ISP Rwanda: Commercial Investment Opportunities in Agriculture Value Chains

December 2018

Highlights from this report

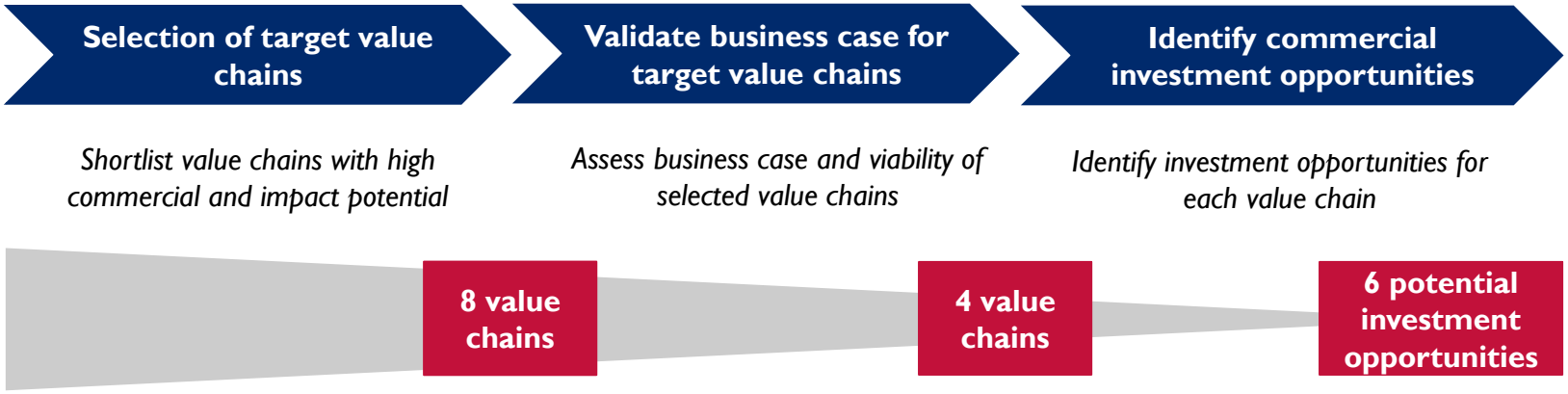
- **There are a range of value chains that have a viable business case in Rwanda** – these are in products that are of high value in the European and Middle Eastern markets, demand significant amounts of manual labor, and are perishable and therefore are typically received in Europe by air
- **There are a number of commercially attractive investment opportunities** as a result of opportunities in these value chains– both as vertically integrated farms, as well as in cross-value chain technical and transactional operations
- **There are opportunities for USAID to accelerate private sector development** by promoting these investment opportunities through activities such as: by recruiting world class business operators, helping match operators and capital, and supporting the industry to solve emergent bottlenecks (e.g., ensuring airfreight capacity can keep up with industry growth)

Approach of the work

This report outlines the assessment of targeted value chains in Rwanda, and the identification of investment opportunities for the GFSS Program to promote.

To identify viable investment cases a three-phase process was followed – the process narrowed in on six investment opportunities opportunities across four value chains over the course of 10 weeks, the team leveraging secondary data sources as well as information from over a hundred individual and organizations inside and outside of Rwanda.

Project approach:



Structure of this report

Assessment of viable business cases

Business case analysis

Snow peas; Passion Fruit; Chilis; Mushroom; Macadamia; Farmed fish; Avocado; Pineapple

Assessment of commercial investment cases

Investment opportunities

Passion fruit farm; Snow pea and chili farm; Mushroom farm; Input provider; Cold chain logistics; Aggregator

Next steps for USAID

Annex

Financial landscape of Rwanda
Airfreight situation

Business case for target value chains

Executive summary – business cases (1/2)

Food security can be obtained in many ways: including nutritional improvement and improved production, decreased cost of staple food, and livelihood improvement (through job creation or increased salary/ livelihood per job or both). **The in Investment Support Program seeks to improve food security by focusing on farm production for sales rather than on subsistence – and attracting commercial investment into smallholder value chains.**

Attracting commercial investment requires a business opportunity of sufficient scale and profit potential. Business opportunities do exist in value chains that are not viable on a commercial scale (e.g., selling to tourists, or catering to a niche local segment), however attracting commercial investment requires the ability to sell in volume and at a profit – these opportunities can exist in areas:

- *Domestic consumption*, which given Rwanda's small and poor population offers limited potential
- *Import substitution*, which is also a challenge in Rwanda given it's small size
- *Export opportunities*, which offers the largest opportunity due to Rwanda's comparatively good infrastructure, ease of doing business, and increasingly air connections to Europe and the Middle East

Horticulture export to Europe is a pardicular opportunity for Rwanda due to 1) growing demand in Europe for high quality fresh produce; 2) difficulties in the Kenyan horticulture market to meet minimum residue levels due to over-application of chemicals; 3) expansion of Rwandair bringing new direct routes to Europe from Kigali, at an affordable/subsidized prices. These factors have led to an already growing focus from MinAgri and NAEB on the horticulture market, and to the entrance of a number of small businesses who are rapidly growing in the space.

Executive summary – business cases (2/2)

We considered eight value chains to understand whether there is a commercial scale business case for them in Rwanda, we considered the following factors to assess thie business case:

- **Viability**: Are Rwandan agronomic conditions favorable for production of this value chain? What are the main drivers for the successful harvest of this product in Rwanda?
- **Profitability**: Can the value chain be grown profitably in Rwanda? Using farmgate price, transport cost, and market price in export target markets as inputs to the analysis
- **Competitiveness**: Can Rwandan be competitive with other countries should a price war begin?
- **Incrementality**: Does the development of this value chain bring incremental impact to Rwandan smallholder farmers or the Rwandan agricultural revenues?

Three value chains were deprioritized due to for profitability or competitiveness reasons:

- Farmed fish relies on maize-based feed, which makes Rwandan uncompetitive for production as other regional players can produce feed much more cost effectivlly
- Avocado and pineapple, while lucrative crops are best transported via sea freight and other producing countries such as Kenya and Ghana have a competitive advantage given their ports

Macadamia was deprioritized due to long payback periods; however it remains a potentially impactful crop for farm families that can wait long-term (>10 years) for a return

Based on these criteria the value chains of **passion fruit, snow pea, chili, and mushroom were identified as commercial investment opportunities**

Increasing farmer income is a key role for agricultural transformation and food security in Rwanda

Potential approaches to increasing food security and nutrition of smallholder farmers:

1. **Increase incomes**
2. **Improve farmers' ability to grow and supply their own nutritious food**
3. **Decrease cost of food**

Given ISP's focus on commercial scale investment, **this project has focused on increasing incomes** as a high impact way of improving nutrition and food security

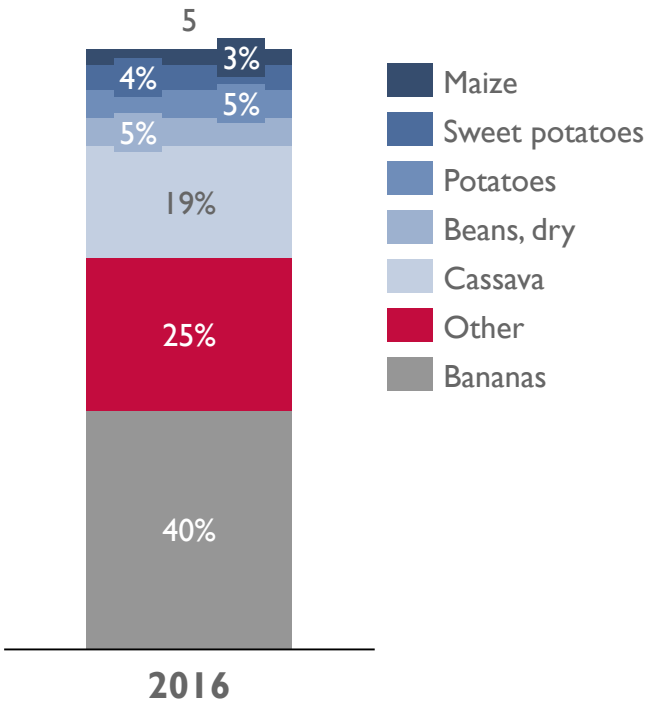
There are a number of ways to promote income growth for Rwandan farmers

Export markets (air freight and regional road transport)	The growth of RwandAir, and focus of Rwandan government on export diversification, makes the policy environment conducive to meet the increasing demand for goods in other markets
Import substitution	This is a policy focus for the Rwandan government, but may be less interesting for commercial scale given the small size of the local market
Growth of local market	While growing, the local market is relatively small, and offers limited opportunities for scale

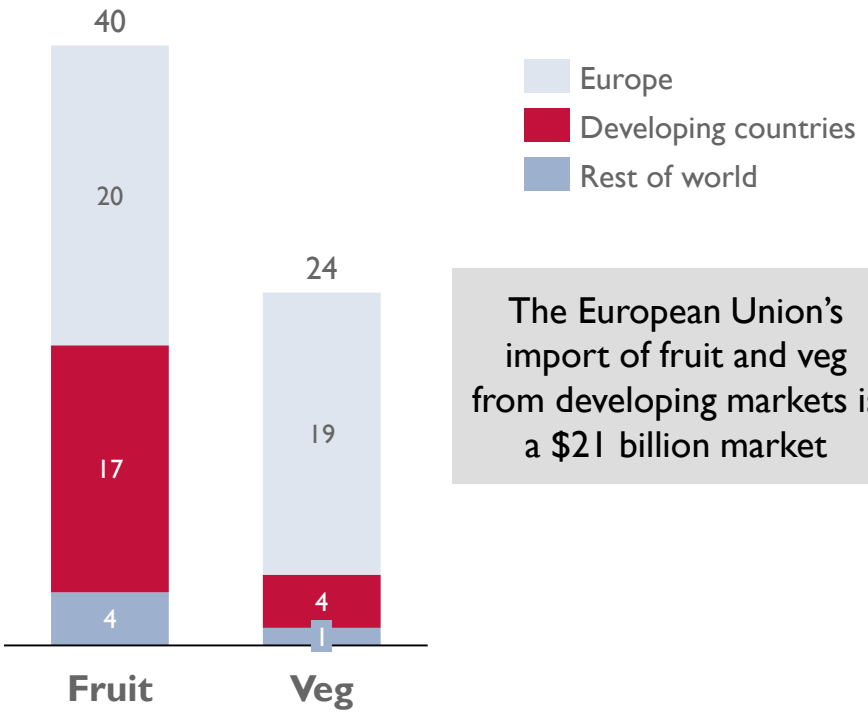
Given ISP's focus on commercial scale investment, this project **focuses on export crops** that can provide high value returns at scale

Domestic production is focused on local consumption, but targeting the EU market is a significant opportunity for growth

Production value of Rwandan agriculture goods
USD Billions, 2016



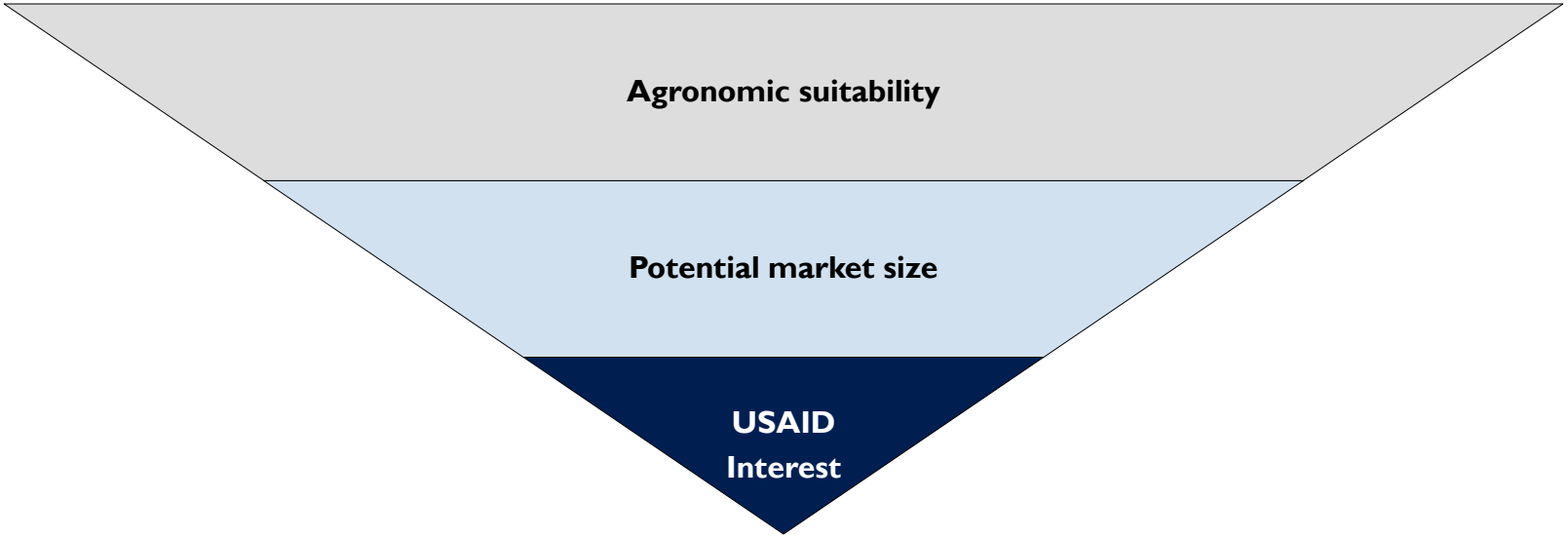
European import of fresh produce
USD Billions, 2016



The European Union's import of fruit and veg from developing markets is a $21 billion market

Source: FAOSTAT; CBI European import of Fruit and Veg report

In phase I, 8 value chains were selected for further analysis on whether they hold a business case for commercial investment



Farmed Fish	**Avocado**	**Mushroom**	**Pineapple**
Macadamia	**Chili**	**Passion fruit**	**Snow pea**

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The value chains were analyzed for their commercial investment potential

Key Questions:	Methodology:
VIABILITY: *Are Rwandan agronomic conditions favorable for production of this value chain? What are the main drivers for the successful harvest of this product in Rwanda?*	• Interviews with producers and aggregators • Literature review
PROFITABILITY: *Can the value chain be grown profitably in Rwanda? Using farmgate price, transport cost, and market price as indicative metrics*[1].	• Estimated farmgate and transport prices – processing cost not included • Market prices from literature review or interviews
COMPETITIVENESS: *Does Rwandan production have a competitive advantage over other producers?*	• FAOSTAT information • Literature review • Interviews with international aggregators
INCREMENTALITY: *Does the development of this value chain bring incremental impact to Rwandan smallholder farmers or the Rwandan agricultural revenues? Can the development of this value chain disproportionately impact the Rwandan agricultural ecosystem?*	• Estimated farmer income / ha • Understanding of potential job creation

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1 Note that this takes into account current farmgate price and 'ideal' transport costs. It excludes any other costs/ levies (as they can usually be worked on). Where analysis yielded lack of profitability, an increase in yield could in theory transform this – we thus looked at the opportunity for yield increase where indicative analysis yielded lack of profitability. This step-wise approach allows to be efficient whilst not missing opportunities

Both Rwanda's competitive advantages and constraints for agricultural development were then considered

Competitive advantages

Favorable climate: Rwanda's high altitude and temperatures allows for year-round cultivation – a strategic advantage to Kenya.

Air freight capability: The growing RwandAir network with preferential air freight rates allows Rwandese high value products to reach markets quickly and cost effectively.

Supportive and stable government: Rwanda is seen as a "safe bet" by market buyers to be able to have a secure supply.

Constraints

Mountainous land divided in small parcels: Challenge to scale commercially, but incremental impact for smallholder farmers. Also allows for more oversight on specialty crops.

Land locked: The lack of a port puts Rwanda at a disadvantage to Kenya to export produce, especially as refrigerated containers become more common.

Given ISP's focus on commercial scale investment, this project **focuses on export crops** that can provide high value returns at scale

Source: Stakeholder interview with IDH; Dalberg analysis

Four of the eight value chains presented a viable business case for commercial investment

Snow Peas	Viable	Cost structure is globally competitive and farmers earn as much as $4,100 per HA when exported to Europe
Passion Fruit	Viable	High margins and high yields make passion fruit a lucrative value chain, offering farmers $5,000 per HA
Chili	Viable	Chilis can provide farmers a $4,500 income, and technical certifications could become a competitive advantage
Mushroom	Viable (specialty mushrooms)	Common mushrooms represent thin margins, however specialty mushrooms offer 80% margins
Macadamia	Viable, but too long return horizon	Intercropping with coffee offers a 27% IRR, but 10 year payback is unrealistic for commercial investment
Farmed Fish	Deal breaker – Cost production	While farming of fish is competitive regionally, the production of fingerlings and feed may be a deal breaker
Avocado	Deal breaker – Cost of shipping	Heavy and transported via sea freight, even ready to eat are shipped via sea and ripened onsite in Europe
Pineapple	Deal breaker – Cost of shipping & low yield	Competitors (Ghana, Costa Rica) are shipping via sea, whilst disease leads to low yields in Rwanda

Source: Dalberg analysis; Noun Project (icons)

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

Farmed Fish

Avocado

Pineapple

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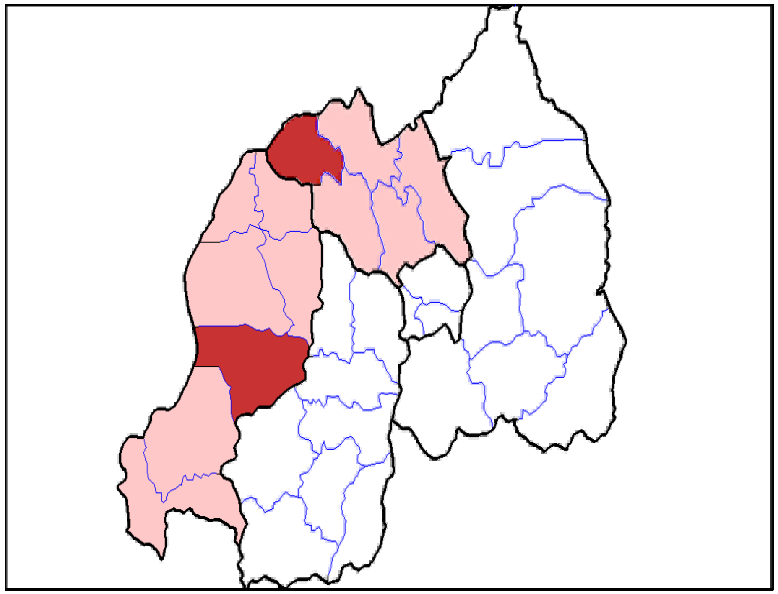
Snow peas grow well in the western and northern provinces of Rwanda due to climatic conditions

Western and Northern province
Karongi and Musanze Districts



Temperature: The ideal growing conditions for snow peas are an average daily temperature of 15-18 °C with a maximum of 24 °C and minimum 7 °C. Average annual temperatures in the Northern and Western province range from 16 to 22 °C

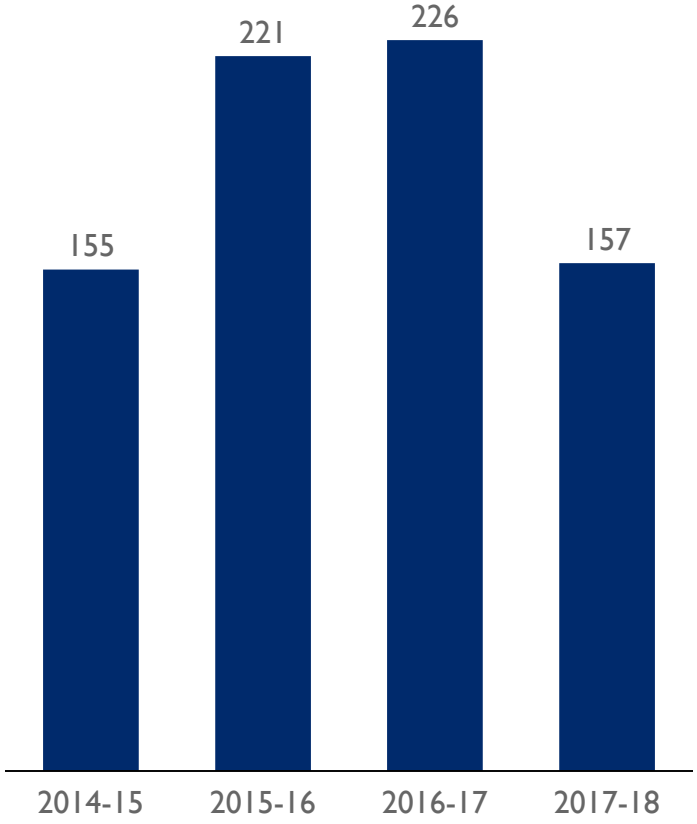
Altitude and other factors: Snow peas grow in a wide range of soils provided the soil is well drained and fertile, ideally at high altitude. The Northern province has fertile volcanic soil, and both provinces have altitudes in the range between 1470-2200 meters

Sources: Previous Dalberg study on snow peas value chain; National Agriculture Export Board (NAEB), Leading Horticulture Export Companies in Rwanda; National Agriculture Export Development Board (NAEB), snow peas; Agriculture Victoria, snow pea and sugar snap pea; Department for Agriculture, Forestry, and Fisheries South Africa, Garden peas guide,2011; Republic of Rwanda, Western Province Karongi District Development Plan (2013-2018; International Journal of Business Management and Economic Research (IJBMER), Opportunities for Rural Development in Musanze District, Africa: A Rural livelihood Analysis ;Wikipedia, Map of Karongi District; Wikipedia, Map of Musanze District

Over the past 4 years the production of snow peas showed signs of growth however is vulnerable to climate shifts

Production of snow peas

Tons per year



Climate shifts:

- In 2018, rainfall during the months of March-April reached 200mm compared to a historical average of 1600mm
- Heavy rain fall can lead to crops being vulnerable to pests and diseases and can result in huge production losses
- A key mitigation is to plant crops in areas that are not susceptible to floods and to enforce adequate water management measures on the farms
- Many exporters of snow peas have slowed or stopped their exports due to a lack of reliable supply in 2018 following heavy rainfall that affected production

Source: National Agriculture Export Board, snow peas production and export volumes (yearly numbers are from July-June); Previous Dalberg study on the snow peas value chain

There are a number of exporters trying to grow snow pea exports however they struggle with lack of farmer experience

Potential exporters of snow peas in Rwanda:

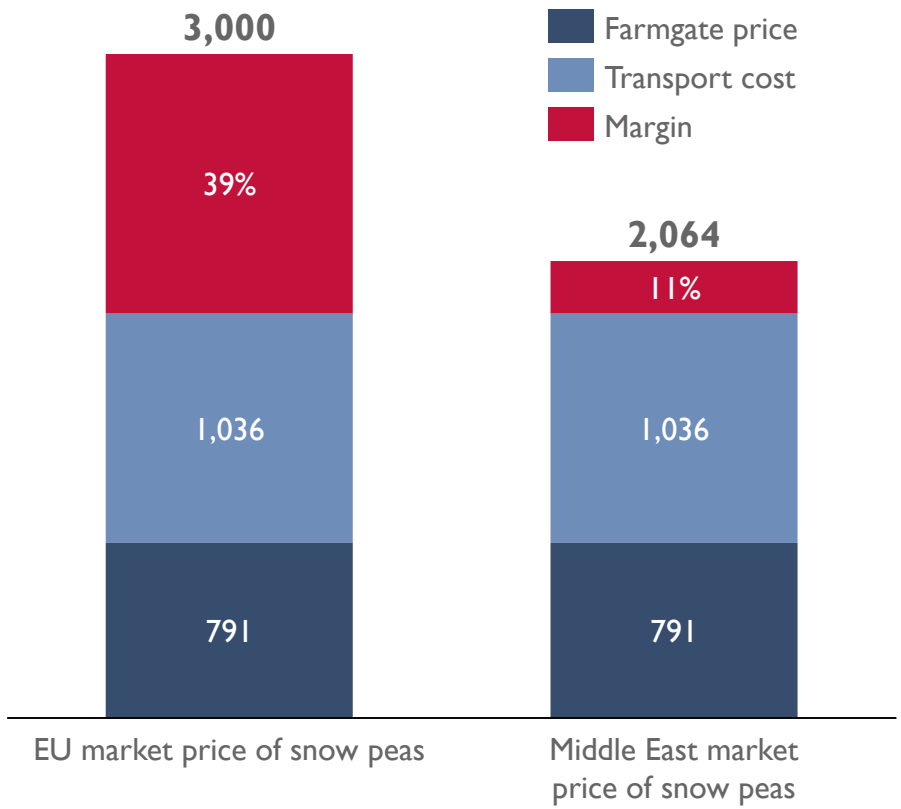
- **Proxifresh Ltd:** a Mauritian company that was founded in 2009 and started operations in Rwanda in 2014, with a focus on exports of French beans, spring onions, passion fruit, snow peas/sugar snaps.
- **Nature Fresh Foods:** a horticulture exporting company that sources premium green chili, hot pepper, French beans, and passion fruits from 50 smallholder farmers from across 4 districts in Rwanda for exports to the EU.
- **Golden Cat Ltd:** involved in the production and export of Horticultural crops namely French beans, snow peas, sugar snaps, Bird- eye chilies, and passion fruit.

" Snow peas are very profitable and there is substantial market for the crop, however, I have tried growing and exporting the crop on three occasions. Each time I received high yields, but the entire produce was rejected due to black spots that formed on the peas by the time the product reached the client"
–Ben Mugisha CEO Nature Fresh Foods

Source: National Agriculture Export Board, snow peas production and export volumes (yearly numbers are from July-June)

Snow peas have particular high profit potential for export to Europe, with a constant import demand

Margin of snow pea exports
USD/ Ton



While green bean imports to Europe are seasonal due to local production, more specialized varieties such as snow peas are imported year-round. This ensures relative price stability as there is constant supply to Europe from a variety of markets.

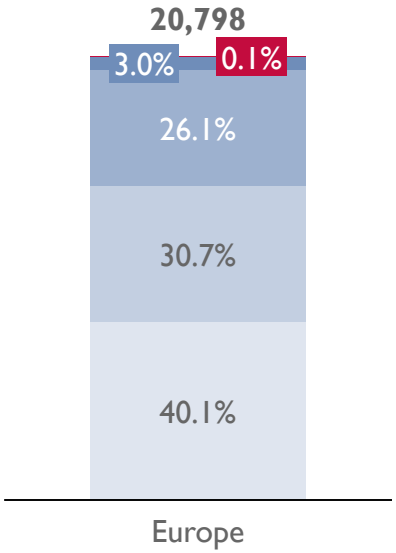
This represents a specific opportunity to develop the value chain in Rwanda where snow peas are in season for 8 months (Sept-Dec, March-May).

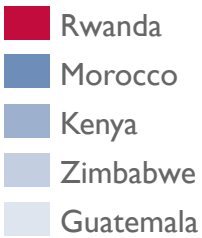
Transport costs are inclusive of ground transport from the farms to the packhouse and from the packhouse to the airport. The Rwandan Government's subsidy on airfreight for direct flights to Europe, enables exporting companies to compete at a regional level.

Source: Previous Dalberg study on snow peas value chain; International Trade Centre, 2015, Fresh Fruit and Vegetable Middle East

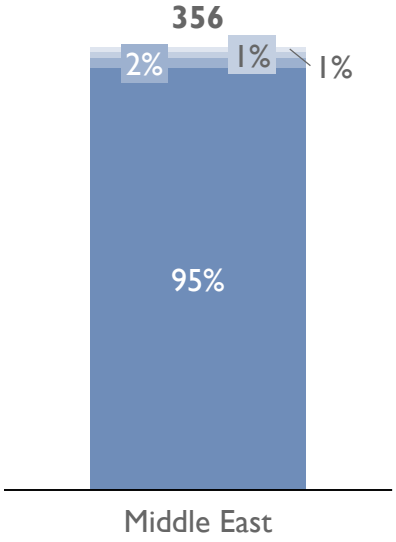
While the European market is a larger export opportunity than the Middle East, it has a range of established competitors

Import volume of snow peas - Europe
Tons, 2016





Import volume of snow peas – Middle East
Tons, 2016

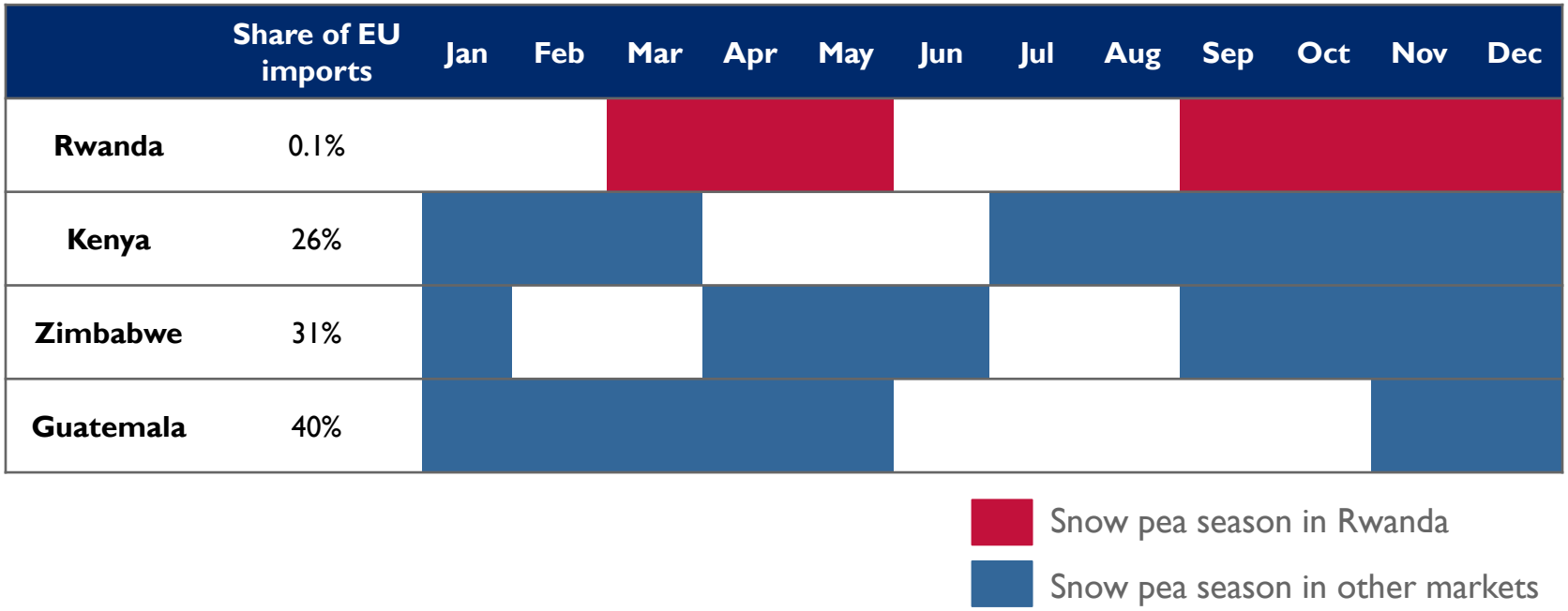


Kenya currently dominates the Middle East market, indicating that there is an opportunity for more East African sourcing of snow peas, however there are currently limited air freight links between Kigali and the Middle East

Sources: CBI Ministry of Foreign Affairs, Exporting fresh beans, peas and other leguminous vegetables to Europe; FAOSTAT; Previous Dalberg study on snow peas;

Rwanda does not have significant seasonal competitive advantage in the global market

Seasonality of snow pea production



Sources: Dalberg analysis; Emerging farmer, grow guide, how to grow peas in Zimbabwe, 2017

Rwanda has a competitive advantage over Kenya on cost, however farmers lack the expertise and production know-how

	Rwanda	Kenya
Cost competitiveness	Rwandan farmgate: $791/ton Rwandan transport: $1,072/ton	Kenyan farmgate price: $975/ton Kenyan transport: $1,970/ton
Transport links	Rwanda has direct flights to Europe with cold storage capacity	Kenya has direct flights to Europe with cold storage capacity
Seasonality	Snow peas in season Sept-Dec and Mar-May	Snow peas in season Dec-Mar and July- Aug
Government support	The Rwandan government is actively supporting horticulture exports through subsidies in inputs, finance, and airfreight	The Kenyan government recently launched the Kenya Horticultural Council to coordinate support to the horticultural industry

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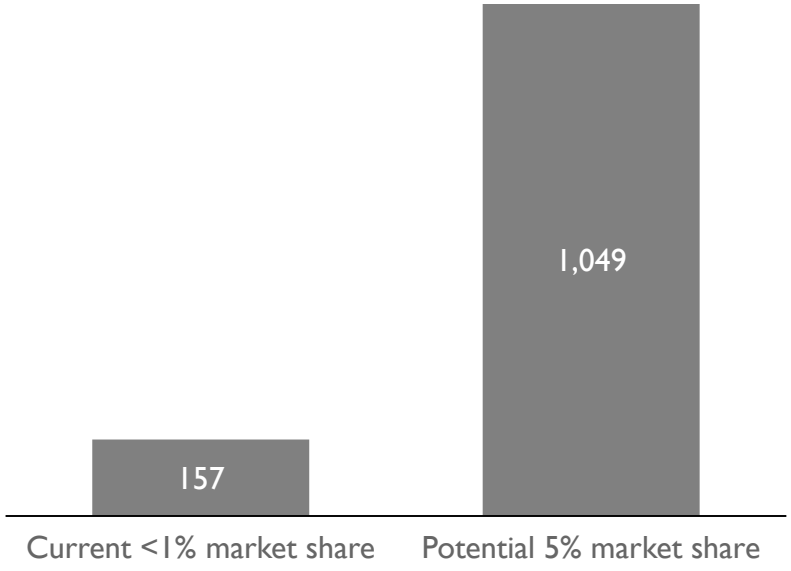
Source: Previous Dalberg on snow peas value chain; National agricultural export board (NAEB), investment opportunities in horticulture in Rwanda; USAID, Global Competitiveness Study: Benchmarking Kenya's Horticulture Sector For Enhanced Export Competitiveness; Greenlife Crop protection Africa, snow peas; Stakeholder interviews

Rwanda could grow its snow pea business ten-fold while only capturing 5% of the European Market

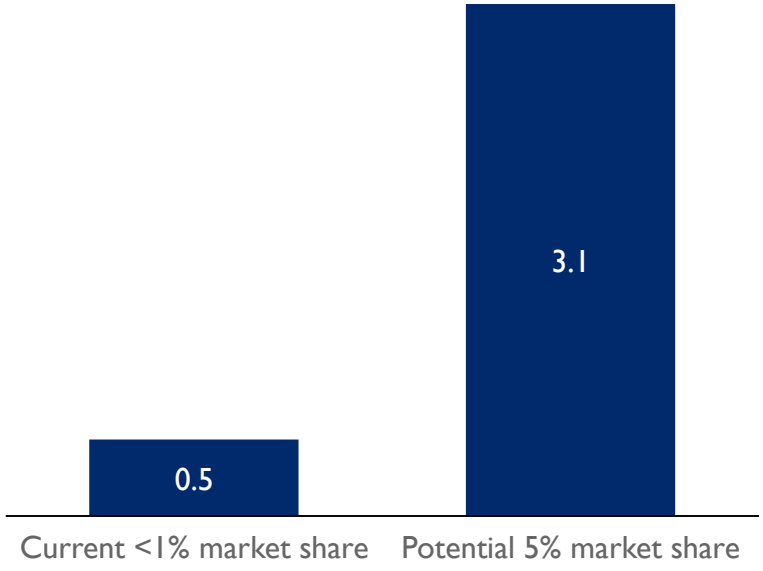
Market potential of snow peas in Europe - volume

Tons



Market potential of snow peas in Europe by- value

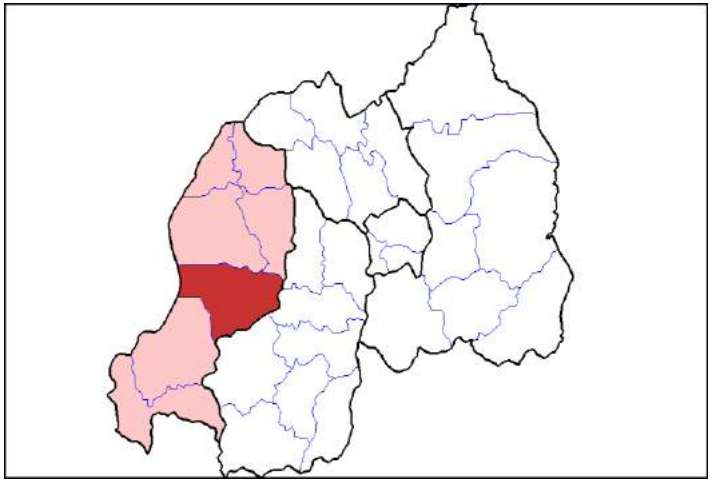
USD (Millions)/year



Sources: Food and Agriculture Organization; DR Congo National Agency for the Promotion of Investments; Rwanda Ag Board Official interview in New Times

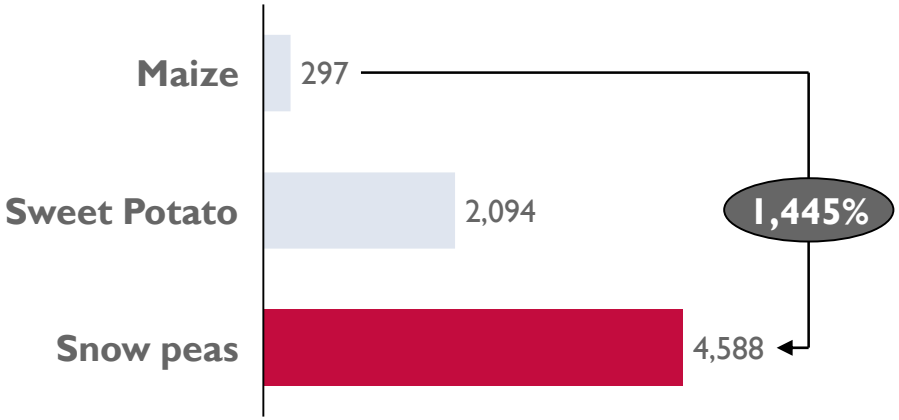
Snow peas have the potential to bring significant additional income to regions that are some of the poorest in the country

