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RWANDA PRIVATE SECTOR DRIVEN AGRICULTURAL GROWTH (PSDAG)

IRISH POTATO VALUE CHAIN ANALYSIS

September 2015

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RWANDA PRIVATE SECTOR DRIVEN AGRICULTURAL GROWTH

IRISH POTATO VALUE CHAIN ANALYSIS

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I. IRISH POTATO VALUE CHAIN ANALYSIS

A. INTRODUCTION TO IRISH POTATO VALUE CHAIN IN RWANDA

Irish potatoes¹ are an important staple food for many rural households, with a portion of it marketed for cash. In 2007, the Government of Rwanda launched a Crop Intensification Program (CIP) to support six priority staple crops including Irish potatoes along with maize, wheat, rice, beans, and cassava. Nearly 1 million households produce Irish potatoes for their own household consumption and some cash sales.²

The country produces a number of different Irish potato varieties, some of which are recognized throughout the region. These vary in taste and cooking characteristics as well as their adaptation to specific soil types. The variety Chinije is particularly prized for its taste and chipping characteristics.³

Production

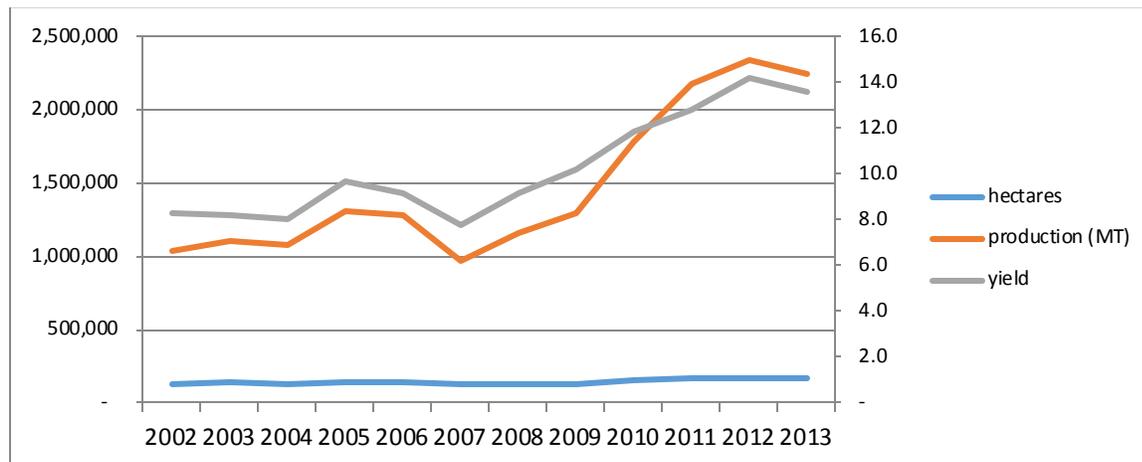
The area under potato production has only increased by about 30%, from 120,000ha to 160,000ha, over the past 10 years.⁴ Total production has increased over the same period by over 110%, from about 1 million MT to 2.2 million MT in 2013. The increased production has largely come from yield gains since the initiation of CIP in 2007 – yields have increased by over 60%. A slight decline in production since 2012 is yield related and not area under production. Other recent value chain analysis documents suggest this is a result of genetic degradation of the seed and possibly an issue of disease related to poor crop rotation.

¹ Potatoes, *solanum tuberosum*, are commonly referred to as Irish potatoes in Rwanda to differentiate them from the also common sweet potato, *ipomoea batatas*.

² Consultant calculations based on data in the Seasonal Agricultural Survey Report 2013; National Institute of Statistics of Rwanda.

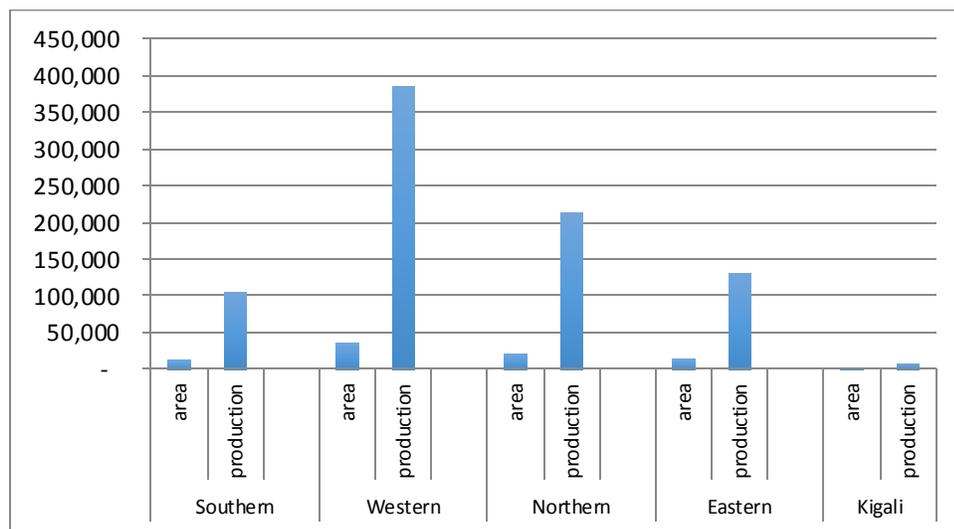
³ EAT Cross-Border Trade Analysis Report, 2013

⁴ Countrystat.org

Figure 1: Rwanda Production, Area, and Yield 2002-2013


Source: CountryStat.org

As shown in Figure 2, potatoes are produced throughout the country, but are more concentrated than other staple crops. The Western and Northern provinces (with additional concentration in Niyabihu, Rubavu, and Musanze districts) account for 67% of the area under potato cultivation. In 2013, the average household plot of potatoes was .04 ha, while commercial producers averaged 3 ha plots. Less than 2% of producers used improved seeds.⁵ Over 100,000 MT of 2013 production, approximately 13% of total potatoes produced, were kept by producers to use for seed in the subsequent season.

