It also includes development agencies and projects supporting community seed production with no regulatory oversight. It is considered the most flexible system and it involves use of both local and improved varieties. The seed production and distribution processes are not monitored or controlled by government policies and regulations but rather by local standards, social structures and norms.

Semi-formal seed system

Semi-formal seed system has overlapping features with both the formal and informal seed systems. The major actors in this system are groups (of farmers) engaged in community-based seed production and marketing. Seed producers do not necessarily go through formal channels to get planting materials or through the formal certification process. The intermediary seed system also includes the production and marketing of seed by local farmers under financial and technical support from NGOs and breeding centers.

Seed potato producers in the Semi-Formal System produce two different types of seed: (1) clean seed and (2) positively selected seed.

- 1. Clean Seed or QDS:** This comprises seed multiplied at the farm level which originates from certified seed. It is produced using Good Agricultural Practices (GAPs). Most guidelines used in production of certified seed are also used in clean seed production. However, sampling, testing and certification by the regulator is omitted or where involved, less rigorous as for the case of QDS. Quality declared seed is officially recognized in Uganda, Tanzania and Rwanda by law and can be legally sold through formal market channels but for localized areas only.
- 2. Positively Selected Seed:** These are seed potatoes produced from farmer seed through a process of selecting the best-looking plants during vegetative growth by farmers trained on seed selection and management. Although the process of production lacks the stringent procedure and inspection by the regulator it offers an opportunity for farmers to control diseases and improve their yields by an average of 30 % per season.

Formal Seed Potato Multiplication

Formal seed potato sources include public institutions, private seed companies, and registered individual seed growers. In the EAC there are three main types of formal seed production systems:

- **Public formal seed system:** Here, the public sector undertakes all activities involved in variety development, seed production and marketing.
- **Public-private formal seed system:** This involves the partnership of the public and private sector from variety development, seed production up to seed marketing. The public institution conducts research and breeding while the private sector multiplies the seed under the supervision of the regulator and distributes the seed to farmers.

- **Private formal seed system:** These are systems that are entirely performed by the private sector from variety development to seed multiplication and distribution. There is minimal government involvement except in seed quality control and certification.

There are three main business models used to produce seeds in EAC as described below.

- **Multiplication from breeder seed:** Licensed local or international, public or private seed producers grow seed from mini-tubers to the second stage of certified seed (C2).
- **Multiplication of imported basic seed:** In this case, basic or certified seed potato tubers are imported (under specified conditions) for further multiplication as certified seed by local seed companies and multipliers.
- **Multiplication of Clean Seed:** Seed potatoes are sourced from certified seed producers which are then multiplied by farmer groups and cooperatives with the support from the extension services.

Sources of Seed Potato

The sources of formal seed in EAC are public institutions and private seed companies and registered individual seed growers. Such seeds must undergo certification by the regulator.

- **Sources of basic seed:** The official source of basic seed for public bred varieties are research institutions and private seed producers. Basic seed can only be produced upon the assurance that the breeder materials are free from all major diseases and pests. Basic seed production begins with tissue culture where meristem tissues are multiplied in a controlled environment to produce in vitro plantlets. These plantlets are transferred to the glass house for hardening. Afterwards, they are then planted in pots, aeroponics or hydroponics to produce minitubers. The minitubers are planted in the field through a number of generations to produce pre- basic seed and basic seed. The basic seed is then supplied to authorized seed multipliers for production of further classes of certified seed
- **Sources of certified seed:** These are mainly the authorized seed multipliers and seed companies that source basic seed either from public institutions or private basic seed producers to produce certified seed. Provided the seed meets the quality standards, the certified seed can be further multiplied up to two cycles for production of ware potato by growers.

Seed Potato Distribution System

The study identified five (5) distribution model that are used EAC to distribute seed potato to farmers as below:

- 1. Private sector led distribution models:** In this, private seed producers multiply certified seed potato and distribute it directly to farmers.
- 2. Government distribution model:** In this model public seed producers such as research station and other public seed producers distribute seed potato directly to farmers
- 3. Individual farmer to farmer distribution:** In this case a farmer who has saved potato seed shares with his neighboring farmers. Normally this seed is usually informal and has not passed through the formal system
- 4. NGO to farmers distribution model:** In this distribution model NGOs working on seed potato distribute seed potato to individual farmers or farmer groups to either further multiply or use for production.
- 5. Community Based Organization (CBOs) to farmer distribution model:** Most NGOs work with community-based organization to multiply basic or certified seed for potato and in turn the CBOs distribute the seed to farmers. This model is preferred by CIP since it allows tracking of the potato seed from source to end user

Certified Seed Supply and Demand

Low Production and Usage of Certified Seed Potato

The poor-quality planting material used by farmers in the EAC is a major contributor to low potato productivity. The majority use seed that is recycled, of poor quality and inherently carrier of diseases and pests, resulting in low yields.