The north west region, where snow peas grow best, is the poorest region in the country. In Karongi, 61.7% of the people living in the district are categorized as poor



Farmer annual income per crop per acre*

USD / year / hectare



Income from snow peas is exponentially higher than that of current staple crops – presenting a significant opportunity for local communities to increase their incomes and then buy both staple foods and more nutritious foods

Sources: National Institute of Rwanda, District Profile Karongi; National Institute of Statistics Rwanda (NISR), seasonal agricultural survey 2014; Rwanda state of environment and outlook report, overview of the Agriculture sector

*Estimated revenue – does not take incremental input costs into account

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Technical support on good agricultural practices to improve quality is currently key barrier to production and export

SNOW PEAS	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy inputs from Kenya and Uganda	Produced primarily by out-growers, snow peas grow seasonally from Sept-Dec and Mar-May	Exporters buy snow peas from farmers, and aggregate for export	Snow peas are processed, packed and exported
Value chain barriers	**Producers do not know best practices or techniques**	**Climatic conditions (e.g heavy rainfall)**	**Few players in this space**	**Limited cargo capacity**
Potential interventions		**Training schemes for farmers** **Organic certification** **Local input providers**	**Increased cold chain capacity** **Availability of local packaging material**	

Sources: Previous Dalberg study on snow peas value chain

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

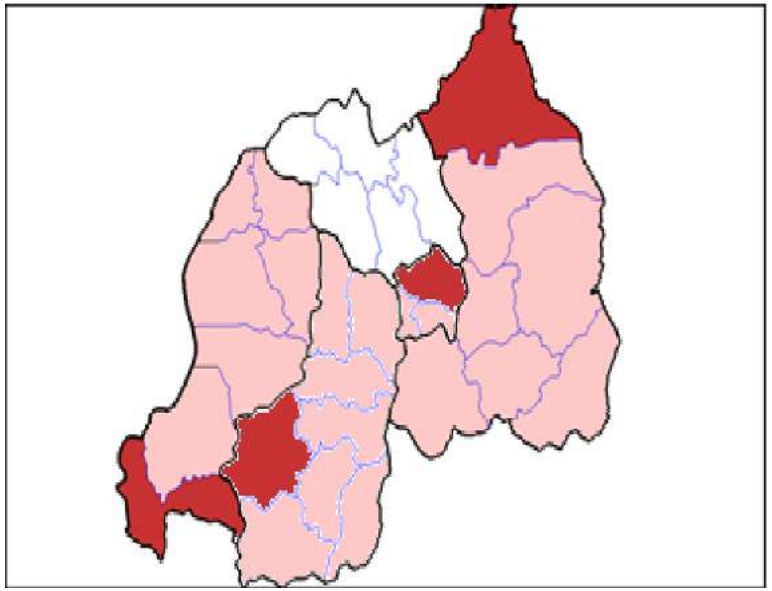
Farmed Fish

Avocado

Pineapple

Rwanda has a subtropical climate suitable to grow passion fruits, but lacks flat lands that improve cost efficiency

Eastern, Western and Kigali provinces
Rwamagana, Nyagatare, Rusizi, Nyamagabe and Gasabo Districts

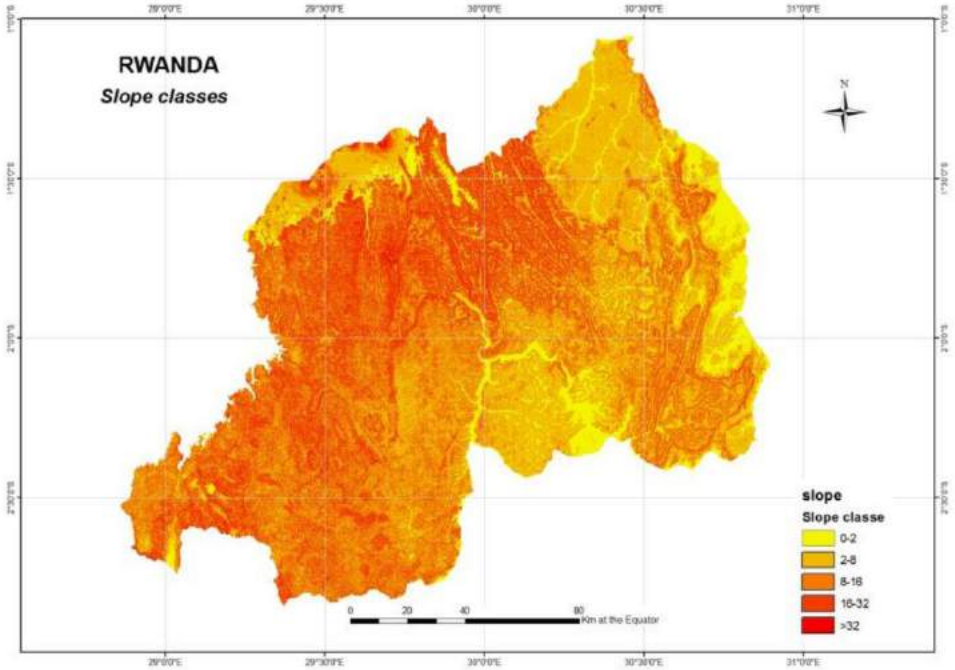


Temperature: The ideal growing conditions for passion fruits are average daily temperatures between 21-25 °C, and annual rainfall levels above 1,200 mm, which comply with Rwanda's climate.

Land conditions: Passion fruits grow well in 600 mm deep, well-drained soils, ideally at high altitude between 1,200m and 2,000. Flat lands are preferred as passion fruits are climbing vines that require 2m x 3m of spacing from one plant to another. Nyagatare and Ruzizi Districts are characterized by relatively gentle hills

Source: Nadine Othman, Lebanese University, Cultivation of passion fruit under local climatic conditions of Lebanon, 2016; National Agriculture Export Development Board (NAEB), Passion fruit; AFSR, Rwanda Seed Commodity Chain Information Management System, 2009

While Rwanda is mostly mountainous, there is more than enough suitable land to develop a passion fruit export industry



Slope	% of land in Rwanda	Hectares
Extreme (over 55%)	17.6%	385,000
High (25%-55%)	21.5%	437,000
Medium (13%-24%)	37.5%	763,000
Low (6%-13%)	16.7%	340,000
Very low (<6%)	6.7%	137,000

With over 450,000 HA of low and very low slope land, Rwanda could produce over 2 million tons of passion fruit (over $2 Billion farm gate value), suitable land is therefore not a limiting factor

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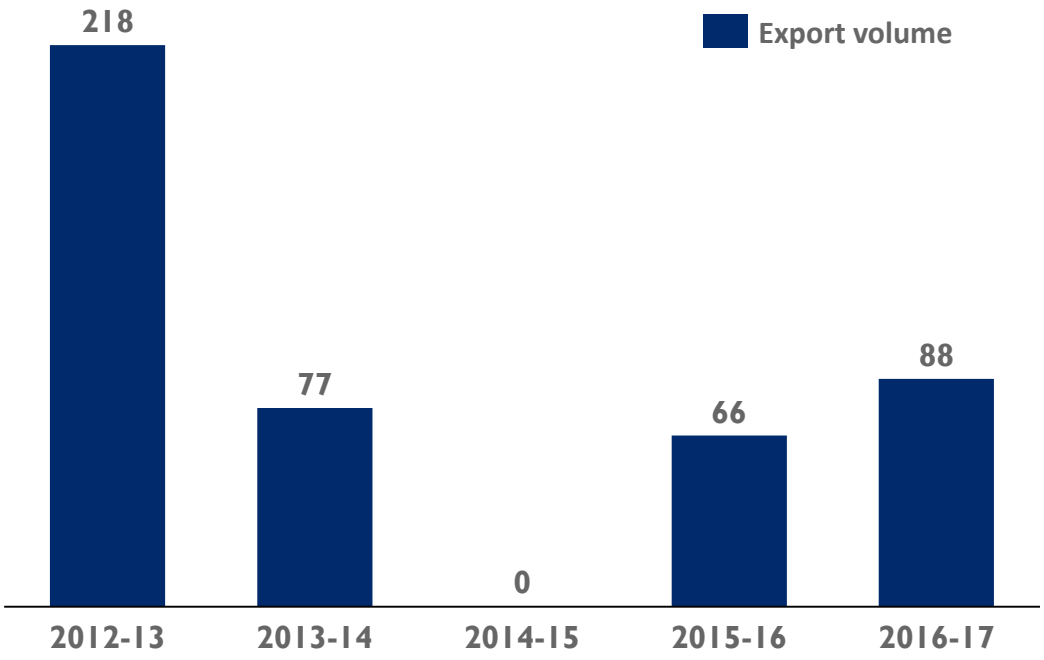
Source: Rwanda Land use map, FAO 2010; Building Capacity for Sustainable Land Use and Management in Rwanda, Ministry of Lands, Environment, Forestry, Water and Mining, UNDP and GEF, 2007

Export of passion fruits has been highly volatile, driven by disease and lack of quality control

Export of passion fruit

Tons per year, USD



Passion fruit is complicated to grow, because it is:

- Highly susceptible to diseases – in particular Passion Fruit Woodiness (PWD)
- Dependent on the ability to procure high-quality seedlings
- Subject to higher international standards (local grades fetch only about half the price

Challenges in developing consistent supply of passion fruit may present an opportunity for a commercial scale producer who can invest to mitigate these challenges

Source: National Iinstitute of Statistics Rwanda Statistical Yearbook 2017; stakeholder interviews; FAO

A number of exporters are already sending passion fruit to Europe, and are excited about its future

Current exporters of passion fruits in Rwanda:

- **Proxifresh Ltd:** a Mauritian company that was founded in 2009 and started operations in Rwanda in 2014, with a focus on exports of French beans, spring onions, passion fruit, snow peas/sugar snaps
- **Nature Fresh Foods Ltd:** a horticulture exporting company that sources premium green chili, hot pepper, French beans, and passion fruits from 50 smallholder farmers from across 4 districts in Rwanda for exports to the EU
- **Golden Cat Ltd:** a mission-driven horticulture company that produces and sources high quality French beans, snow peas, sugar snaps, Bird- eye chilies, and passion fruits from 250 smallholder farmers, and exports to the EU

*"Passion fruit **is a very lucrative business because the yield is very high** and the demand is not being met. We should think about exporting them more."*

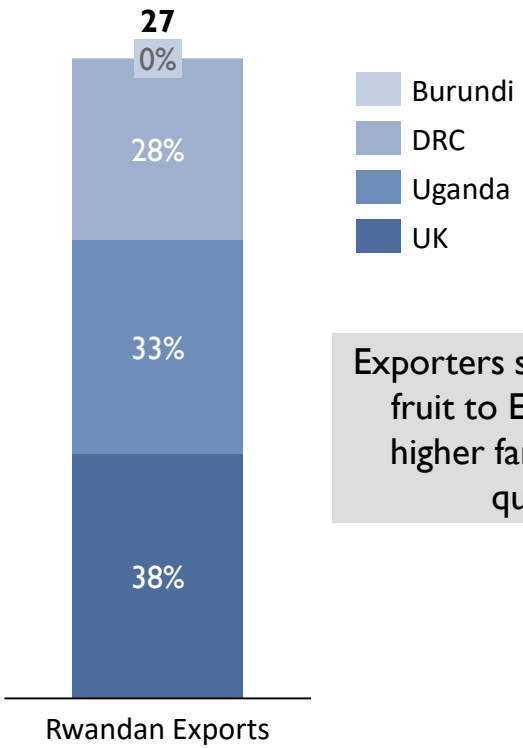
"Most of the passion fruits are shipped to the Netherlands. We have two potential buyers in Czech Republic and Sweden, but their requirements are very strict and the reject rates are high."

*"It is **difficult to compete with Nairobi** because farmers in Rwanda are still learning and lack the expertise. Buyers often turn to exporters in Rwanda when the supply from Kenya is low."*

Sources: Previous Dalberg work; Stakeholder interview

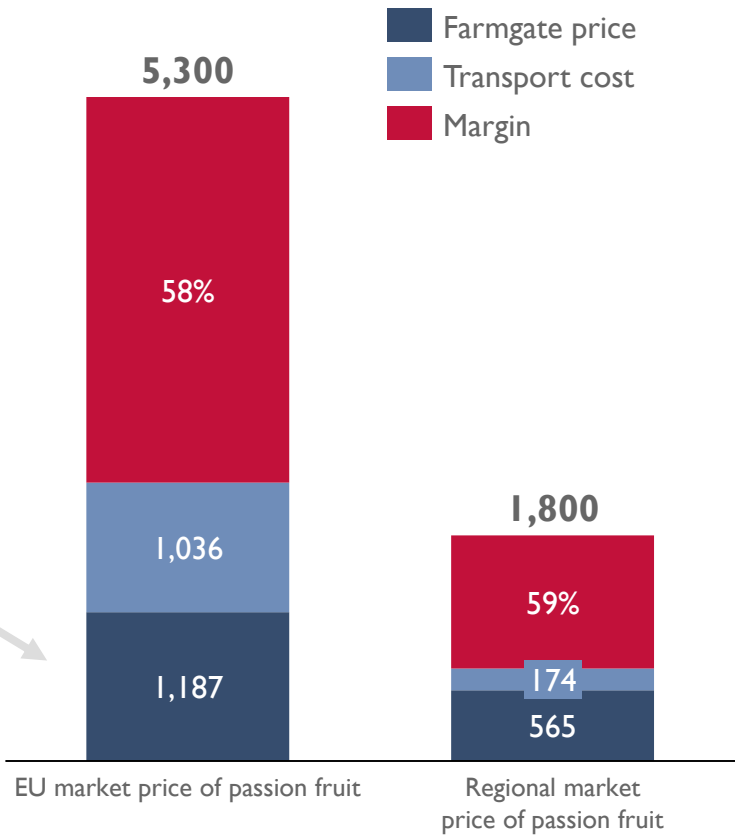
Passion fruits are particularly profitable for export to Europe, with a constant import demand

Rwandan passion fruit monthly exports – by destination
Ton (Thousands), 2018



Exporters send high quality grade fruit to Europe – providing a higher farmgate price for EU quality product

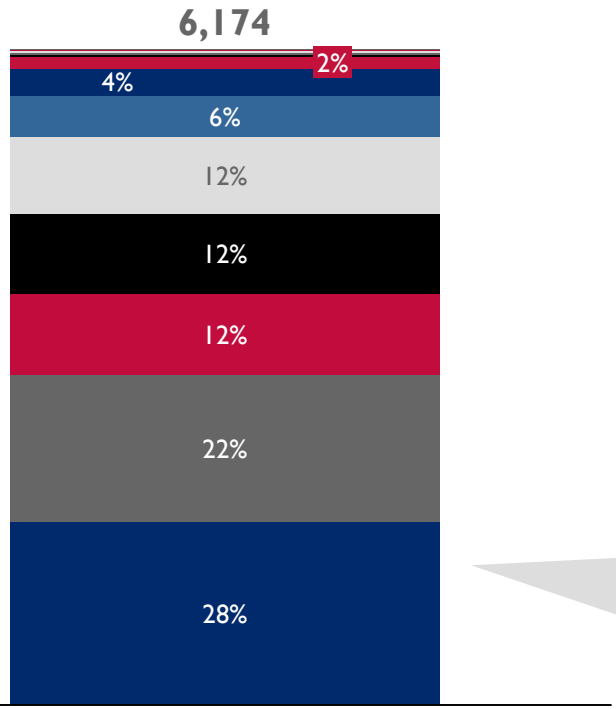
Margins of passion fruit exports
USD / Ton

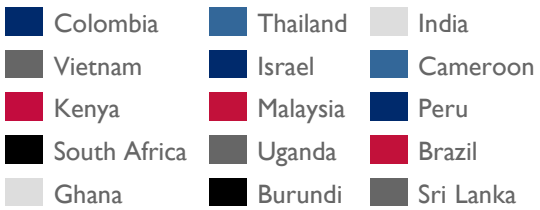


Sources: Dalberg analysis; NAEB, May 2018 Report, 2018; Stakeholder interview; AllAfrica Market Watch available at https://allafrica.com/stories/201805010029.html

Kenya has established a sizeable share of the EU passion fruit market that is otherwise dominated by Colombia and Vietnam

European import volume of passion fruits globally
Tons, 2011





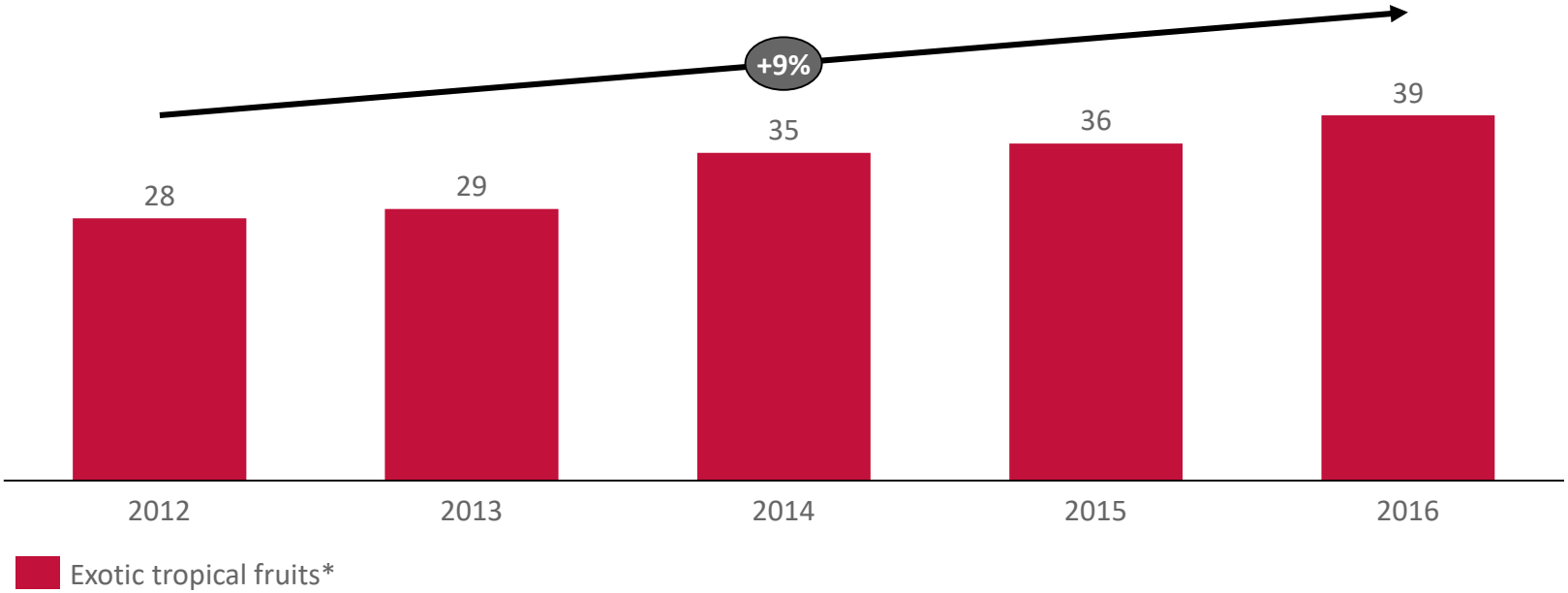
Colombia mainly provides yellow passion fruits, which are mostly used for processing due to strong acidity. Vietnam provides hybrid varieties. **Rwanda produces the same as Kenya, purple passion fruits, which is the most popular variety in Europe**

Source of Passion Fruit in European Market

Sources: FruitTrop Close-up Passion Fruit 2013; CBI Ministry of Foreign Affairs; Eurostat; European Fruit Juice Association

The primary opportunity for passion fruit is in fresh fruit export to Europe – whose category demand is steadily rising

European imports of exotic tropical fruits
Tons (Thousand)

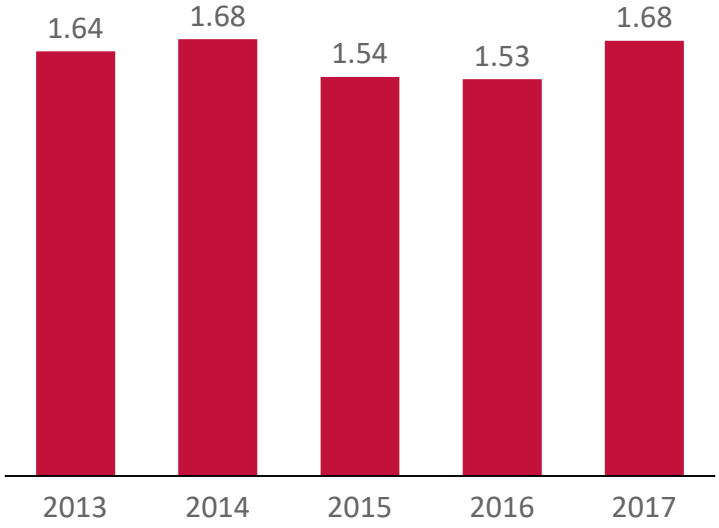


Purple passion fruit, the variety grown in Rwanda, is the preferred passion fruit in Europe

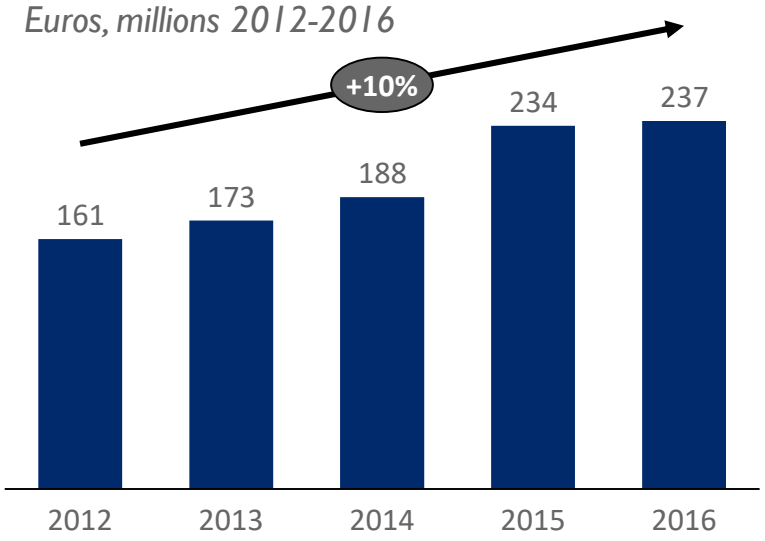
Sources: CBI Ministry of Foreign Affairs, Exporting tropical fruit to Europe;
* Fresh tamarinds, cashew apples, lychees, jackfruit, sapodilla plums, passion fruit, carambola and pitahaya

There is also small but growing opportunity in tropical fruit puree for Europe however non-purple passion fruit is preferred

European imports of processed fruit products
Euros, billions 2013-2017



European consumption of processed fruit products
Euros, millions 2012-2016



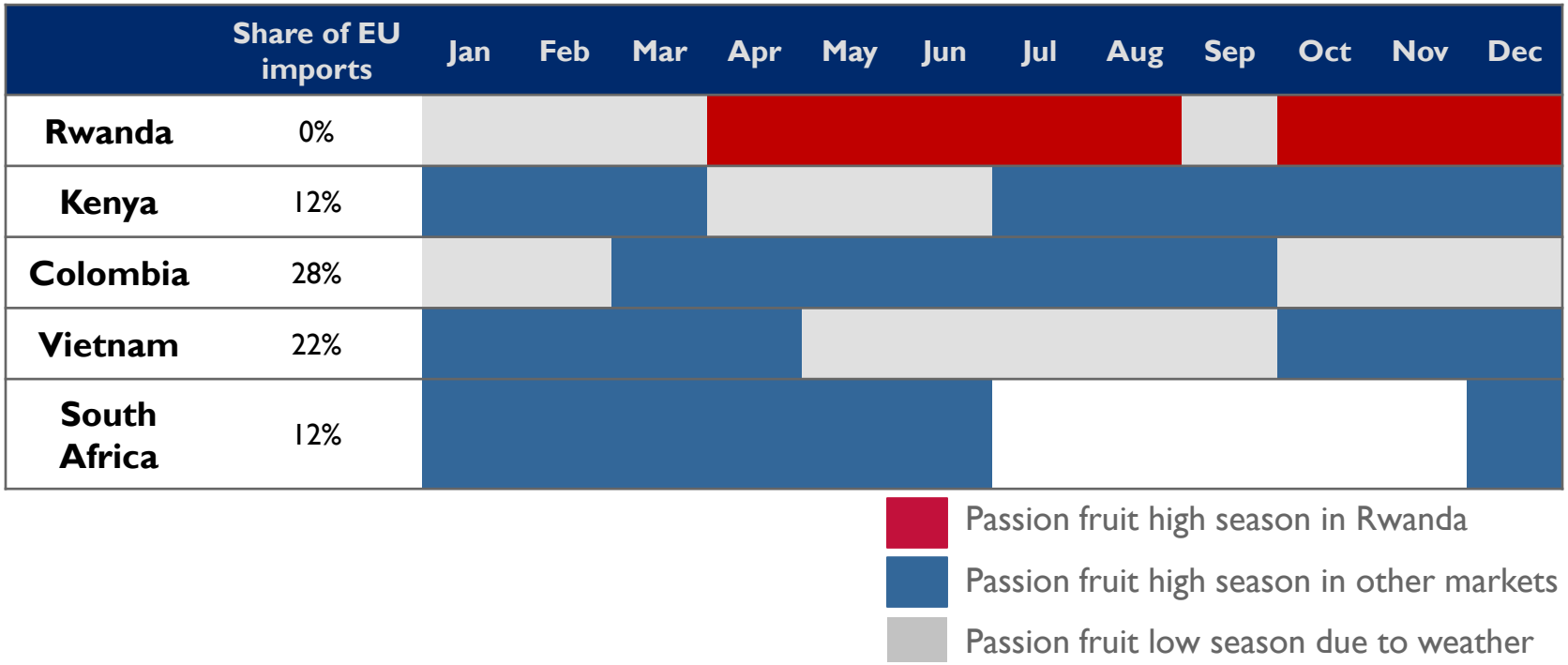
Fruit jams, jellies, marmalades, fruit or nut purée and pastes
Tropical fruit puree

European consumption of fruit puree has been increasing, and import value of puree and other forms of processed fruit products have remained stable. Yellow fruits are preferred for processing of juices, but require more dilution and sweetening than purple fruits.

Sources: CBI Ministry of Foreign Affairs, Exporting tropical fruit purees to Europe;

Passion fruit is a year-round fruit on the European market, which both Rwanda and Kenya can supply

Seasonality of passion fruit production



Stable year-round global supply of passion fruits, and its position as a "top end" fruit means relatively low price variability. Today exporters come to Rwanda for fruit when there is low supply in Kenya.

Sources: Dalberg analysis; FruitTrop Close-up Passion Fruit 2013; Previous Dalberg work;

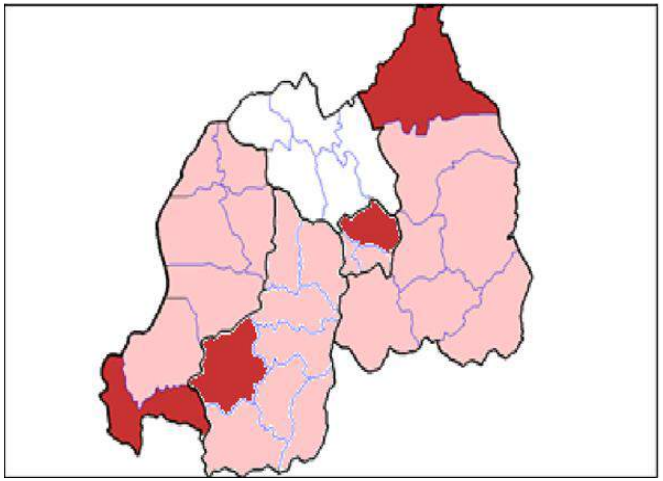
Rwanda has a competitive advantage over Kenya on cost, however farmers lack the expertise and production know-how

	Rwanda	Kenya
Cost competitiveness	Rwandan farmgate and transport costs are 11% higher than Kenya. Access to inputs and irrigation can lower costs through better yields and scale	Kenyan farmgate and transport costs are 2,820 USD/ton
Transport links	Rwanda has direct flights to Europe with cold storage capacity at a lower cost	Kenya has direct flights to Europe with cold storage capacity
Seasonality	Passion fruits in season Apr-Aug and Oct-Dec	Passion fruit in season Jan-Mar and Jul-Dec
Government support	The Rwandan government is actively supporting horticulture exports through subsidies in inputs, finance, and airfreight	The Kenyan government recently launched the Kenya Horticultural Council to coordinate support to the horticultural industry

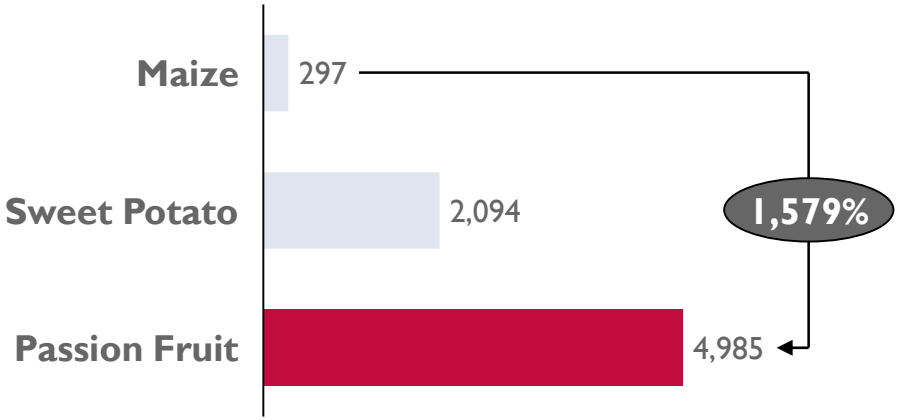
Source: Dalberg analysis; Previous Dalberg on passion fruit value chain; National agricultural export board (NAEB), investment opportunities in horticulture in Rwanda; FAO in Rwanda; Oxfam Organic Ltd; Stakeholder interview

Passion fruit have the potential to bring significant additional income to regions that are some of the poorest in the country

The Western province, where passion fruits grow well, is the poorest region in the country.



Farmer annual income per crop per hectare
USD / year / hectare



Income from passion fruit is exponentially higher than that of current staple crops – presenting a significant opportunity for local communities to increase their incomes and diversity revenue streams

Sources: Dalberg Analysis; National Institute of Statistics Rwanda (NISRI), Poverty Trend Analysis Report, 2010/11-2013/14, 2016; National Institute of Statistics Rwanda (NISR), Seasonal Agricultural Survey 2014; Rwanda state of environment and outlook report, overview of the Agriculture sector; Stakeholder interview; Yield 4.2/ha, World Bank Sector Document for Passion Fruit 2012

A lack of seedlings and irrigation tools are currently constraining growth of passion fruit in Rwanda

PASSION FRUITS	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy inputs from Kenya and Uganda	Produced primarily by out-growers, passion fruits grow seasonally from Apr-Aug and Oct-Dec	Exporters buy passion fruits from farmers, and aggregate for export	Passion fruits are packed and exported
Value chain barriers	**Producers do not know best practices** **Lack of healthy seedlings** **Lack of irrigation facilities**		**Few players in this space**	**Limited cargo capacity**
Potential interventions	**Training schemes for farmers** **Local input providers** **Increased adoption of irrigation systems**		**Increased cold chain capacity** **Organic certification** **Availability of local packaging material**	

Sources: Previous Dalberg study on passion fruit value chain; Stakeholder interview

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

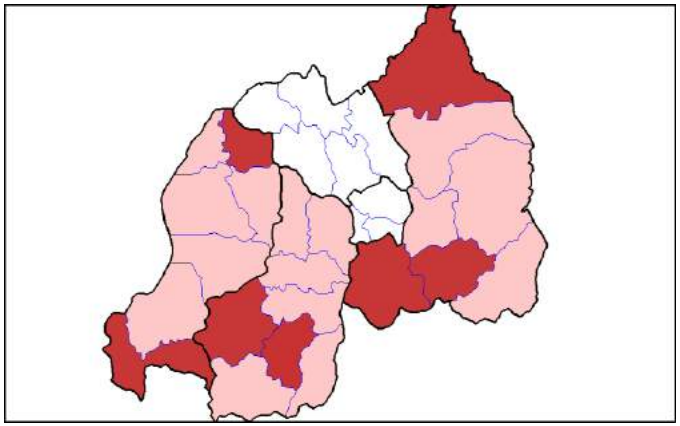
Farmed Fish

Avocado

Pineapple

Chilies grow well across Rwanda, in particular the Southern, eastern, and Western provinces of Rwanda

Southern, Eastern , and Western provinces
Huye, Bugesera , Nyanza, Ngoma, Nyagatare, Rusizi, Nyabihu, Districts



Temperature and agronomic conditions: The ideal growing conditions for chilies are an average daily temperature of above 15 °C. Average annual temperatures in the Southern and Eastern provinces range from 14 to 28 °C. They require at least 2000mm of rainfall annually.