Figure 2: Rwanda Area and Production by Province 2013


Source: Seasonal Agricultural Survey Report 2013

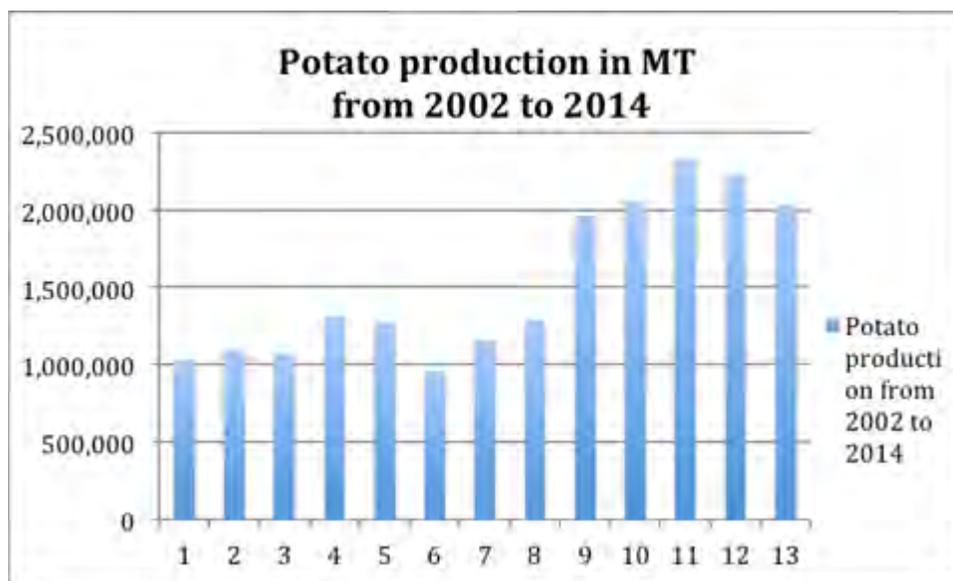
Potatoes are grown in all three seasons. Season A and Season B each produce about 45% of total production, while 10% of annual production occurs in Season C. There is little to no storage of potatoes reported at the

⁵ Seasonal Agricultural Survey Report 2013, National Institute of Statistics of Rwanda

household level. The small plots may be a specific decision to control the quantity of production they can physically manage, can incorporate in their crop rotation plans, and the volume they can consume easily before significant post-harvest losses occur. In 2013, 22% of total production was sold into the market, 185,000 MT. Most of this was marketed Season A production (24% of Season A production was sold versus 14% of Season B.)

Despite the overall increases in production due to CIP, MINAGRI has noted a decline in the last three years in total production, to which they attribute to a lack of access to quality seed.⁶

Figure 3: Potato Production in MT from 2002 to 2014



Source: *Road Map for the Privatization of Potato Seed Production*, April 2015, compiled by the author from the MINAGRI crop assessment data

Consumption

Potatoes are consumed both by rural and urban populations. Sixty percent of production is kept by the producing households for their own consumption, 500,000 MT in 2013. Irish potatoes are the most important food purchase, accounting for 7.6% of total food purchases and 8.3% of all food consumption⁷. For urban consumers, Irish potatoes represented 6.5% of total food purchases, directly after restaurant food with the largest share. For rural consumers, Irish potatoes were a close second only to dry beans, with 8.1% of total food purchases. Current demand is sufficient to consume all current production domestically, as highlighted in the End Markets section below.

B. BUSINESS ENABLING ENVIRONMENT

⁶ Road Map for the Privatization of the Potato Seed Sector, MINAGRI, April 2015

⁷ National Institute of Statistics of Rwanda, Third Integrated Household Living Conditions Survey (EICV3), 2011

Government Policy

CIP activities include land use consolidation, improving seed and fertilizer use, improving extension services, developing agricultural marketing, promoting agro-input deals, and stimulating private sector input and output markets. Under the CIP, land holdings are consolidated and rearranged to form larger holdings and farmers' production activities are synchronized.

National goals according to *Support To MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities*, draft report March 2015, include an targeted increase in yield of increase to 30 MT/ha (RAB 2014). The national target for 2019 is to reach a total area of 200,000 ha under cultivation with a target production of 6,000,000 MT of Irish potatoes per year (separate from seed potato.) This would necessitate an additional 40,000 ha to come under production of potatoes, about 25% increase of area, excluding the additional new land necessary to bring into potato seed multiplication to meet the separate seed targets. Potato seed requires land, which either has never previously produced potatoes or has undergone a long period of rotation. Also, since water can carry disease, high quality potato seed should be multiplied at a higher elevation than other current or previous potato production on any significant slope.

The Rwandan National Seed Law (2003) and subsequent Ministerial Orders (2010) laid the regulatory foundation for access to quality seeds for staple food crop production.⁸ Despite this foundation, there are still major challenges that remain to be addressed. The 2014 PSTA III recognizes the following challenges that remain:

- Strong public sector involvement in all seed sector components; further private sector involvement is needed;
- Inadequate quantities of seeds produced nationally for some crops which forces the Government to import seeds particularly for maize and wheat;
- Poor quality of internally produced seed; quality deterioration has occurred during seed production and storage.
- Poor sanitary status of seed; the prevalence of crop pests and diseases.
- Poor germination of seeds distributed under the CIP to date.
- Limited effective distribution.⁹

Currently RAB controls the import, production, and testing of all high quality seeds for staple food crop production (both hybrid and open pollinated varieties). In general, 'foundation' seeds produced by RAB are then sold to private seed multipliers (made up of both private companies and producer cooperatives.) 'Certified' seeds are then distributed to farmers for sale through a nation-wide agro-dealer network. For most staple food crop value chains, new varieties of seeds must go through official trials and testing for performance (value in cultivate in use – VCU) by RAB before they are released for sale to the general public. This process can take years, which means farmers are using old varieties. The 2013 National Seed Law is currently under review by MINAGRI and donors. Though the law has been harmonized in accordance with the COMESA Seed Regulations and African Regional Intellectual Property Organization Plant Variety

⁸ Rwanda Seed Sector Baseline Study, The African Seed Trade Association, September 2010..