Although data on certified seed potato was not available for a number of years in most partner states, the complete data for 2018 indicate that EAC produced over 18,000 MT of seed potato cumulatively as shown in Table 4

Using average land area planted with potato in EAC and seed potato planting rate to calculate the amount of seed used, we find that the volume of certified seed in 2018 could only satisfy 4% of the total amount of potato seed required, with the remaining 96% coming from the informal sector.

Table 4: Volume in metric tonnes of certified seed potato produced in EAC, 2011-2019

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Burundi	ND	ND	ND	295	237	244	364	606	625
Kenya	762	823	660	655	560	1,240	ND	2,002	6,000
Rwanda	ND	ND	ND	ND	ND	2,596	7,916	14,203	9,063
South Sudan	0	0	0	0	0	0	0	0	0
Tanzania	ND	62	411	1,010	553	1,860	698	700	834
Uganda	ND	ND	ND	ND	ND	235	386	665	625
EAC	762	885	1,071	1,960	1,350	6,175	9,364	18,176	11,147

Source: KEPHIS Kenya; TOSCI Tanzania; RAB Rwanda; MAIFF Uganda; ISABU Burundi

Improved Potato Variety Released and Adopted

There are a total of 138 potato varieties registered and released by EAC partner states for commercialization. However, only 30% have been adopted and currently under production by farmers as shown in Table 5. Many farmers still use local varieties for various reasons, including their market demand, taste, cooking time, and sale price despite their susceptibility to pests and disease.

Table 5: Percentage of Improved Potato Varieties Adopted by Farmers in EAC

	Burundi	Kenya	Rwanda	South Sudan	Tanzania	Uganda	EAC
# of varieties released	18	60	27	None	10	23	138
# of released varieties adopted by farmers	5	15	10	None	3	8	41
% of released varieties adopted by farmers	28%	25%	37%	None	30%	35%	30%

Source: Author's analysis based on primary data collected for the study



Seed Potato Production and Marketing Challenges

Stakeholder interviews revealed various seed potato multiplication and certification challenges in the region, as summarized below:

- **Investment in seed multiplication is risky:**
 - **Low Farmer demand / willingness to pay for seed potato**
As indicated above, farmers are primarily using local varieties which have satisfactory traits and do not invest in seed potatoes every season. While seed multipliers were found not to have carryover stocks, they at least perceive demand to be unstable which makes the investment risky. As such they do not want to be left with unsold seed, due to its perishability
 - **A long process of seed production**
The duration from basic seed multiplication to certified seed production and certification may take a minimum of 3 generations (3 years) to bulk adequate quantities seed. In the process, changes in demand from smallholder farmers occur, leaving producers with unclaimed seed. This uncertainty is risky for the high investments in seed potato production.
- **Lack of pest-free land for seed multiplication**
Land in the main potato growing areas of EAC partner states have been used for ware potato production continuously for a long period, with low or no crop rotation. In addition, the use of farm-saved seed for more than 3 consecutive seasons, and poor agronomic practices have led to the accumulation of pests and diseases. These include Potato Cyst Nematode (PCN) and bacterial wilt pathogens, the most limiting potato production pests. To obtain high-quality seed, production needs to take place on 'clean' or 'virgin' land on which potato or related crops have not been grown previously to reduce the incidences of pests and diseases.
- **Large farms and high levels of investment required**
To reach a scale that renders investment in the potato business profitable seed potato multiplication and certification requires a minimum of 200 hectares of land. This is in addition to the associated investments in irrigation, production, mechanization, certification, packing and storage. For tissue culture-derived seed potato production models, seed producers will only generate revenue after two or three years. A major challenge cited by seed potato producers is the inability to access adequate financing for investments and operations.
- **Inadequate seed potato storage facilities**
Typically, farmers in EAC keep seed from their previous harvested crop under very poor conditions (usually the harvested crop is kept in piles on the floor or in bags). These conditions favor infection with pathogens, which are transmitted to the field multiplying in the next season. Some varieties need to break dormancy hence need to be stored for a longer period, requiring appropriate storage.

8. EAC Seed Regulatory Environment

In EAC, seed certification standards were developed through ASARECA harmonization initiatives. These were in alignment to the Organization for Economic Co-operation and Development (OECD) Seed Schemes and the International Seed Testing Association (ISTA) laboratory testing procedures and methods. The standards were later developed into EAC seed potato certification standards, which have now been domesticated as national standards for implementation. While adoption of OECD and ISTA standards can raise the level of quality assurance, most EAC partner states still struggle to comply with these standards due to lack of technical, skilled, adequate personnel and laboratory facilities.