Chili varieties in Rwanda

Birds eye: Mostly dried and exported. Traditional crop in Rwanda with established agronomic expertise

Scotch bonnet: Native to the Caribbean and Central America, with a sweeter flavor and stouter shape. Exported fresh and used locally, fresh or processed

Green chili: Exported fresh, small local market. Relatively new crop to Rwanda, accounting for only a small portion of chilies produced. Has a longer shelf life than other varieties

Chilies rotate particularly well with French beans and snow peas, however are currently not produced by smallholder farmers

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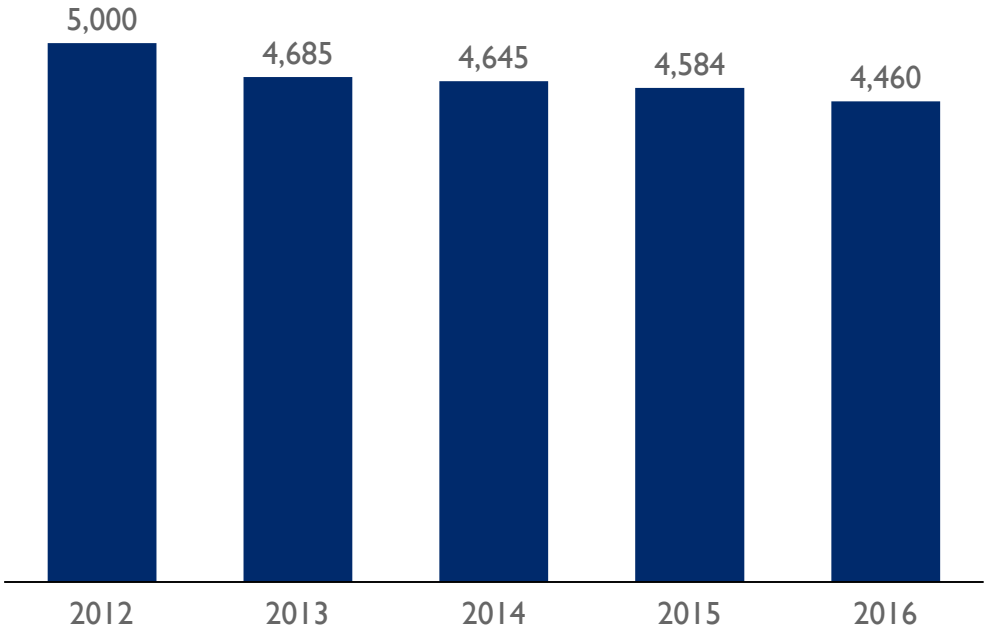
Sources: FAOSTAT; Daniel Sabiiti, Rwanda's Chili Pepper on High Demand in Europe, 2017, available at: http://ktpress.rw/2017/08/rwandas-chili-pepper-on-high-demand-in-europe/; Peterson Tumwebaze, Twahiri finds the sweet side of Chili in farming, 2016, available at: https://www.newtimes.co.rw/section/read/199507; Fortune of Africa, Chili farming, available at: http://fortuneofafrica.com/rwanda/chilli/; USAID FTF, Postharvest loss assessment of green chilies in Rwanda

The production of chilies has slowed slightly, perhaps because Chilis are marginally more expensive and complicate to grow

Production of chilies

Tons per year



Chilis are a more technical crop because they:

- Are **more prone to diseases** that other horticulture crops (e.g., French beans or snow peas)
- require **slightly more care and inputs (e.g. chemicals and fertilizer)** to over their lifetime
- Are subject to **more control and tests in Europe** (Rwandan exporters are currently facing high levels of rejects)

The more complicated technical nature of Chilis may offer a competitive advantage or an investor, and for Rwanda once the crop become established

Source: FAOSTAT; Stakeholder interviews

A number of horticulture aggregators include chili in their portfolio of exports to Europe

Potential exporters of chilies in Rwanda:

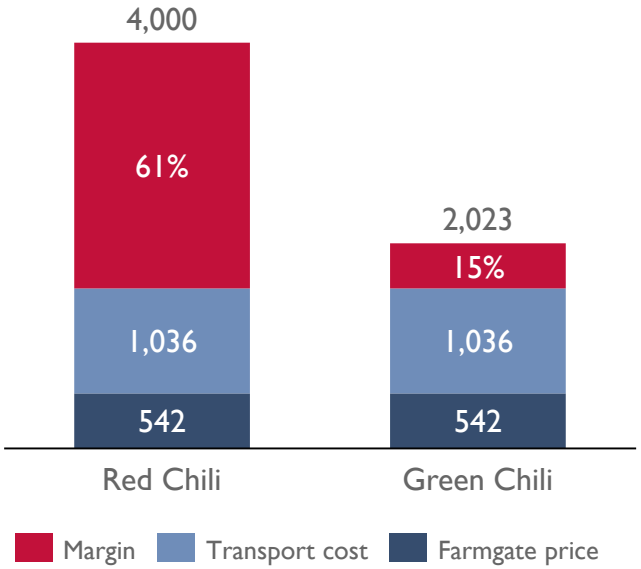
- **Gashora farm Ltd:** a leading Rwandan supplier of fresh and dried chili to the Europe, the U.S. and India markets. Also exports chili oil to the U.S.
- **Nature Fresh Foods:** a horticulture exporting company that sources premium green chili, hot pepper, French beans, and passion fruits from 50 smallholder farmers from across 4 districts in Rwanda for exports to the EU.
- **Golden Cat Ltd:** a mission-driven horticulture company that produces and sources high quality French beans, snow peas, sugar snaps, Bird- eye chilies, and passion fruits from 250 smallholder farmers, and exports to the EU
- **Freshpack International Ltd:** a UK-based company that imports vegetables and fruits from various African countries to the UK and Europe
- **Floris Ltd:** a supplier of organic horticulture products since 2001. Produces and exports fresh fruits including chilies, bananas and avocados to local and European market
- **Promagri Rwanda:** specializing in production of dried birds eye chilies and export to Europe

Source: NAEB, Leading horticulture companies in Rwanda; Gashora Farm website; Freshpack UK website; Trickle Out Africa website

Chilies are have profit potential for export to Europe where chilis sell at a premium

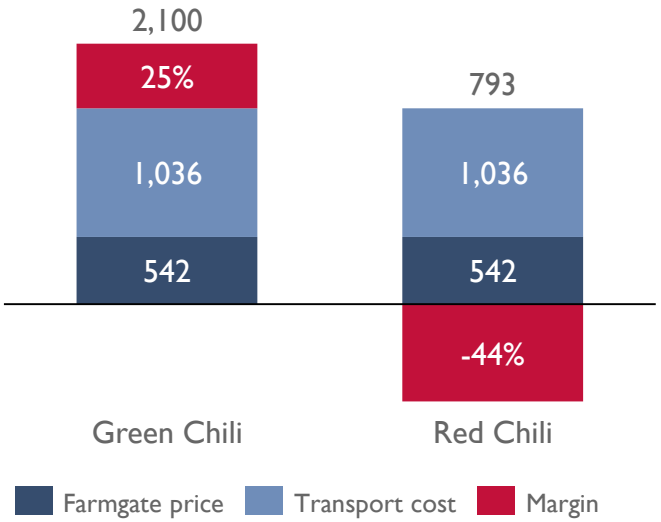
Margin for Europe

USD / ton



Margin for the Middle East

USD / ton

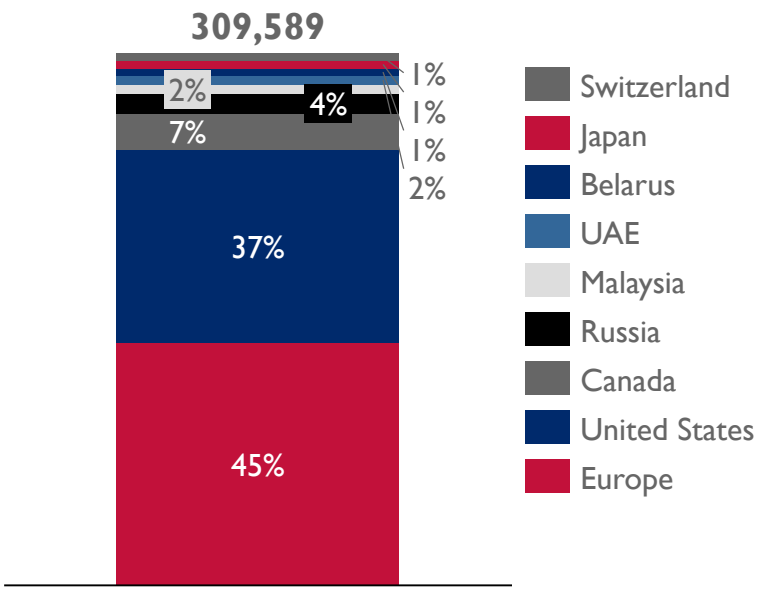


The Middle East both locally produces and imports various types of fresh green chilies and dried red chilies from the region, mostly from India, Saudi Arabia, Jordan, and Thailand

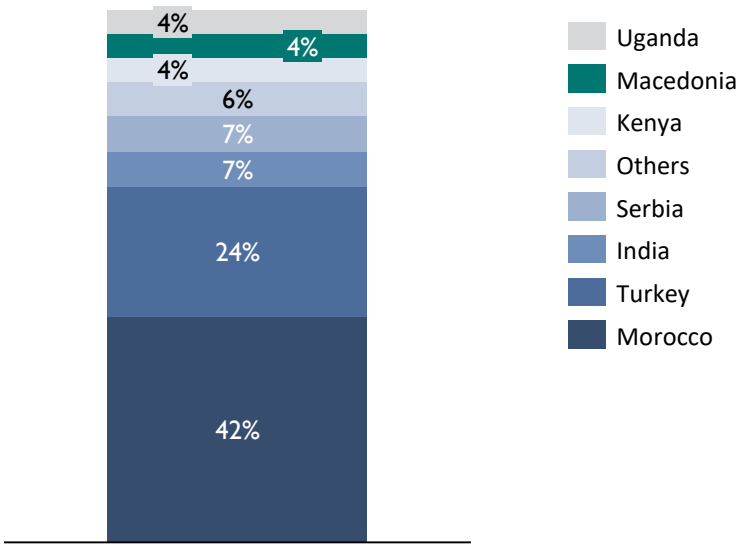
Source: Dalberg analysis; Previous Dalberg study on chilies value chain; International Trade Centre, 2015, Fresh Fruit and Vegetable Middle East; Stakeholder interviews

Europe is the biggest importer of chilis, sourcing over 140,000 tons of chili each year

Top 20 importers of chili
Tons, 2016



Import volume of chilis - Europe
Tons, 2016

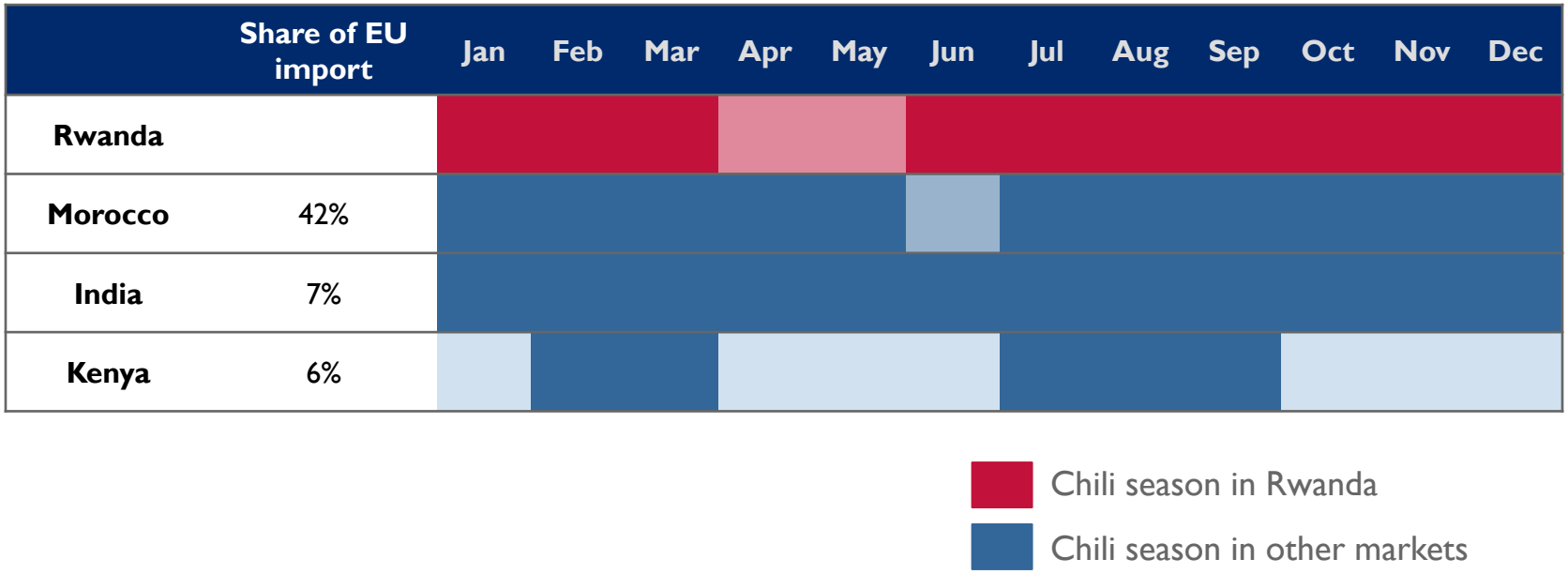


Most commonly used chilies in Europe include bell pepper, green chili, jalapeno, cayenne, habanero, Scotch bonnet, and birds eye. Imports from outside Europe are either counter-seasonal or special varieties not grown in Europe for ethnic food

Source: Dalberg analysis; Tridge Platform; CBI Ministry of Foreign Affairs, Exporting pepper to Europe;

Globally chili is produced year-round by the key exporters, therefore there is limited seasonal competitive advantage

Seasonality of chili production



Sources: Dalberg analysis; Previous Dalberg study on chili; FAOSTAT, 2018, crop calendar; Nautilus Organic, 2018, crop calendar; Fresh harvest Morocco, crop calendar;

Rwanda is well-positioned to compete in chili markets globally

	Rwanda	Kenya
Cost competitiveness	Farmgate and transport costs in Rwanda are only 7% higher than Kenya – indicating opportunity for competitiveness with scale	Kenyan farmgate and transport costs are 2,360 USD/ton
Transport links	Rwanda has flights to Europe with cold storage capacity	Kenya has direct flights to Europe with cold storage capacity
Seasonality	Chilies in production year-round, with lower level of production in Apr-May	Chilies in production year-round, with lower level of production in Oct-Jan and Apr-Jun
Government support	The Government is actively supporting horticulture exports through subsidies in inputs, finance, and airfreight	The Kenyan government recently launched the Kenya Horticultural Council to coordinate support to the horticultural industry

Source: Previous Dalberg on snow peas value chain; National agricultural export board (NAEB), investment opportunities in horticulture in Rwanda; FarmbizAfrica

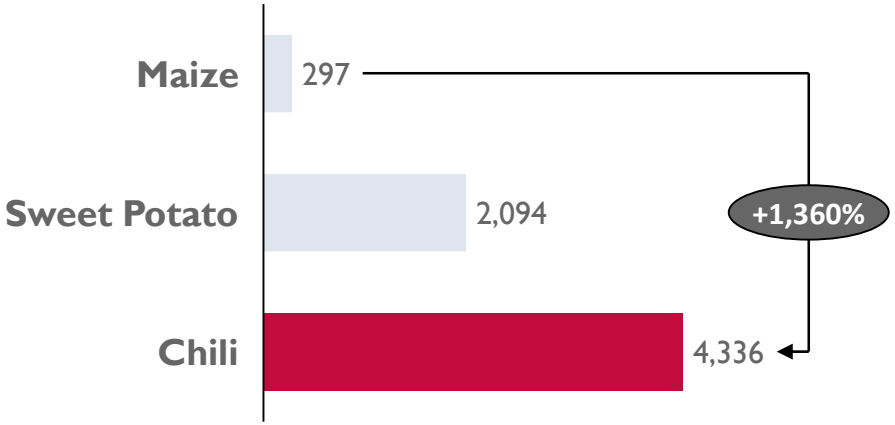
Chilis offer farmers a significant increase in incomes per hector of land

Benefits of rotating chilies and snow peas:

- Farmers can mitigate against production losses by rotating snow peas and chili to improve the soil quality and boost yields
- This can translate into additional incomes for farmers through lower levels of rejects
- Extension services may be necessary to ensure chilis are of high enough quality for export

Farmer annual income per crop per hectare

USD / year / hectare



Income from chili is exponentially higher than that of current staple crops, presenting a significant opportunity for local communities to increase their incomes and diversity revenue streams

Sources: National Institute of Rwanda, District Profile Karongi; National Institute of Statistics Rwanda (NISR), seasonal agricultural survey 2014; Rwanda state of environment and outlook report, overview of the Agriculture sector

Increased local inputs and irrigation could significantly improve chili yields and quality

Chili	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy inputs from Kenya and Uganda	Produced primarily by out-growers, chilis grow year round	Exporters buy chilis from farmers, and aggregate for export	Chilies are processed, packed and exported
Value chain barriers	Lack of local inputs	Climatic conditions (e.g heavy rainfall)	Few players in this space	Limited cargo capacity
Potential interventions	Training schemes for farmers Organic certification Local input providers	Irrigation	Increased cold chain capacity Availability of local packaging material	

Sources: Dalberg research; stakeholder interviews

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

Farmed Fish

Avocado

Pineapple

Mushroom farming is a new arrival to Rwanda, but has the potential to grow due to its climate requirements

Button mushrooms: Are the most commonly available mushroom globally, and equally as nutritious as the oyster variety. In 2016, a 250MT/year mushroom production plant was opened in Rwanda's Musanze district to reduce East Africa's reliance on imported mushrooms from Europe.

Oyster mushrooms: Are relatively easy to grow in Rwanda as they can survive a wide range of temperatures. Oysters are growing in popularity globally as they tend to grow year-round, are rich in nutrients, and can produce high yields per acre. They are also popular for their cholesterol reducing effects.

Exotic varieties of mushrooms like Shiitake and Portobella mushrooms can also be grown in Rwanda using the same structures as button and oyster mushroom.

Agronomic conditions for mushrooms:

- Temperatures between 13-16 °C
- Moist environments with plenty of light

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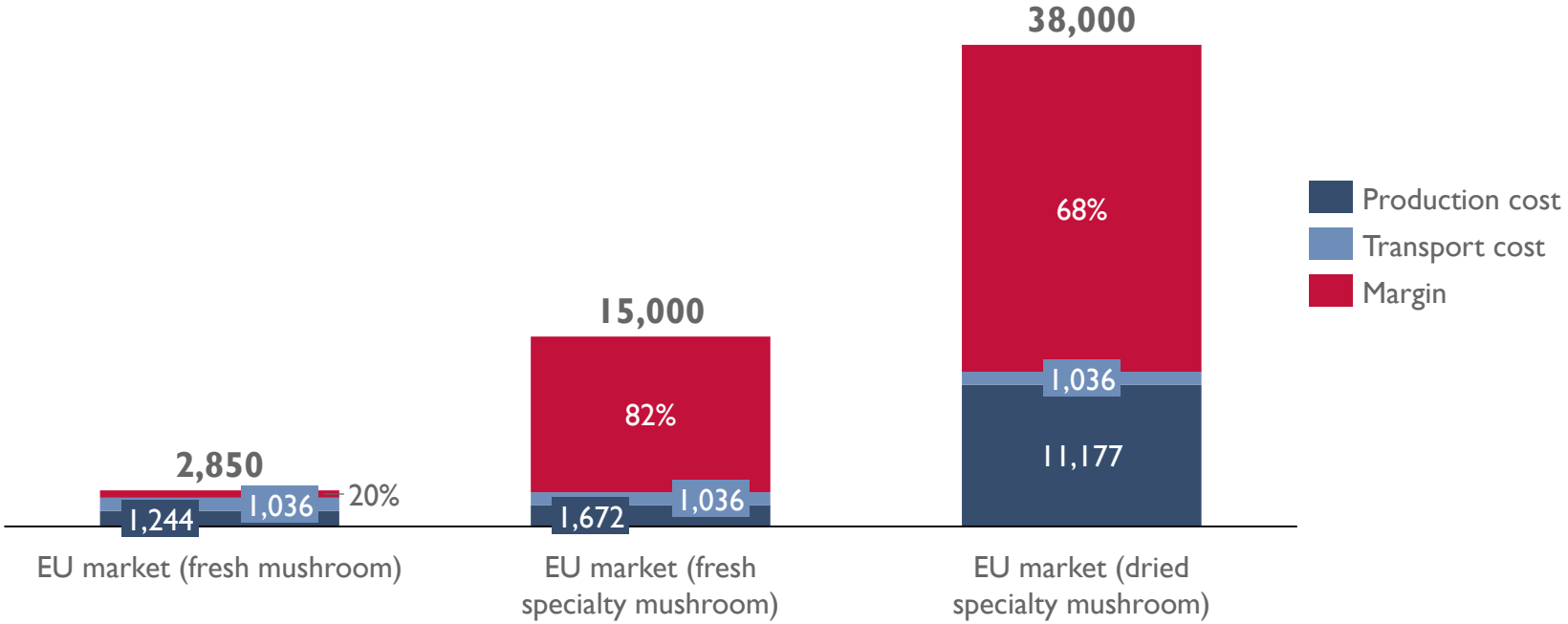
Sources: Rwanda Ministry of Agriculture and Animal Resources, Rwanda on track to boost mushroom industry; SFGate home guides, The needs for mushroom growth; Mushroom Appreciation, Different types of mushrooms; Rwanda News Agency, USAID assists Kigali farms to launch first button mushroom processing facility, 10 November 2016;

Specialty mushrooms present the most attractive market opportunity in Europe

Profitability of mushroom production
USD / MT



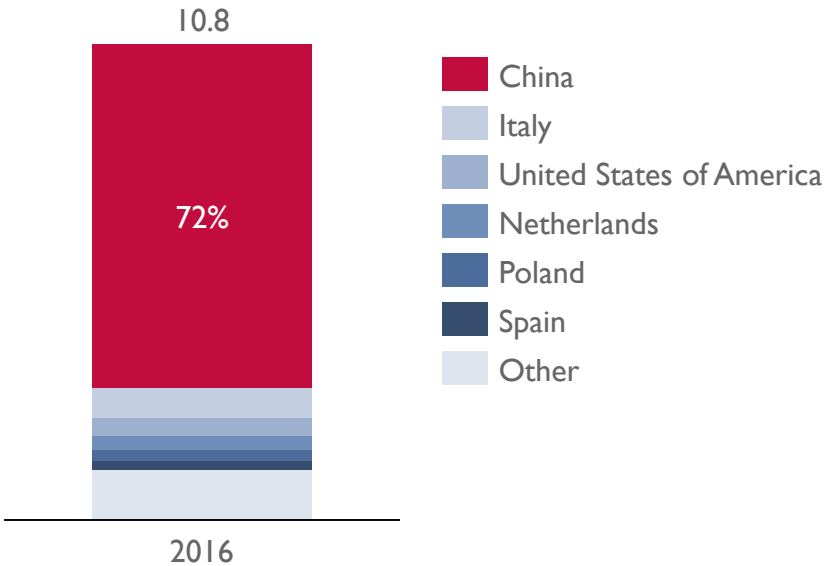
Assumptions
- Farmgate price is calculated using production cost from Kenya, adjusted for Rwanda
- It takes 10kg of fresh mushrooms to produce dried mushrooms, increasing production costs
- Transport costs fixed at $0.95 / kg for airfreight, $0.11 / kg for in-country ground transport (i.e. from farm to airport)

Source: Kuza blog, Mushroom farming in Kenya; Bio-fungi ltd, Global Mushroom market overview; Dalberg analysis

China dominates the fresh mushroom market – however primarily for its own consumption as shipping is challenging

Global production of mushrooms and truffles

Tons (Millions), 2016



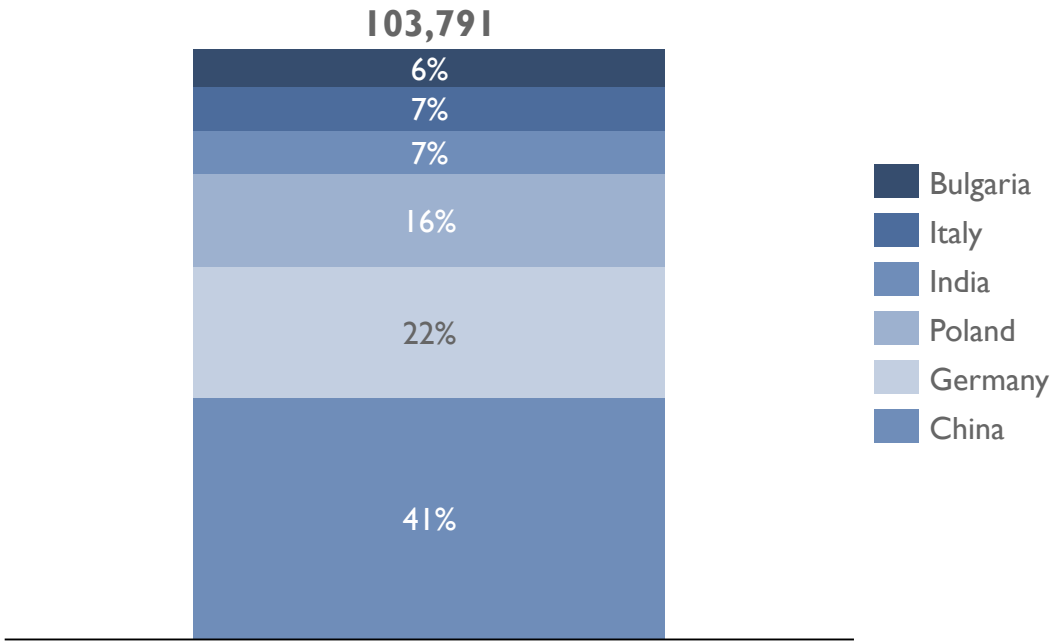
The global mushroom market accounted for US$ 38.13 Bn in 2017, expanding at a CAGR of 7.9% from 2018 to 2026. While there is limited data on the global demand of mushrooms multiple sources, and current trends, indicate that it will continue to grow faster than supply over the coming years. **In China alone it is estimated that mushroom demand has grown 10% annually over the past few years.**

Most specialty mushrooms must be on shelf within 4 days of picking, meaning that a cold supply chain must be both available and efficient

Source: Gro Intelligence: Growing Mushroom Demand, 2017. PRNewsWire, Global Mushroom Market Size, 2018-2026

Specialty dried mushrooms in particular have a large growing market in Europe, currently supplied primarily by China

European imports of dried mushrooms from leading suppliers (2015)
USD (Thousands)

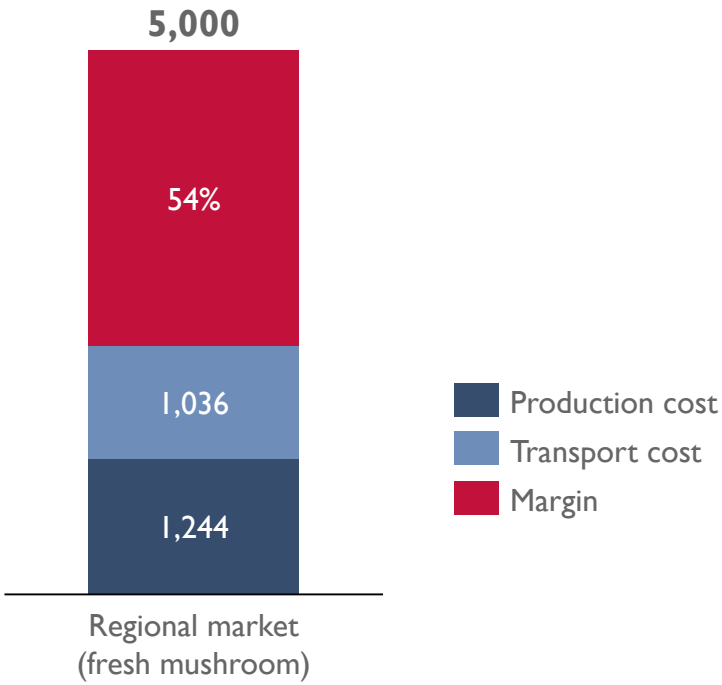


China has specialized in shitake mushrooms and medicinal mushrooms and offers a range of exotic dried mushrooms in the European market priced from $8.43 / kg to $348 / kg depending on the variety

Source: Center for the Promotion of Imports from Developing Countries; Dalberg analysis

Mushrooms also have potential to be profitable in East Africa – however the market is relatively small

Profitability of mushroom production
USD / MT



Recently opened Kigali Farms is Rwanda's largest mushroom marketer and substrate producer. It currently distributes over a ton of fresh mushrooms to markets, restaurants, supermarkets and retail customers every month, however plans to expand capacity for regional distribution.

"In Kenya, there is a high demand for mushrooms. The country produces 500 tons a year – of which 476 tons are button mushroom – against an annual demand of 1200 tons"
- National Farmers Information Service (NAFIS), Kenya

While an attractive niche opportunity, the total addressable East Africa opportunity is estimated to be less than $5 million, it could also be hard to defend against regional competition

Source: Kuza blog, Mushroom farming in Kenya; Dalberg analysis

Rwanda has a significant cost advantage over Kenya for regional production due to lower labor costs, and cheap air freight

	Rwanda	Kenya
Cost competitiveness	Rwandan farmgate price is 70% lower than Kenya mostly due to cheaper labor	Kenyan farmgate price is 5 USD/kg
Transport links	Rwanda has direct flights to Kenya and other east African markets with cold storage capacity	Kenya has direct flights to most east African markets with cold storage capacity
Government support	Limited government involvement in mushroom production, aggregation or export	Limited government involvement in mushroom production, aggregation or export

Source: Kigali farms, Kenya National Farmers Information Service

Mushrooms provide an attractive economic opportunity for commercial farming to create jobs

Job creation. Given the infrastructure needed for mushroom growing, they are most likely to be grown on a commercial scale – creating jobs both within the farms and along the value chain.

Efficient land use. Mushroom farming is not land intensive, with only a small shed needed, and a processing plant available for packaging and cooling for export. It is therefore an efficient option for agricultural land use.

Sources: National Institute of Rwanda, District Profile Karongi; National Institute of Statistics Rwanda (NISR), seasonal agricultural survey 2014; FAO Report – Growing Mushrooms, 2009; Dalberg analysis

The lack of awareness about the crop, and high cost/skill barrier to entry, have kept the value chain limited

Mushroom	Inputs	Production	Aggregation	Export
Current value chain process	Most inputs are locally available, but Spawn (i.e. seedlings) is limited.	Produced primarily by Kigali farms, but a few smallholders also grow mushrooms	Exporters buy mushrooms and aggregate for export	Mushrooms are packaged, processed and exported
Value chain barriers	**Limited availability of spawn** **Lack of technical expertise for growing mushrooms** **High upfront costs for establishing a mushroom farm**		**Few players in this space**	
Potential interventions	**Training schemes for farmers** **Local input providers**			

Sources: Kigali farms

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

Farmed Fish

Avocado

Pineapple

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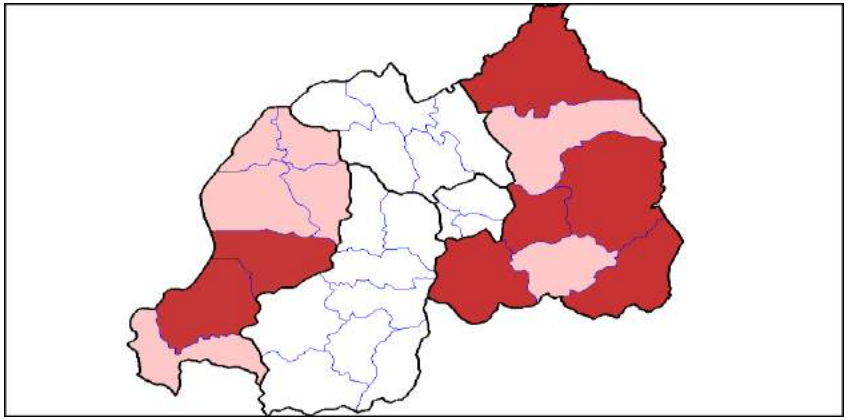
Macadamia nuts are highly complementary to coffee, however have a long incubation period from planting to harvest

Western and Eastern provinces
Karongi, Nyamasheke, Bugesera, Rwamagana, Kayonza, Kirehe, Nyagatare districts



Between 2004 and 2006 the Rwanda Government in collaboration with the World established an initiative for the production of macadamia seedlings which saw the entrance of macadamia producers and exporters

Agronomic conditions for macadamia :

- Grown in tropical conditions
- Altitudes between 900 and 2,400 meters
- Annual rainfall levels above 1,000 mm
- Temperatures between 20-24 °C
- Humidity levels above 65%

Farming macadamia:

- Macadamia intercrops well with coffee and improves yields for both crops
- Majority of local production in Rwanda is facilitated by out-growers
- After planting, it takes 5 years for a macadamia tree to begin nut production. It will take an additional 10 years for the tree to reach its optimum productivity

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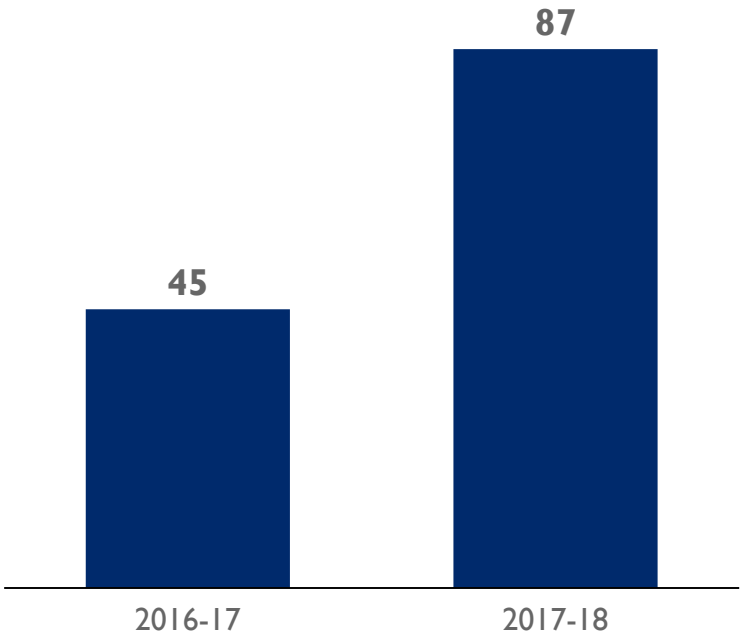
Sources: National Agriculture Board Rwanda (NAEB), Study of macadamia production in Rwanda, 2015; Agencia FAPESP, Intercroping with macadamia protects coffee and boosts yields

The macadamia industry in Rwanda is nascent, with only a handful of aggregators playing the space

Rwandan production of macadamia

Tons per year



Current aggregators of macadamia

- **Rwanda Nut Company:** Started operations in Rwanda in 2012 and is involved in the production, processing, and exporting of macadamia by sea to the United States. NC sells 90% of its products to the international market and 10% is sold on the local market
- **Norlega Macadamia:** has been cultivating Macadamia in Eastern Province mainly in NGOMA District since 2005. Norlega is the first industrial macadamia processor in Rwanda. The Enterprise mainly produces roasted macadamia nuts for the local and international markets.

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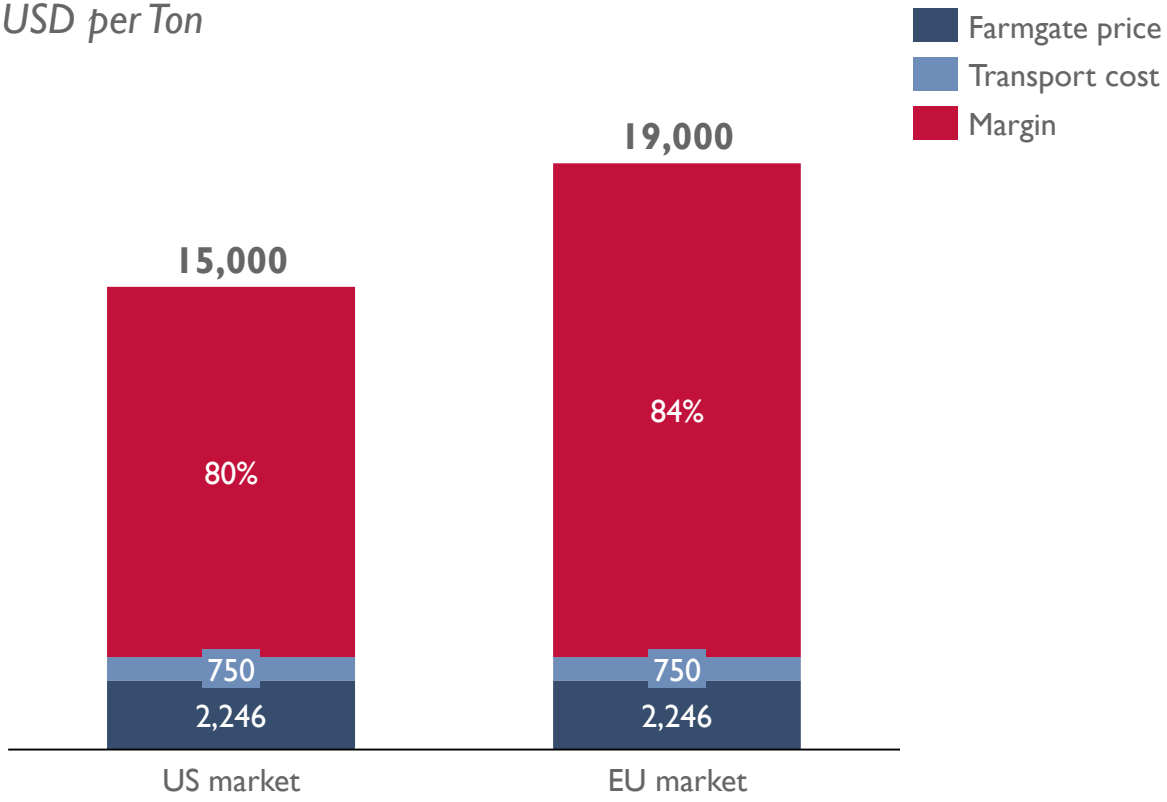
Source: Dalberg stakeholder interviews, 2018; National Institute of Statistics Rwanda (NISR) Annual report, Rwanda; Nuts and dried fruit, statistical yearbook, 2015; Global Agriculture Information Network , China tree nuts annual, 2018

Macadamias have high profit potential with an 80-84% margin, and as a stable product are transported by sea freight

Profitability of macadamia production

USD per Ton

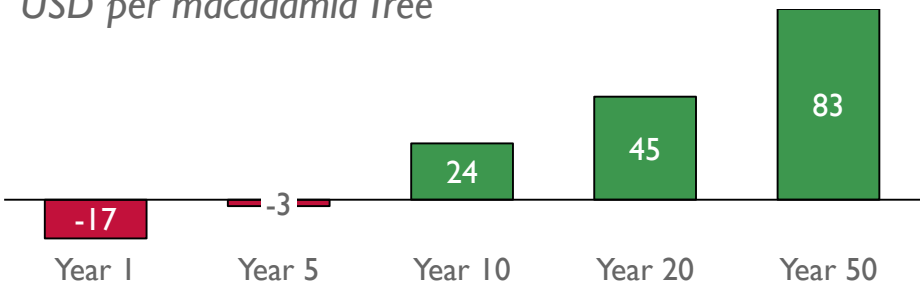


Source: Dalberg stakeholder interviews, 2018; Department of Agriculture, Forestry, and Fisheries, Fresh Food Trade SA,2018; CBI Ministry of Foreign Affairs, Exporting macadamia nuts to Europe

Macadamia trees may represent an attractive return in the long-run for a very patient investor

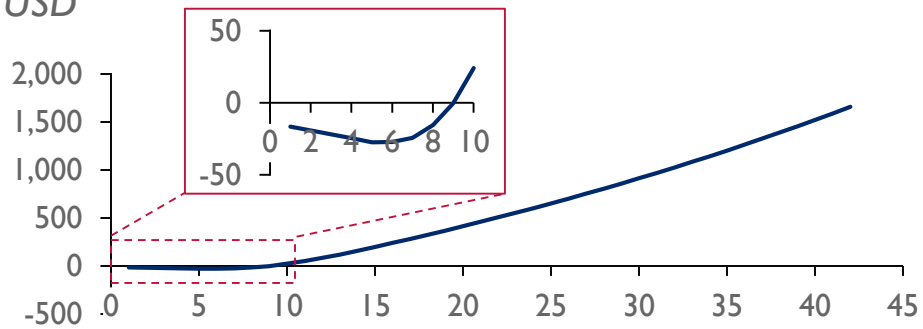
Yearly increased return from Intercropping macadamia with coffee over growing coffee alone

USD per macadamia Tree



Cumulative ROI in one macadamia tree

USD



- Investment is required over the first five years until the tree begins producing vale, **total investment is about $28 per tree** (for the sapling, planting costs and opportunity cost of land) before trees begin producing positive cash flow
- The initial **investment is recovered within 10 years**
- The life of the tree is about 50 years, and the investment has a **27% IRR** over this time

The length of time required to see a return on macadamia indicates that the value chain may represent a more interesting option for a family business than a commercial investor