⁹ Strategic Plan for the Transformation of Agriculture in Rwanda, Phase III, 2014

Protection Protocol (ARIPO PVP), there are still concerns that law may impose restrictions on the import of seeds that would prohibit Rwandan farmers benefiting from worldwide international seed varieties. As noted under Production, MINAGRI believes the recent decline in the annual production of potatoes is due to the use of poor quality seeds by potato producers, which reflects the lack of access to high quality seeds. GoR has therefore developed a five-year roadmap for the privatization of high quality potato seed production to meet minimum seed requirements to reach 2019 production goals. (See section on Inputs.)¹⁰

Beginning in 2008, GoR began the process to privatize the system to import and distribute fertilizers, which are subsidized for farmers. From 2011 to 2015, the USAID Fertilizer Import and Distribution System Project (PReFER) project assisted with this program such that the import and distribution system has grown and the subsidy program has been extended from three to ten types of fertilizers, including micro-nutrients needed to boost the effectiveness of fertilizers. There are approximately 900 agro-dealers in the rural areas selling fertilizers, micro-nutrients and seeds that are connected to the subsidy and distribution system.¹¹

Access to Finance

In Rwanda, the share of access to financial services for those in the agriculture sector is minimal at about 4% compared to other sectors. The cost of credit is relatively affordable compared to other countries in the region and continent; however, access to formal financing for the actors in agricultural value chains is scarce due to a range of constraints discussed below. There are three active commercial banks including Banque of Kigali, Banque Populaire du Rwanda and KCB Bank, six microfinance institutions, and 416 Savings and Credit Cooperatives (SACCOs), one for each sector, lending to rural population including smallholder farmers and traders. In addition, the Rwanda Development Bank (BRD) has historically engaged in lending directly to borrowers in the sector, but recently restructured, divested its commercial banking arm, and developed a new strategy that would enable the bank to take on more of a facilitation role to empower and enable commercial banks. The bank has earmarked USD \$170 million to assist in lending for agro-processing, mechanization, modernization, and input distribution and another USD \$220 million to assist the export industry.

In general, lending in the agriculture sector for food crops remains challenging due to the following reasons:

Lenders:

- Limited understanding of agriculture value chain dynamics and market opportunities;
- Limited access to information about prospective borrowers;
- Lack of knowledge of appropriate financial product development;
- Limited expertise and tools to appraise loans, assess risk, and manage portfolios;
- Funds for lending are scarce because banks mainly rely on deposits and MFIs rely on external support such as grants.

Borrowers:

- Limited understanding of agriculture market opportunities and market information;

¹⁰ Road Map for the Privatization of the Potato Seed Sector, MINAGRI, April 2015

¹¹ COMESA SEED TRADE HARMONIZATION REGULATIONS, 2014; Input from Dave Soroko, PSDAG Policy Consultant, June-July 2015; input from PSDAG staff Year 2 Work planning Workshop, July 2015.

- Borrowers lack trust and knowledge of formal financial service providers and prefer the use of tontines (community lending);
- There is a general lack of borrower readiness – borrowers do not have formal financial records, are not formally registered, do not have a history of profitable operation or management of money, do not have a viable business plan, and/or do not have sufficient collateral;
- Lack of understanding of how to manage and use loans appropriately;
- Weak horizontal and vertical relationship between value chain players;
- Limited technical expertise in new investments, leading to higher than expected losses.

As a result, there are delays in loan approvals, which lead to cash flow issues for borrowers and lack of follow up on loan performance, creating high risk of mismanagement of borrowed funds and subsequent defaults. Commercial banks have focused more on well-established and reputable cooperatives, small and medium enterprises, and large agribusiness companies operating in thriving value chains such as maize, rice, dairy, tea and coffee. Financing to other value chains, such as potatoes, beans, and horticulture has been limited. Loans are given predominantly for pre-harvest working capital with limited loans given for investment or start-ups. In addition, the cost of borrowing is high - average interest rates are 18%- 20% per annum, collateral requirements are 125%-200% of loan value based on fixed assets. Guarantee facilities exist, mostly through BDF Ltd., but both processing the guarantees for new loans and accessing the guarantees for defaults is slow.

Micro-finance institutions (MFIs) target smallholder farmers, cooperatives and traders in remote areas with micro to small loans. The cost of lending for MFIs is higher than commercial banks however their lending conditions are more reasonable.

Some value chain and embedded financing exists, but is limited. Horizontal and vertical relationships between value chain actors are weak and there is a lack of access to market information, which leads borrowers to 'side-selling' and defaulting on contract obligations to larger buyers. Financing for input agro dealers' trade has been sourced mostly from dealers' own funds (60%), with the remaining coming from institutional credit from input suppliers (21%), and financing from financial service providers (19%). Involvement of formal financial institutions (banks and MFIs) in financing agro dealers varies from region to region depending on the stability and profitability of fertilizer business in the area.

SACCOs in Rwanda are institutions that facilitate financial inclusion especially for the rural populations with low incomes. All SACCOs are legally registered and monitored by the Central Bank of Rwanda despite their cooperatives status. The main purpose of the SACCOs is to encourage a culture of saving and thereby raise the social and economic welfare of its members. This is achieved by pooling savings from members and providing credit based on those savings. The Central Bank monitors and grants licenses to lend to those SACCOs that have reached a minimum of 10 million RWF in savings. Once they begin to disburse loans, the Central Bank monitors the financial health of portfolios (portfolio-at-risk) and the organization's ability to properly manage the loans. SACCO's can lend a minimum of 20% of their deposits, once licensed and depending on their performance appraisal. There are about 479 SACCOs in total of which 416 are sector based, commonly known as UMURENGE SACCOs and 63 non-sector based, privately owned SACCOs. The privately-owned SACCOs have traditionally out-performed the UMURENGE SACCOs. SACCOs do not currently conduct much lending in the agriculture sector because 1) farmers do not typically provide consistent savings, and 2) like other financial institutions, SACCOs lack the capacity to assess risk and manage portfolios in agriculture, and lack products that are conducive to the needs of the agriculture sector.

Insurance is considered a vital financial service needed in order to reduce risk in agriculture lending. Three insurance companies, (SORAS, SONARWA, UAP), have started developing and testing agriculture insurance products, that include weather index insurance, crop area yield insurance, livestock insurance and disaster insurance. About 150,000 farmers have bought insurance to cover their loans, however, limited borrowers' knowledge on insurance operations and limited understanding of weather patterns and micro climates in Rwanda has negatively affected the success of such products.

C. END MARKETS

Consumers mostly purchase their potatoes from a local market, over 50% of their potato purchases. The second most important place of purchase was from small retail shops, with 26% of purchases occurring there.¹² The available market information does not detail the market segmentation between washed versus unwashed potato sales, or if there is any prepackaging of set volumes (2 kg, 5kg, or something similar.)

Only between 20%-25% of total production is sold by producers into the market for cash. Even though the percentage of total production marketed is relatively low, in 2013 this was equivalent to 185,000MT. The volumes traded across borders are surprisingly low, as outlined in the Export section below. This marketed production mostly meets the current domestic consumption demand.