Membership to International Bodies and Treaties

Most of the EAC partner states belong to a number of international bodies and treaties which support regional and international seed movement. The study examined membership to such as the International Seed Testing Association (ISTA), Organization for Economic Co-operation and Development (OECD) seed schemes, Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and African Regional Intellectual Property Organization (ARIPO), the Common Market for Eastern and Southern Africa (COMESA), Southern African Development Community (SADC), Sanitary and Phytosanitary Standards (SPS) and the International Union for the Protection of New Varieties of Plants (UPOV) as shown in Table 6.

Among the EAC partner states, Burundi, Rwanda and South Sudan are yet to join OECD seed schemes and ISTA although the generally follow their procedures for seed certification and laboratory testing. It is noteworthy that the regional harmonized regulations are aligned to OECD and ISTA requirements, which if implemented will meet the requirements.

Table 6: Membership to seed related International Bodies and Treaties

COUNTRY	ISTA	OECD	ASARECA	COMESA	SADC	SPS	UPOV	ARIPO
 Burundi	✗	✗	✓	✓	✗	✓	✗	✗
 Kenya	✓	✓	✓	✓	✗	✓	✓	✓
 Rwanda	✗	✗	✓	✓	✗	✓	✗	✓
 South Sudan	✗	✗	✓	✗	✗	✗	✗	✓
 Tanzania	✓	✓	✓	✗	✓	✓	✓	✓
 Uganda	✓	✓	✓	✓	✗	✓	✓	✓

Source: Author's analysis based on primary data collected for the study

Availability of Seed Policy, Seed Law, Seed Regulation and Seed Potato Protocols

A seed system will operate efficiently when supported by good policies, laws, regulations and protocols are in place and which are fully implemented correctly. All the EAC partner states, except South Sudan, have recently developed or enacted seed policy, seed law, seed regulation and some form of seed potato certification protocol in place. The status of EAC partner states on seed legal frameworks is as shown in Table 7.

Table 7: Availability of Seed Policy, Seed Law, Seed Regulation and Seed Potato Protocols

	Burundi	Kenya	Rwanda	South Sudan	Tanzania	Uganda
Seed Policy	Yes	Yes	Yes	Draft	Yes	Yes
Seed Law	Yes	Yes	Yes	Draft	Yes	Yes
Seed Regulations	Yes	Yes	Yes	Draft	Yes	Yes
Seed Potato certification Protocols	Under Development	Yes	Under Development	No	Yes	Yes

Source: Author's analysis based on primary data collected for the study

Seed Certification Process

The process of seed certification in the region generally follows the steps below;

1. Register as a seed merchant with the national Authority.
2. Identify the source of basic seed, which may include confirmation letter from the breeder as the origin of the breeder seed.
3. Apply for field inspection, with a minimum of two inspections.
4. Apply for pre-harvest inspection where off types, trueness to variety, freedom from diseases and pests are checked.
5. Post-harvest inspection after the seed producer has sorted and graded the seed.

Only registered seed merchants/ entities are permitted to produce certified seed potatoes, but a seed merchant can have one or more out growers who produce seed under the license of the merchant.

Phytosanitary Measures

Import and export requirements and SPS measures (international, regional, national or local), aim to prevent the introduction and/or spread of pests. These form the most considerable aspects of cross-border seed trade, particularly for potato. All EAC Partner States have a national phytosanitary framework either within the seed law or under the plant health law. South Sudan is however yet to finalize and publish its law. At the regional level the SPS protocol have been developed and all but one the partner states have ratified it. Once this is done and implemented, faster seed movement across borders will be facilitated.

For a long time the original EAC partner states (Kenya, Uganda and Tanzania) had regulations on regional import, in form of the plant protection order which were prepared by the East African Standing Technical Committee on plant import and export as early as in 1971 and revised in 2009. The order restricts the importation of plants or plant parts without a plant import permit. The permit was obtained and signed by the director of agriculture in the respective member state. However, these functions have now been delegated to the designated authority in each member state to increase efficiency. The designated authorities need to be strengthened to perform this important role in seed trade.

Import and export Process for seed potato in EAC

The general process of importing or exporting seed potato in EAC is as detailed below:

1. Register as an importer or exporter with a relevant national authority.
2. Give notice to import or export.
3. Obtain plant import permit and phytosanitary certificate from the corresponding seed certifying authority in the country of origin.
4. Inspection is done at the point of exit or entry as well as sampling and verification before sale.
5. Obtain an international orange ISTA certificate for exports or obtain an international orange ISTA certificate from the corresponding seed certifying body in the country of origin for imports.
6. For export, the importer will comply with the laid down standards requirement for the country of destination but will be inspected by the regulator in their own country.
7. For imports, the importer follows the standards in the country of export.

