

# What it takes to increase potato seed supply in Kenya towards 100% food and nutrition security

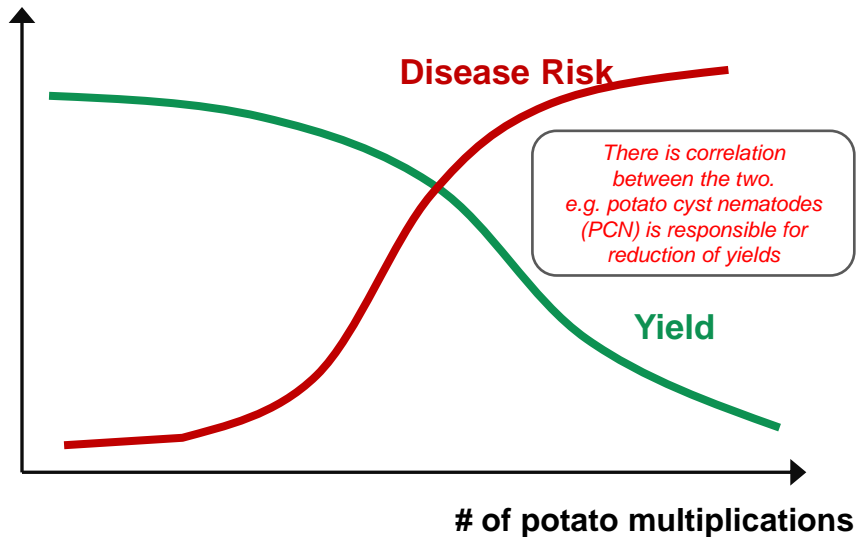
May 2019



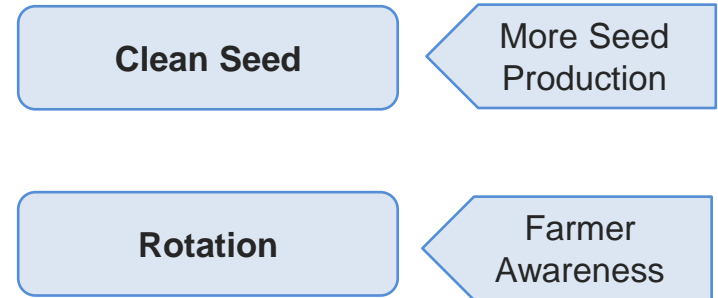
**Disclaimer:** The investment model is still being reviewed by experts, hence figures in this presentation are preliminary/tentative estimates. No representation or warranty is made by the authors as to the correctness, accuracy, adequacy, completeness or reasonableness of the content of this presentation, projections and assumptions used. Readers should make (and will be deemed to have made) their own determination of the relevance of the information contained herein and its own independent investigation and assessment of the opportunity.

# What is at stake?

As potato is grown over generations without rotation, disease risk will exponentially increase and yield will decline



This is why clean/certified seeds and break cropping are critical



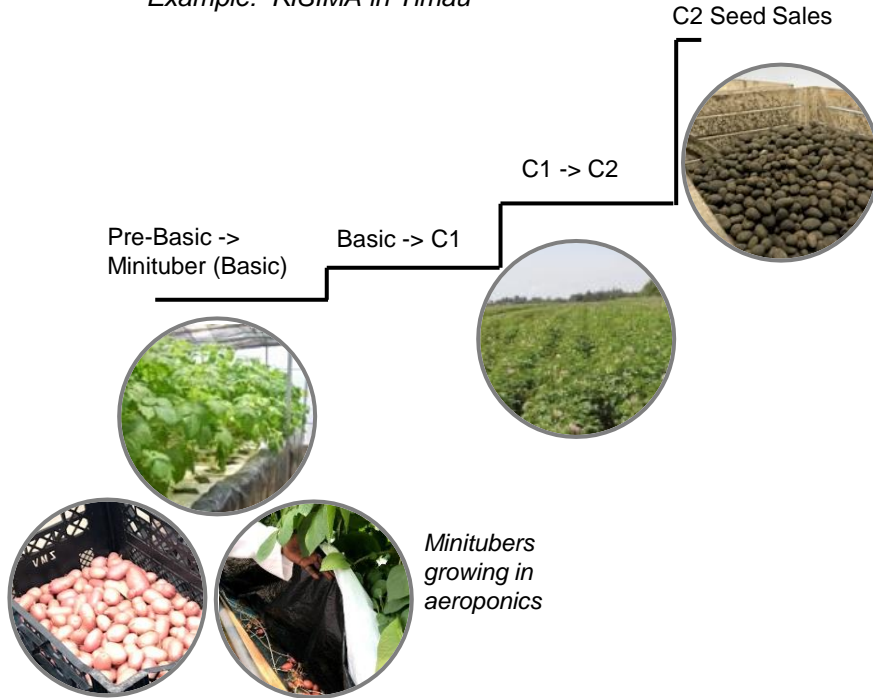
If measures are not taken, Kenyan potato growing areas will continue to suffer from disease (even more than today), production will decrease, and we end up relying on potato imports...