Domestic Fresh Market

Price

The 2013 EAT Cross-Border Trade Analysis analyzed esoko price data which showed that although markets in Musanze and Kigali are closely correlated to one another, prices in other rural markets (such as Nyakarambi) fluctuate independently. This may suggest that potato traders are not as active in connecting the smaller markets with the larger markets, or it may suggest that given strong decentralized demand that some smaller markets are well served by local production and surplus volumes are not significant enough to attract arbitrage into other markets. The consultation process with stakeholders during that same study indicated that, as is the case for beans, there are few large commercial buyers, although many small traders use 5–10 MT trucks to move potatoes within the country.

Exports

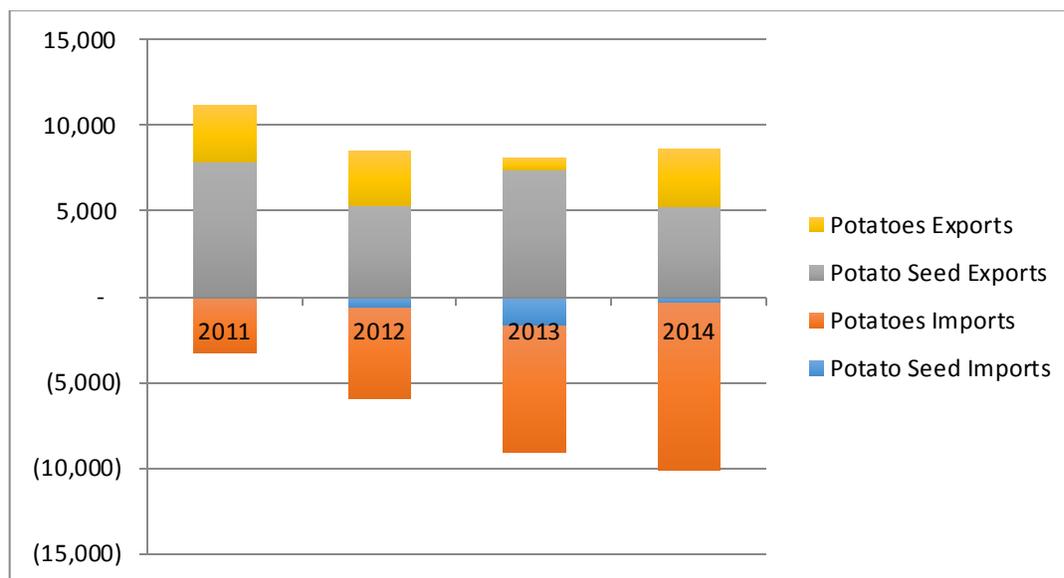
The Irish Potato Value Chain Assessment draft report¹³ states that increased yields have resulted in large cross border trade to Burundi, DRC, and Uganda. This contradicts the Cross-Border Trade Analysis Report

¹² National Institute of Statistics of Rwanda, Third Integrated Household Living Conditions Survey (EICV3), 2011

¹³ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

that highlights that total potato trade has averaged only 10,000MT annually, only about 1% of total production. Official trade statistics¹⁴ confirm overall low volumes and indicate slightly more ware potato imports and slightly more potato seed exports, which is not obviously accurate given the low potato seed production within Rwanda.

Figure 4: UN Comtrade Official Rwanda Potato Imports and Exports 2010-2013



The Cross-Border Trade Analysis consultation found that traders suggested that exports could be increased when Rwandan potatoes were at their cheapest, but that the potatoes did not store well; therefore, traders in importing countries only purchased what they could sell immediately. The perishability was directly related to the harvest and marketing of early, immature potatoes (also known as new potatoes) and a lack of proper curing post-harvest. The study also found that most exports to DRC were informal while trade with Burundi and Tanzania was more likely to be formal, which is related to the distance from the main production areas within Rwanda. Most imported potatoes come in from Uganda. The open trade framework within the EAC offers not significant incentive for informal trade, thus much of the trade with Uganda is thought to be formal.

The Cross-Border Trade Analysis further considered specific price characteristics among main regional markets and found attractive windows of time when Rwandan potatoes could be competitive in regional markets. It found that comparing monthly wholesale prices in Musanze with prices in Kabale and Kampala (both in Uganda), Musanze potatoes are least competitive in Ugandan markets between January and March. However, the remaining months offer profit opportunities, with potential margins highest in November/December and May. Conversely, for producers in Kisoro in Uganda, located only 40 km from Musanze, the Kampala and Kabale markets would be less profitable from January to March than the Musanze market, and their potatoes would therefore be exported into Rwanda.

Potentially higher margins exist for potatoes exported through Kigali into Tanzania. Throughout the Akagera

¹⁴ UN Comtrade

region and as far as Mwanza, prices of potatoes in November 2012 significantly exceeded the price in Kigali, in some cases at least double the wholesale price in Kigali.

The Cross-Border Trade Analysis finally considered the Burundi market. The consultations of that study found “Ruhengere potatoes” selling at a premium of approximately USD\$0.10 over local varieties in Kayanza, Burundi. Traders reported that prices for “Ruhengere potatoes” in Kayanza could be attractive through October and November. To the south, in Bujumbura, prices are higher and exports from Rwanda could remain viable all year round.

Even with this price analysis from the Cross-Border Trade analysis, the volumes traded to date are extremely low and the trade networks do not exist to take advantage of these potential arbitrage opportunities. More research will be needed to analyze these potential arbitrage windows and understand the necessary volumes and absorptive capacity of the markets prior to prioritizing the facilitation of this regional trade. Another study confirmed that Rwanda is considered a competitive regional producer of potatoes, but that domestic consumption is strong enough to absorb all current production.¹⁵