However, despite EAC regional harmonization efforts and legal instruments requiring equal treatment, there is lack of trust and do not consistently recognize the inspection processes and SPS regimes of each other. Permits for seed export and import are often not granted, mainly due to SPS controls. If well implemented, SPS should facilitate efficient regional seed trade.

EAC Potato and Seed Potato Standards

With support from the Policy Analysis and Advocacy Programme (PAAP) of ASARECA, the East African Community developed and approved an East African Standard for fresh potato tubers (ware potato tubers) in 2010. It specifies the requirements for ware potato tubers of varieties (cultivars) grown from (*Solanum tuberosum L.*) and its hybrids to be supplied fresh and either packaged or sold loose for human consumption. It however does not cover the requirements for potato tubers intended for industrial processing.

In 2011, with support from PAAP, the East African seed potato standard was developed which specifies requirements and methods of sampling and testing of seed potato. This includes requirements for varietal identity, purity; genealogy, traceability, pests and diseases, internal and external quality, physiology, sizing, packaging, and labeling. These standards are in line with ISTA procedures and methods. The East African seed potato standards have now been domesticated as national standards by EAC partner states except South Sudan whose laws are still in draft

The Partner States follow the EAC seed potato standard in the following areas:

1. Field inspections
2. Field requirements
3. Storage requirements
4. Tolerance for pests and diseases
5. Tolerance for requirements for lot
6. Requirements for sizing
7. Packaging
8. Seed labels

Most seed potato imports to the EAC come from the European Union (EU), whose seed potato production, certification and trade standards are aligned with those of ISTA and the United Nations Economic Commission for Europe (UNECE).

Among the six EAC partner states, Kenya is a member and observes the UNECE standard S-1 which governs the marketing and commercial quality control of seed potato and adheres to international Standards for Phytosanitary Measures (ISPM) No. 33 on pest free potato micro-propagative material and mini-tubers intended for international trade in EU. This is an area that will need more collaboration in future.

9. EAC Intra-Regional Trade

Potato trade in East African Community was estimated to have an annual value of 10-15 million USD in 2018 (FAO, 2019). According to this data, the market value of ware potato and potato products exports was 9-10 million USD, and the value of imported ware potato and potato products was 6-7 million USD among EAC partner states.

Ware Potato Intra-Regional Trade

Between 2013 and 2018, Rwanda was the highest net importer of ware potato compared to the other EAC Partner States (See Table 8). Low volumes of ware potato were imported by Burundi, Kenya, South Sudan, and Tanzania compared to Rwanda and Uganda during the period. Uganda has been the highest net exporter of ware potato compared to the other EAC Partner States (See Table 8). There has been a slight increase in export of ware potato by EAC partner states since 2014, though not significant.

Table 8: Total Volume of Ware Potato Traded within EAC, MT (2014-2018)

		Exporting Countries					Total Imports
		Kenya	Uganda	Tanzania	Burundi	Rwanda	
Importing Country	Kenya		17	4103	0	0	4,120
	Uganda	30,746		0	0	755	31,501
	Tanzania	400	0		2	58	460
	Burundi	0	0	0		18,857	18,857
	Rwanda	4	52,204	0	1		52,209
	South Sudan	5	2,191	0	0	0	2,196
	Total Exports	31,155	54,412	4103	3	19,670	109,343

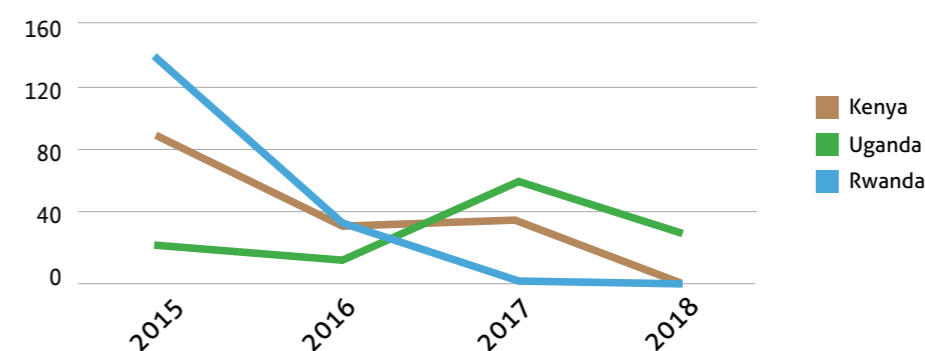
Source: KEPHIS Kenya, 2018; RAB Rwanda, 2018; TOSCI Tanzania, 2018; MAAIF Uganda, 2018

Seed Potato Intra-Regional Trade

Although seed trade plays a meaningful role in EAC, the lack of data from Tanzania, Burundi, Rwanda (imports), and South Sudan (both imports and exports) of seed potato does not allow meaningful assessment on overall seed trade in EAC region.