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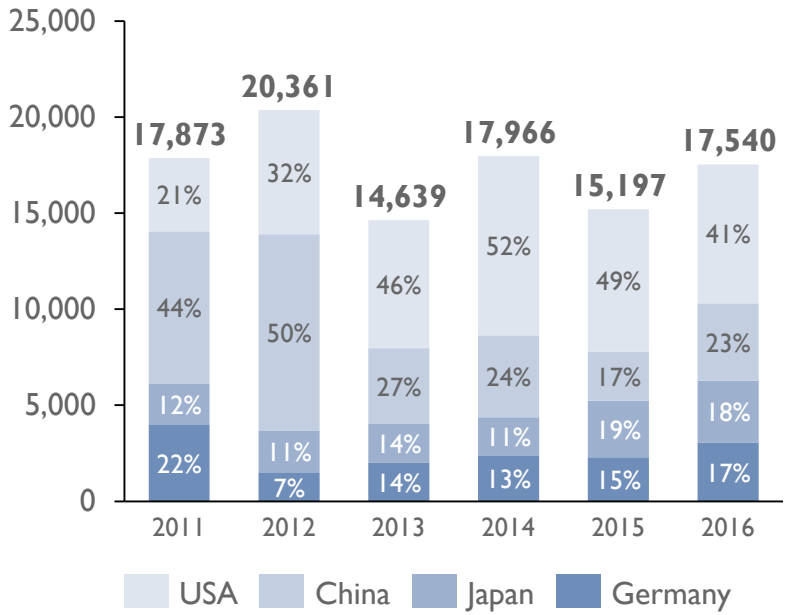
Source: FAOstat; https://www.agmrc.org/commodities-products/nuts/macadamia-nuts; 1Mithamo MW, 2Kerich RK and 1Kimemia JK; Impact of intercropping coffee with fruit trees on soil nutrients and coffee yields; https://www.daf.qld.gov.au/business-priorities/plants/fruit-and-vegetables/fruit-and-nuts/macadamias/macadamia-harvesting,-yields-and-prices; NAEB; Dalberg Analyis

USA, China, and Japan are the largest importers of Macadamia however China has aggressively begun producing domestically

Import volume of macadamia
Tons, 2016



- **Global macadamia consumption is on the rise**, with USA and China leading, however consumption in other areas is levelling off, particularly in Europe
- Global **prices are expected to continue to rise in the short term** as consumption increases
- **China will produce 190,000 tons of macadamia by 2022**, half of the worlds production, turning the country from a significant importer into big exporter

Global trends make it uncertain whether predicted long-term returns from macadamia investments can be realized

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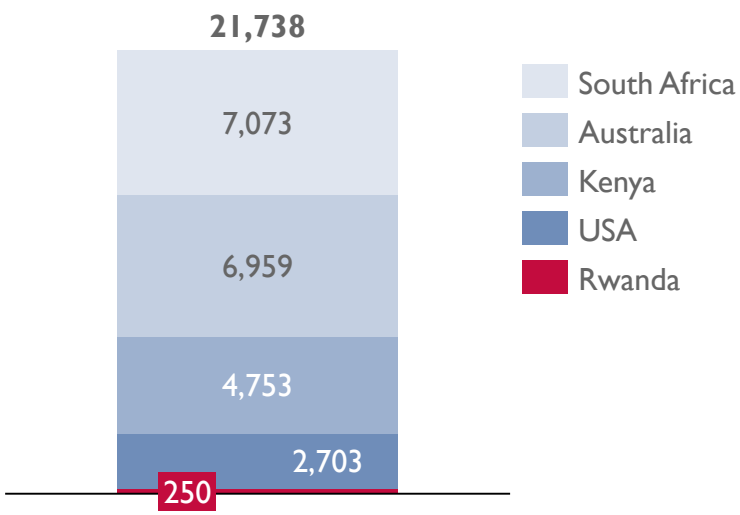
Sources: Technical Assistance to Enhance the Government of Rwanda's Capacities in the Agriculture Sector for the Sustainable Use of Land and Water Resources, Value Creation and Nutrition Security (TECAN), Agro export marketing strategy for Rwanda 2018-2024; Nuts and dried fruit, statistical yearbook, 2017/2018; https://www.producereport.com/article/china-produce-half-global-macadamia-crop-2022

South Africa, Australia, and Kenya are the largest exporters of macadamia globally however exporters play in different markets

Global export volumes of top macadamia exporters

Tons, 2016



Regional exporters	Export destinations
South Africa	Hong Kong Vietnam China
Kenya	USA Europe Japan China
Rwanda	USA

There is an opportunity for Rwanda to compete with Kenya for the European market

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Sources: Technical Assistance to Enhance the Government of Rwanda's Capacities in the Agriculture Sector for the Sustainable Use of Land and Water Resources, Value Creation and Nutrition Security (TECAN), Agro export marketing strategy for Rwanda 2018-2024; Nuts and dried fruit, statistical yearbook, 2017/2018; Department of Agriculture, Forestry, and Fisheries, A profile of the SA Macadamia value chain, 2016; Dalberg stakeholder interviews,2018

Rwanda has a competitive advantage over Kenya on cost, however farmers lack the expertise and production know-how

	Rwanda	Kenya	South Africa
Cost competitiveness	Rwandan farmgate cost for macadamia is 2,246 USD/ton, however it is estimated this can be lowered through scale	Kenyan farmgate cost for macadamia is 1,763 USD/ton	Nut in shell farmgate prices of macadamia 2774 USD/ton
Transport links	Macadamia are sea freighted via Mombasa or Dar	Macadamia are sea freighted from Mombasa	Macadamia are sea freighted to Asia
Seasonality	Harvesting takes place between June-Oct and Dec-Feb	Harvesting takes place between March- May	Harvesting takes place between Feb-Aug
Government support	The Rwandan government is actively supporting macadamia through land provisions and financing	The Kenyan Government has made efforts in providing high quality inputs for macadamia	*No information*

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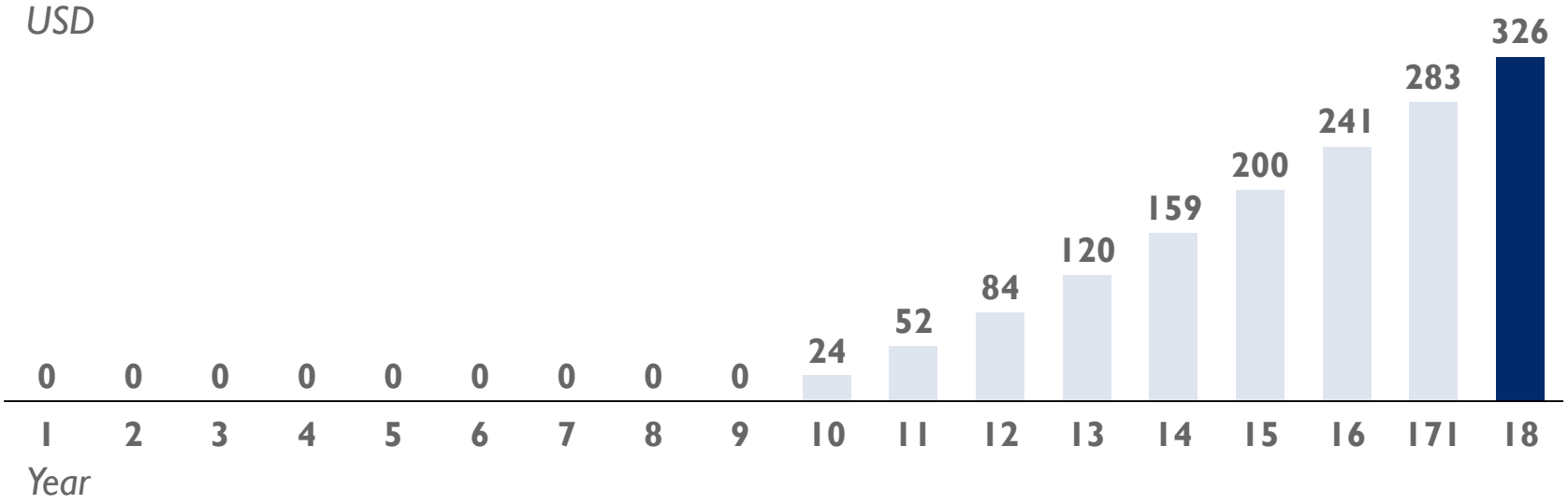
Source: Previous Dalberg on snow peas value chain; National agricultural export board (NAEB), investment opportunities in horticulture in Rwanda; Bloomberg, China Macadamia Appetite Makes Kenya Coffee Farmers Go Nuts, 2018; Macadamia SA; Agrieco, Nut price comes out of its shell; The Star, Macadamia the new green gold for farmers, 2014

Macadamia, with it's low upfront cost and high long-term returns, can become a savings account for farming families

A small investment in macadamia trees would be an ideal way to save for education costs of a child

Cumulative returns on $28 investment in one Macadamia tree



An investment of $618 today into 22 Macadamia trees would yield about $7,200 in over the course of 18 years, roughly the cost of sending a student for a 4 year agricultural sciences degree at University of Rwanda

Source: FAOstat; https://www.agmrc.org/commodities-products/nuts/macadamia-nuts; 1Mithamo MW, Kerich RK and 1Kimemia JK; Impact of intercropping coffee with fruit trees on soil nutrients and coffee yields; https://www.daf.qld.gov.au/business-priorities/plants/fruit-and-vegetables/fruit-and-nuts/macadamias/macadamia-harvesting,-yields-and-prices; NAEB; university of Rwanda; Dalberg Analysis

Currently the largest gap in the value chain is the local scarcity of seedlings which limits the production capacity of macadamia

Macadamia	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy inputs from Kenya and Uganda	Produced primarily by out-growers	Exporters buy macadamia from farmers, and aggregate for export	Macadamia are processed, packed and exported by sea
Value chain barriers	**Scarcity in the availability of seedlings locally**	**Availability of adequate irrigation**	**Few players in this space**	
Potential interventions	**Organic certification** **Local input providers**		**Availability of local packaging material**	

Sources: Dalberg stakeholder interviews, 2018

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

Farmed Fish

Avocado

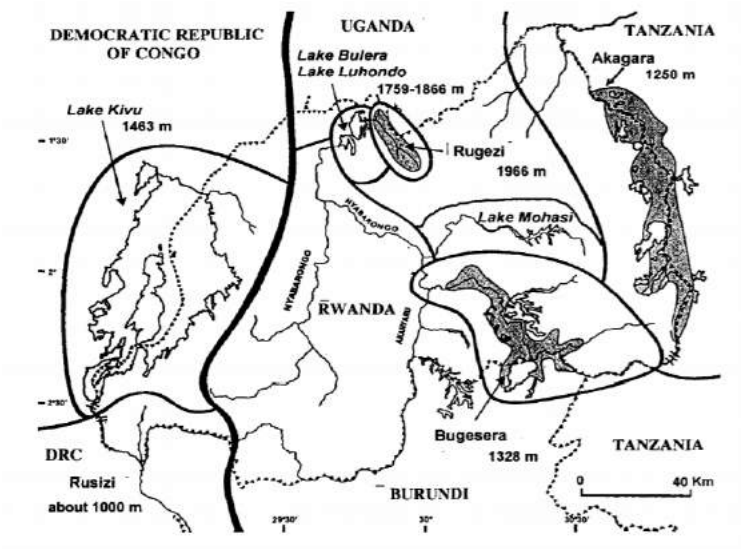
Pineapple

Given the high number of constraints and low margin, frozen fish is not an attractive opportunity for Rwanda

- **Europe mainly imports fish from China and Vietnam (jointly 62%)** with Africa (Tanzania and Uganda) accounting for just 8%, or $138M of European fish imports, in 2015
- **Feed and fingerlings**[1] jointly account for ~ 40% of the costs of growing the fish (or 60% of variable costs)
- With no local feed production and a high cost structure for it, **Rwanda has a structural disadvantage for feed production**
- There's **no reason to believe that Rwanda has a structural advantage** over China and Vietnam in processing and transport
- **To capture some of Tanzania's and Uganda's market share, Rwanda would need to overcome multiple issues in parallel:** local feed and fingerling production, local processing and frozen chain transport
- The high need for investment and innovation and high risk given need for concerted results, is not justified by the low potential margins of ~ **15% that Uganda currently realizes,** which are further put under pressure by low Chinese production costs

1 In turn, feed is the biggest driver of fingerlings costs

Fish farming is relatively new to Rwanda, with limited pond farming and no lake fish farms



Agronomic conditions for farmed fish:

- Flat valley bottoms with very gentle slopes
- Water temperatures between 20-35 °C
- Minimum water depth of 0.5cm to avoid weed invasion

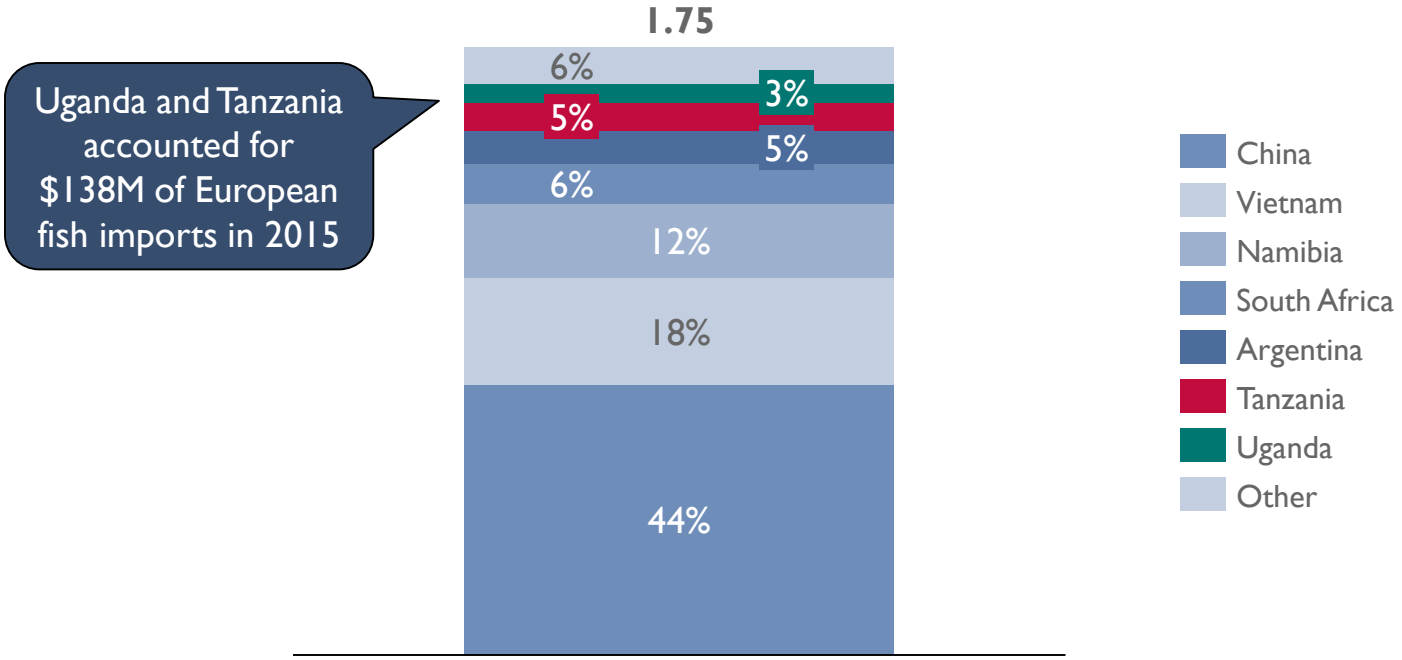
Pond fish farming: Fish are bred in controlled environments usually a reservoir or artificial lake. Pond fish farming requires more investment than lake farming due to upfront costs in constructing the reservoir and maintaining the right climatic conditions for fish.
Rwanda has 10 key pond sites owned by the government, cooperatives and families. These sites are found across the country but mostly in the Western province. The main species reared in ponds are tilapia and catfish

Lake fish farms: Fish are bred in lakes using cages and other enclosures to contain and protect the fish until they can be harvested. Generally requires less investment in maintaining the right climatic conditions for the fish, but there are risks in mitigating theft and disease.
In Rwanda, lake fishing is mostly done on Lake Kivu and smaller lakes such as Lake Mugesera and Muhazi. The main fish species caught in the lakes are Nile tilapia, African catfish and the Lake Tanganyika Sardine (Isambaza)

Sources: Rwanda Agriculture Board; Fortune of Africa Rwanda, Fish farming in Ponds Rwanda; BioOne, An annotated checklist of the fishes of Rwanda

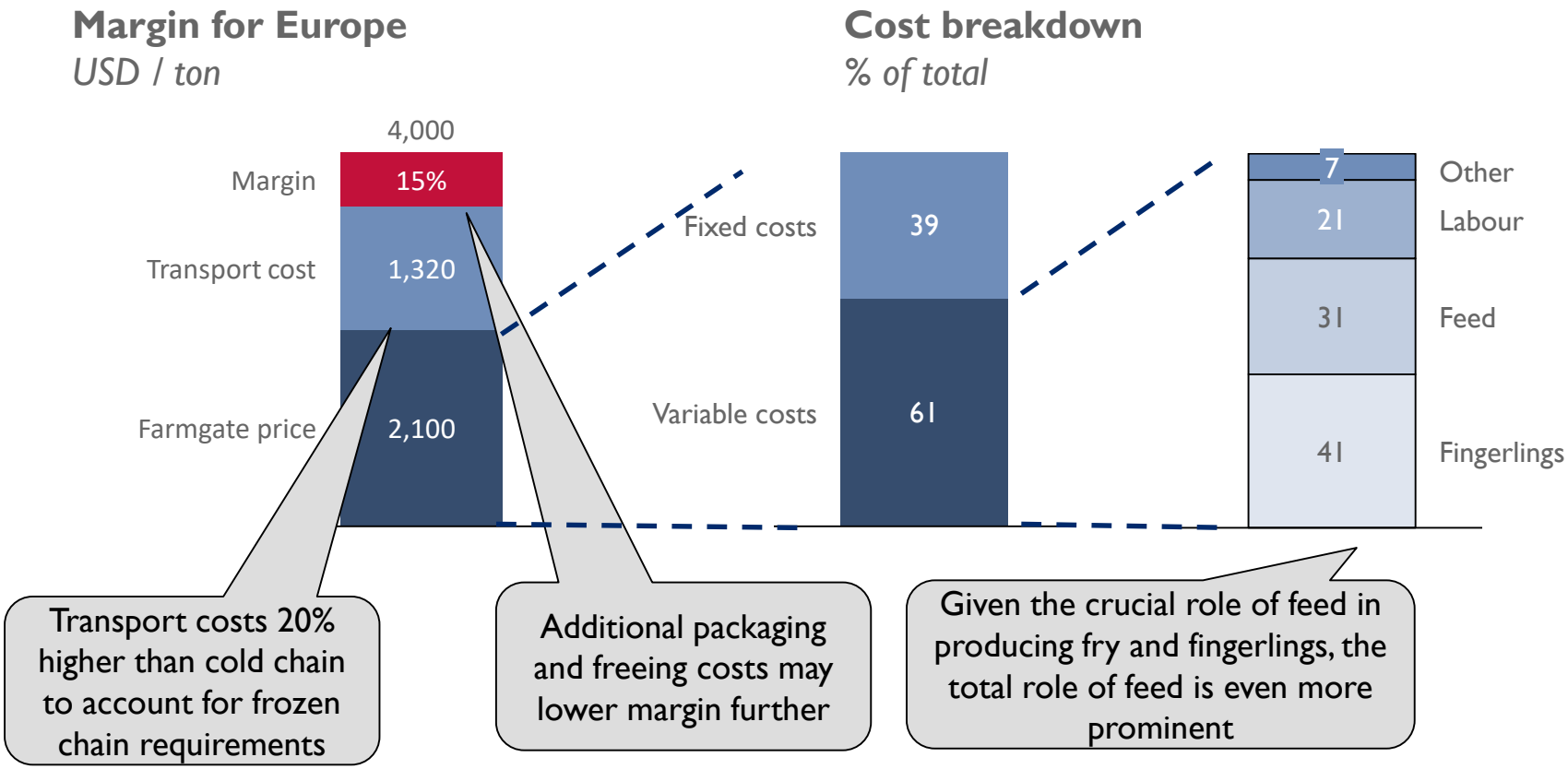
Whilst China and Vietnam jointly supply 62% of European fish imports, Uganda and Tanzania supply 8%

European imports of fish from Developing Countries
USD (Billions), 2015



Source: Center for the Promotion of Imports from Developing Countries;; Dalberg analysis

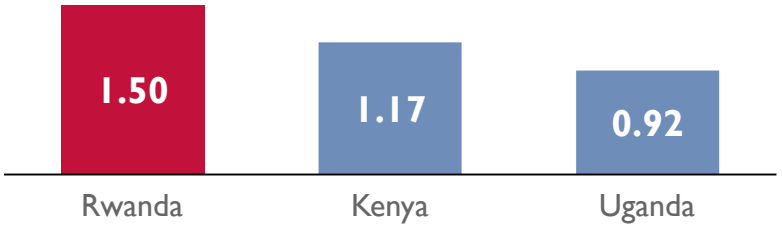
Ugandan fish exports to Europe attract low margins with feed being an important cost driver



Source: Dalberg analysis; Previous Dalberg study on chilies value chain; International Trade Centre, 2015, Fresh Fruit and Vegetable Middle East; Stakeholder interviews; Direct calls to fish farmers in Uganda

Rwanda has structural disadvantages driving a high cost of feed, which limits competitiveness

Regional feed prices
USD / Kg



- There are only three fish feed factories in Rwanda with a combined production capacity of 9 tons per day
- **Local Rwandan maize is five times more expensive than Ugandan maize, and soy is double the price – making local competitiveness of feed unattainable**
- Rwanda can reduce its cost of feed by up to 36% by importing fish feed from Uganda. However, this carries risks of aflatoxin contamination and does not provide sufficient cost savings to make fish farming competitive at scale

"High cost of electricity prevents us from manufacturing all hours. Also, to make fish feeds, we need cereal grains such as maize and soya. However, soya grains are quite expensive. Rwanda produces little quantity of soya which forces us to import." - *Rwandan fish feed producer*

Sources: Rwanda Ministry of Agriculture, Rwanda Agriculture Board, Skretting Aquaculture Nutrition company; The New Times, Fish farmers decry lack of quality, affordable feeds, July 16, 2018, Dalberg analysis

Today however Rwanda does not have a competitive advantage due to a high feed costs and limited focus on the value chain

	Rwanda	Uganda	China
Cost competitiveness	Sector is too nascent to determine, but unlikely to beat Chinese fish	Farmgate price of Ugandan fish is $2.1 / kg	Chinese can sell fish sell for as low as $1.8 / kg in East Africa* less than local fish
Transport links	Whilst Rwanda has direct flights to Europe with cold storage capacity, there's no frozen chain yet	Direct flights to European markets with frozen chain	Extensive sea transport linkages with Europe and Africa with appropriate cooling
Access to inputs	Sustained feed cost disadvantage (>60% above Uganda) and limited local production	Lower cost of feed at $0.92 / kg compared to Rwanda	Produces 16 – 18 million tons of aquatic feed per year
Government support	Limited government involvement in fish production, aggregation or export	Ugandan government supports aquaculture development through loan rebates and tax exemptions	Chinese government supports fisheries education, scientific research and fish processing

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Sources: Uganda Investment Authority; Asian Journal of Agricultural Extension, Economics and Sociology, Profitability and Viability Analysis of Aquaculture Production in Central Uganda; Macrothink Institute, "A brief answer: why is China's Aquaculture Industry so Successful; The East African, Rwanda looks to Tanzania, Uganda for fish to sell to DRC, July 31, 2018; Dalberg Analysis

* Farmgate price not available

The lack of affordable feed is the most significant value chain barrier for growth

Farmed fish	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy feeds and other inputs locally	Produced primarily by smallholders as only one major fish farm in Rwanda	Exporters buy fish from farmers, and aggregate for export	Mostly informal exports to DRC and Burundi
Value chain barriers	**High cost of feeds impedes sustainable fish production and competitiveness**		**Few players in this space**	
Potential interventions	**Affordable fry, fingerling and feed production**		**Introduction of frozen chain capacity**	

Sources: Rwanda Agriculture Board

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

Farmed Fish

Avocado

Pineapple

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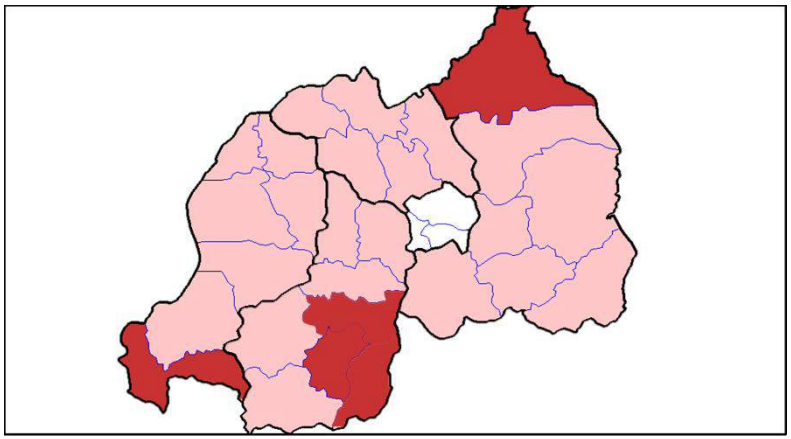
Avocados thrive in Rwanda - Fuerte avocados for regional and domestic consumption and Haas for export

Northern, Southern, Eastern and Western provinces
Gisagara, Huye, Nyagatare, Nyanza, Ruzizi Districts



Agronomic conditions for avocados:

- Grown in tropical conditions
- Altitudes between 900 and 2,400 meters
- Annual rainfall levels above 1,000 mm
- Temperatures between 20-24 °C
- Humidity levels above 65%

Varieties of avocado grown in Rwanda

Fuerte Avocado: Medium-sized, pear-shaped avocados with smooth skin that stays green even after ripening. Creamy and rich with slightly higher oil content than the Hass variety. Dominates most of avocados produced in Rwanda. Increasingly losing market share in the EU market

Haas Avocado: Small-/Medium-sized, oval-shaped avocados with pebbly skin that turns purply-black when ripe. Accounts for 80% of all avocados consumed around the world, including the European market

Out of 32 varieties grown in Rwanda, Hass and Fuerte are grown for exports. Both varieties thrive under similar environment conditions.

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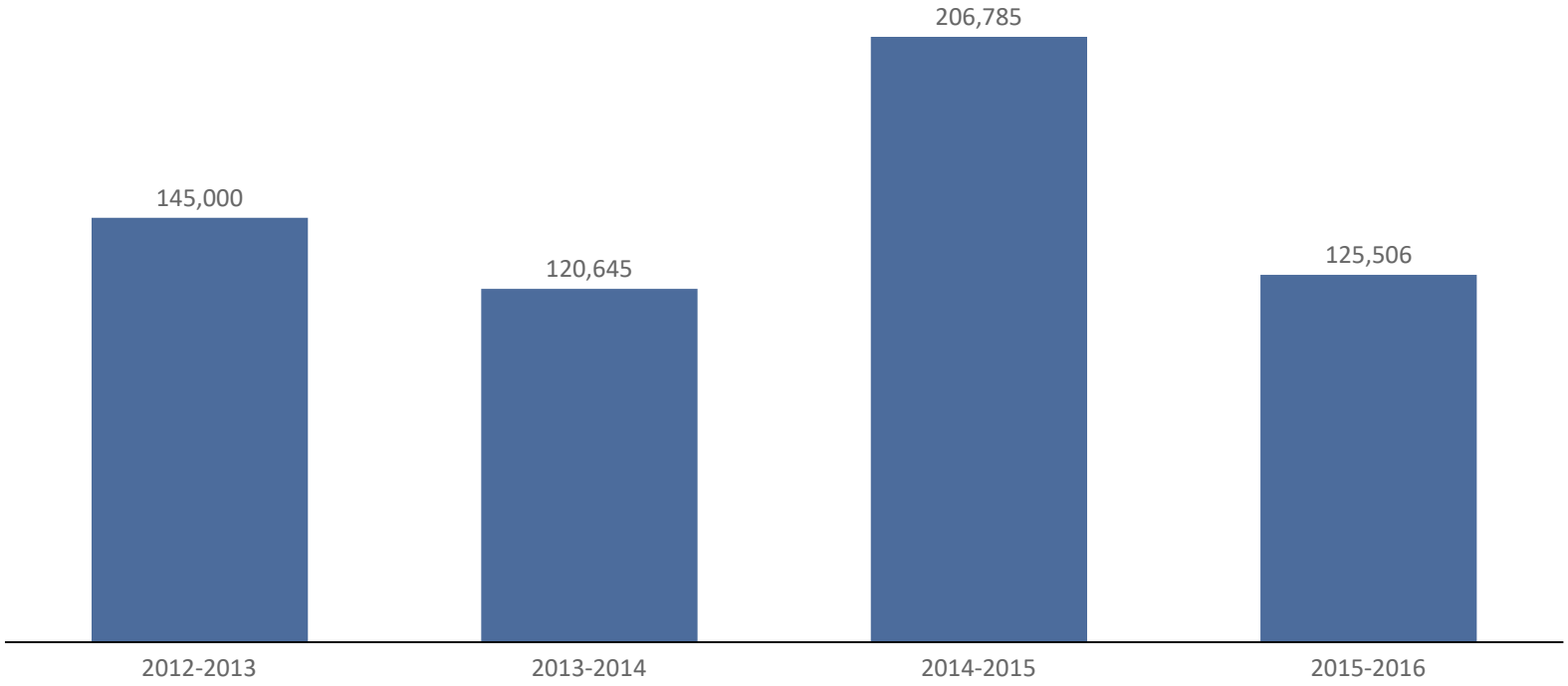
Sources: USAID, The business case of investing in the export of avocadoes, 2012; NAEB website; South African Avocado Growers' Association Yearbook 37, 2017; California Avocado Commission website; Daily Nation, To reap from avocados, follow this guide

Rwanda's avocado production and export however have been volatile, with Rwanda often acting as a backstop for Kenya

Production volume of avocados in Rwanda

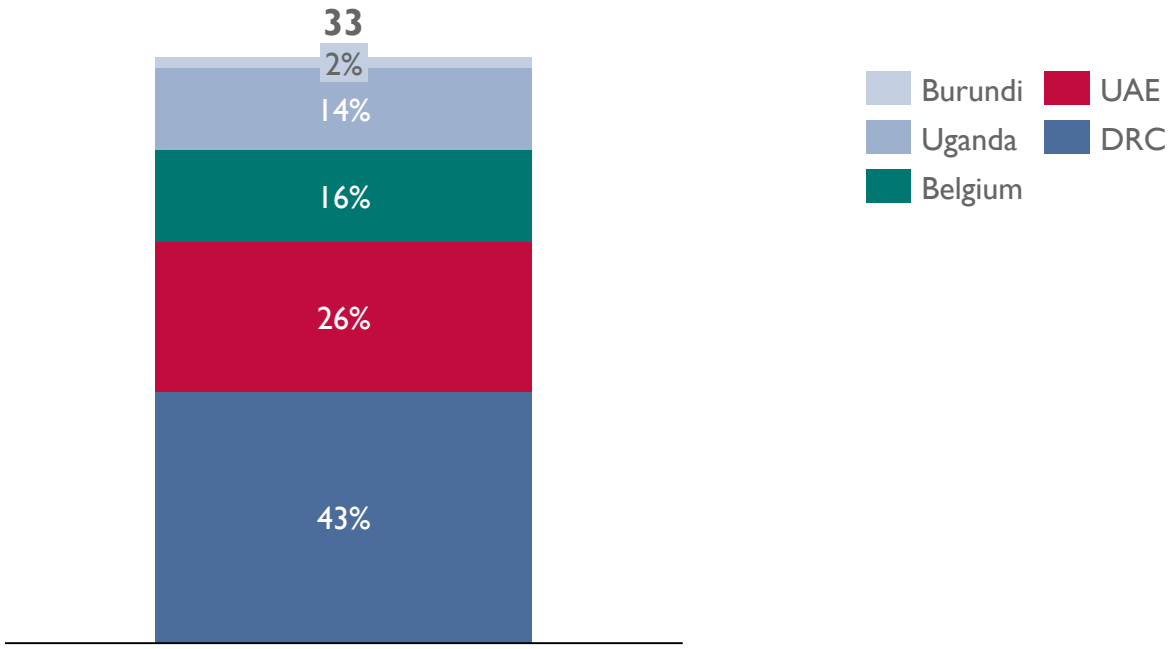
Tons per year



Source: National Institute of Statistics Rwanda (NISR), Yearbook 2017; FAOSTAT; stakeholder interviews

Rwanda is exporting primarily within the region, with exporters currently operating on a small scale for EU and ME exports

Destination of Rwandan avocados by volume
Average monthly exports (MT, Apr-June 2018)



Source: NAEB, 2018

There are a number of aggregators already working in Rwanda for export markets

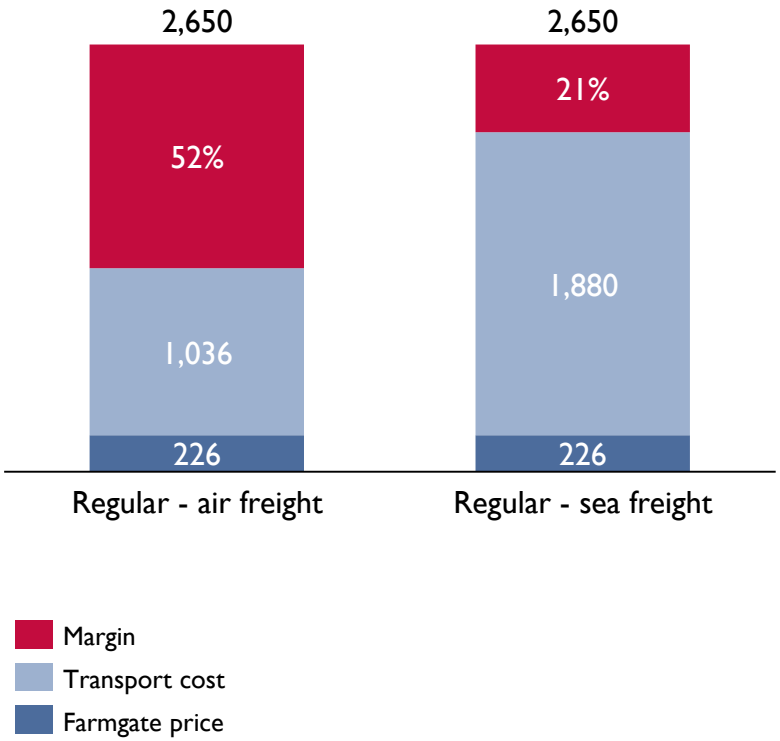
Current aggregators and exporters of avocados in Rwanda

- **Esline Foods Ltd:** A company that started is currently exporting 2 tons per week of avocadoes to Dubai, and also selling around 200kg in the local market
- **Floris Ltd:** a company that engages with 530 farmers growing organic banana, passion fruits, tree tomatoes and avocados and exports 1-2 tonnes of fresh fruits per week to Belgium
- **Freshpack Ltd:** An British company that sources of fresh fruits and vegetables, including avocados, from East and West African countries to the European market
- **Garden Fresh Ltd:** A producer and exporter of fresh vegetables with global food safety certifications such as GAP and HACCP. Mainly producing French beans and planning to scale production of crops such as chilies and avocados for export

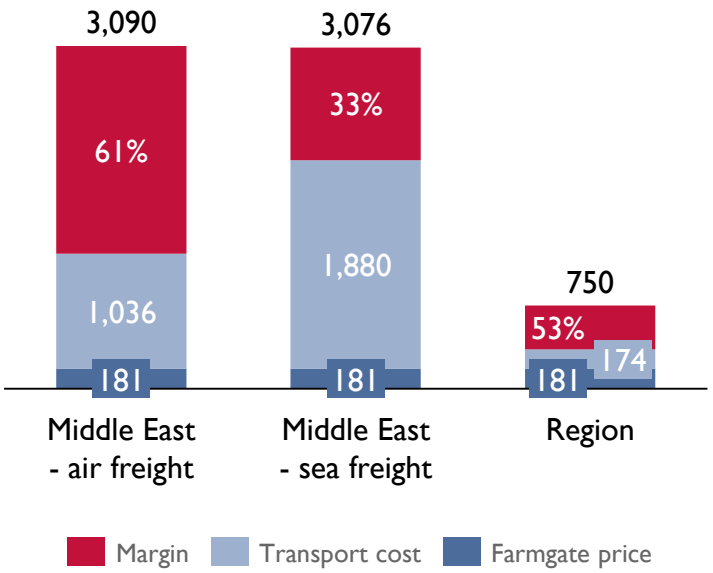
Source: Previous Dalberg study on horticulture; NAEB, Leading horticulture companies in Rwanda

Avocados have the potential to be highly profitable for export to Europe and the Middle East with both air and sea freight

Margin of Hass avocado exports to Europe
USD per ton



Margin of Fuertes avocado exports to the Middle East and EAC region
USD per ton



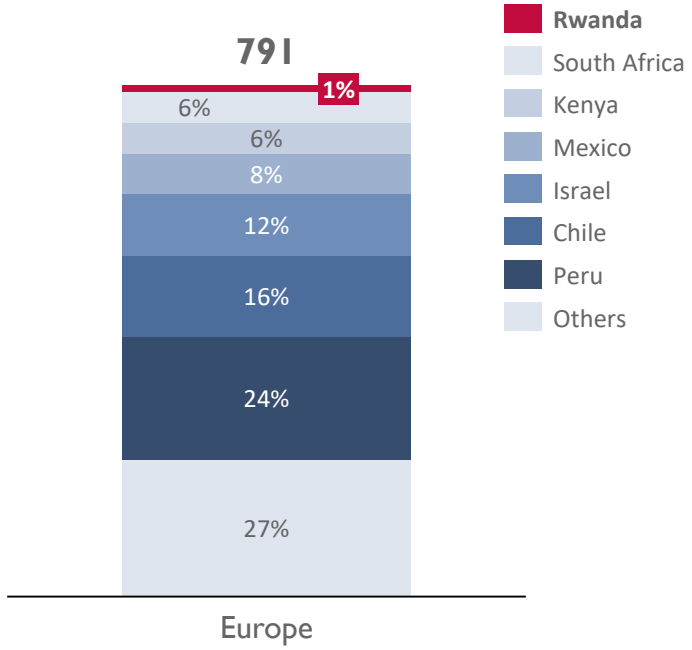
Source: Dalberg analysis; NAEB, 2018, May 2018 Report; ITC Statistics analysis; Stakeholder interview; FCE Export