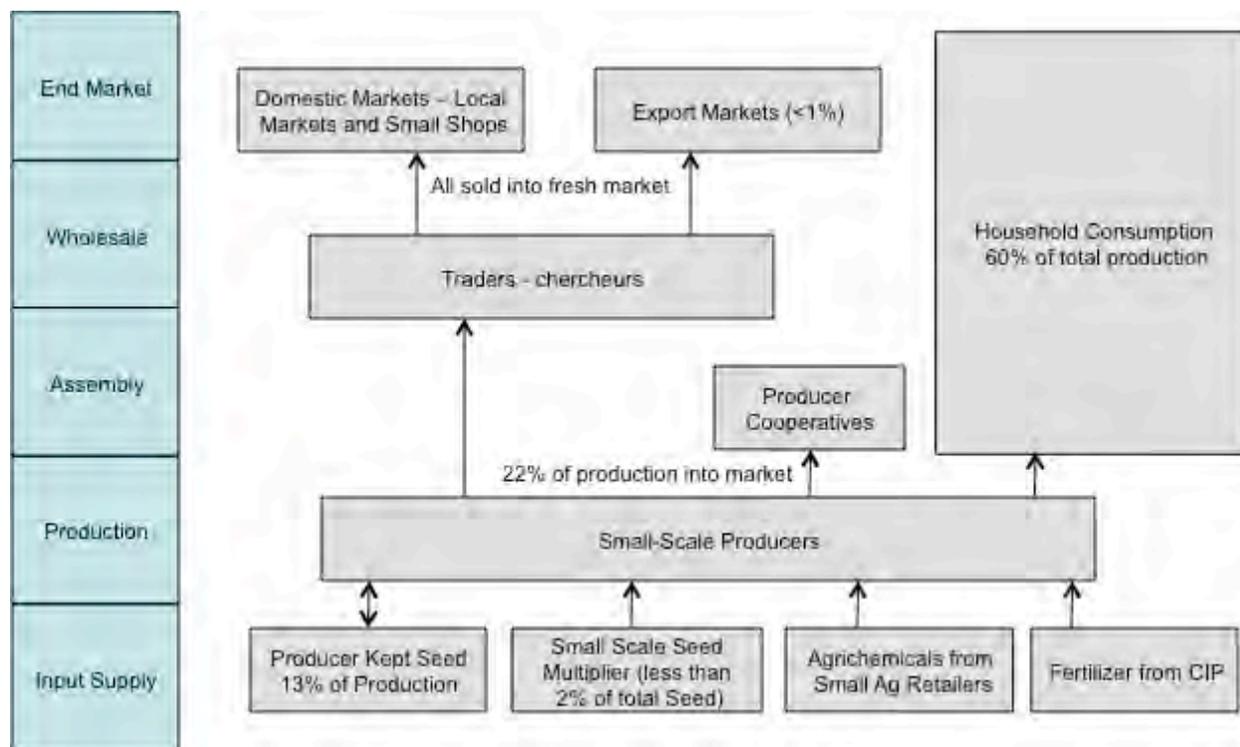
¹⁵ Banque Populaire du Rwanda, Sector Policy for Irish Potato in 2012 for their Agri Commercial Officers.

D. CHAIN ANALYSIS

1. STRUCTURE OF THE VALUE CHAIN

Value Chain Map

Figure 5: Potato Value Chain Map



Inputs

RAB is the only source of local variety development. According to the Irish Potato Value Chain Assessment draft report¹⁶, RAB has only released 1 variety since 1992, but has two varieties expected to be released soon. The International Potato Center (CIP) is the main international research institute partner of RAB. The limited research has been focused on disease resistance and yield, not necessarily focused on market requirements include taste, starch, storage, and/or processing. The value chain assessment draft notes the lack of a policy and regulatory framework to allow private sector importation and development of potato seed (see section on Business Enabling Environment). In 2014, the Dutch Embassy commissioned a study of the Rwandan seed sector. The study succinctly indicated, “In summary, the last few years the formal seed system

¹⁶ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

has been dominated by the activities of the Rwanda Agricultural Board (RAB). RAB brought together the support functions of research and extension (e.g. varietal development and popularization of new varieties), while also being responsible for some regulatory tasks of seed inspection and certification as well as the variety release. In addition, RAB has been the main actor responsible for early generation seed production, contracting out growers for seed multiplication and organizing the seed distribution to recipient farmers. In the formal seed system, only seed multiplication was left to other organizations than RAB. Though the system has contributed significantly to the performance of the Crop Intensification Program, the system has been criticized for too many hats' (being player and referee at the same time), especially when it comes to the regulatory areas of: quality control and variety release.¹⁷

The potato seed value chain, along with current actors and production capacity are noted between Figures 6 and 8 below.

Figure 6: The Potato Seed Chain

Generation	Grade of seed	Place of production	Activity/operation	Responsible
G0	In vitro plantlets	Laboratory	Variety maintenance in vitro multiplication	RAB/INES
G1	Breeder seed/Mini-tubers	Aeroponic screen houses or conventional screen houses	Mini-tuber production	RAB/Private sector ¹⁸
G2	Pre-basic seed	Private seed producers fields/stations	Multiplication	Private sector
G3	Basic seed	Private seed producers fields/stations	Multiplication	Private sector
G4	Commercial seed (Certified and Quality Declared seed)	Private seed producers fields	Multiplication	Private sector

Source: *Road Map for the Privatization of Potato Seed Production, April 2015, MINAGRI, RAB*

As noted under production, MINAGRI noted a decline in the last three years in total production, to which they attribute to a lack of access to quality seed. In order to meet the needs of farmers producing on the targeted 200,000 ha by 2019, MINAGRI has estimated that farmers will need 62,500 MT per season of post G4 seed. In order to reach that level, suppliers need to produce 722,083 vitro plantlets per season starting in 2015 B. RAB and the Institute for Applied science of Ruhengeri (INES-Ruhengeri) are currently the only two producers of vitro plants in Rwanda. RAB's current production capacity is 780,000 plantlets/season. RAB, however, lacks funding to expand and long administrative and financial procedures limit its ability to provide minimum quantities needed to meet 2019 production targets. INES Ruhengeri is a private high learning institution teaching applied sciences. The institution commercially produces vitro plants using one laboratory, 2 greenhouses, and 3 ha of seed multiplication field. Its current production capacity is 80,000 plantlets/season and they are planning to expand their capacity to 320,000 plantlets /season, but also lack funding for investment in the necessary infrastructure. SEMAREMBO is a private family-owned company that is in the process of constructing a laboratory and a growth chamber. According to MINAGRI, its current human, technical and financial capacities are very limited and have no previous experience in vitro plant production.

¹⁷ Exploratory Study on Rwanda's Seed Sector: Options for Dutch Support. 2014. Joep van den Broek and Jean Marie Byakweli.

¹⁸ Private sector is private seed companies; cooperatives; private seed growers

Therefore, the potential capacity of RAB and INES to produce vitro plants is estimated at 1,100,000 vitro plants per season (if INES finds funding to expand). This would meet MINAGRI's minimum estimated requirement. Further investment in vitro plant production needs to be considered carefully. MINAGRI states the investment climate may change with the introduction of new varieties under breeder's rights protection where private seed companies may prefer to produce their vitro plants.