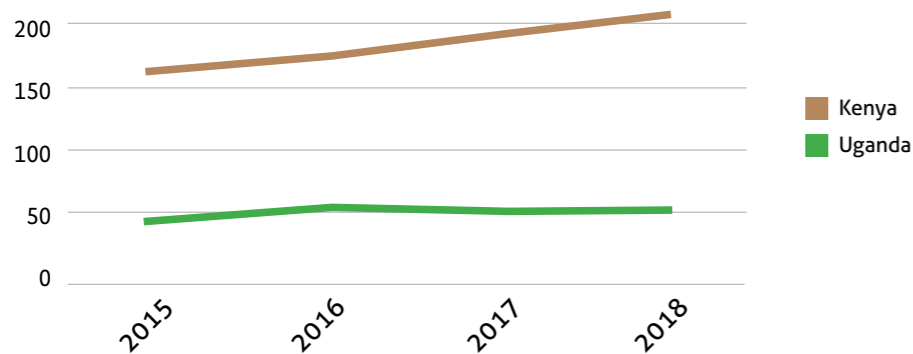
With available export and import seed data for some EAC partner states, the observations that can be drawn from Figure 5 and Figure 6 is that regional seed potato trade was very low compared to other crops such as maize, which is commonly grown by all the EAC partner states.

Figure 5: Volumes of Seed Potato Exported by Kenya, Rwanda and Uganda (in MT)



Source: KEPHIS Kenya, 2018; RAB Rwanda, 2018; MAAIF Uganda, 2018

Figure 6: Volumes of Seed Potato Imported by Kenya and Uganda (in MT)



Source: KEPHIS Kenya, 2018, MAAIF Uganda, 2018

Interview with border officials suggests that the low level of trade in seed potato is driven by financial, logistical and phytosanitary constraints. Seed potatoes are bulky, perishable and very expensive to transport, don't stand up well under long-distance transport unless in refrigerated containers or ship holds, and are tightly controlled by phytosanitary authorities. For example, Kenya did not allow imports of seed potato tubers (other than in-vitro plantlets) up to 2012 and has only allowed seed potato tuber imports under a tightly-controlled program. This was initially as an emergency response to the collapse in domestic seed potato quality and then as a seed potato stock rebuilding effort after the appearance of the Potato Cyst Nematode (PCN), a quarantine pest at a time of rapid expansion of potato consumption in Kenya (Agri Experience, 2018). The Kenyan example has been used to justify tuber imports to other partner states that have similar restrictions, by those entities wanting to export seed potatoes into the region. Restrictions on import of seed tubers has had a significant effect on quantities moved across borders.

Progress made by EAC to facilitate Intra-Regional Trade

Reduced clearance time at the border: The establishment of One Stop Border Post has reduced clearance time for goods drastically. According to a World Bank report published in 2018, establishment of OSBP by EAC partner states has reduced border clearance time by over 30%, from 6.4 days to 2.8 days

Reduced turnaround time for cargo transporters: The development of infrastructure such as roads and rail by EAC partner states has reduced turnaround time significantly. This has increased number of trips from one to a maximum of four trips in a month among the EAC partner states

Review of Common External Tariff and the Rules of Origin protocols: The region has been implementing the Common External Tariff and the Rules of Origin protocols since 2005. The two are under review to create an enabling environment for easy trade within the region.

Development of EAC harmonized seed regulation: EAC drafted its seed and plant variety Bill and regulations in 2019, which is awaiting discussion and passage by the EAC Legislative Assembly. When enacted, this will ease the seed production and trade within the region.

EAC Regional Seed Potato Trade Barriers

The long and expensive process to register a variety in the EAC member states had been cited as one of the barriers for free exchange of varieties and seed. Initially, variety testing for at least 3 years was required in each country before commercial release in each EAC partner states. This formed a key aspect of regional harmonization, setting testing up to 2 seasons ultimately leading to faster regional release. Streamlining this regional release among the partner states would greatly expand access to seed and new varieties by the farmers in the region.

Presently, even when the same crop varieties are registered in more than one country, seed trade is still hampered by bilateral mistrust in regulatory capacities, lack of clarity in certification and trade procedures, inefficiency of border operations, lack of seed testing capacity for importation, perceived private-sector risks, lack of quality seed trade data to guide decision-making and the national political economy. The current development of EAC seed and plant varieties Act, once enacted, will help solve some of the problems related to variety registration, seed certification and testing, if implemented. The following barriers to regional trade were identified:

- 1. Mistrust among EAC partner states around the certification process and quality assurance capacity of trading partners:** The regulators interviewed in each EAC partner states were concerned about the different stages each one of them were in terms of quality assurance, seed testing, and phytosanitary capacities, to agreed standards. EAC Partners states such as Kenya, Uganda and Tanzania with more mature seed systems, with membership to ISTA and OECD seed schemes feel restricted to deal in seed of lower standards. They are therefore reluctant to accept seed if they doubt the ability of their counterparts to effectively certify or carry out pest surveillance and disease monitoring/testing on potato.
- 2. Lack of clarity and effectiveness of trade and certification procedures in EAC partner states:** The seed importers/exporters were concerned about the lack of transparency around trade requirements and inefficiencies in trade regulations and procedure implementation. They viewed regional seed regulation harmonization taking very long to be implemented hence not facilitating trade between EAC partner states.
- 3. Lack of capacity by some of the EAC partner states for seed testing for cross border trade:** Internationally traded seed has to be accompanied by an International Orange ISTA Seed Certificate or a Blue International Seed Sample Certificate issued by an ISTA-accredited laboratory. However, the lack of the necessary and accredited testing facilities to adequately test seed for trade purposes in EAC partner states with no ISTA accredited laboratory such as South Sudan, Burundi and Rwanda has made seed trade process time consuming and, in some cases, impossible.
- 4. Unavailability of seed trade data for effective decision making:** Availability of seed import and export data proved to be a major challenge especially in Burundi, Rwanda, South Sudan, and Tanzania. Getting the data either on a timely basis or getting it at all was a serious challenge during the study data collection. In Kenya and Uganda data is available, though not always complete.



10. Gender in Potato Value Chain







Gender Roles in Potato Value Chain in the EAC

In general, the African culture did not allow women to be household heads except those that become widows, those that buy own land and unmarried. This has implication on the decision-making process, which in a household may involve a man alone, woman alone or jointly by a man and woman. Household heads usually influence decision making at all levels within the household, which may include decisions on land utilization, type of crop to grow, management of the crop and marketing of the harvested products. The final decisions made in such a community lies solely on the household head and this influences the level of participation of men and women in a vital business venture, for this case seed potato production business. The low number of women who are household heads makes it difficult for them to push forward decisions that address their challenges in seed potato business. It implies that their ability to engage in profitable seed potato business is greatly affected.

Interview with stakeholders in the potato sector in EAC revealed that the roles assumed by men and women in ware and seed potato business were observed in three categories: 1) roles mostly done by men, 2) roles mostly done by women and 3) roles done jointly by men and women. This means that all roles are done by either category but the level of involvement in such a role varied, to some extent, by each EAC partner states. Below are the common roles that are done in each category in the EAC states as shown in Figure 7.

- 1. Roles mostly done by men:** The activities which are highly labour intensive are mostly done by men. The roles mostly done by men were bush clearing, transporting, bagging and loading.
- 2. Roles mostly done by women:** There was no roles that were done by women that were common in all the EAC partners states
- 3. Roles jointly done by both men and women:** weeding and land preparation were jointly done by men and women.

Table 9: Gender Roles in Potato Value Chain in each EAC Partner State

COUNTRY	Decision	Bagging	Bush cleaning	Harvesting	Land preparation	Selling	Sorting	Spraying	Transporting	Weeding
 Burundi	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓
 Kenya	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗
 Rwanda	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓
 South Sudan	✗	✓	✓	✗	✗	✓	✓	✓	✓	✓
 Tanzania	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗
 Uganda	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗

✓ Done by Men ✓ Done by Women ✗ Done by both

Constraints Affecting Men and Women Participation in Ware and Seed Potato Production

The following constraints were shown to determine the participation of men and women in seed potato production.

Access to agricultural credit to facilitate acquisition of production tools and equipment

The access to credit, the type of credit provider and the nature of decision made to borrow are all crucial in access to credit facilities for seed potato business. The study found out that men are more likely to access credit than women in EAC. This eventually limits women participation in seed potato business that would require more capital intensive investment.



Society social norms and responsibilities assigned to women

The low level of participation of women in seed potato business could as well be due to social norms and responsibilities that society assigns to women and such roles include domestic chores, low involvement in marketing, development activities and managing non-farm businesses.

Access and ownership of related production resources

Potato production requires additional resources, including land, advisory services, and stores for storage purposes. It is critical to own these resources as it reduces the cost of hiring them. In this region it was noted that most of these resources are owned by men, which reduces the level of engagement by women, as the decision to use them rests elsewhere. However, where the decision is made jointly, resources are efficiently utilized.

Existing Opportunities for Men and Women in Seed Potato Production

Despite the challenges in engaging in seed potato business, a lot of opportunities exist for men and women engaging in seed potato production.

High prices offered for seed potato and the profits:

The high seed potato price and the potential profits in seed potato business is the biggest incentive for engagement. Seed potato offers better prices as compared to other crops with similar production costs. Comparative pricing between ware potato and seed potato revealed that the seed potato had a price 30 percent higher than ware potato. The more the women get involved in seed potato business the more they get uplifted. This is in agreement with findings (USAID, 2010), where women were found to be excellent seed multipliers and this requires their capacity to be built.