* Margin does not include handling costs – to be estimated in Phase 3

European demand for avocado continues to grow, with Latin America disproportionately supplying avocados by sea freight

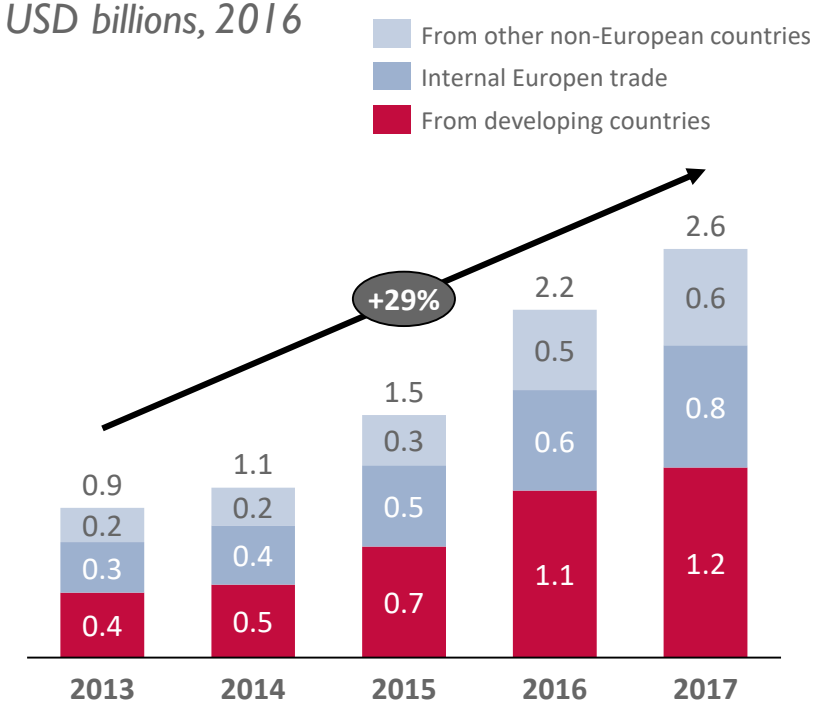
Import volume of avocados - Europe

Tons (thousands), 2016



Import value growth in Europe

USD billions, 2016

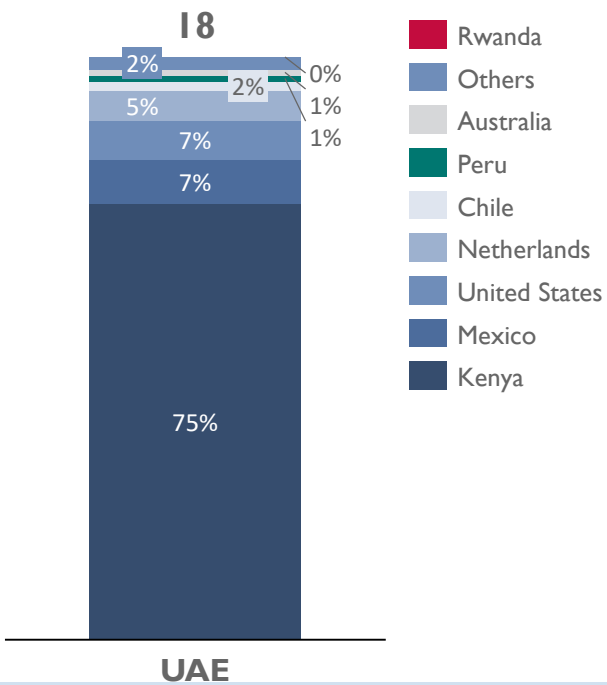


European ripening facilities have significantly improved over the past few years, with most buyers now ripening on site in Europe, allowing for sea freighted avocados to have a high quality on shelf

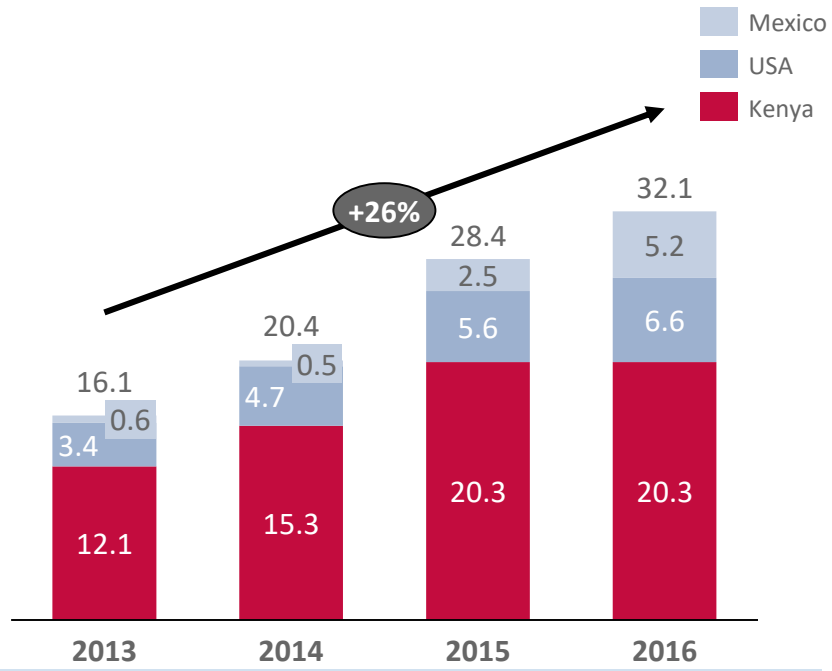
Sources: Dalberg analysis; FAOSTAT; CBI Ministry of Foreign Affairs, Exporting fresh avocados to Europe; NAEB, Agro export marketing strategy for Rwanda 2018-2024, 2018; International Trade Center Trade Map; stakeholder interviews

The UAE's demand for avocado also continues to grow, with Kenya disproportionately supplying avocados

Import volume of avocados - UAE
Tons (thousands) 2016



Import value growth in UAE from Top 3 exporters
USD billions, 2016

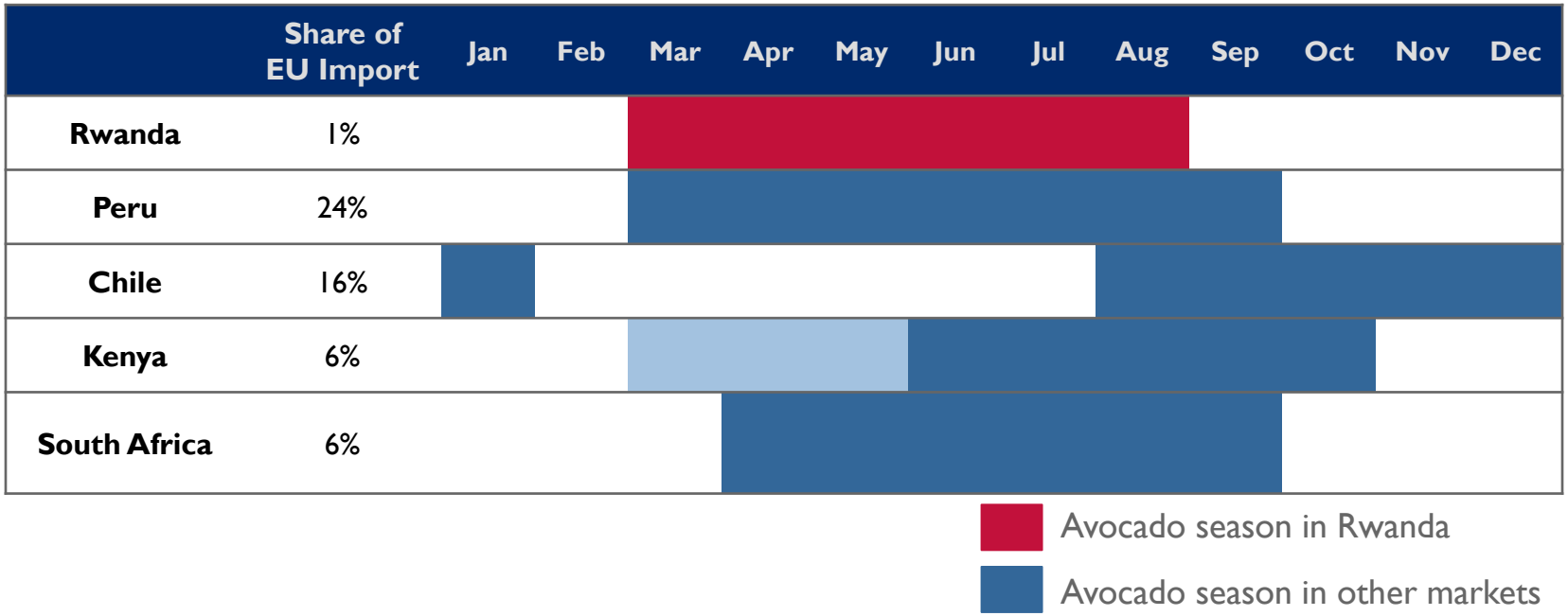


Import of avocados in the Middle East has grown constantly and rapidly in the past four years. Avocados from Rwanda account for only a small percentage of this growing market

Sources: Dalberg analysis; International Trade Center, Fresh fruits & vegetables Middle East; Tridge

Rwanda does not have seasonal advantage over key competitors

Seasonality of avocado production



Peru currently dominates the European market and Kenya accounts for most of the Middle East market. Both countries ship avocados to export destinations by sea freight, significantly lowering transport cost

Sources: Dalberg analysis; CBI Ministry of Foreign Affairs, Exporting fresh avocados to Europe;

Ready to eat avocados were considered based on Rwanda's air freight advantage, but the advantage does not materialize

Ready to Eat

- "Ready-to-eat" avocados are fruits sold already ripened
- Currently avocados are picked when firm (mature but not ripe), transported in temperature-controlled containers, and ripened at the export destinations, often by retailers
- "Ripe" avocados are sold at a 60% price premium in most UK supermarkets
- However, current practice is to transport even these avocados before they are ripe by sea, and to ripen them at the store

Implications for Rwanda: There is limited added value of shipping "ready-to-eat" directly from the country of origin due to the successful processes that have been developed in the UK and Holland

Rwanda is at a disadvantage even for ready-to-eat avocados due to it shipping costs

Source: Dalberg analysis; CBI Ministry of Foreign Affairs, Exporting avocados to Europe; The Packer, Price gap closes for organic avocados; The Guardian blog available at https://www.theguardian.com/lifeandstyle/wordofmouth/2013/feb/19/my-quest-perfectly-ripe-avocado; stakeholder interview

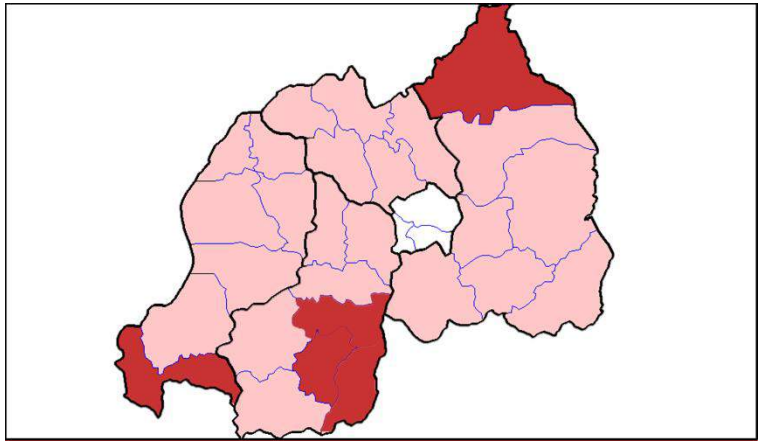
Rwanda has a significant competitive disadvantage by not being able to sea freight directly

	Rwanda	Kenya
Cost competitiveness	Rwandan farmgate and transport costs are 16% higher than Kenya when shipping airfreight, Rwanda has double the yield potentials for Hass avocado production compared to Kenya, but no cost effective way to get these heavy products to market	Kenyan farmgate and transport costs are approximately USD 1,050 per MT
Transport links	Rwanda has direct flights to Europe with cold storage capacity. Sea freight from Rwanda is more expensive than air, making it not viable	Kenya has sea port access that allows its exports directly via sea freight
Seasonality	Avocados in season in Mar-Aug	Avocados in season Mar-Oct
Government support	The Rwandan government is actively supporting horticulture exports through subsidies in inputs, finance, and airfreight	The Kenyan government recently launched the Kenya Horticultural Council to coordinate support to the horticultural industry

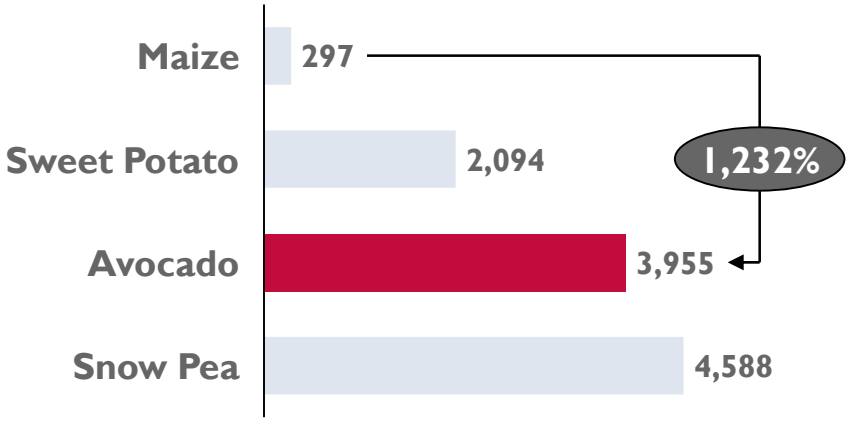
Source: Dalberg analysis; USAID, The business case for investing in the export of avocados in Rwanda, 2012; USAID, Global Competitiveness Study: Benchmarking Kenya's horticulture sector for enhanced export competitiveness; NAEB, Avocado

Avocados for export can bring additional income to farmers – however other export crops have more potential

Avocados are grown by small holder farmers and cooperatives countrywide, and especially well in Eastern and Southern provinces



Farmer annual income per crop per hectare
USD / year / hectare



Income from avocados is exponentially higher than that of current staple crops – however lower than other crops where Rwanda has a higher competitive advantage

Sources: Dalberg analysis; National Institute of Statistics Rwanda (NISR), seasonal agricultural survey 2014; Rwanda state of environment and outlook report, overview of the Agriculture sector; Stakeholder interview; Yield 17.5 tons/ha, from USAID, The business case for investing in the export of avocados in Rwanda, 2012

Currently the largest gap in the value chain is lack of farming expertise in organic production and difficultly in input provision

Avocados	Inputs	Production	Aggregation	Export
Current value chain process	Farmers buy inputs from Kenya and Uganda	Produced primarily by out-growers, avocados grow seasonally from Mar-Aug	Exporters buy avocados from farmers, and aggregate for export	Avocados are packed and exported
Value chain barriers	Limited production of Hass avocados		Few players in this space	High airfreight cost Not Global GAP certified
Potential interventions	Training schemes for farmers Organic certification Local input providers		Increased cold chain capacity Availability of local packaging material Global GAP certification	

Sources: Previous Dalberg study on snow peas value chain

Value Chain Business Case

Snow Peas

Passion Fruit

Chili

Mushroom

Macadamia

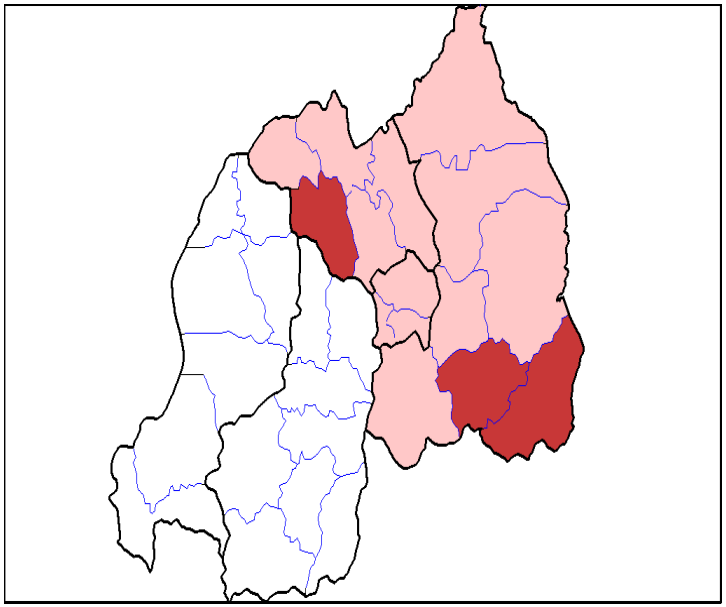
Farmed Fish

Avocado

Pineapple

Rwanda primarily grows the Smooth Cayenne pineapple variety in the northern and eastern regions

Northern and Eastern province
Gakenke, Ngoma, and Kirehe Districts



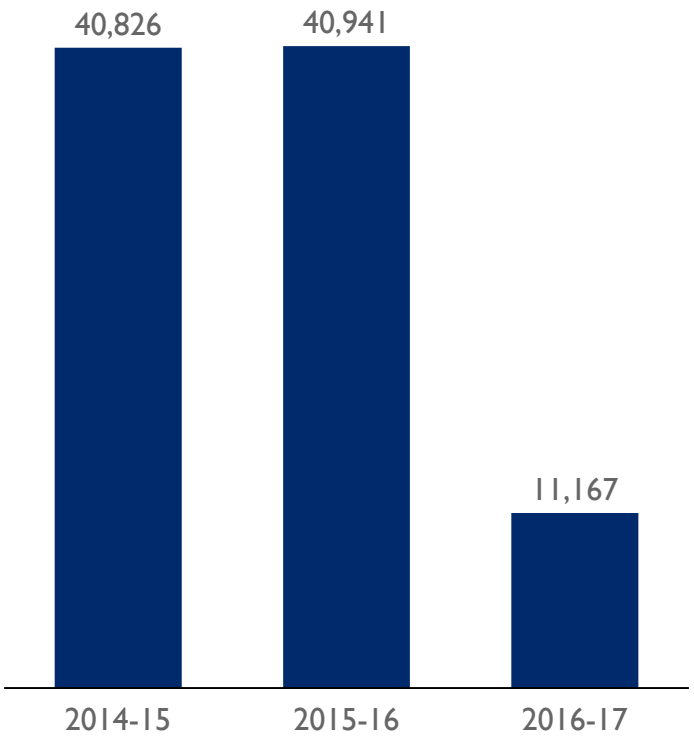
- **Temperature:** The optimum daily air temperatures for pineapple is 32 °C and 22°C at night. Average annual temperatures in Rwanda are 22 °C
- **Land conditions:** Pineapples grow well in non-compacted, well-aerated and free-draining soil. Plants need to be spaced 3-5 feet apart between slopes with a fall between 2-6%
- **Varieties:** Rwanda's mainly produces smooth cayenne varieties for export to Europe and has the capacity to produce organic and wider varieties of dried pineapple such as MD2, Victoria and Red Spanish

Sources: NAEB, overview of pineapple,; Queensland Department of Agriculture and Fisheries, Land requirements for growing Pineapple,; FreshPlaza, Rwanda's Pineapple's find ready buyers/; Homeguide, how far apart should pineapples be planted,

Production of pineapple has declined due to a bout of disease in Rwanda that led to many farmers abandoning the crop

Rwandan production of pineapple

Tons per year



- Pineapple is a crop with a long gestation time – needed 14 months to bear fruit
- A severe bout of disease decimated Rwandan production in 2016
- Many farmers were deterred from re-planting pineapple and instead moved to other crops, effectively reducing the amount of land dedicated to pineapple

Source: FAOSTAT; Interview Dr. Ndabmenya, RAB

There are limited large aggregators currently operating in the pineapple value chain

Current exporters/aggregators of pineapple in Rwanda:

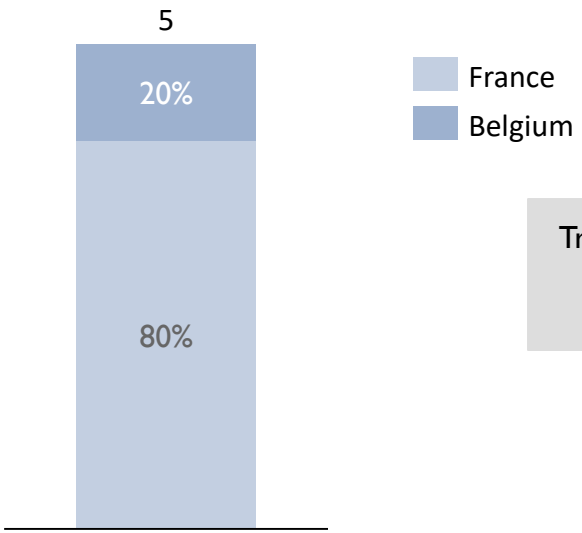
- **Inyange industries.** Is a leading food processing manufacturer Rwanda. Inyange is the largest buyer of pineapple from farmers in the Eastern province, sourcing up to 48 tons per week for juice production for local and regional sale.
- **Tuzamurane cooperative.** The tuzamurane cooperative was established in 2010 to equip women with horticulture skills and improve their access to markets and savings schemes. The cooperative has improved incomes for approximately 300 farmers since its launch. The cooperative has been able to attain organic certification, invest in a drying room and processing facilities, and has established linkages to lucrative markets for high-margin and organic dried pineapple to countries across Africa and France

Source: Oxfam case study, Tuzamurane pineapple cooperative, Rwanda; Wageningen, factors affecting small scale farmers pineapple production, the case study of Ngoma District, 2011

The high cost of transport for pineapple makes it only competitive for export to the Middle East

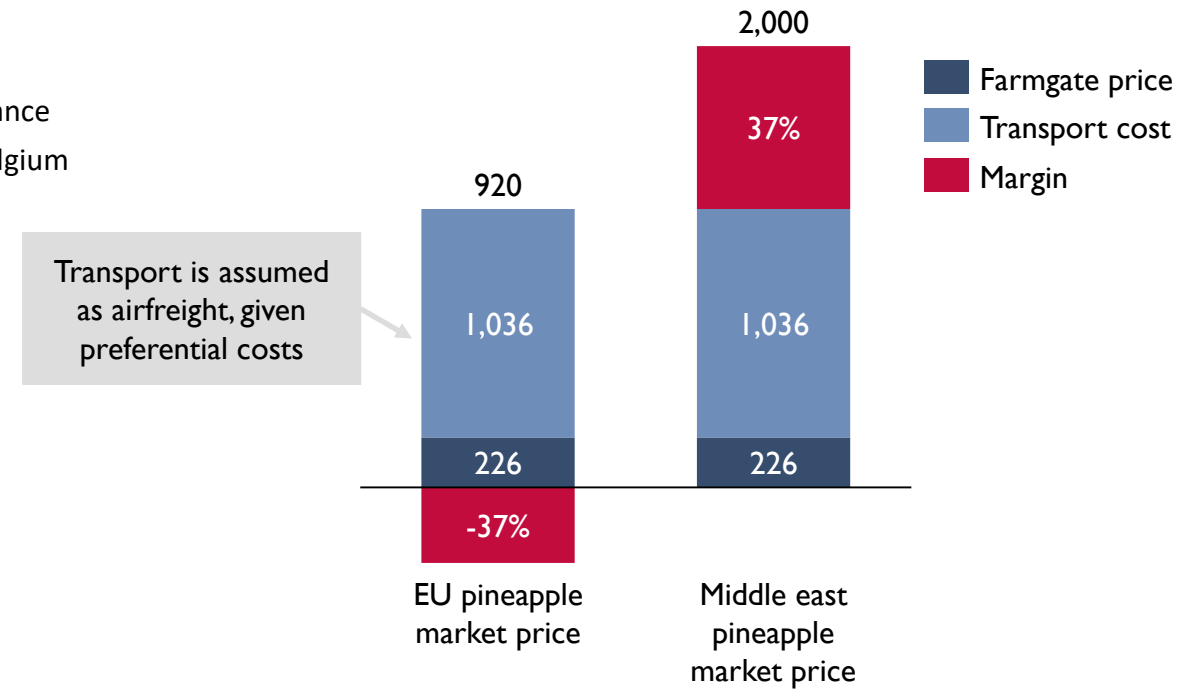
EU destination of Rwandan pineapple*

Tons, 2016



Margins of fresh pineapple exports

USD/ton



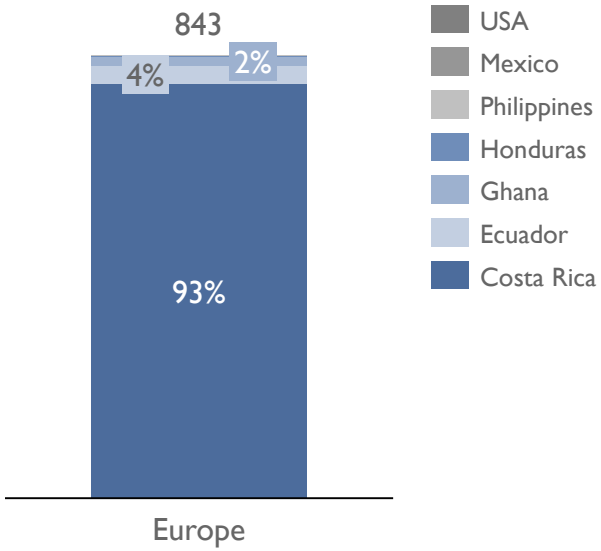
There is no data available for regional exports to DRC or Burundi, although we anticipate these are sizeable

Sources: FAOSTAT; Oxfam case study, Tuzamurane pineapple cooperative, Rwanda,2018; Van Hall Larenstein University, Factors Affecting Small Scale Farmers' Pineapple Production, The case study of Ngoma District, Rwanda,2011 ; International Trade Centre, 2015, Fresh Fruit and Vegetable Middle East

Both Europe and the Middle East have established sources of fresh pineapple that pose a high barrier to entry

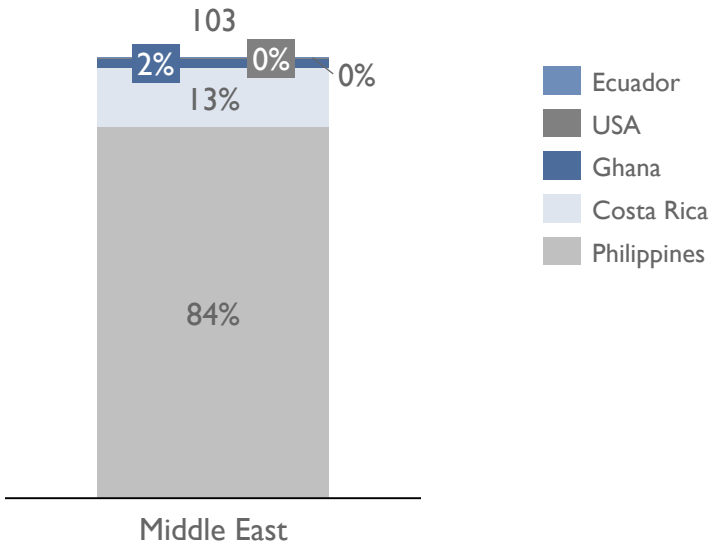
Import volume of pineapple - Europe

Tons (thousands), 2016



Import volume of pineapple – Middle East

Tons (thousands), 2016

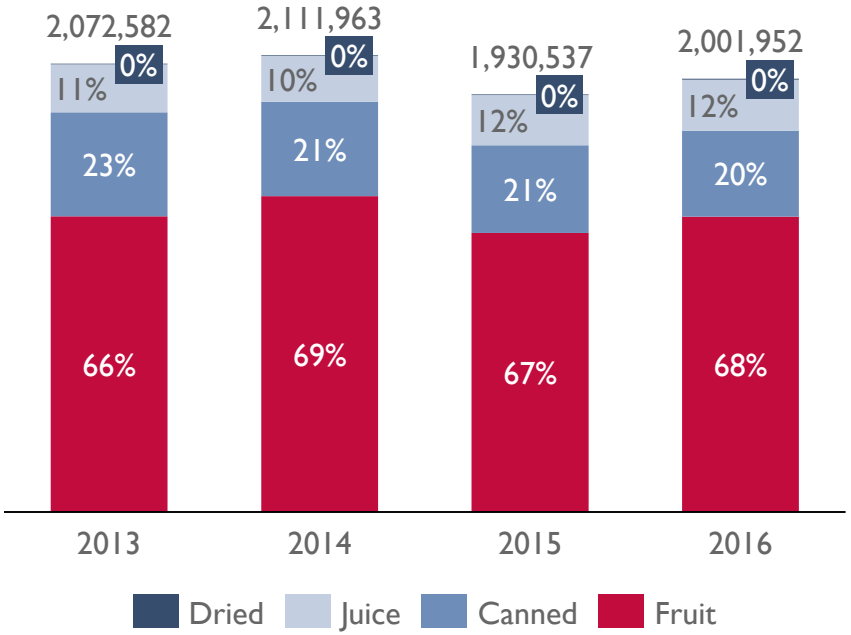


Cost Rica dominates the European market with the MD2 pineapple – a cheap pineapple that brought the fruit to Europe as an affordable option. Its high yields and consolidated supply chains through Dole and Del Monte have secured dominance in the market.

Sources: FAOSTAT

Europe imports various forms of pineapple, however only high value fresh pineapple is suitable for export from Rwanda

Import volume of pineapple - Europe
Tons, 2013-2016



Niche forms of fresh pineapple

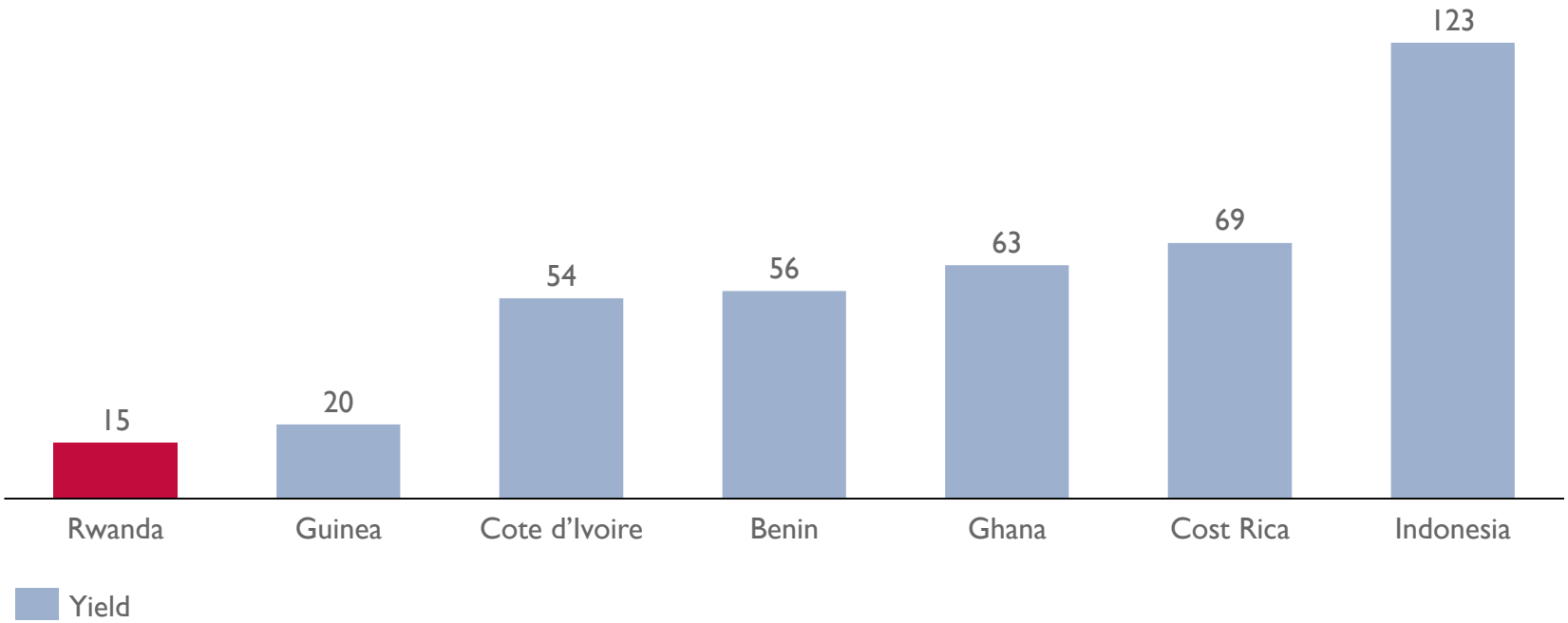
- **Organic.** Rwanda is already involved in organic production of pineapple, however it is challenging to train farmers in productive organic farming. Organic pineapple has the potential to fetch a 50% higher retail price
- **Specialty**. Some variants of pineapple such as the Victoria can claim premium prices on the market, however this variety is very niche and Rwanda today does not produce it widely

Juiced and canned fruit is best shipped via sea freight due to its stability and weight, they therefore do not leverage Rwanda's competitive advantage

Sources: FAOSTAT; Previous Dalberg study on pineapples in Benin,2018

Current yields in Rwanda make it difficult to guarantee a viable commercial investment opportunity

Benchmark pineapple yields
Tons/ha, 2016

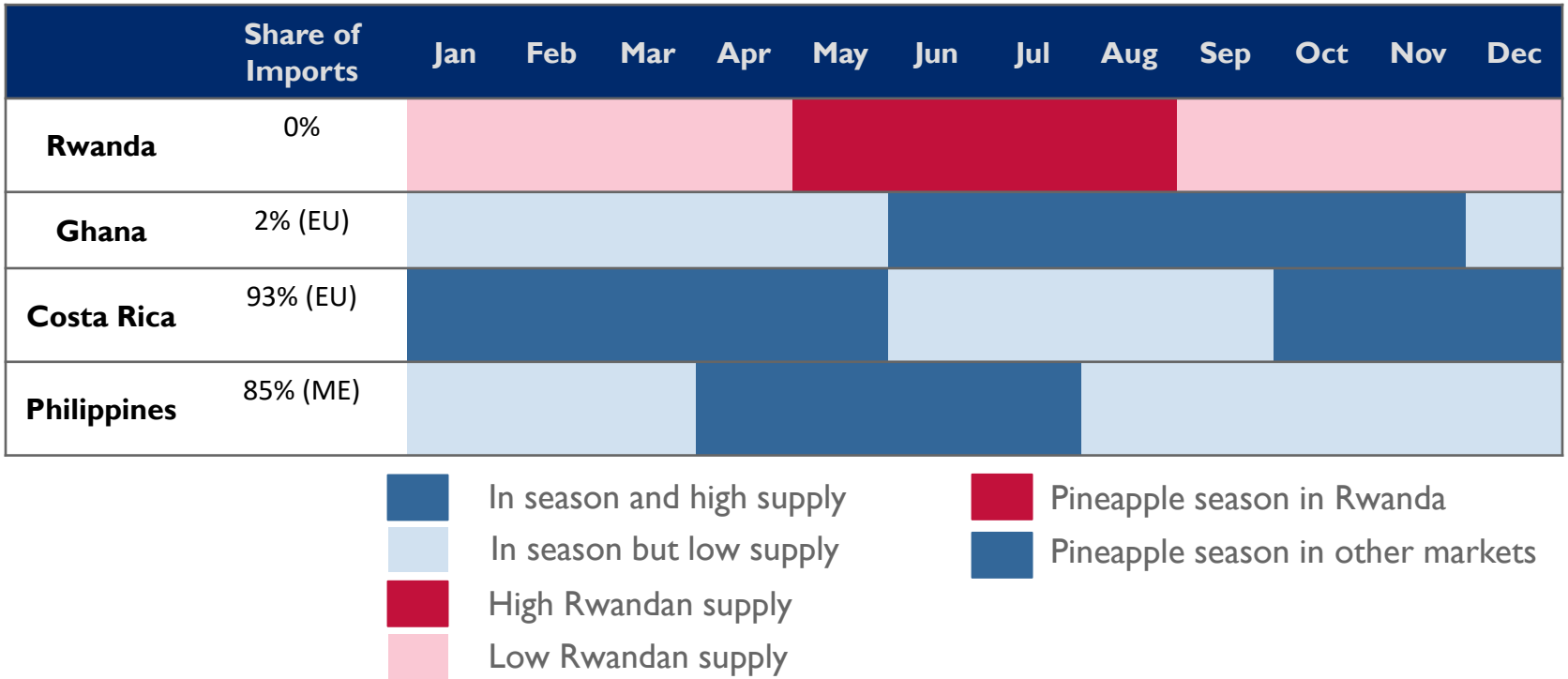


Low yields in Rwanda are attributed to a lack of inputs – both in seedling and in fertilizer, as well as high vulnerability to disease.