Figure 7: Sources of Vitro Plant Production and Capacity

Actor	Public/Private	Equipment	Capacity (vitro plants)
RAB	Public	2 Laboratories in Musanze and in Rubona 1 small growth chamber 1 new big growth chamber	780,000
INES Ruhengeri	Private	1 Laboratory 1 small growth chamber	80,000

Source: Road Map for the Privatization of Potato Seed Production, April 2015, MINAGRI, RAB

In order to meet the 2019 goals, the value chain will need an estimated 7,220,833 mini tubers per season. Historically, RAB has been the dominant producer of mini-tubers as well, but does not generate enough income from its production to sustain its activities. Recently private entrepreneurs began investing in screen houses and aeroponics with the support of Government projects and NGOs. These entrepreneurs still face issues with lack of skills in management of the screen houses/aeroponics and lack funds to purchase vitro plants. Current production of mini-tubers is estimated at 1,650,000/season, which represents a 5,570, 830 mini-tubers short-fall of what is estimated to be needed. To fill this gap, further investment in screen houses and aeroponics will be required. According to MINAGRI, aeroponics systems are more productive and cost-effective. (To cover the gap, 19 aeroponics systems would be needed as opposed to 90 conventional screen houses).

Figure 8: Sources of Mini-Tuber Production and Capacity

Actor	Public/private	Location	Equipment	Capacity
RAB	Public	Musanze SIGIRA	4 Screen houses 2 Aeroponics(17x50m) 1 Aeroponic: (25x16m) 2 Screen houses (25x16)	1,150,000 mini-tubers
Private entrepreneurs and cooperatives	Private	Musanze	5 Screen houses 1 Aeroponic	
		Gicumbi:	4 Screen houses	
		Nyabihu	5 Screen houses	
		Bulera	2 Screen houses	
		Rubavu	5 Screen houses	
		Nyamagabe	2 screen houses	
Total			23	1,650,000 mini-tubers

Source: *Road Map for the Privatization of Potato Seed Production*, April 2015, MINAGRI, RAB

The estimated 7,220,833 mini tubers per season would then be used to produce 1,733 MT of pre-basic and 10,400 of basic seed that would then be used to produce 62,500 MT of certified, commercial seeds per season. This process is conducted through field seed multiplication. Historically, RAB has also been dominated multiplication with 83 ha of land scattered in its different research stations. In addition, there are 160 private seed multipliers, including cooperatives, who are registered for potato seed production, but currently only 80 of them (50%) are active.¹⁹

Potato seed multiplication requires highland areas where insect pressure is less and disease transmission is thus lower. It also requires land that is managed with proper crop rotation, requiring longer rotation periods between seed multiplication than for ware potato production. The Cross-Border Trade Analysis cited analysis that indicates a shortage of quality potato seed within the region, including in Uganda. While Uganda also has some potential to multiply seed itself, they also suffer from a seed production shortage. There have been programs working with potato producer cooperatives to develop seed multiplication ventures and develop market linkages for the seed with other small potato producers. This includes work with the Impuyaki cooperative in Gicumbi District. The Irish Potato Value Chain Assessment draft report²⁰ includes a list of certified seed producers, but notes they are only selling at 30% of their capacity because the rest of their production is sold as ware potatoes to cover cash flow and because the seed market is not well developed or well connected. MINAGRI has corroborated this by indicating that when compared to ware potatoes, seed takes more time to produce and yields are lower, since the seeds need to be harvest when they are smaller. Farmers stop producing seed because they can earn more money by producing and selling ware potatoes.²¹

In addition to increasing the availability of clean, quality seed through small scale seed multipliers, there is also an opportunity to improve the producers' capacity to select better seed and manage their own production in the interim. As noted earlier, less than 2% of potatoes produced are using quality, clean seed. An interim solution must be to improve production management of ware potatoes and the ability of farmers to better manage and select seed from their own production.

The Irish Potato Value Chain Assessment draft report²² makes no mention of other required inputs for potato production including fertilizer and agrichemicals. Fertilizer has been a core component of the CIP program that includes potato as a core crop. Banque Populaire du Rwanda (BPR) developed a Sector Policy for Irish Potato in 2012 for their Agri Commercial Officers. They noted significant agrichemical use in potato production, with Dithane the most important, a fungicide to control potato blight. The BPR memo considers potatoes one of the Rwandan staple crops with the heaviest pesticide use, usually 6 to 8 applications of at least 3 different products over the course of production. The use and cost of pesticides is noted in the BPR memo as one of the key issues of potato inputs.

¹⁹ Road Map for the Privatization of the Potato Seed Sector, MINAGRI, April 2015

²⁰ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

²¹ Road Map for the Privatization of the Potato Seed Sector, MINAGRI, April 2015.

²² Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

Producers

While potatoes are principally grown as a staple crop, the average producer retains 13% for use as seed in a subsequent season and sells 22% for cash. Potatoes are a high cost crop with high labor and agrichemical costs. Poor rotation and disease management (disease can be transferred by bugs or even by water from fields higher up on a slope) further increases agrichemical costs and decreases yield. Improved seed can represent a significant cost component, which will not return the investment under poor production practices. Some cooperatives facilitate access and finance of pesticides and application equipment for their producers.

Assembly and Wholesale

Most potatoes are sold at the farm gate to traders who assemble within the local markets. Potatoes are sorted and repacked, at times washed, within some markets for wholesale and/or retail. Over 50% of consumers' potato purchases are made directly in local markets. The second most important place of purchase was from small retail shops, with 26% of purchases occurring there.²³ Women are often involved in the washing and sorting of potatoes within the market. There are some potato cooperatives that facilitate aggregation of volumes from their member farmers and facilitate sales to the same traders.²⁴ Premiums for value addition before processing are as follows:

Value Addition Description	Price Premium
Pruning - a farmer must sell within 2 weeks after pruning	+40 RWF / kg over market price
Sorting	+10-20 RWF / kg over market price
Grading - only few aggregators currently sell the graded potatoes based on their niche markets (super markets and hotels). Potatoes are graded in 3 categories.	Grade A (large) = +20 RWF/ kg over market price Grade B (medium) = at market price Grade C (small) = -20 RWF below market price
Brushing- cleaned and brushed potatoes are sold to supermarkets while simply brushed are sold to other buyers (hotels, restaurant, and individual consumers who want to store potatoes for at least 1 month) ²⁵	Brushed potatoes sell at the same price as cleaned potatoes.