The existence of support from the Government and development partners

The existence of support from the Government and development partners working in the potato sector provides agro inputs and extension services to the farmers. Farmers benefit from training opportunities and starter inputs provided by different development partners operating in the area.

11. Validation and Prioritization of Recommendation

A two days regional workshop was convened to validate the regional report specifically focusing on the, data sources, analysis conducted around the potato sector value chain, stakeholder map and policy frameworks across the region as well as regional level findings and recommendations. A breakout session was devoted to discussing and validating recommendation for the study. This session was divided into six (6) country level groups aimed at: 1) first to validate the findings on accuracy and completeness and propose improvements; 2) prioritize the recommendations and actions, and 3) assign actors who will be responsible for the implementation of the recommendations at national and regional level. Below are the recommendations that the workshop generated:

Partner States Recommendations

1. Partner states to lead in improving capacity of national seed potato aggregators with quality infrastructure, and enhance/improve market linkages for seed multipliers and ware potato.
2. Develop and scale-pilot (proof of concept) genotyping technology for certified seed potato labeling and traceability to mainstream quality and purity confidence for breeders, multipliers, regulators, governments, and growers by:
 - a. Promoting and supporting public and private sector investment in tissue culture production of quality certified seed potato.
 - b. Identify potential partners/private sector seed multipliers who are interested to invest in tissues culture production of quality certified seed potato
 - c. Capacity building of seed multipliers in tissue culture production of quality certified seed potato
 - d. Cleaning of all early generation seed potato varieties through improvement of public and private tissues culture laboratories.
 - e. Identification of all developed seed potato varieties through molecular technologies
3. Support EGS production and subsequent seed categories
 - a. Increase the infrastructures (Tissue culture, screen house and aeroponic) required inputs
 - b. Mapping capacity need
 - c. Support the operational capacity for EGS producers
 - d. Promotional campaign for quality seed potato use (demo plots, exhibition, tours...)
 - e. Operationalize the potato platforms
 - f. Access roads to production sites
4. Support the capacity of actors in sustainable innovation, technology, GAP for seed and ware potato production.

EAC Secretariat Recommendations

Establish regional platform for potato sector coordination to support communication between research, extension, and farmers and support innovative linkages between research, informal and formal seed potato actors to strengthen seed supply and enhance responsive demand across diverse national and regional markets.

EAC Secretariat & Partner States Recommendations

1. Implementation of harmonized regional seed potato policies, laws and regulations to improve trade and reduce Non-Tariff Barriers (recognition of regional registered varieties, SPS controls, quality trust, reduced customs processes, proper labeling, and reduce counterfeits) through the following activities:
 - a. Enhance implementation of East African Standards (EAS) on seed potato for regional trade
 - b. EAC to support URT to conclude the ratification process of the SPS protocol
 - c. The secretariat to expedite enactment of the harmonized seed and plant variety bill and regional instruments in EAC
2. Stimulate national commercial production of quality-controlled seed potatoes by conducting performance trials in RSS for Potato varieties from within and outside South Sudan with support of development partners and research institutions.
3. Build capacity of farmers in sustainable innovations, technology and GAP for seed and ware potato production to enhance quality and productivity. Conduct demonstrations on potato production through demo farms of sustainable innovations in seed and ware potato productions. Also provide advisory on variety suitability and recommended use of improved variety and safe crop nutrition and protection program to farmers with support of development partners.
4. Support and improve capacity of national seed potato aggregators with quality infrastructure, and enhance/improve market linkages for seed multipliers and ware potato through
 - a. Establishment of storage facilities for both ware and seed potato
 - b. Improvement of feeder roads to allow for transportation of both seed and ware potato
 - c. Market information
 - d. Market intelligence to establish demand
 - e. Market infrastructure



Annex: Key Potato Value Chain Actors

Roles	Burundi	Kenya	Rwanda	South Sudan*	Tanzania	Uganda
Research and breeding	ISABU	KALRO, CIP	RAB	Directorate of Agriculture and Research	TARI	NARO
Variety release & regulation	ONCCS	KEPHIS	RICA	Directorate of Plant Protection	TOSCI	DCIC
Breeder and basic seed production	Private seed producers	KALRO, ADC, Private seed producers	RAB, Private seed producers	Directorate of Agriculture and Research	TARI, Private seed producers	NARO, Private seed producers
Certified Seed production	Private seed producers, Farmer groups	KALRO, ADC, Private seed producers, Farmer groups, Co-operatives	RAB, Private seed producers, Farmer groups	Directorate of Agriculture and Research	TARI, Private seed producers, Farmer groups	NARO, Private seed producers, Farmer groups
Processing and packaging	Processors	Processors, Supermarkets	Processors, Supermarkets		Processors, Supermarkets	Processors, Supermarkets
Education, training & extension	IFDC	MoA, County Government	MINAGRI	Directorate of Agriculture and Research	Local Government Authority	MAAIF
Distribution and sales	Potato collection centers	Supermarkets, Local markets, Viazi Soko	Supermarkets, Local markets, Traders		Supermarkets, Local markets, Traders	Supermarkets, Local markets, Traders
Ware production	Farmers	Farmers, farmer groups	FECOPPOR-NA		Farmers	Farmers
Advocacy	Seed Trade Association	NPCK, STAK	Potato stakeholders Platform	South Sudan Potato Farmer Association	TASTA	UNPP
Policy Development		MoA	MINAGRI		MoA	MAAIF