Source: Dalberg analysis and interviews, 2018

Rwanda does not have significant seasonal competitive advantage in the global market

Seasonality of pineapple harvest



Irrigation is needed to expand the pineapple production season in Rwanda

Sources: BMC Agriculture and Food security, Impact of climate variability on pineapple production in Ghana, 2017; SF Gate, The seasons for pineapple; Brandon Gaille, 20 Philippines pineapple statistics and trends; Costaderoexports, pineapple season

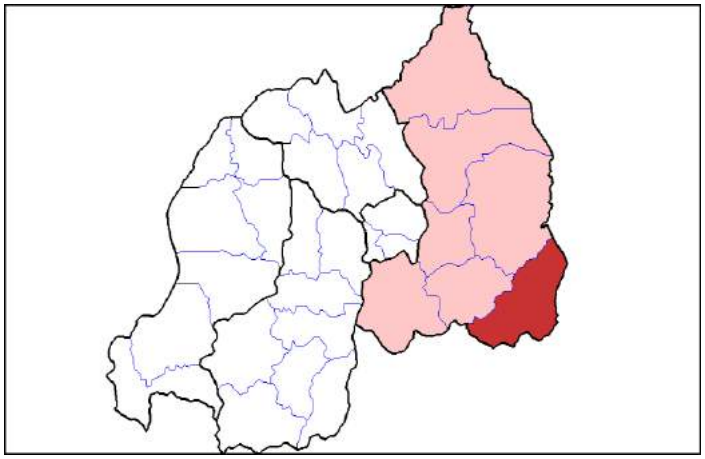
Rwanda has limited competitive advantage over Ghana, therefore a niche market would need to be found

	Rwanda	Ghana
Cost competitiveness	Farmgate price of pineapple in Rwanda: $226 per ton Transport price of pineapple in Rwanda: $1,036 per ton	Farmgate price of pineapple in Ghana: $116 per ton Transport price of pineapple in Ghana: $917 per ton. Ghana has close to 80% higher yields than Rwanda per hectare produced
Transport links	Exported pineapple in Rwanda is shipped via airfreight	Majority of pineapple in Ghana is shipped by sea
Seasonality	Harvesting takes place between May and August	Harvesting takes place between June and November
Government support	Government support to smallholders with road networks in remote regions. Government has also support in establishing linkages with European buyers	Government has supported smallholder farmers in Ghana to link them with the export market directly

Source: BMC Agriculture and Food security, Impact of climate variability on pineapple production in Ghana, 2017; ESSD Africa, The rise of Ghana's pineapple industry, 2005; IFW, Organic pineapple farming in Ghana- a good choice for smallholders?,20111; Dalberg stakeholder interviews,2018; Previous Dalberg study on pineapple value chain in West Africa; SA news, International success for E cape farm

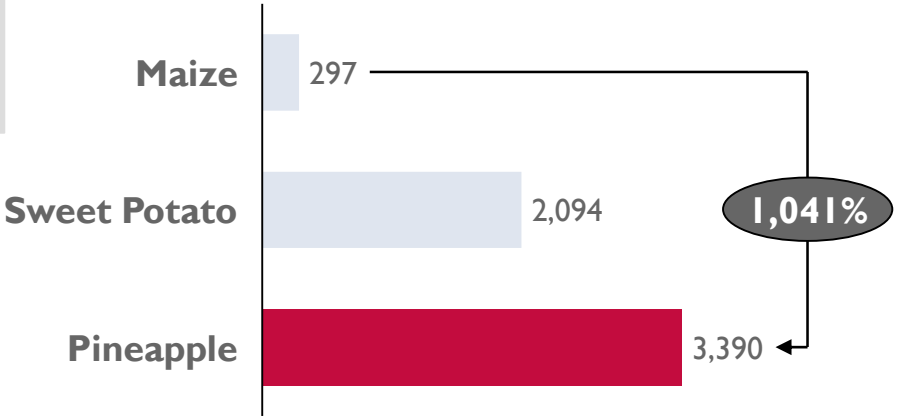
Pineapple has the potential to bring significant additional income to regions that are some of the poorest in the country

The Tuzamurane cooperative in Kirehe District Eastern Province has improved the livelihoods of close to 300 farmers, 50% of which are Women. Cooperative members have moved away from the poorest income categories as a result of pineapple production



Farmer annual income per crop per hectare

USD / year / hectare



Income from pineapple is exponentially higher than that of current staple crops – presenting a significant opportunity for local communities to increase their incomes and diversity revenue streams

Sources: Oxfam case study, Tuzamurane pineapple cooperative, Rwanda; National Institute of Statistics Rwanda (NISR), seasonal agricultural survey 2014; Rwanda state of environment and outlook report, overview of the Agriculture sector

A lack of technical support with training and inputs, as well as land planning for production, limits yields and production

SNOW PEAS	Inputs	Production	Aggregation	Export
Current value chain process	Farmers source inputs locally in Rwanda	Produced primarily by out-growers, pineapples are usually in high supply from May to August	Cooperatives produce and export pineapples	Pineapple are processed, packed and exported
Value chain barriers	Scarcity of good quality inputs and inadequate irrigation	Limited land availability to increase production capacity	Few players in this space	Limited cargo capacity
Potential interventions		Training schemes for farmers Organic certifications Local input providers	Increased mechanization to produce more Availability of local packaging material	

Sources: Previous Dalberg study on snow peas value chain; Dalberg stakeholder interviews,2018

Four of the eight value chains presented a viable business case for commercial investment

Snow Peas	Viable	Cost structure is globally competitive and farmers earn as much as $4,100 per HA when exported to Europe
Passion Fruit	Viable	High margins and high yields make passion fruit a lucrative value chain, offering farmers $5,000 per HA
Chili	Viable	Chilis can provide farmers a $4,500 income, and technical certifications could become a competitive advantage
Mushroom	Viable (specialty mushrooms)	Common mushrooms represent thin margins, however specialty mushrooms offer 80% margins
Macadamia	Viable, but too long return horizon	Intercropping with coffee offers a 27% IRR, but 10 year payback is unrealistic for commercial investment
Farmed Fish	Deal breaker – Cost production	While farming of fish is competitive regionally, the production of fingerlings and feed may be a deal breaker
Avocado	Deal breaker – Cost of shipping	Heavy and transported via sea freight, even ready to eat are shipped via sea and ripened onsite in Europe
Pineapple	Deal breaker – Cost of shipping & low yield	Competitors (Ghana, Costa Rica) are shipping via sea, whilst disease leads to low yields in Rwanda

Source: Dalberg analysis; Noun Project (icons)

Commercial Investment Opportunities

Executive summary – commercial investment opportunities (1/2)

European demand for fresh horticulture continues to grow as airfreight and refrigerated shipping makes imports from developing markets more accessible. This demand is supplied by fruit and vegetable buyer industry that has consolidated over the years.

Buyers look for reliability of volumes, quality/certification of products, and a competitive price. Sourcing traceability has also increased in importance in recent years, leading to these buyers being even more particular about their suppliers, and looking for trusted sources of produce.

In many value chains Rwanda is well placed to meet quality and price demands, this creates an investment opportunity focused on getting to a scale and serving European markets.

There are two types of investments that can obtain commercial returns in the market, 1) Vertically integrated commercial farms and 2) Cross-value chain technical and transactional companies

Vertically integrated farms have the ability to professionalize the horticulture sector by bringing in quality inputs, more mechanized farming, and developing strong linkages with European buyers.

Opportunities in passion fruit farming and snow pea/chili farming have potential to deliver an IRR of 20-25%, with an approximately 5 million USD up-front investment. A more specialized product like shiitake mushroom production could also be an interesting investment opportunity – the high labor requirements of the cultivation and harvesting lends itself particularly to Rwanda where labor costs are competitive vs. other markets. These opportunities have some risks, notably with climate change, and their reliance on affordable airfreight. These can be mitigated through long term planning and partner interventions.

Executive summary – commercial investment opportunities (2/2)

Cross-value chain opportunities require smaller upfront investments but can obtain significant returns by growing with the industry, these companies can also help to accelerate the growth of the sector and can help to increase the inclusion of across smaller-scale to producers.

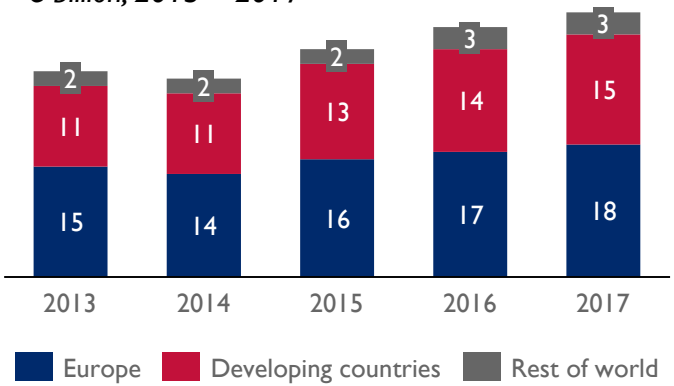
There is an opportunity for an input providers who can bring higher quality inputs and agronomic support to farmers. There is also a need for a cold chain provider who can deliver products from farm to airport and support high-quality packing of products. Finally, there is an opportunity for an aggregator who can consolidate supply from Rwandan producers to meet buyer orders. **Each of these opportunities represent a 1to 2million investment opportunities with the potential for 15-30% returns.**

USAID can accelerate private sector development by promoting these investment opportunities through activities such as: by recruiting world class business operators, helping match operators and capital, and supporting the industry to solve emergent bottlenecks.

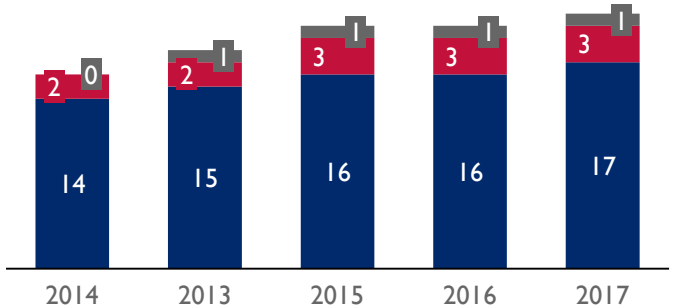
One key bottleneck that requires immediate attention is Rwanda's capacity to airfreight goods. Each of the investment opportunities outlined in this report benefit from Rwanda's strong air connections. While there is steadfast commitment by Rwandair and the Government of Rwanda to continue growing the network, the current flight network could max out its capacity to transport horticulture outputs by 2020. There are opportunities to mitigate the challenge in the short-term and to ensure long-term solutions; USAID could play a role helping resolving the challenge.

There has been a steady increase in sourcing fresh produce from developing countries - including the chosen value chains

European imports of fresh fruits
€ billion, 2013 – 2017



European import value of fresh vegetables
€ billion, 2013 – 2017



Selected value chains for commercial opportunities:

Snow pea imports have been growing steadily over the past five years, with imports worth 200 million EUR annually

Fresh exotic fruits such as **purple passion fruit** are growing in popularity as prices decrease and more global suppliers begin production at scale

Fresh chilis, especially the specialty varieties that can be grown in Rwanda, are in high demand as exotic cooking trends in Europe continue

The global mushroom market is growing at an 8% CAGR, with **shiitake mushrooms** in particular seeing a boom in demand

Sources: CBI: Centre for the promotion of exports from developing countries; ITC Trade Map

These growing imports are managed by a consolidating sector of horticulture buyers and processors across Europe

Large Importers. The big retail players source primarily from large established aggregators/importers. They are however keen to help develop value chains that could feed into those aggregators in the future. They are focused on reliable supply, consistency, and quality.

Specialty Importers. As demand for specialized produce grows, and more products are sourced outside of Europe, some importers are focusing on smaller lucrative opportunities. These importers are more concerned about quality of produce and the certifications.

Wholesalers. These are the old-school buyers of produce that sit in the main cities and then sell to smaller retail/restaurants, and/or re-export. If you want to sell to them you have to have someone physically based in the market. They typically buy produce that fills the gaps of their long-standing suppliers, and pay the market rate (no pre-fixed contracts).

Large importers present the largest commercial opportunities, however specialty importers may have more appetite for sourcing from a new East African market

Across the chosen value chains there is interest from buyers, with clear needs to be able to export at a premium to the EU

Certification	Reliability	Quality at the right price
Global GAP and one social certification are the minimum barrier to entry for a producer looking to sell in the premium European market. Producers without certification can only sell to wholesale at a lower price point.	Buyers are looking for producers who can meet the needed volumes, on time, regularly – and especially during peak seasons where Europe is not producing. European buyers try and establish long-term and regular contracts, making reliability critical for success.	Most buyers already have established relationships with producers, therefore the price and product quality would have to be attractive in order to convince them to switch sourcing.

All buyers consulted also indicated that they had not heard of the potential to export these crops from Rwanda – indicating that awareness raising to buyers is also needed

There are two approaches to investments that can help catalyze and grow horticulture exports from Rwanda

Vertically integrated value chain investments	• Vertically integrated commercial farms can operate between 100 and 1,000ha with both own production and out-grower sourcing • Average IRR of opportunities is above 25% with approximately 5 million USD needed to invest upfront in a 100 ha farm	• Passion fruit farm • Chili and snow pea farm • Shiitake mushroom farm
Cross-value chain technical and transactional investments	• As the horticulture sector develops and NAEB facilities reach capacity, most existing commercial farms are operating individually to find cold chain and input supply solutions, losing advantages in economies of scale. • While average IRR of opportunities is slightly lower at 18%, the upfront initial investment is also smaller at approximately 1 million dollars	• Input provider • Cold chain logistics provider • Aggregator

Six commercial investment opportunities in horticulture have been identified for companies and investors

Passion fruit farm	A vertically integrated passion fruit farm with all own production on 100 ha of land
Chili and snow pea farm	A vertically integrated chili and snow pea farm with 50% out-grower sourcing – 100ha and 1000ha opportunity
Shiitake mushroom farm	A shiitake mushroom growing facility capable of competing with new producers in Eastern Europe
Input provider	Provision of quality imports (seeds, fertilizer, pesticides) to commercial horticulture producers
Cold chain logistics provider	Refrigerated truck and packhouse facilities from farm to airport
Aggregator	A specialized packer and buyer to serve European buyers efficiently with consistent quality products

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

Developing a passion fruit farm at commercial scale has the potential for an above market IRR

A commercial passion fruit farm in Rwanda has a potential to be a profitable business opportunity by becoming a vertically integrated value chain producing for export on 100 ha of land. A commercial farm can produce a greater volume of passion fruits that meet the quality and quantity requirements of EU buyers by ensuring quality input provision, thorough pest control, and cold chain logistics.

Business model:

Production on own farm

Cold chain transport and packing

Export and sales to Europe

Preliminary investment data for 10 year horizon:

Investment needed	Approx. $4 million
IRR	20-25%

Types of investors/operators sought:

- Commercial passion fruit farms in Kenya, Zimbabwe or South Africa
- European aggregators
- Large local producers

Source: Dalberg analysis

A commercial farm with quality fruit can increase Rwanda's contribution to the global passion fruit market

Opportunity

Passion fruits are a highly valued exotic fruit with an **increasing demand in Europe.** Rwanda produces **purple passion fruits, the preferred variety for fresh consumption in Europe.** Today, Rwanda-based aggregators source most of their passion fruits from out-growers whose yields are inconsistent due to lack of access to quality inputs and high susceptibility of passion fruit plants to various diseases. Their products are also not Global GAP certified – a requirement for many European retailers. As a result aggregators are exporting small volumes to European buyers with lower wholesale prices. **There is an opportunity for a farm that can secure quality input provision, a stable cold chain, and the correct certifications to ensure suitability of the produce for EU export to high value retailers.**

Market need

A vertically integrated commercial farm can produce export-grade passion fruits at a greater volume and consistency. Rwanda's **favorable climate conditions and a strong potential to compete with Kenya and Zimbabwe on price and product offerings** make it particularly attractive for large scale passion fruit farming. Kenya in particular has struggled to supply fruits with acceptable minimum residue levels (MRL), a requirement for export to the EU. Commercial farming at scale is essential for passion fruit given the year-long maturity for a passion fruit vine to produce, and cost of quality inputs, leading to significant input financing requirements.

Source: Dalberg analysis; Stakeholder interviews, 2018

With commercial farming Rwanda is well positioned to capture a share of the $140 million European exotic fruits market

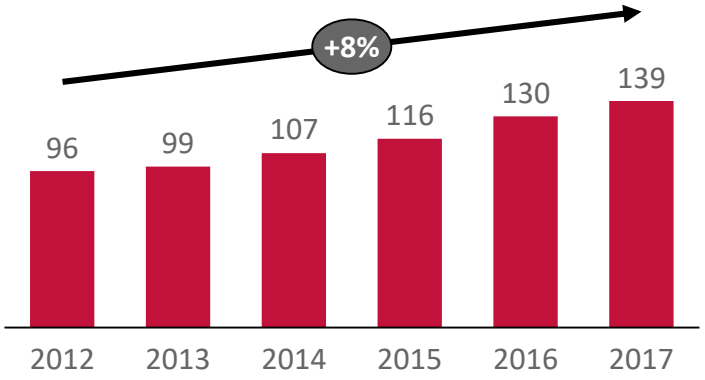
Demand dynamics:

- EU import demand of exotic tropical fruits grew by a CAGR of 8% P5Y. Passion fruit comprises a growing portion of this volume
- *"We're always looking for new sourcing."* – Don Limon buyer, global leader in passion fruit buying

Supply dynamics:

- Colombia and Zimbabwe are the leading exporters of purple passion fruits
- Producers have struggled with high MRL which takes them out of the premium European retailers

European imports of exotic tropical fruits[1]
USD million, 2012-2017



Rwanda is uniquely positioned to serve the growing passion fruit market:

- **Favorable climate:** Rwanda's high altitude and temperatures allows for year-round cultivation – a strategic advantage to Kenya.
- **Air freight price**: The growing RwandAir network with preferential air freight rates and a growing capacity allows Rwandese high value products to reach markets quickly and cost effectively.
- **Supportive and stable government**: Rwanda is seen as a "safe bet" by market buyers.
- **Competitive prices**: Rwanda has a competitive labor and airfreight cost structure for passion fruit production at $2,934 / MT which delivers an estimated margin of 25% for sales in Europe

USAID FROM THE AMERICAN PEOPLE

Source: Dalberg analysis; EUROSTAT (Comext); CBI – Exotic Tropical Fruit Europe; Stakeholder interviews, 2018

[1] Fresh tamarinds, cashew apples, lychees, jackfruit, sapodilla plums, passion fruit, carambola and pitahaya

A commercial farm would have certifications, cold chain, and extensive marketing to ensure large volume of exports to EU

Production on own farm

Land acquisition: Approximately 100 ha of relatively flat land (with slope<15%) to produce 1,100 MT/year

Input provision: Provide virus-free and healthy seedlings at a lower cost

Integrated pest management: Control MRLs by monitoring type, amount and timing of pesticides used

Drip irrigation system: Consistent supply of water year-round allows for higher yields

Certification: Global GAP and a social certification are minimum requirements from most international buyers – No certification loses 20% of market price

Cold chain transport and packing

Cold chain logistics: Refrigerated trucks to transport from farms to packhouse, to airport are essential to keep low rejects

Packing and quality management: Need an independent packhouse facility to accommodate the increased production volume from both a 100 ha commercial farm and out-growers. Tight temperature controls and appropriate handling equipment can prolong product shelf life

Export and sales to Europe

Air Freight: Securing regular and reliable air freight shipments, at a feasible cost, will be critical to ensure regular supply for buyers

International buyer relationships: An ability to establish or grow buyer relationships with key European buyers to secure regular orders

Potential buyers include Special Fruits and Total Produce

Source: Dalberg analysis

Producing passion fruit at a commercial scale would be a $4 million investment with above market rate returns

Financial snapshot for a commercially viable passion fruit farm:

Investment required	Approx. $4 million	*Investment includes land, preparation, packhouse, and truck costs + all operating expenses including airfreight*
Size of farm	100 hectares	*Provides sufficient scale for operation. It is believed that more than one farm of this size could be developed*
Average Volume	Approx. 1,100 MT per year	*Yield benchmarked with an operational commercial producer in Zimbabwe*
Average Sales	Approx. $3.5 million per year (by year 3)	*Average market price*
IRR	20-25%	*Over 10 years*

Revenue assumptions
- Average yield is significantly higher than current farms however lower than regionals commercial producers (to be conservative)
- Start producing in Year 2 as it takes time to set up the farm and reap the first harvest
- Price for passion fruit grows in consistent proportion to costs of production

Expenses assumptions
- Land is leased, with 2 laborers per ha, per commercial farming comparable in other countries
- Cost and capacity of packhouse calculated based on the NAEB packhouse, adjusted to the farm's capacity
- Seedlings are imported / replaced once a year
- The cost of fertilizer, pesticides and other inputs increases in consistent proportion to price of fruit

Source: Dalberg analysis; stakeholder interviews, 2018

Market dynamics and disease present some risk – needing good agronomy and quality inputs to ensure a quality fruit

Risk	Description of risk	Mitigation strategy
Disease in passion fruit crops	Passion fruit is particularly susceptible to diseases that can wipe out a harvest – this has been a key hindrance to passion fruit production in Rwanda to date.	Secure high quality inputs from trusted suppliers; Plant new seedlings every year instead of every three years; Bring agronomists on board with specific passion fruit expertise; intercrop with other vegetables on some of the land.
Falling market prices	Colombian passion fruit prices in particular have been dropping over past few years. They have use more pesticides than most African farms therefore produce high quantities but cannot sell to the north European market.	Ensure fruit has low MRL; build business around supplying purple passion fruit, which is higher value and in which Rwanda enjoys a greater advantage.
Limited airfreight capacity	Rwandan exporters are facing difficulty due to their products being offloaded by Rwandair, which currently flies three times weekly to Europe and only operates passenger planes.	This is being addressed by the government – with more planes on order; Consider shipping with other airlines until RwandAir increased capacity arrives (in 2-3 years). Airfreight subsidy is needed to cover the extra cost difference.
Establishing buyer relationships	International buyers may already have reliable suppliers and not recognize Rwanda as a sourcing destination for passion fruits.	Seek investors/operators with existing buying relationships. Reduce price in shot-term to gain market share.

Risk Level High Medium Low

Source: Dalberg analysis; stakeholder interviews, 2018

Successful operation requires post-harvest handling capability, certifications and securing consistent sales volumes from buyers

Capabilities that would be ideal in an operator…

- Experience in running a commercial farming business in the global south
- Agronomic expertise in passion fruits
- Knowledge in Integrated Pest Management (IPM)
- Understanding in certification and specification requirements from EU buyers
- Existing relationships with international buyers; Or capability to interact and build trusting business relationships with the buyers in a professional manner

A potential operator for this opportunity could be…

Commercial producers from other countries: Commercial farms in other African countries, ex. Bally (Zimbabwe), or Israel

Commercial buyers: Global north based wholesale/retailers who have a sourcing model from production sites, ex. Special Fruit

Existing Rwandan operators: Large commercial farms with potential to grow, in partnership with an interested investor, ex. Proxifresh, Nature Fresh, Sun Fresh

Other African commercial producers would be particularly interesting operators – they could bring expertise and buyer connections that would generate supply and help increase expertise in the country

Source: Dalberg analysis; Stakeholder interviews, 2018

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

Developing a commercial snow pea and chili farm has the potential to earn high revenues and above market returns

A commercial snow pea and chili farm in Rwanda has a potential to be a profitable business opportunity by becoming a vertically integrated supplier of snow peas and chilies. By producing for export on 100 ha of land, in addition to sourcing from out-growers, it will benefit from economies of scale to be able to supply consistent and reliable volumes of quality snow peas and chilies to the EU.

Business model:

Production on own farm supplemented by out-growers

Cold chain transport and packing

Export and sales to Europe

Preliminary investment data for 10 year horizon:

Investment needed	Approx. $4.5 million
IRR	20-25%

Types of investors/operators sought:

- Commercial horticulture producers in Kenya, Guatemala or Morocco
- European aggregators
- Large local producers or aggregators

Source: Dalberg analysis

A commercial snow pea and chili farm with technical expertise and stable cold chain can attract new EU buyers to Rwanda

Opportunity

Rwanda has favorable climate conditions and a competitive labor and airfreight cost structure to produce snow peas and chilies. Today **Rwandan producers are increasingly producing chilies and trying to produce snow peas for exports** due to a growing demand and lucrativeness. However they lack the high level of technical expertise required to grow snow peas, and irrigation to produce chilies and snow peas in more consistent volumes. **The entrance of an established commercial player in the Rwandan snow peas and chili sector** has the potential to position Rwanda as a preferred sourcing destination.

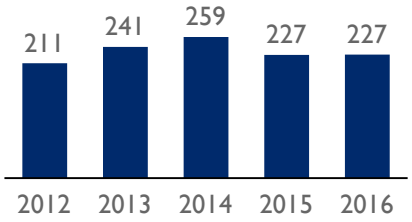
Market need

With growing demand of snow peas and chilies, and with volume and quality inconsistencies in leading suppliers in Kenya, **EU buyers are open to considering new sources of supply that can meet quality and price specifications and provide consistent volumes.** Existing global commercial players can benefit from **Rwanda's climate and cost advantage if they undertake large scale commercial farming of snow peas and chilies in Rwanda,** leveraging their technical expertise, setting up irrigation and cold chain systems, and acquiring certifications. Their existing relationships with European buyers can accelerate the development of these sectors that are primed for growth.

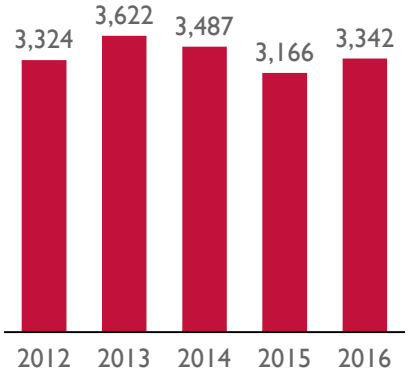
Source: Dalberg analysis; Stakeholder interviews, 2018

Rwanda has a competitive margin that allows it to compete in the large chili and growing snow pea market

European imports of snow peas
USD millions, 2012-2016



European imports of chilies
USD millions, 2012-2016



Demand dynamics:
- EU imports for snow peas and chilies have been stable P5Y
- European buyers are constantly looking for new reliable and cheaper sources

Supply dynamics:
- Guatemala, Zimbabwe, and Kenya are the largest snow peas suppliers in Europe
- Morocco and Turkey are the largest chili suppliers in Europe
- All suppliers are struggling to meet certification and MRL requirements

Rwanda is uniquely positioned to serve the large and stable market for snow peas and chilies:
- **Favorable climatic conditions:** Rwanda's high altitude and temperatures allows for year-round cultivation of snow peas – a strategic advantage to Kenya. Chilies grow well across the country
- **Air freight price:** The growing RwandAir network with preferential air freight rates and a growing capacity allows Rwanda's high value products to reach markets quickly and cost effectively
- **Favorable business environment:** The Rwandan government has set up incentives to grow the agriculture sector, such as tax incentives, access to land and finance, and subsidized airfreight rates
- **Competitive prices:** Rwanda has a competitive labor and airfreight cost structure for snow peas and chili production which provide a 31% and 29% margin for sales in Europe respectively

Source: Dalberg analysis; FAOSTAT; Stakeholder interviews, 2018

A commercial farm must have agronomic support, certifications and cold chain to ensure quality exports to EU

Production on own farm supplemented by out-growers

Land acquisition: Need 100 ha of commercial farm land and 100 ha of out-grower farms to produce 500 MT of snow peas and 1,800 MT of chilies per year

Input provision: Need quality inputs at lower prices both for commercial farm and out-growers to ensure quality

Drip irrigation system: Consistent supply of water year-round allows for higher yields

Agronomic expertise: Need strong technical expertise to grow snow peas at consistent quality and volumes, for exports

Certification: Global GAP and a social certification are minimum requirements from most international buyers – No certification loses 20% of market price

Cold chain transport and packing

Cold chain logistics: Refrigerated trucks to transport from farms to packhouse, to airport are essential to keep low rejects

Packing and quality management: Need an independent packhouse facility to accommodate the increased production volume from both a 100 ha commercial farm and out-growers. A new packhouse with tight temperature controls and appropriate handling equipment can prolong product shelf life

Export and sales to Europe

Air freight: Securing regular and reliable air freight shipments, at a feasible cost, will be critical to ensure regular supply for buyers

Capability to build and maintain relationship with European buyers: This business will need an appropriate level of professionalism and business insights to be able to negotiate on price and generate new business opportunities through building and maintaining strong and lasting relationship with European buyers

Potential buyers include Total Produce and Greenery

Out-growers on an additional 100 ha of land could produce approx. 50% of the farm's volume and contribute average sales of $2.5 million per annum.

Source: Dalberg analysis

A 100ha commercial snow pea and chili farm represents a $5 million market rate investment

Financial snapshot for a commercially viable snow pea and chili farm:

Investment required	Approx. $4.5 million	*Initial capital includes land, preparation, packhouse installation, irrigation system, equipment costs, etc. Operating costs include inputs, labor, packing, and transport*
Size of farm	100 hectares of own farm	*Provides sufficient scale for operation. Additionally source from 100 hectares of land of out-growers*
Average Volume	Approx. 500 MT snow peas + 1,800 MT chilies per year (by year 3)	*Average annual yields for Rwandan producers*
Average Sales	Approx. $5.5 million per year	*Average market prices for EU buyers*
IRR	20-25%	*Over 10 years*

Revenue assumptions:
- Start producing in Year 1 in partial volumes of Year 2
- Out-grower yields for both chilies and snow peas are lower, and failure rate for chilies is higher than own farm
- Out-grower failure rate for snow peas to decrease over time as farmers gain technical expertise of the crop
- Commercial farm and out-grower reject rates are the same and remain constant over time

Expenses assumptions:
- Land is leased, with laborers per hectare based on commercial industry averages
- Cost and capacity of packhouse calculated based on the NAEB packhouse numbers, adjusted to the farm's production capacity
- Out-grower production expenses include farmgate, handling & packing, and airfreight

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Source: Dalberg analysis; Stakeholder interviews, 2018;
[1] Average annual yield for current Rwandan producers; [2] Average annual yield for current Rwandan producers

There are 1,100 ha in Muyanza ready for investment to start operations – with a projected annual revenue of $36 million

Financial snapshot for a commercially viable farm:

Investment required	Approx. $31 million
Size of farm	1,100 hectares
Average Volume	Approx. 3,300 MT snow peas + 11,000 MT chilies per year
Average Sales	Approx. $36 million per year (at full operation)
IRR	22-26%

Assumptions:

- Investment includes farming equipment and machinery, irrigation, packhouses, cold trucks, land preparation, and all operating expenses (inputs, packing, airfreight)
- Two packhouses need to be built
- Land is leased from the farmers who own it[1]
- Land preparation is required each year, following Year 1
- Hire 3 farmers per ha (3,300 farmers in total)
- Grow snow peas and chilies for exports, with potential to add other crops as well
- Lower input prices than the 100ha farm model given greater economies of scale available
- Yields, failure rates, and reject rates kept at the same level as the 100ha farm model

The site in Muyanza already has:

- 1,100 ha of land prepared to be farmed for Year 1
- An irrigation dam of 2.4 million cubic meters
- Five cold rooms
- An input provider ready to provide planting materials (GIFT Rwanda Ltd)
- 9,000 farmers who own the land

Given the scale of the Muyanza land, and its readiness for planting, a large regional or international operator should be approached. Given the amount of finance required development finance institutions are the most likely investors.

Source: Dalberg analysis; stakeholder interviews

[1] The land is currently managed by the district, and all costs associated with land need to be discussed with the district

Price and climatic fluctuations pose risks - however both can be mitigated with buyer relationships and agronomic practises

Risk	Description of risk	Mitigation strategy
Market volatility	Snow peas and chilies prices are prone to price fluctuation particularly during large exporters' peak harvest seasons, and this can affect the profitability of Rwandan exporters.	Establish linkages with large buyers who can offer more stable prices year-round. This will be possible once the commercial farm acquires Global GAP and social certifications and is able to supply greater and more consistent volumes.
Climate change	Increased variability in rainfall can result in large production losses. In 2018, rainfall levels reached 2000mm compared to a historical 160mm, which led to crop vulnerability to pests and diseases and therefore lower yields.	Install irrigation in the initial set up of the farm; Build plastic covers and drainages to mitigate damages from heavy rainfall; Diversify sales with out-grower crops.
Limited airfreight capacity	Currently, Rwandan exporters are facing difficulty due to their products being offloaded by Rwandair. Rwandair currently flies three times weekly to Europe and only operates passenger planes.	This is being addressed by the government – with more planes on order; Consider shipping with other airlines until RwandAir increased capacity arrives (in 2-3 years). Airfreight subsidy is needed to cover the extra cost difference.
Technical capacity of management teams	Rwanda is slightly challenged with the scarcity of seasoned agronomists with the technical know-how for large scale chili and snow peas production.	Recruit experienced staff with the relevant exposure in agronomy, sales & marketing, finance , logistics, procurement, and inventory management.

Risk Level | High | Medium | Low

Source: Dalberg analysis; Stakeholder interviews, 2018
NAEB= National Agricultural Export Development Board

Technical expertise, certifications and professionalism are required to increase and secure consistent sales volumes

Capabilities that would be ideal in an operator…

- Agronomic expertise in chilies and snow peas
- Experience in or capability to run a farming business on a large scale
- Existing relationship with international buyers
- Ability to interact with international buyers in a professional manner and understand their demand
- Experience in operating in Africa

Potential operators for this opportunity could be…

Commercial producers from other countries: Large horticulture exporters producing and/or aggregating snow peas and chilies to export to EU, ex. Bally (Zimbabwe), VegPro (Kenya)

Commercial buyers: Global north based wholesale/retailers who source from production sites in the global south

Existing Rwandan operators: Horticulture producers and/or aggregators exporting to EU, looking to scale their businesses on a commercial scale, ex. Proxifresh, Nature Fresh, Golden Cat

Kenyan or Zimbabwean commercial producers would be particularly interesting operators – they could bring expertise and buyer connections that would generate supply and help increase expertise in the country

Source: Dalberg analysis; Stakeholder interviews, 2018

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

Developing shiitake mushroom production at a commercial scale is a small investment with high potential for returns

A commercial shiitake mushroom farm in Rwanda, with an end to end production to export solution, has the potential to be a highly profitable business by providing an additional source of reliable shiitake mushroom supply to the growing European market. Rwanda's competitive labor costs and airfreight costs make it a particularly attractive opportunity.

Business model:

Production in shiitake production house with own spawn lab

Cold chain transport and packing

Export and sales to European buyers

Preliminary investment data for 10 year horizon:

Investment needed	Approx. $3 million
IRR	>40%

Types of investors/operators sought:

- Asian mushroom producers
- European mushroom buyers

Source: Dalberg analysis

Shiitake mushrooms are highly suited for Rwanda with high labor needs and a robust composition for airfreight

Opportunity

Shiitake mushrooms command a price premium in Europe, selling for as high as $12,000 per metric ton. **As Asian food trends grow in Europe, the need for shiitake mushrooms will continue to rise**. Mushrooms are a delicate product to handle, and shiitake in particular must be harvested by hand. This presents a clear opportunity for Rwanda, where labor costs are relatively low compared to European production.

An opportunity exists to set up a commercial mushroom farm to produce quality shiitake mushrooms in Rwanda and export them to Europe. This can be achieved by having a seasoned player from a leading mushroom-producing country set up a commercial farm in Rwanda. Commercial farming is essential to ensure correct handling of the mushrooms, and leverage economies of scale.

Market need

European buyers are looking for consistent and reliable sourcing of shiitake mushrooms to meet growing consumer demand for healthy food. While they currently source from China and other European countries, there is an opportunity to leverage Rwanda's favorable climate and low costs to provide an alternative for their sourcing. **A commercial player from a different geography would have the right expertise to produce quality mushrooms for the European market.**

Source: Center for the promotion of imports from developing countries; Dalberg stakeholder interviews 2018

There is an opportunity to capture part of the market for shitake mushroom, estimated at $35 million globally by 2023

The global mushroom market accounted for $38.1 billion in 2017 and projected to expand at a CAGR of 7.9% from 2018 to 2026. In particular, Shiitake mushrooms are expected to reach $35.4 billion in global sales by 2023.

Current trends indicate that mushroom demand will continue to grow faster than supply over the coming years.