²³ National Institute of Statistics of Rwanda, Third Integrated Household Living Conditions Survey (EICV3), 2011

²⁴ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

²⁵ Based on information provided by Ibisubizo Company, an active aggregator of Irish potatoes.

In the potato value chain, farmers complained of poor trading terms with traders and wholesalers leading them to sometimes sell their produce at below cost. Therefore, the Ministry of Trade and Industry (MINICOM) in collaboration with MINAGRI and the Ministry of Local Governance (MINALOC) are in the process of introducing a new structured trading system for the Irish potato value chain that will engage farming groups, traders, and wholesalers in a system designed to more evenly distribute income along the value chain. The project, in partnership with Fédération des Coopératives de Pomme de Terre au Rwanda (FECOPORWA), will establish collection centers through cooperatives at key locations to aggregate produce from members, provide temporary storage facilities for produce, and put in place systems and processes for weighing, sorting, and grading the different varieties of potatoes in order to determine accurate prices for each variety. The project also establishes a solution to organize the business transaction through formal contracts between farmers, traders, and wholesalers (Regional Potato Trading Company).²⁶

Vertical and Horizontal Linkages, Governance and Inter-firm Relationships

Vertical linkages:

The vast majority of potatoes are produced sold as spot production at the farm gate or within the local markets. There are collection centers, meant to provide a minimal infrastructure for producers and traders to aggregate and conduct transactions. Traders largely avoid these collection centers and meet individual producers at their farms.²⁷

FECOPORWA, the Federation of Potato Producer Cooperatives, facilitated trade contracts between 4 producer cooperatives (Bulera, Musanze, Nyabihu, and Rubavu) with 4 potato wholesale traders in Kigali (Protraco, Duhahirane, Tuzamurane, and Nezerwa).²⁸ The terms of these contracts and experience would be relevant to understand potential for vertical integration in the fresh potato market.

It is anticipated that the new processors may pursue production contracts. Given the active trade of potatoes, there could be incentives to side sell if prices move against the contracts or processors have working capital limitations for timely purchases. For processing, quality and consistency will be important for managing processing efficiency and cost. This will include not only the production practices, but also the use of harvest maturity indexes and proper post-harvest curing and handling.

Horizontal linkages:

As highlighted below, there are various other programs and NGOs active in supporting and developing the potato value chain.

Trader Demographics

²⁶ PSDAG team meetings with MINICOM and FECOPORWA from March to August 2015; CONCEPT PAPER ON THE ORGANIZATION OF IRISH POTATO VALUE CHAIN, MINICOM, June 2015

²⁷ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

²⁸ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

The Irish Potato Value Chain Assessment draft report²⁹ indicates that producers often sell to small scale traders, often called chercheurs. There are active producer cooperatives and the Federation of Potato Producer Cooperatives, FECOPORWA.

According to the Cross-Border Trade Analysis Report (2013), five large importers using 20-MT trucks dominate the trade into Burundi. They may use agents or assemblers to accumulate the necessary volumes of potatoes in Rwanda (either from farmers or through markets, re-exporting the limited volumes coming in from Uganda) but they control the majority of the market in Burundi and sell to smaller traders and retailers on credit.

Processing

The potato market is dominated by fresh market, with some value addition through sorting, sizing, washing, and packing occurring on a limited scope. There are 4 known processing ventures, with some that are still in development phase, which are:³⁰

- Holland Fair Food: Joint venture Dutch and Rwandese. Production of packaged potato crisps under brand name, Winnaz. Start-up capacity anticipated at 8 MT/week.
- NYABIHU Potato Company Ltd: MINICOM supported cooperatively owned plant (producer cooperative.) MINICOM supported equipment, BDF the construction, and COIMU (Nyabihu producer cooperative) operational funds from members. Capacity 6 MT/day.
- Life Secret Company: Starch extraction to supply starch to Utexrwa and other small ventures.

Other Programs and NGOs supporting the Potato value chain³¹

IFAD/PASP – Five-year, \$83 million, Post Harvest Agricultural Support Project: Assists with post-harvest for various commodities, including potatoes in Musanze, Rubavu, and Nyabihu. The project sits with MINAGRI and plans to support up to 200 cooperatives in business training, accessing finance, accessing mechanization services, and post-harvest handling infrastructure.

IFDC/Catalyst II: Supporting private potato seed multiplication and production, and formulation of new fertilizer recommendations for producers.

FAO: Regional project supporting market linkages between producers, traders, and other regional end markets in varied roots and tubers, including potatoes.

IMBARAGA, BAIR, and OTP: Examples of local NGOs providing potato production and post-harvest extension services to producers.

²⁹ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

³⁰ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

³¹ Support to MINAGRI in the Coordination of Agribusiness Clusters around Selected Commodities: Irish Potato Value Chain Assessment, Draft Report March 2015.

The Dutch Embassy (EKN): EKN is supporting a seed potato support project to assist Rwanda in availing more and better potato varieties, and enhance their seed multiplication and marketing capabilities. In addition, support is provided for the development of Rwanda's system of Plant Breeders Rights. The activity contributes to ensuring sufficient protection for breeders to invest in Rwanda's private seed sector.

INES: Musanze based institute providing academic education in agriculture. Has a business department which includes in-vitro and mini-tuber production for potatoes.

Belgian Technical Cooperation (BTC) – Since 2011, BTC has been supporting RAB in a project focusing on five core elements: 1) production and sales of Quality Declared Seed (QDS), building a bridge between farm saved and certified seed; 2) improved business and market orientation of seed multipliers and other private seed stakeholders; 3) the development of an internal quality assurance system supported by RAB in parallel to the external quality assurance system by MINAGRI (Certification and Inspection); 4) the Rwanda Seed Enterprise capacitated to establish high operational standards including timely delivery of certified seed; and 5) the development of clear crop specific roadmaps describing the seed chain towards certified and quality declared seeds. The project is known for developing field-based farmer field schools working in conjunction with MINALOC. This project will close in December 2015.

MINAGRI chairs a **Potato Seed Working Group** and a **Seed Sector Working Group** that are actively meeting to address issues with privatization of the potato seed industry and the development of the new Seed Law and National Seed Policy.