References

- Africa Agricultural Development Support Services. (2017). A regional market assessment for specialized processing potatoes in East African Countries.
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2019). East African Community Seed Potato Cross Border Trade Situation.
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). (2010). Informal Cross-Border Trade in EAC Implications for Regional Integration and Development.
- Economic Policy Research Centre, (2016). Investment Opportunities and Challenges in the Irish Potato Value Chain in Uganda. PASIC
- Food and Agriculture Organization of the United Nations (FAO) (2019), Food and Agriculture Data. <http://www.fao.org/faostat/en/#data>
- Food and Agriculture Organization of the United Nations (FAO) (2018), Food and Agriculture Data. <http://www.fao.org/faostat/en/#data>
- International Finance Corporation (IFC). (2020). Increasing Seed Potato Availability in Kenya: Priority Investments and Policy Actions. World Bank.
- Kachwekano Zonal Agricultural Research and Development Institute (KaZARDI) (2015). Strategies to Improve Seed Potato Availability in Uganda (unpublished)
- Kenya National Bureau of Statistics. (2018). Enhanced Food Balance Sheets for Kenya, 2014-2018.
- Kenya Plant Health Inspectorate Service (KEPHIS) (2016). Seed Potato Production and Certification Guidelines.
- Kenya Plant Health Inspectorate Service (KEPHIS) (2018). KEPHIS Annual Report 2018. KEPHIS.
- Kilimo Trust (2017). Calories and household income from potato sub-sector (chips) project survey report. Project baseline indicators for potato farmers, retailers, and food vendors.
- Kilimo Trust (2018). Potato Demand and Value Chain in Tanzania: Calories and Household Incomes from Potato Subsector (CHIPS) Project
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) (2016) Agricultural Sector Strategic Plan 2015-2020.
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) (2015), Development Strategy and Investment Plan 2010-2015.
- Ministry of Agriculture, Livestock, and Fisheries (MAAIF) (2016). Seed and Plant Varieties Act, 2016.
- Ministry of Agriculture, Livestock, and Fisheries. (2016). The National Potato Strategy, 2016-2020.
- Ministry of Agriculture, Livestock, and Fisheries. (2019). The Crops (Irish Potato) Regulations, 2019.
- Mpogole, H., and R.M.J. Kadigi (2012). Round Potatoes (*Solanum tuberosum*) profitability and implications for variety selections in the Southern Highlands of Tanzania. Journal of Development and Agricultural Economics
- Muthoni, J., Shimelis, H., Melis R., (2013). Potato Production in Kenya: Farming Systems and Production Constraints. Journal of Agricultural Science; 5, 182-197.
- Netherlands Enterprise Agency. (2017). Seed Potatoes Tanzania, The Hague, Netherlands
- Research Gate. (2017), Participatory Assessment of Potato Farming Systems, Production Constraints and Cultivar Preferences in Uganda
- Scientific African. (2016), Potato Market Access, Marketing Efficiency and On-farm Value Addition in Uganda
- Southern Agricultural Growth Corridor of Tanzania (SAGCOT) (2017). Round potato value chain analysis report for Mbarali cluster.

Notes

Imprint

Published by the

East African Community (EAC) Secretariat
EAC Headquarters
3 EAC Close
P.O. Box 1096
Arusha
United Republic of Tanzania
www.eac.int

As at

August 2021

Design & layout

MEDIA DESIGN www.media-design.me

Printed by

Zenith Media Limited, Arusha

Photo credits

© 2012 CIAT/Neil Palmer (Cover), GIZ FABI

Text

Global Project Agricultural Policy and Innovation Fund (FABI)
Improvement of Regional Trade with Seed Potatoes in Eastern Africa

Funded by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Global Project Agricultural Policy and Innovation Fund (FABI)
Improvement of Regional Trade with Seed Potatoes in Eastern Africa
EAC Headquarter, Former State Lodge, EAC Close
P.O. Box 13854
Arusha
United Republic of Tanzania
www.giz.de; www.eacgermany.org

On behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), Germany