"The most imported types of mushroom in Europe are Chinese shiitake mushrooms and different types of far eastern dried mushrooms, all together accounting for 77% of European imports. Developing countries have opportunities to export premium-priced wild mushrooms such as truffles, or exotic mushrooms with health benefits such as shiitake."
- Center for the Promotion of Imports from Developing Countries

Rwanda is uniquely positioned to serve the growing mushroom market due to:

- **Air freight price**: The growing RwandAir network with preferential air freight rates allows Rwandese high value products to reach markets quickly and cost effectively
- **Favorable business environment:** The Rwandan government has set up incentives to grow the agriculture sector such as tax breaks, access to land and finance, and subsidized airfreight rates
- **Competitive prices**: Rwanda has a competitive cost structure due to a favorable warm climate for mushroom spawning and cheap labor costs

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Source: Gro Intelligence, 2017, Growing Mushroom Demand; PRNewsWire, Global Mushroom Market Size 2018-2026; Market Research Future, 2017, Shiitake Mushroom Market Research report – forecast till 2023

A commercial farm focused on Shitake mushrooms would be vertically integrated to enable quality supply to Europe

Production on own farm

Spawn development: Build a spawn lab to avoid high cost and complexity of importing spawn

Mushroom growing: Build a mushroom growing facility on at least 1 ha of land to produce as much as 1,500 MT of mushrooms per year

Training: Bring in agronomic experts to train farm managers due to the limited expertise in mushroom production in Rwanda

Certification: Ensure Global GAP and a social certification as these are minimum requirements from most international buyers – no certification loses 20% of market price

Cold chain transport and packing

Cold chain logistics and infrastructure: Establish a strong cold chain to control mushroom quality. This will include a packhouse for mushroom storage and manipulation, and a refrigerated truck for transportation to airport

Packing: Before packing, grade harvested mushrooms and run quality checks. Afterwards, package mushrooms by wrapping, top-sealing or bagging

Export and sales to Europe

Air Freight: Secure regular and reliable air freight shipments at a feasible cost

International buyer relationships: Establish and grow relationships with key European buyers (ex Banken Champignons and FME mushrooms) to secure regular orders

Source: Dalberg analysis

A shiitake mushroom commercial farm would require a moderate investment and could generate significant return

Financial snapshot for a mushroom farm

Investment required	Approx $3 million	*Initial capital includes growing house installation, spawn lab, other machinery and equipment* *Operating costs includes inputs, labor, airfreight and maintenance costs*
Average volume	1,000 MT / annum	*Produces at similar rate to existing commercial farms in the United States*
Average Sales	Approx $10 million / year at full capacity (in 3 years)	*Average European market price*
IRR	>40%	*Over 10 years*

Revenue assumptions
- Commercial farm produces at rate of 2/3 that of best practice commercial farms from year 2
- Wholesale price of $12,000 / MT
- Prices remain stable over time

Expenses assumptions
- Land is leased and farm development cost reflects Kigali farms experience
- Input prices remain stable
- Spawns imported in year 1, lab comes online in year 2
- Labor per MT is 20% above international average (5people per MT per week)

The biggest risk is a price war with China and limited airfreight capacity for Rwandan shiitake mushrooms

Risk	Description of risk	Mitigation strategy
Price competitiveness with established players	Chinese shiitake mushroom producers reduce prices to defend market share in Europe	Offer competitively priced shiitake mushrooms leveraging Rwanda's relatively low production costs
air freight	Shiitake mushroom volumes exceeds available capacity on existing airfreight services in Rwanda	Secure upfront airfreight space for high demand periods with current providers. Leverage large margins (due to low wage costs), to pay above market rate to secure air freight.
Cold chain failures	Shiitake mushrooms are vulnerable to cold chain failures	A vertically integrated model, and a generator, ensures that the cold chain is controlled as much as possible; processing such as mushroom extraction or drying could be brought into the value chain if needed

Risk Level | High | Medium | Low

Successful operation requires significant experience in shiitake mushroom growing

Capabilities that would be ideal in an operator…

- Experience in or capability to run a mushroom farm on a large scale
- Agronomic expertise in mushrooms, including spawn production
- Ability to interact with international buyers in a professional manner and understand their demand

Potential operators for this opportunity could be…

Commercial players seeking to lower sourcing costs: Commercial farms in Europe ex. Banke Champignon, Hirano Mushroom;

Commercial players seeking to diversify production: Asian commercial producers such as Hirano Mushroom

This opportunity has potential to attract Asian investment given their expertise in mushroom development and previous investments in new geographies (ex. Hirano Mushroom in Kosovo). It has attractive returns, and could be an important new source of supply as global demand grows.

Source: Dalberg analysis

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

There are high potential returns for professional horticulture aggregators in Rwanda

A fresh fruit and vegetable exporter has the potential to be a profitable business opportunity by becoming a professional horticulture provider linking Rwandan suppliers of in-demand products to international buyers. A horticulture aggregator can ensure the quality and consistency of exports by supplying cold chain solutions to Rwandan suppliers and establishing strong links with EU buyers, further attracting export opportunities in the European market.

Business model:

Securing contracts with European buyers

Cold chain transport and packing

Sales to European buyers

Preliminary investment data for 10 year horizon:

Investment needed	Approx. $1 million
IRR	25-30%

Types of investors/operators sought:

- Kenyan aggregators
- Moroccan aggregators
- Guatemalan aggregators

Source: Dalberg analysis

A horticulture aggregator can ensure consistent supply, high quality, and professionalism in negotiations and service

Opportunity

The Government of Rwanda is strongly prioritizing the horticulture sector and has put in place incentives for businesses investing in the sector. **Rwandan producers are increasingly producing high value crops such as chilies, passion fruits** and other tropical fruits for exports due to a growing demand and lucrativeness. For example, french bean and snow pea export volumes have grown at 117% and 10% CAGR over the past 3 years. With this growth trajectory the NAEB packhouse and cold trucks are expected to reach their maximum capacity soon. **The entrance of a horticulture aggregator in the Rwandan sector will enable consistent quality and volumes of fresh fruits and vegetables shipped to EU buyers**. This aggregator would provide logistics, packing, and certification support.

Market need

European buyers seek consistent and reliable sourcing of fresh fruits and vegetables and a good professional partnership with an exporter from Rwanda. European buyers are also currently facing difficulty of high maxim residue levels from Kenya and Ethiopia and are therefore likely to consider sourcing from regional competitors such as Rwanda. Given that advantage, **an experienced and credible aggregator can take advantage of the growing sector and the cost advantage** that would be incurred from setting up in Rwanda.

Source: Previous Dalberg study, 2018; Dalberg stakeholder interviews, 2018

Rwanda is well placed to take a share of the $ 4.4 billion European opportunity in key value chains

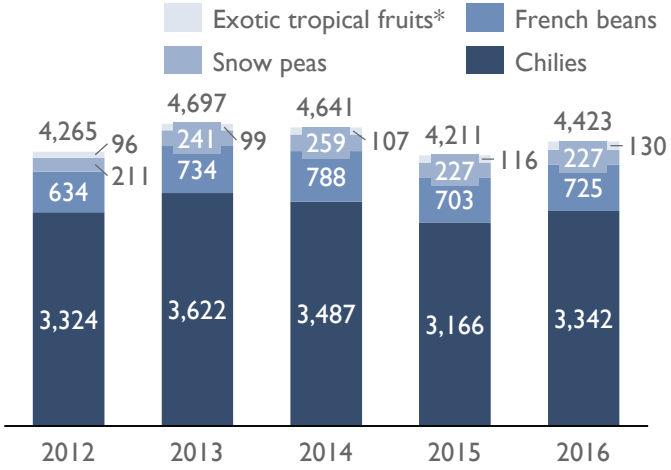
Demand dynamics:

- EU imports for high value horticulture (ex. French beans, snow peas, passion fruits) have grown P5Y
- European buyers are constantly looking for new reliable and cheaper sources of product

Supply dynamics:

- Guatemala, Zimbabwe, Kenya, and Morocco are the leading exporters of French beans and snow peas
- Passion fruit supply is from Colombia and Zimbabwe.
- Morocco and Turkey are the largest supplier of the European chili market
- All suppliers are struggling to meet certification and MRL requirements

European imports of horticulture
USD million, 2012-2017



Rwanda is uniquely positioned to serve the specialty horticulture market:

- **Favorable climatic conditions:** Rwanda's high altitude and temperatures allows for year-round cultivation of French beans and snow peas
- **Air freight price**: The growing Rwandair network with preferential air freight rates and a growing capacity allows Rwandese high value products to reach markets quickly and cost effectively.
- **Favorable business environment:** The Rwandan government has set up incentives to grow the agriculture sector such as tax incentives, access to land and finance, and subsidized airfreight rates
- **Competitive prices:** Rwanda has a competitive cost structure across high value horticulture

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Source: FAOSTAT; Dalberg analysis,2018
* Fresh tamarinds, cashew apples, lychees, jackfruit, sapodilla plums, passion fruit, carambola and pitahaya

An aggregator ensures all product is certified and in a cold chain, while establishing good buyer relationships

Securing contracts with European buyers and Rwandan producers

Establishing strong buyer relationships: Industry credibility and professionalism will be crucial for the aggregator to establish buyer relationships with key long-term European buyers such as Total Produce and Greenyard to secure regular orders

Rwandan producer relationships: Securing contracts with large Rwandan producers will be essential for the aggregator to ship consistent volumes to European buyers

Cold chain transport and handling

Certification: Support farmers and smaller aggregators acquire these Global GAP and social certifications required by buyers – No certification loses 20% of market price

Cold chain logistics: Refrigerated trucks will be needed to transport products from famers to airports to keep low levels of rejects

Handling and quality management: Need an independent packhouse facility to truly accommodate the projected growth in the horticulture sector. This packhouse will have tight temperature controls and appropriate handling equipment to prolong product shelf life

Export and sales to European buyers

Packing: Products will be packed according to the clients packaging requirements and in observance of HACCP and BRC certificates required by buyers

Airfreight: Securing regular and reliable airfreight shipments, at a feasible cost, will be critical to ensure regular supply for buyers

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Source: Dalberg stakeholder interviews, 2018; Dalberg analysis
HACCP: Hazard analysis and critical control points certificate
BRC: British retail consortium global standards

Setting up an aggregator would be a $1 million investment and deliver an attractive market rate return

Financial snapshot for a horticulture aggregator:

Investment required	$ Approx.1 million	*Initial capital includes packhouse installation and cold trucks purchase etc.* *Operating costs includes labor, packaging, purchase of produce, and airfreight*
Average Volume	Approx.1,200 MT per year	*The aggregator should be able to capture 50% of export volumes of French beans, snow peas, chilies, and passion fruits by its 7th year of operation*
Average Sales	Approx. $3.5 million per year (by year 3)	*French beans @ 2.70 USD/kg;* *Snow peas @ 3.40 USD/kg;* *Chilies @ 3.0 USD/kg; Passion fruits @ 5.30 USD/kg*
IRR	25-30%	*Over 10 years*

Revenue assumptions:
- Revenues are projected to increase as we estimate that export volumes will grow at half the rate projected by NAEB

Expenses assumptions:
- This investment will include constructing a packhouse 1,300 MT/per year , purchasing equipment, and 3 refrigerated trucks
- Expenses include purchasing the product at farmgate price, manipulation, packaging, and airfreight

Source: Previous Dalberg study 2018, Dalberg analysis

Albeit the limited risks, a new aggregator will need to consider bottle-neck risks such as low production levels of crops

Risk	Description of risk	Mitigation strategy
Climate change	Increased variability in rainfall can result in large production losses due to crop vulnerability to pests and diseases. A third party business that does not manage its own production is particularly sensitive as it cannot mitigate the risk directly.	Prioritize working with larger producers who are able to install irrigation systems and better water management and flood control systems
Volatile production levels	Though French beans are currently the fastest growing horticulture product, production of all export crops from Rwanda is still limited at this stage.	Cover multiple value chains, ensuring diversification of produce; Ensure coordination with technical support for suppliers.
Market volatility	Snow peas and French beans prices are prone to price fluctuation particularly in seasons where large exporters are in season, and this can affect the profitability of exporters.	Established linkages with clients who can offer consistent prices year-round. This will require the exporter to have the pertinent certifications.
Limited airfreight capacity	Rwandan exporters are facing difficulty due to their products being offloaded by Rwandair, which currently flies three times weekly to Europe and only operates passenger planes.	This is being addressed by the government – with more planes on order; Consider shipping with other airlines until Rwandair increased capacity arrives (in 2-3 years).

Risk Level High Medium Low

Source: Dalberg analysis

Ideal operators for an aggregator are large aggregators abroad and producers with capacity to invest in Rwanda

Capabilities that would be ideal in an operator…

- Experience in running a large aggregation business in the global south
- Understanding in certification requirements and specifications from EU buyers
- Ability to forecast and efficiently manage the quantity and quality of produces from smaller aggregators and producers
- Existing relationship with international buyers; Or capability to interact and build trusting business relationships with the buyers in a professional manner

Potential operators for this opportunity could be…

Commercial players from other countries: Large horticulture exporters aggregating horticultural products from commercial farms and out-growers to export to EU, ex. VegPro (Kenya)

Existing Rwandan operators: Horticulture aggregators exporting to EU, looking to scale their businesses on a commercial scale

Working with an existing Kenyan aggregator would ensure buyer relationships are already established and could just be expanded to the Rwandan market

Source: Dalberg analysis

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

With less than a million USD investment an input provider can establish a footing in a nascent industry – with strong returns

A quality input provider focused on the horticulture sector will be able to establish a footing in a nascent but premium horticulture input provision sector. Horticulture is the fastest growing sector among the various value chains in Rwanda, notably French beans, snow peas, passion fruit, and chilies for export. This opportunity requires relatively little initial investment and offers moderate returns.

Business model:

Import premium inputs to Rwanda

Supply inputs to commercial farms and cooperatives

Provide extension services

Preliminary investment data for 10 year horizon:

Investment needed	Approx. $1 million
IRR	15-20%

Types of investors/operators sought:

- Established input providers in Kenya
- Expansion of existing Rwandan input provider operations, with global input provider support

Source: Dalberg stakeholder interviews, 2018; Previous Dalberg study

An input provider can tap into a growing market in Rwanda for hybrid seeds, and quality chemicals and fertilizers

Opportunity

Rwanda's horticulture exports are growing exponentially year on year, and are expected to continue growing at a 47% CAGR. **Currently, the availability of good quality inputs is limiting Rwandan horticulture from being export-ready.** Notably, access to hybrid seeds that are pest and disease resistant and can achieve higher yields, and good quality pesticides. **The entrance of an expert input provider in the Rwandan horticulture sector would create a local availability of high grade inputs, and support commercial farms and out-growers to improve their yields and quality of produce**. The input provider will initially import the inputs and then transition to local production as the scale of the Rwandan market grows. Additionally, **a premium input provider could provide technical expertise through extension services on agronomy, soil analysis services, and best practice pesticide and chemical applications.**

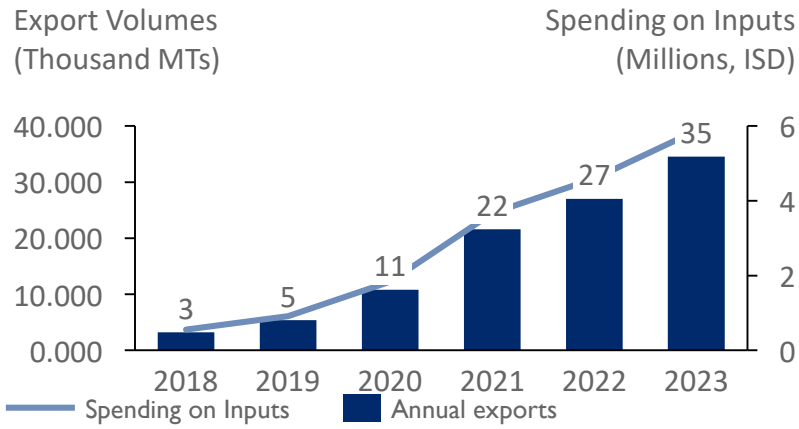
Market need

EU buyers are looking for consistent and reliable sourcing of fresh fruit and vegetables year-round of high quality and which meet the certification requirements and minimum residue limits. To achieve this at scale Rwandan producers will require premium inputs that are currently not available locally in Rwanda. **Extension services focused on production for export will also ensure farmers are applying inputs in the most effective way that adheres to EU standards.**

Source: NAEB export volume forecasts, 2018; Dalberg analysis; Dalberg stakeholder interviews, 2018

As horticulture grows due to strong government support and high margins there is a growing opportunity in input supply

Growth in horticulture exports and input revenues



A big challenge is that we don't have quality seeds, and we don't have people here who know how best to use them – Commercial passion fruit farmer

In Rwanda, if you're able to have a bit of agronomic science, and not just focus on product use, you can have better results. This shift is really necessary because otherwise people will just put pesticides… - Commercial snow pea farmer

An input provider is uniquely positioned to serve the growing horticulture sector in Rwanda:

- **Positive outlook for Rwanda's horticulture sector:** Due to Rwanda's favorable climate and competitive cost structure the horticulture sector is set to grow exponentially to meet demand
- **Strong political will to grow the sector:** Horticulture is a high priority sector for the Rwandan government and there is strong support to companies in the sector
- **No established player in the market:** There are no established seed providers working on the ground in Rwanda - at most they provide ad hoc shipments to distributors
- **Virgin lands:** A lot of agricultural land has never been exposed to fertilizer or pesticides, providing an environment ideal for planting high quality seeds and determining new formulas for optimal yield

Source: Dalberg stakeholder interviews, 2018; Previous Dalberg study; National Agriculture export board, projected export volumes 2018

An input provider will need to set up a warehouse, import and distribute inputs to producers, and provide extension services

Warehouse and operational set up

Land acquisition: Acquiring at least 1 hectare of land , will be critical to construct a warehouse facilities in Kigali

Warehouse construction: A warehouse is essential for the operations of the provider and will have a warehouse with 25MT/ day capacity to cater for the growing demand over the next 10 years

Establishing linkages with customers: Partnering large Rwandan producers with wide out-grower networks will be imperative in acquiring a consistent market for high grade inputs locally

Import and distribution

Import of inputs: Bulk quantities of inputs will ideally be procured Europe, India, Sri-Lanka, and Kenya, namely from established providers such as; Syngenta, Ligature biotechnologies, Serendib horticulture technologies, and Bayer

Distribution to farmers: Inputs will be distributed directly to Rwandan producers who will then supply them among their out-growers networks if needed. Alternatively, distributors may be used to supply smaller commercial operations, however without extension services

Extension services

Agronomy: Technical experts will be hired to support will be provided to farmers in planting methods, chemicals & fertilizer application, and other best practice farming methods

Soil analysis: Frequent soil tests will be done to ensure optimum management of soil nutrients

Source: Dalberg stakeholder interviews, 2018; Dalberg analysis

Setting up an input provider in Rwanda would be a small investment with reasonable returns and a first-mover advantage

Financial snapshot for an input provider:

Investment required	Approx. $1 million	*Investment includes warehouse construction, machinery, equipment, and all operating expenses*
Average Sales	Approx.$ 3 million within 10 years, up form about 200k in year 1	*Selling inputs at the current market price of quality inputs for French beans, snow peas, chilies, and passion fruit.*
IRR	15-20%	*Over 10 years*

Revenue assumptions:
- Volumes of produce are set to grow per NAEB's industry growth estimations
- The input provider will offer extension services with top international experts leading local teams
- Business will capture 50% market share in Rwanda

Expenses assumptions:
- Assume import of all products, although there is reason to believe that certain products can be produced locally as scale increases
- Assume full cost of import duties

Source: Dalberg stakeholder interviews, 2018; Previous Dalberg analysis, Previous Dalberg study; National Agriculture Export Board (NAEB), projected export volumes 2018

The highest risk for an input provider is substitution by counterfeit inputs and low demand

Risk	Risk description	Risk mitigation
Counterfeit supply of inputs	Smuggling of counterfeit inputs that are cheaper and lower quality is rampant in Rwanda. This posses a slight risk to a provider looking to gain traction for supply for premium quality inputs locally	Strategically provide inputs to more established farmers who are exporting to European markets and are targeting optimum yields and quality for their produce
Ability to pay for inputs	Given the current access to finance challenges in the agriculture space there may be difficulties in paying upfront for more premium inputs	Input provider can work with buyers or finance institutions to secure credit; NAEB could work with input provider for credit assurance
Insufficient volumes	The input business is reliant on maintained production volumes – in case these decline or cease in some value chains they will lose revenue	Ensure diversified value chain offering
Government regulation	The Rwandan government is looking to strengthen domestic production of inputs and could implement policies to discourage imports of inputs	Fastrack plans to set up own nurseries for local production

Risk Level High Medium Low

Source: Dalberg analysis

Ideal operators for an input provider are large international or regional players with capacity to invest in Rwanda

Capabilities that would be ideal in an operator…

- Experience running a large input (seed, fertilizer, pesticide) business
- Strong agronomic expertise and understanding of good agricultural practices
- Experience in operating in East Africa

Potential operators for this opportunity could be…

Global commercial input players: Large and established commercial input providers , ex. Syngenta, Bayer, Ligature, and Serendib

Regional commercial input players : Smaller seed companies looking to expand, ex. Kenya Seed Company

Local commercial input players : Investing in local input providers, ex. GIFT Rwanda and Africhem Rwanda, that are established and have an attractive growth potential

Working with a large global supplier such, in partnership with their existing distributor, would ensure existing knowledge was continued and scale up could happen quickly

Source: Dalberg analysis

Investment Opportunities

Passion Fruit Farm

Snow Peas and Chili Farm

Mushroom Farm

Aggregator

Input Provider

Cold chain logistics provider

A third party cold chain logistics company is in high demand in Rwanda, and has potential for above market returns

A cold chain logistics company in Rwanda can provide a third party fleet of refrigerated trucks for transportation of fresh produce and a cold room for storage and manipulation. Given the growing horticulture export volumes in Rwanda it has the potential to grow and reach profitability quickly.

Business model:

Cold chain transport and packing

Storage and leasing of pack house space to fresh produce exporters

Preliminary investment data for 10 year horizon:

Investment needed	Approx $1.5 million
IRR	15-20%

Types of investors / operators sought:

- Regional logistics operators with good understanding of the East African market
- Local logistics operator interested in scaling up present business

Source: Dalberg analysis

A cold chain logistics company is crucial for Rwanda to be able to deliver high quality horticulture to Europe

Opportunity

The Government of Rwanda is strongly prioritizing the horticulture sector, resulting in significant growth in export volumes over the past three years and high projections for the coming years. Following this fast growth the NAEB packhouse and cold trucks which helped kick-start the industry are currently operating at maximum capacity. A few of the large horticulture producers have considered building their own facilities however these require high upfront capital investment, and limited scalability. **A cold chain logistics company in the Rwandan horticulture sector can leverage economies of scale and provide a more cost-effective and efficient solution for Rwandan producers.**

Market need

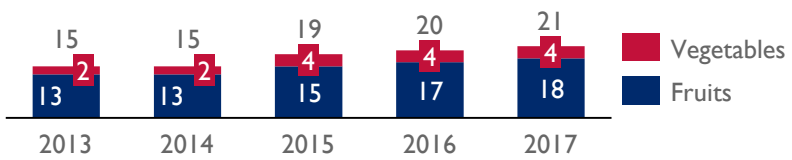
European buyers are looking for consistent and reliable sourcing of fresh fruits and vegetables. While agronomically Rwanda is well placed to serve this demand, the lack of an adequate cold chain from farm to airplane leads to a lot of rejected produce. **By establishing a cold chain logistics company, Rwandan producers would be able to keep their produce in a reliable cold chain at an affordable cost and without needing a large capital investment, ensuring their products are of export quality.**

Source: Previous Dalberg study, 2018; Dalberg stakeholder interviews 2018
NAEB: National Agriculture Export Development Board

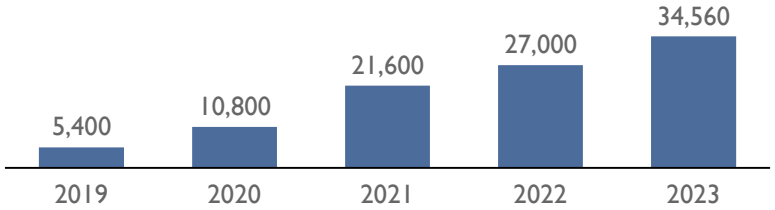
Rwanda is well positioned to capture a share of the growing European fresh horticulture market

European imports of fresh fruits and vegetables from developing countries grew by a CAGR of 38% between 2013 and 2017 driven by increasing regional demand for fresh and healthy food, and insufficient local supply. Rwanda can capture a share of the European fresh horticulture market by supplying high quality fresh produce.

European imports of fresh horticultures from developing countries
USD billion, 2013 – 2017



Projected Rwandan horticulture exports
MT, 2019 – 2023



Rwanda is uniquely positioned to serve the growing European horticultures:

- **Growing exports**: Horticulture exports from Rwanda have increased over the past year and projected to grow by a CAGR of 47% over the next ten years
- **Air freight price**: The growing RwandAir network with preferential air freight rates allows Rwandese high value products to reach markets quickly and cost effectively
- **Favorable business environment:** The Rwandan government has set up incentives to grow the agriculture sector such as tax incentives, access to land and finance, and subsidized airfreight rates
- **Competitive prices**: Rwanda has a competitive cost structure for most horticulture value chains due to a favorable climate with year round production and cheap labor

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Source: CBI – Centre for the promotion of exports from developing countries; ITC Trade Map; Rwanda Revenue Authority; Dalberg analysis

A cold chain logistics company will enable end to end cold chain from farm to airport

Cold chain transport

Refrigerated trucks: Transport fresh produce from the customer sites and farms to the packhouse using refrigerated trucks to maintain the quality of produce

Logistics system: Use a comprehensive logistics operating system to manage the fleet of trucks and numerous shipments – ideally provided by a global logistics supplier or tech provider

Cold storage of fresh produce prior to export

Land acquisition: Acquire at least 1 hectare of land to construct each packhouse facility in Kigali

Packhouse construction: Set up a packhouse to provide infrastructure for commercial producers/exporters to manipulate and pack fresh produce (packing to be done by produce owners).

Refrigerated transport to airport: An additional truck will transfer packed produce to the airport

Source: Dalberg analysis

An initial investment outlay of about $1.5 million is required to set up the cold chain company for reasonable return

Financial snapshot for a cold chain logistics company

Investment required	Approx $1.5 million	*Initial capital includes packhouse installation and cold trucks purchase etc.* *Operating costs includes fuel, packhouse operating costs and asset maintenance*
Average Volume	31,000 MT / annum	*The cold chain company would capture 20% of export volumes of horticultures by year 10*
Average Sales	Approx $3.6 million per year	*50% increase over current NAEB prices to account for transport from farm to packhouse*
IRR	15-20%	*Over 10 years*

Revenue assumptions

- Prices are higher than current NAEB prices to account for transport from farm to packhouse
- Company captures 20% of horticultures export market

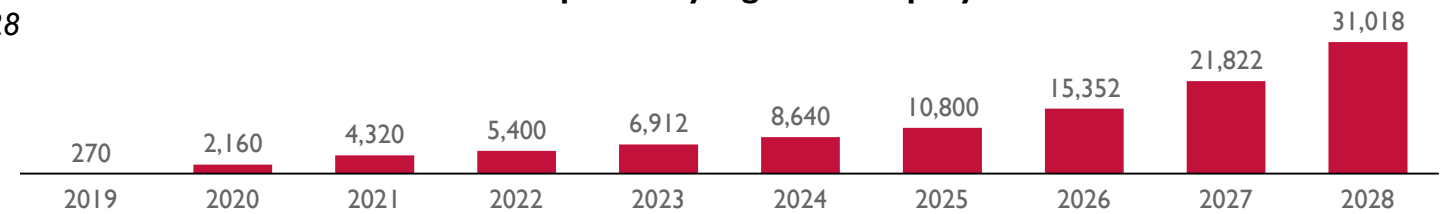
Expenses assumptions

- Packhouse has same volume and manipulation capacity as existing NAEB packhouse
- Over ten years, three packhouses will be constructed as needed to store company's share of horticulture exports
- Over ten years, 86 refrigerated cold trucks (7 MT capacity each) will be purchased as needed to transport weekly volumes

Source: Stakeholder interviews; Dalberg analysis

As the logistics company grows, it will need to scale its asset base of packhouses and trucks

Projected volumes of horticulture stored and transported by logistics company
MT, 2019 – 2028



$250,000 each; 52MT / week

One packhouse | Two packhouses | Three packhouses

$50,000 each; 7 MT / trip

Two trucks | 25 trucks | 89 trucks

Assumptions

- Rwandan horticulture export volumes are expected to grow at the rate projected by NAEB for the industry
- The cold chain logistics company will capture a small share of the annual horticulture volumes in year one, but this will increase in subsequent years
- Packhouse capacity is 10,400 MT per annum (i.e. 52 MT per week) and refrigerated truck capacity is seven tons per trip
- The cold chain company will set up one packhouse at the start of operations, and additional ones in year 7 and year 9 as horticulture export volumes grow
- Starting with two refrigerated trucks in year 1, the cold chain company will gradually increase its fleet to 89 trucks to transport the expected volumes of horticulture over ten years

Source: Stakeholder interviews; Rwanda Revenue Authority; Dalberg analysis

The biggest risk for operation is uncertainty in the Rwandan demand for the services and increased vertical integration

Risk	Description of risk	Mitigation strategy
Increased vertical integration	Producers increasingly vertically integrate their cold chain, removing the need for additional services	Launch quickly into the market; Provide competitive prices and quality service
Fuel price uncertainty	Fuel prices spike and significantly increase cost structure for cold chain company	Increase pricing to offset impact of new fuel prices
Low production	Production volumes lower than expected due to other value chain barriers (ex. input provision)	Diversify with other country investments and uses (ex. healthcare), and work with NAEB to guarantee minimum volumes and contract commitments

Risk Level | High | Medium | Low

Source: Dalberg analysis

Ideal operators of a logistics company are successful operators in other geographies, particularly East Africa

Capabilities that would be ideal in an operator…

- Experience in or capability to run a large scale logistics company
- Some agronomic expertise e.g. in operating packhouses
- Operating history of more than one decade
- Experience in operating in East Africa

Potential operators for this opportunity could be…

Existing Rwandan operators: Small logistics player looking to expand and commercialize

Commercial logistics players from other countries: Logistics company in East Africa, ex. Siginon group or Global north based logistics company, with experience in Africa ex. Kuehne + Nagel

This opportunity has potential to attract significant local investment given the pressing problem it solves, a relatively low upfront investment (about $1.5 million) with attractive long term returns, and less need for agricultural expertise and international linkages

Source: Dalberg analysis

Next steps

What this means for USAID and GFSS

There are a number of ways in which USAID and the forthcoming GFSS Programming can support income growth for farmers through the horticulture export opportunity:

Investment promotion	USAID has the capabilities to use its networks and convening power to promote these investments to potential investors – private equity firms, international companies, or local companies. These can also be seeded as part of Ngorize Nshore.
De-risk investments	By de-risking these investments through subsidizing set-up costs, providing connections to the relevant stakeholders, doing fund feasibility, USAID can further attract investment to these opportunities.
Support impact	Parts of these opportunities, such as out-grower schemes, have incremental impact on farmers, and could be supported explicitly by USAID as part of the investment opportunities, for example by financing technical support or land preparation.
Solve market bottlenecks	There are some market bottlenecks that USAID could proactively address through conversations with stakeholders or funding – most urgently the current limited airfreight capacity and high airfreight cost without Rwandair subsidy.

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Additional investment opportunities could be identified by following the same process we used in this work

Starting with eight high-potential value chains we validated the business case for four and identified six investment opportunities – Other value chains should be considered

Other horticulture value chains with potentially similar advantages to those we studied

- French Beans
- Cauliflower
- Cucumbers
- Strawberries
- Tomatoes
- Apples
- Egg plant
- Citrus
- Broccoli

Livestock that grazes and does not consume wheat or maize-based feed

- Sheep
- Goats
- Wild birds
- Organic /grass fed meats

Low weight, high value products such as herbs spices where labor is a high percentage and transport is a low percentage of the overall cost

- Ginger
- Rosemary
- Thyme
- Vanilla
- Seed spices
- Cinimon

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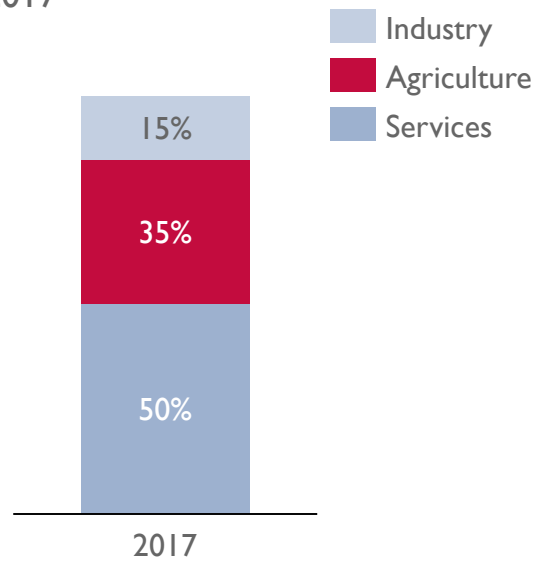
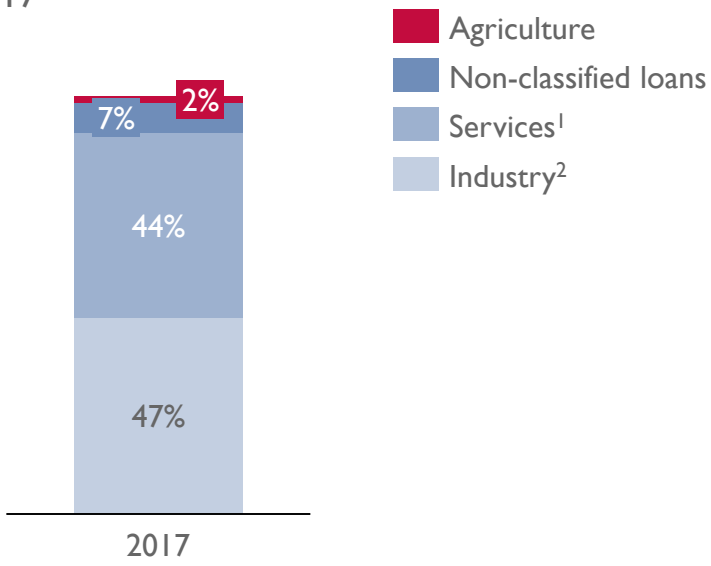
ANNEX 1: Agricultural finance landscape of Rwanda

Agriculture is a critical part of the Rwandan economy but significantly under-represented in lending

Sectoral contribution to GDP
%, 2017



Sectoral distribution of loans
%, 2017



Agriculture investments are small due to:

- Agriculture in Rwanda is still primarily driven by smallholder farmers, therefore the size of the loan is small and transaction costs are high
- Lenders perceive agriculture to be high risk, and are not equipped to better assess risk
- There is little equity and limited high value assets in agribusinesses for collateral
- Traditional lending products do not accommodate the cyclical nature of cashflows in agriculture

[1] Services includes service sector, hotel, transport & warehousing, OFI & insurance, and trade
[2] Industry includes mining, manufacturing, water & energy, and mortgage industries
Source: AfDB, 2018, East Africa Economic Outlook 2018; The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; BRD, Agriculture Sector; BNR, 2017, Annual Financial Stability Report July 2016-June 2017

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There are a variety of service providers in lending – targeting different segments of agriculture

		Debt	Equity*
Public-sector lender	BRD is the largest lender in agriculture (37% of agriculture loan portfolio); Primarily lends to agribusiness, especially in agri-processing and coffee & tea production	• *Development Bank of Rwanda*	
Commercial banks	33% of agriculture loan portfolio; Provide a wide range of financial products for pre- and post-harvest of staples and cash crops; Different banks target different customer segments (i.e. smallholders, cooperatives, agribusinesses)	• *Urwego Opportunity Bank* • *Kenya Commercial Bank* • *Banque Populaire du Rwanda* • *COGEBANQUE*	
Specialized lenders	Different lenders provide loans to aggregators, smallholders and agribusiness SMEs; The majority of lending is working capital financing to aggregators in the coffee value chain	• *Root Capital* • *One Acre Fund* • *Growfin*	• *AgDevCo*
Development financial institutions	Bilateral and multilateral DFIs funds projects in agriculture, as well as provide matching grants to farmers and agribusiness SMEs	• *OPIC*	• *IFAD* • *CDC* • *KfW* • *IFC/World bank*
Microfinance institutions	20% of agriculture loan portfolio; Loans for individual farmers and SMEs in agricultural production; Focus on commodities grown in their respective districts	• *Umurenge SACCOs* • *Duterimbere,* • *RIM* • *Ejo Heza*	
Value chain actors	Provide loans to cooperatives and farmers, inputs on credit and post-harvest finance for aggregation based on business transaction history		• *Traders and processors*

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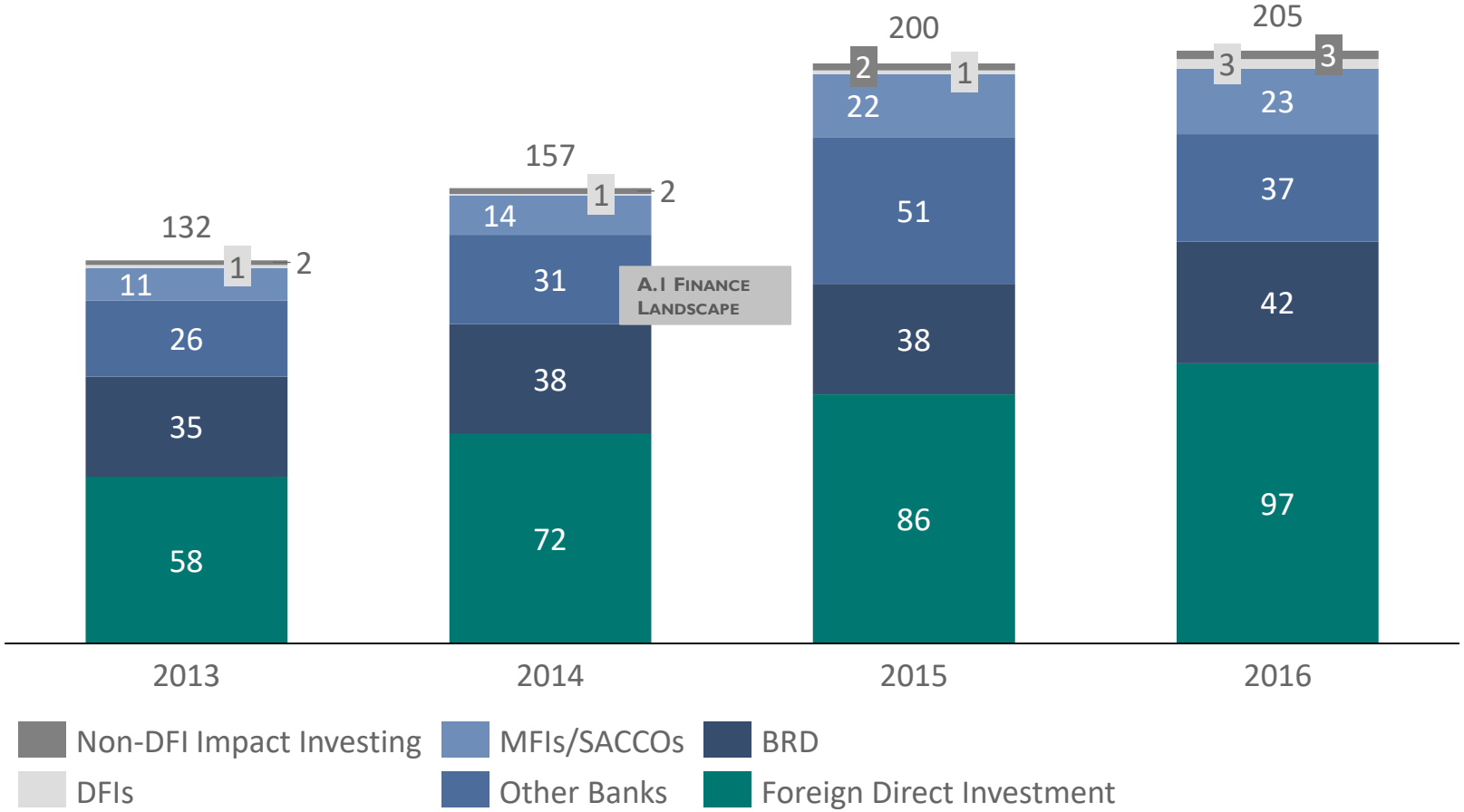
* All investors investing in equity also invest in debt

Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; Bank websites

Agriculture investment is growing across sources, the largest and fastest growing is FDI while impact investment remains small

Agriculture investments in Rwanda

USD, millions



A.1 Finance Landscape

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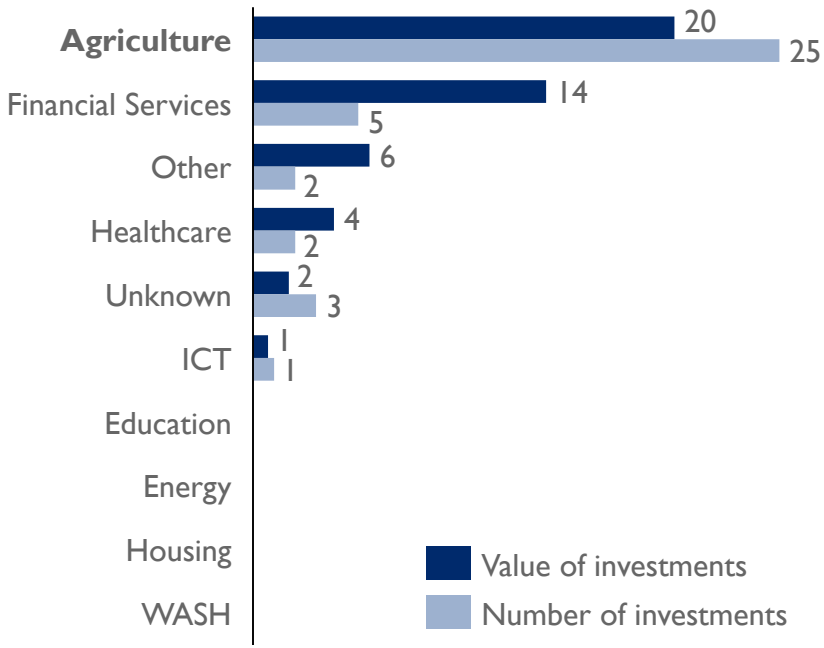
DFI investment and impact investment projections by Dalberg analysis, based on GIIN 2015 Report numbers
Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; GIIN, 2015, The landscape for impact investing in East Africa: Rwanda;

Impact investing by non-DFI actors is focused on agriculture, while DFIs invest in financial services and infrastructure

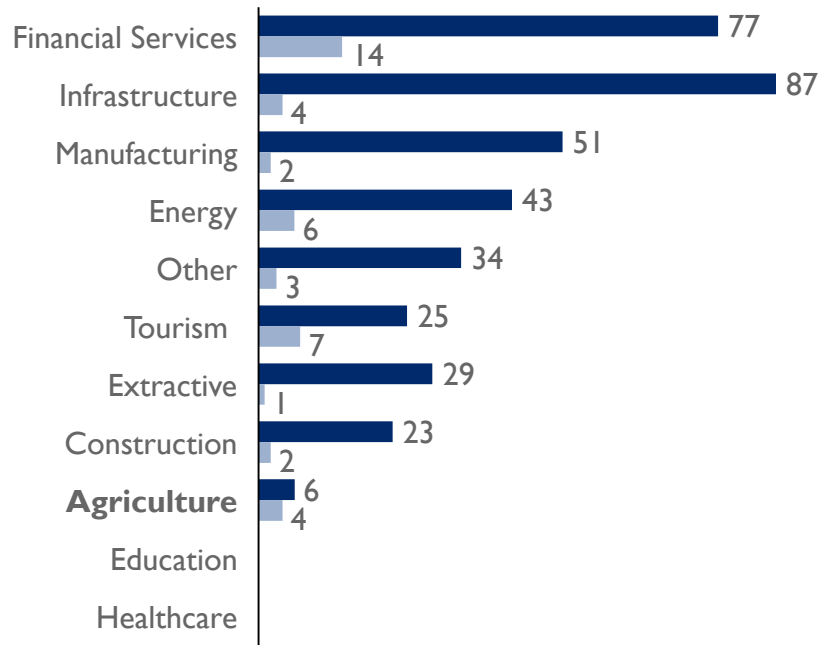
Non-DFI impact investments by sector

USD, millions, 2004-2014



DFI direct investments by sector

USD, millions, 2004-2014



- Non-DFI impact investors most commonly use traditional debt and equity instruments while DFI prominently use debt as a preferred instrument for direct investment in Rwanda
- The value of impact investments made is so much higher than those out standing (previous slide) because the vast majority of these deals are short-term debt

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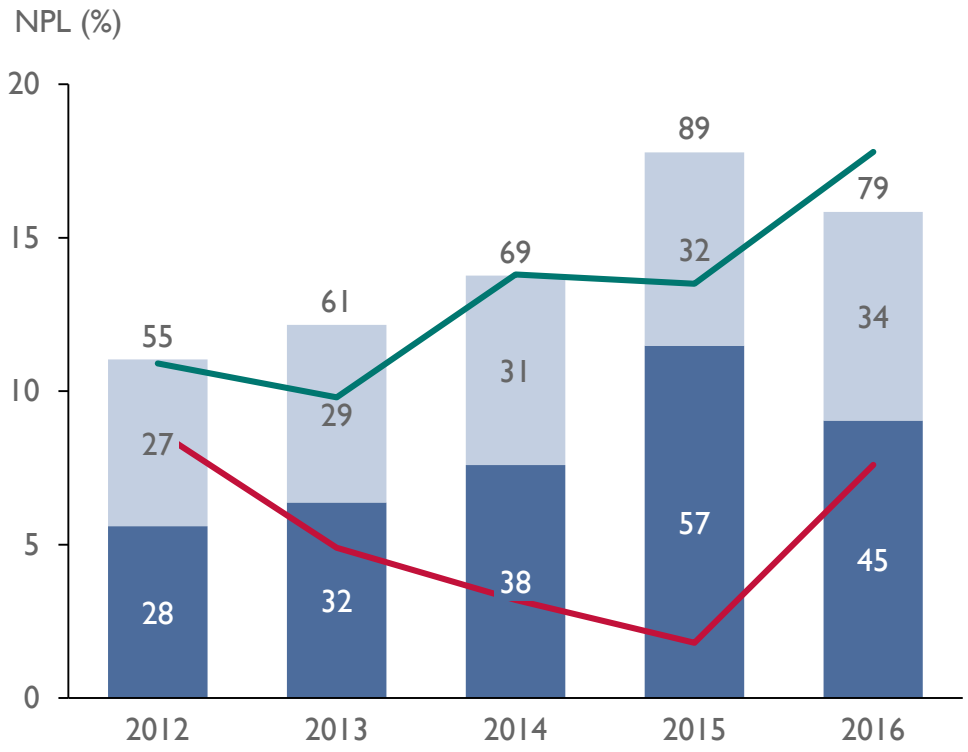
Source: GIIN, 2015, The landscape for impact investing in East Africa: Rwanda

Banks prefer to fund agribusiness (processing and trading) over production due to perceived lower risk

Composition and performance of bank loans to the agriculture sector

USD, millions, 2012-2016



NPL (Agri production)
NPL (Agribusiness)
Loans to agri production
Loans to agribusiness

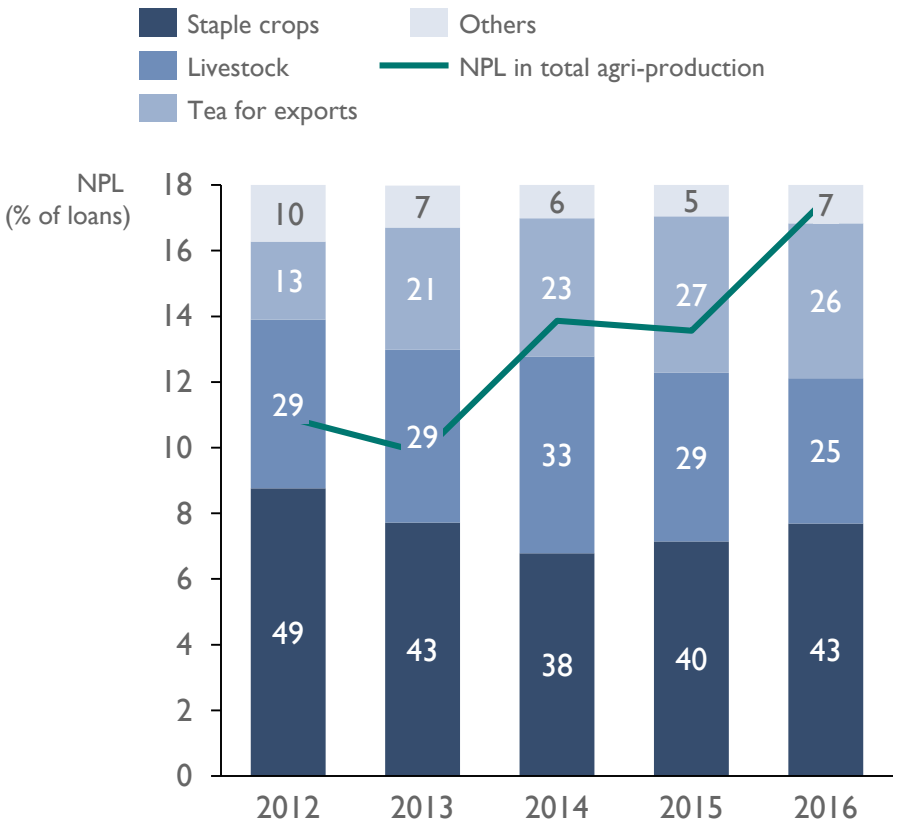
Increased agribusiness activities also contributed to high rate of growth of loans to agribusiness

Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; National Bank of Rwanda

While staple crops take most agri-production lending, agribusiness lending is concentrated in high value coffee lending

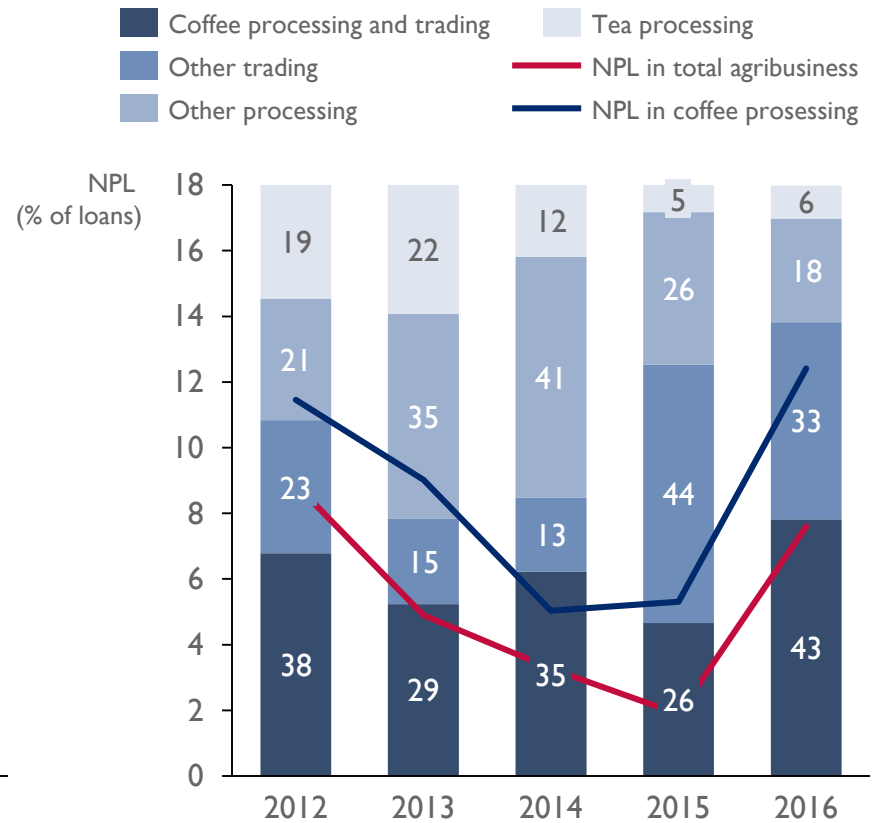
Composition of bank loans to agri-production

%, 2012-2016



Composition of bank loans to agribusiness

%, 2012-2016

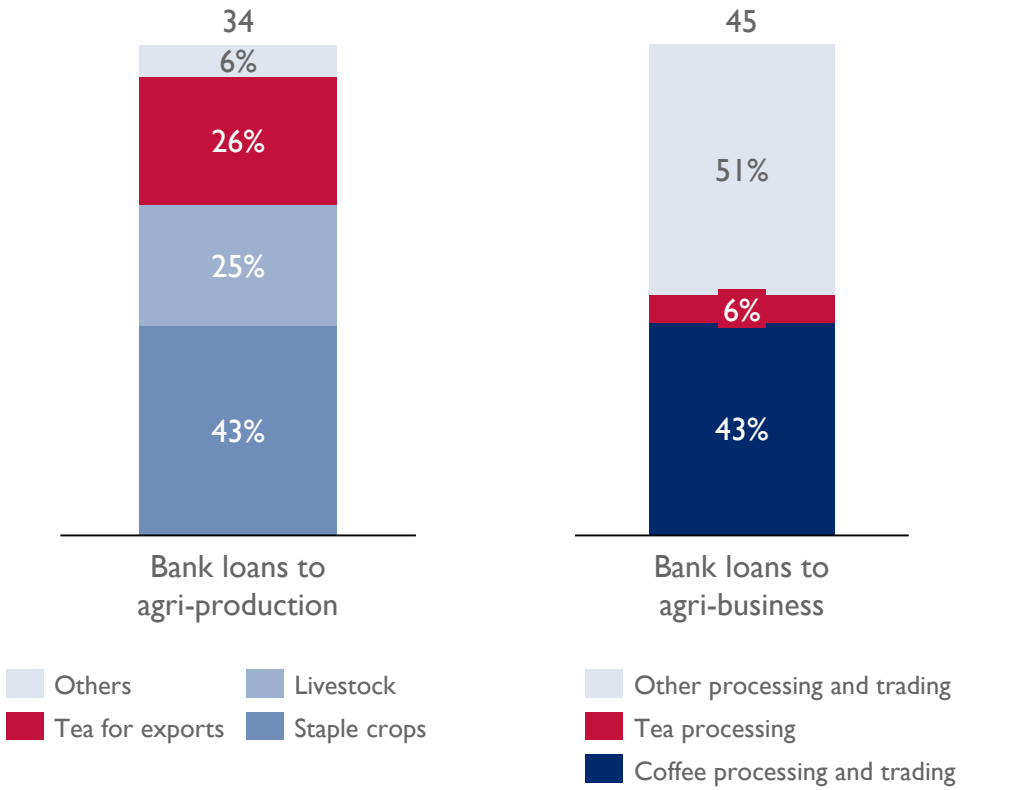


Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; National Bank of Rwanda; US Department of Commerce, International Trade Administration, Rwanda Market Overview

Lending has yet to make its way high value sectors beyond coffee and tea, despite their prominence in agriculture exports

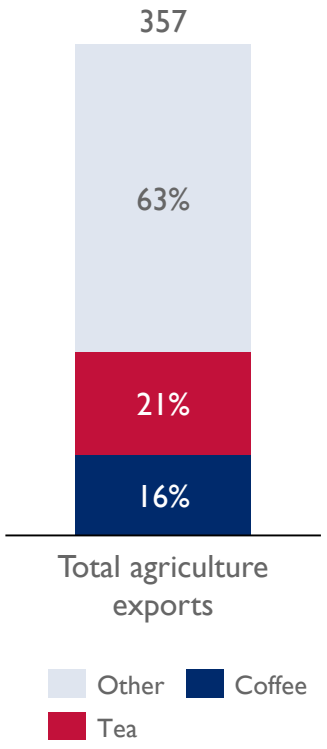
Distribution of Rwandan agriculture loans

USD (Million) 2016



Rwandan agriculture exports

USD (Million) 2016



Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda; NAEB, 2017, Annual Report 2016-2017

Rwanda's commercial lending to agriculture is also heavily supported by donor and government programs

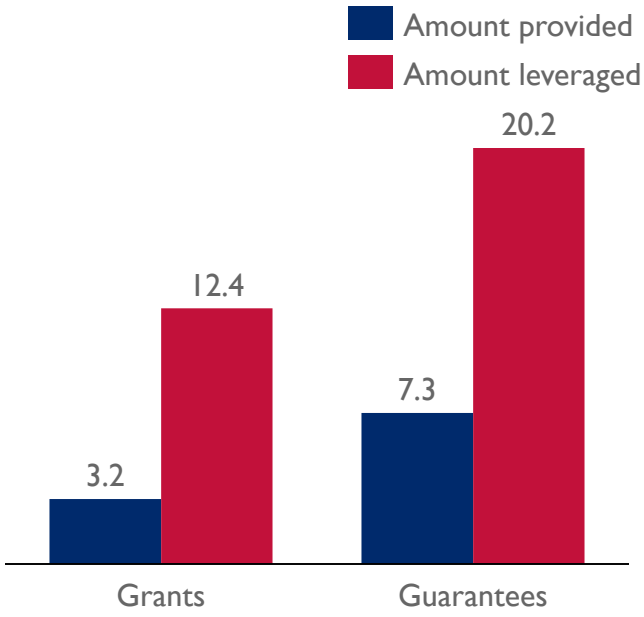
Grant Support

- Donors provide matching grants to the agriculture retail and wholesale loans made by the Business Development Fund (BDF)
- The International Fund for Agricultural Development (IFAD) and the USAID are the two major sources of matching grants
- Matching grants are provided to farmers and agribusiness SMEs to help them adopt technology, increase input use, and commercialize production

Guarantee Financing

- PCGs are used to encourage financial institutions to lend to borrowers such as SMEs that are considered riskier due to lack of adequate credit history, collateral, and/or production
- BDF is the major provider of partial credit guarantees (PCGs) in Rwanda, and agriculture sector is the main beneficiary of BDF guarantees, receiving 65% of the total guarantee portfolio

Matching grants and partial credit guarantees provided to agriculture
USD, millions, 2015-2016



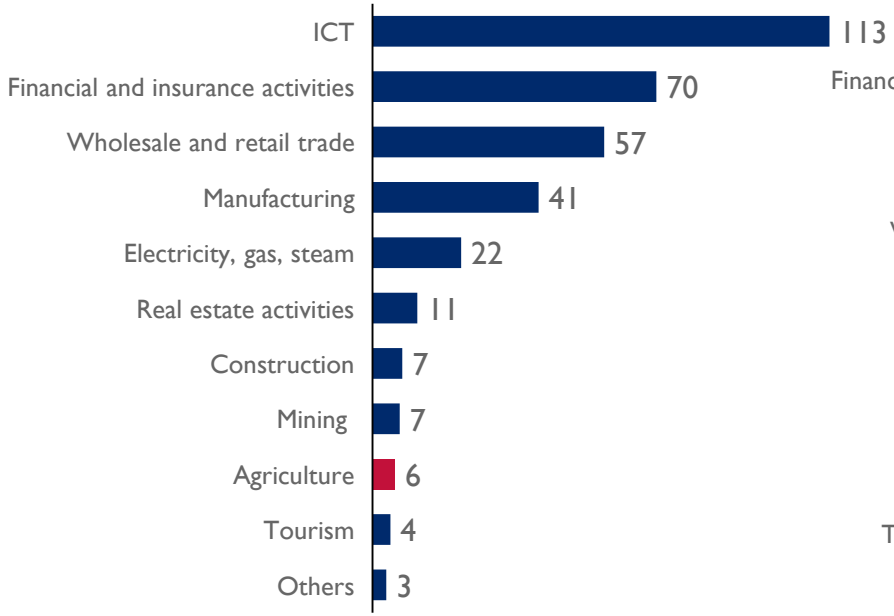
BDF both manages the matching grants and issues partial credit guarantees

Source: The World Bank, 2018, Agriculture Finance Diagnostic: Rwanda

Consistent with lending trends, agriculture is a small portion of FDI inflows to Rwanda relative to its economic contribution

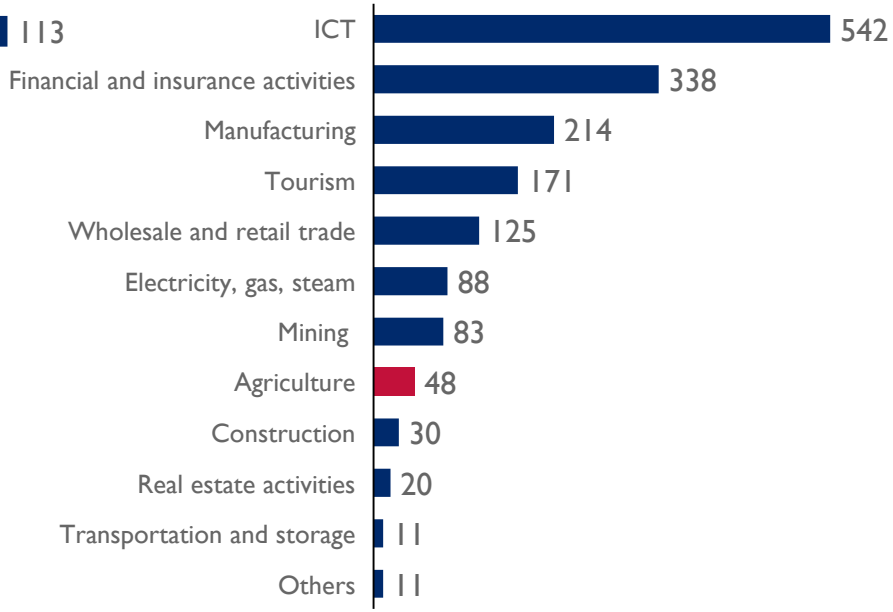
Foreign direct investment inflows by sector

USD, millions, 2016



Foreign direct investment stocks by sector

USD, millions, 2016



FDI stocks and inflows are concentrated in ICT – driven by the strong government promotion of the sector – and financial services – as investors see Rwanda's financial sector to be relatively sound and stable. FDI into agriculture is small given the nascency of highly commercial and exportable crop value chains in Rwanda

Source: National Bank of Rwanda, 2017, Foreign Private Capital in Rwanda

To attract investment into agriculture, Rwanda needs to present profitable investment opportunities and potential operators

Investable operators	• Sufficient financial and operational capacity to come into Rwanda • Capable of managing a large-scale, vertically integrated agriculture business, or experienced in providing services that address bottlenecks across different value chains • Able to engage with European buyers and understand changing trends in the EU market
Investment opportunities	• In both specific value chains cross-value chains targeting exports of high value agricultural crops • Large enough to provide economies of scale – lower unit cost per volume produced or productivity per unit of input • Enabling supply of consistent and reliable export volumes and high quality products
Potential to make risk-adjusted market rate returns	• Producing high margin crops for exports or facilitating the production and/or export processes • Finding donor or government support to provide additional finance needed to make investments viable

Presenting attractiveness of opportunities in Rwandan agriculture to investors is key to drawing potential investment into agriculture investments in the country

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Airfreight situation in Rwanda

Securing sufficient and affordable airfreight is a key success driver for growing horticulture exports from Rwanda

The challenge	Current **NAEB projections for horticulture growth exceed Rwandair's capacity for airfreight by 2020**. Rwandan producers also rely on Rwandair's subsidized airfreight rate for a significant competitive advantage over Kenya.
What is currently being done	Rwandair has **plans to double its fleet of planes by 2024**, primarily with increased routes to Europe. It is committed to continuing its horticulture subsidies to promote growth in the horticulture sector. The new airport in Bugasera will have world class cargo capabilities.
What is needed	**Additional affordable airfreight capacity for export must be available to ensure reliable shipments of horticulture** and to build trusted relationships with European buyers. This can be done by reallocating capacity, increasing the frequency of flights, and making Kigali airport a more attractive airport hub to use.
USAID's potential role	Given that airfreight is a critical bottleneck in the development of the sector and consequently of income gains for farmers, **USAID has the opportunity to play a catalytic role in increasing airfreight capacity** by working with Rwanda Airport Authority and Rwandair to ensure alignment to this strategy, attracting more airfreight players by subsidizing relationship development and transport prices, and investing in more professional capacities at Kigali airport.

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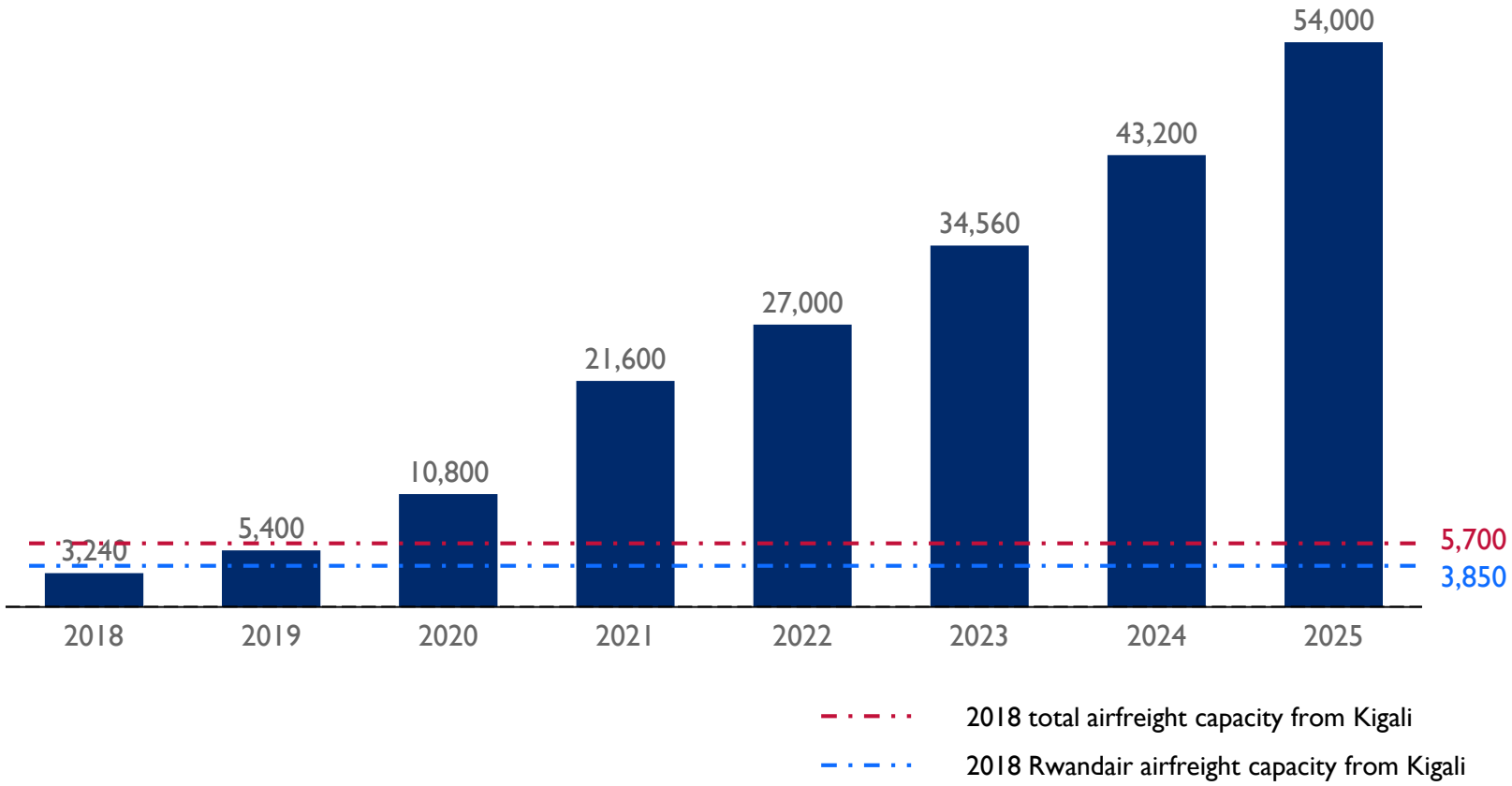
As the horticulture sector grows it is critical to bring more airfreight capacity into the country

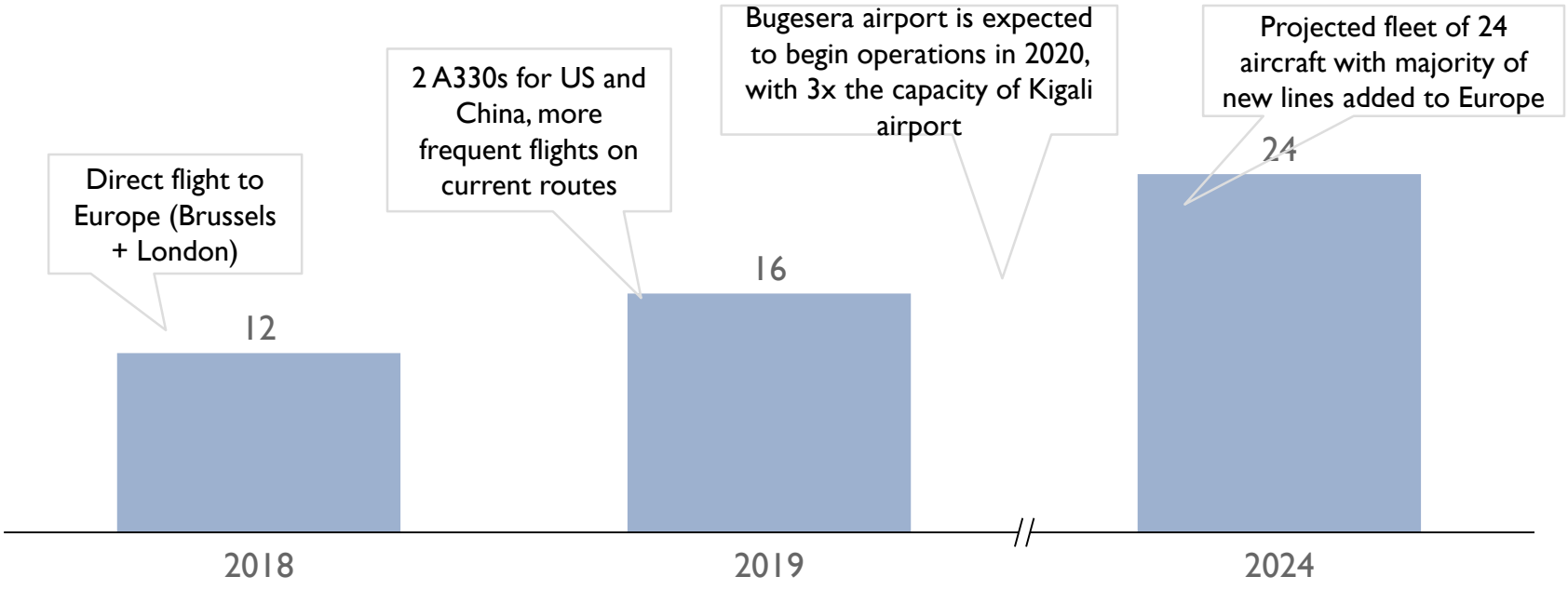
Growth in horticulture exports from Rwanda
MT per annum, 2018-2025



Source: Rwanda Revenue Authority; NAEB

Rwandair's growth plans are to double capacity in 6 years – but this may not keep pace with horticulture sector growth

Rwandair aircraft capacity
Number of aircraft



Rwandair's management is committed to supporting the horticulture expansion, however it is constrained by lead times of up to two years from ordering a plane to it being operational. The increased capacity will also not be enough to serve the current horticulture projections.

Source: Stakeholder interview with Rwandair cargo, 2018

There are a number of solutions that can help to increase airfreight capacity in the short-term and to speed-up growth

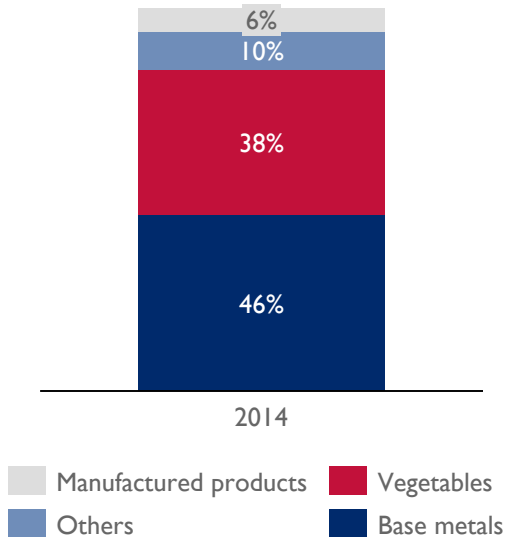
1. **Effective allocation of airfreight capacity**

2. **Subside additional cargo flights as a stop-gap solution**

3. **Support Rwandair to develop a cost-effective long-term solution quicky**

Due metals are currently taking almost 50% of airfreight cargo capacity – this capacity could be cleared for horticulture

Volume of Rwanda airfreight exported goods
%, 2014



Rwanda is one of the world's leading producers of tin, tantalum, and tungsten - in 2016 mineral exports generated more than $160 million in revenue. This number is increasing as global mineral prices increase with 2018 revenues expected to reach $600 million.

The importance of this sector to Rwanda, and the high per kg price of the minerals, mean that many exporters prefer to transport via airfreight.

This practice, while lucrative for the industry, may be restricting capacity for horticulture exports.

By conducting a comprehensive review of the composition of current airfreight cargo, the Rwandair can better prioritize capacity – especially during peak seasons

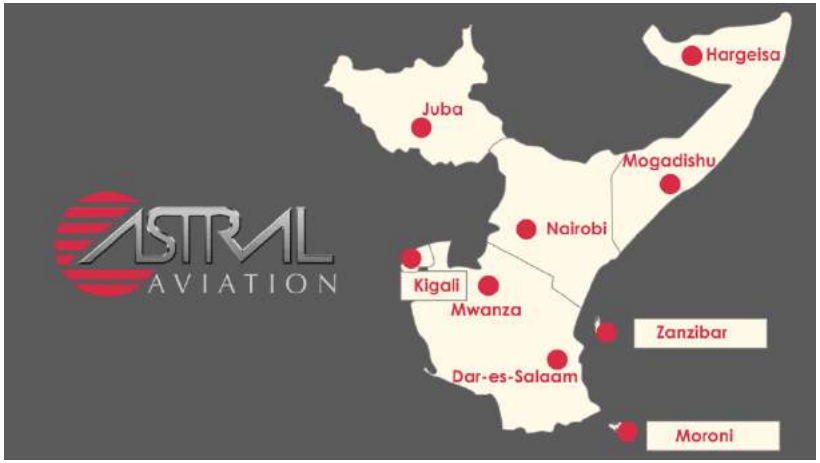
Source: PSDAG study on Rwandan airfreight competitiveness, 2015; stakeholder interview; UN Comtrade, US exports.gov

Kigali is currently not a regular stop within freighter routes due to a perceived lack of volume and higher costs

Freight companies such as Astral Aviation have the capability of stopping in Kigali en route to European destinations and ensuring reliable supply at least once a week to Europe.

Rwandair has been quoted a price of $1.60 - $1.80 per for shipping on dedicated cargo lines to Europe.

While Rwandair awaits new aircraft and routes, **it may make sense for a donor to subsidize stop-gap solitons so that the horticulture industry can continue to grow ahead of the airline**



Fully subsidizing the anticipated air freight capacity gap in 2020 would cost less than $5million and would sllow the industry to keep growing while the new airport is finalized

Source: Stakeholder interviews; Astral Aviation website

The long-term solution will be to increase flights to Europe through the Kigali hub

The new Bugesera airport which is planned to open in 2020 will:

- Triple the capacity of international flights
- Dramatically improve the passage experience enabling Kigali to run more transit passengers

For these reasons it is expected that the **new airport will enable a significant number of new Rwandair flights to Europe**

Better planning can also help to solve the problem. Running A350's, for example, can more double the cargo capability per aircraft.

With a 1.5 – 3 year lead time required to take delivery of an aircraft, Rwandair is already projecting and planning the 2021 fleet

Providing Planning and logistical support to Rwandair could help to ensure that air routes are developed as quickly as possible and with broader export industry objectives in mind

Source: Stakeholder interview airfreight experts; KAA website

Given the critical nature of this bottleneck for the industry, USAID and ISP have the potential to find targeted solutions

Support Rwandair's review of priorities in service and cost structures to ensure business strategies are aligned with MinAgri and other policies

Develop a fund that can subsidize airfreight costs for horticulture during peak seasons, or pre-finance block-booking of cargo space for Rwandan commercial exporters

Facilitate engagement with large logistics companies to find both short term solutions for horticulture export and long-term solutions for regional competitiveness

Support Rwandair to develop long-term growth plans that consider horticulture, and ensure that these plans are finalized, and aircraft are ordered so that scale-up can happen as soon as possible

Given the long lead times in the aviation industry, without proactive action to increase horticulture airfreight capacity from Rwanda **there is a high risk that producers will continue to increase production without a cost effective way to export their product regularly to European buyers**. It is therefore critical that in conjunction with support for commercial investment in horticulture, USAID also support removing this bottleneck from the market.