2. SYSTEMIC CONSTRAINTS IN THE VALUE CHAIN

The main enabling environment constraint relates to potato seed. The Value Chain Assessment draft notes the lack of a policy and regulatory framework to allow private sector importation and development of potato seed. The analysis also indicates that the seed law relevant to plant health protection and plant breeder rights is currently being discussed in Parliament. (See sections on Business Enabling Environment and Inputs.)

High quality clean potato seed is constrained by sufficient quality and volumes of vitro plantlets, mini-tubers, and pre-basic seed. Seed producers need increased capacity in high quality seed production practices, land management (for proper rotation, disease management, and identification of sufficient 'clean' areas appropriate for seed production), seed harvest and post-harvest handling processes and infrastructure (seed potatoes require proper curing and storage), but also seed market development and linkages with potato producers. The seed producers are largely small potato producers themselves, who have been either encouraged to multiply potato seed by programs or have diversified into some seed multiplication to supply their own or immediate area's potato seed needs. Broad development and linkages for the potato seed market are needed to demonstrate the use and benefit from quality potato seed and promote awareness of existing multipliers. Seed markets must be developed along with the multipliers' capacities to meet any new seed demand, as current multiplication levels within the country are quite low.

Harvest and post-harvest practices on the part of the producers are cited in a number of the noted value chain analyses as relevant constraints to improved market access and performance. These include the impact of not using a harvest maturity index or properly curing and the resulting increased perishability of the potato in these cases. Early potatoes are easily bruised and damaged, in addition to a generally shorter shelf-life.

Field curing or use of small solar tunnel shelters for curing (in the case of rain) can significantly decrease the perishability of potatoes, ensuring less loss during market handling.

Potato seed does need to be stored for at least a couple of months at a time to be conditioned and in preparation for the subsequent season. There are various experiences with simple, thick walled, locally constructed structures that can be utilized for seed conditioning and storage.³² These basic structures can hold up to 20-30 MTs each. More formal structures can be utilized for larger volumes of seed. Producer level storage is most likely economically appropriate for seed multipliers, which has a higher value than ware potatoes. Properly harvested, cured, and packed potatoes are less perishable horticultural products.³³ If properly handled, potatoes can be transported longer distances and be kept over multiple days or even weeks in ambient conditions with minimal quality loss for fresh market use. Temperature, humidity, and light all affect quality and perishability. It is anticipated that new processing ventures will need limited controlled environment storage. Controlled environment storage requires proper management and only high quality potatoes will retain quality over the storage period. There are no significant global examples of 'toll storage' similar to grain elevator storage in grain of producers utilizing a paid storage service in potatoes. Therefore, major constraints found in the value chain that affect the business transaction include:

1. Lack of quality and quantity of improved seed, specifically vitro plantlets that can produce up to 45 MT/ha (150% increase over traditional seed);
2. Poor agricultural practices, the misuse of pesticides, harvesting before maturity and curing process, which lead to high perishability before sale; and
3. Weak vertical relationships with limited market information and poor terms of trade.

E. OPPORTUNITIES AND INCENTIVES FOR UPGRADING

Potatoes are an important staple food, but also represent an important cash crop for about 1 million households, mostly concentrated in Western and Northern Rwanda. There is a dynamic trade moving nearly 180,000 MTs of potatoes from production areas throughout the country for consumption, both in rural and urban areas. Initial analysis also indicates that Rwanda has an opportunity as a competitive potato producer to sell into regional markets with increased domestic production. The yield gap between current averages and potential yield could be 100%. Assuming that no additional production would be kept by the producing households for their own consumption (assumes their current consumption levels would not increase), this would mean an additional 2 million metric tons. An increased average yield of 20% over the medium term would be more appropriate and more than double the amount of potatoes within the market (from about 180,000 MTs to about 500,000 MTs.) This can be achieved without increasing the land under potato production, and only focusing on improving production practices and improving the availability and management of improved, clean potato seed.

Seed and Input Supply:

- Policy and regulatory framework to allow foreign genetic material introduction by both public and private introduction.

³² World Vision program working with potatoes, onions, and carrots in Angola; Gates Foundation funded, is one example in Sub-Saharan Africa.

³³ Identification of Appropriate Postharvest Technologies for Improving Market Access and Incomes for Small Horticultural Farmers in Sub-Saharan Africa and South Asia, World Food Logistics Organization, 2010.

- Introduce and test new varieties from the Netherlands that have shown potential within the region.
- Develop seed multiplier capacity and production practices – link with in-vitro plantlet and mini-tuber sources.
- Develop an industry wide potato seed market development campaign to promote utilization of improved seed potatoes and strengthen linkages between seed multipliers and producers.
- Support appropriate seed conditioning and storage capacity with seed multipliers.

Production:

- Proper crop rotation and disease management are important for managing cost of production and productivity. Pesticide cost and application increases the cost of production. Utilization of quality seed is uneconomical with poor production and disease management.
- Potatoes are a high labor crop. Labor efficiency is an area for potential margin improvement.
- Harvest and post-harvest practices should be market driven. Work with traders to best understand associated premiums may offer opportunities to utilize appropriate harvest maturity indexes (fully mature versus early potatoes), field curing, and/or sorting and washing for sale.

Assembly and Wholesale:

- Terms of trade are not well known – working with the trade to best understand where potential harvest, post-harvest curing, or packing can offer premiums worth farm level effort. The MINICOM/FECOPORWA Collection Center program aims to improve this.
- Traders may utilize appropriately sized controlled environment storage with high throughput potential.
- With increased production, the trade ultimately will need to move and handle the increased volumes. Further trade level analysis is needed to understand need for upgrading market centers, if leasing mechanisms are needed to upgrade transport equipment, and what, if any, trade finance may be needed.

Exports:

- The Cross-Border Trade analysis identified interesting regional price variations which indicate some arbitrage opportunities for Rwandan potatoes into neighboring countries. But the volumes traded to date are extremely low and the trade networks do not exist to take advantage of these potential arbitrage opportunities. More research will be needed to analyze these potential arbitrage windows and understand the necessary volumes and absorptive capacity of the markets prior to prioritizing the facilitation of this regional trade. DRC and Burundi offer the most attractive opportunities for near-term analysis and consideration.
- The Cross-Border Trade Analysis identified possible transport arbitrage opportunity with empty trucks returning to Mombasa and Dar es Salaam. A transport clearing house might facilitate utilization of backhauls to move competitive potatoes into target markets. This needs more analysis prior to pursuing.