# There are two types of seed production systems

#1

Procure/import Pre-Basic (Genetic Material), grow Minitubers (Basic) via aeroponics, and multiply C1 and C2\* Seeds in the soil

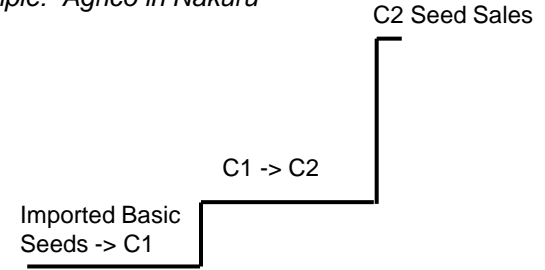
Example: KISIMA in Timau



#2

Procure/import Basic Seeds, and multiply C1 and C2\* Seeds in the soil

Example: Agrico in Nakuru



KEPHIS thinks disease risk is minimal, as genetic materials never touched foreign soil



Capex is higher, and due to heavier cost at aeroponics stage, Return on Investment is lower than the other model

Medium to long-term solution, rather than the quick-win

Pros/  
Cons



Better Rol

The importation model takes shorter time to build than the other option.

- This implies the country needs to create an enabling environment for importation to sort the current crisis while at the same time ensuring there's minimal disease pressure



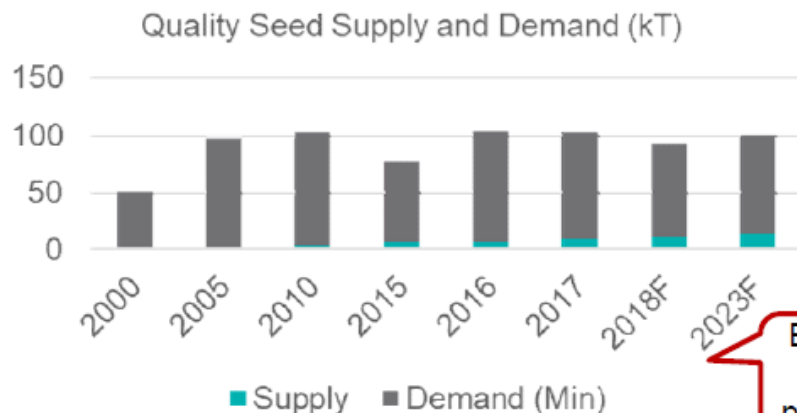
KEPHIS thinks disease risk is higher. That said, could this be professionally controlled farms and setting reasonable disease tolerance threshold?

\* Certified 1 and Certified 2 seeds

# Certified Seed Production in Kenya Today

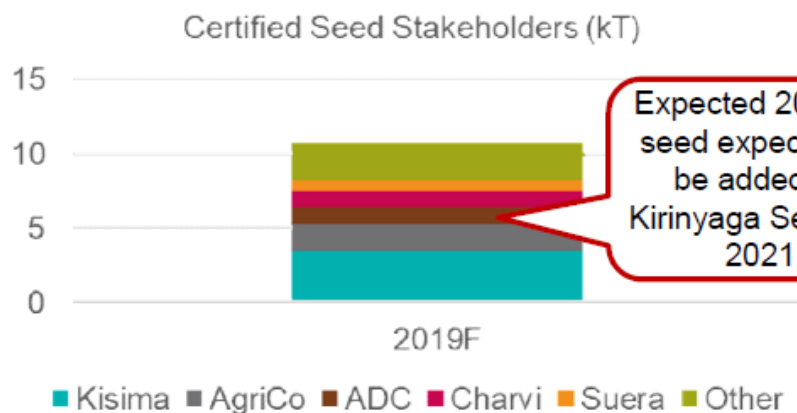
Only 4% of the country's seed is certified...

## Quality seed meets <4% of minimum demand



Based on planned production

## 5 main farms supply ~80% of seed



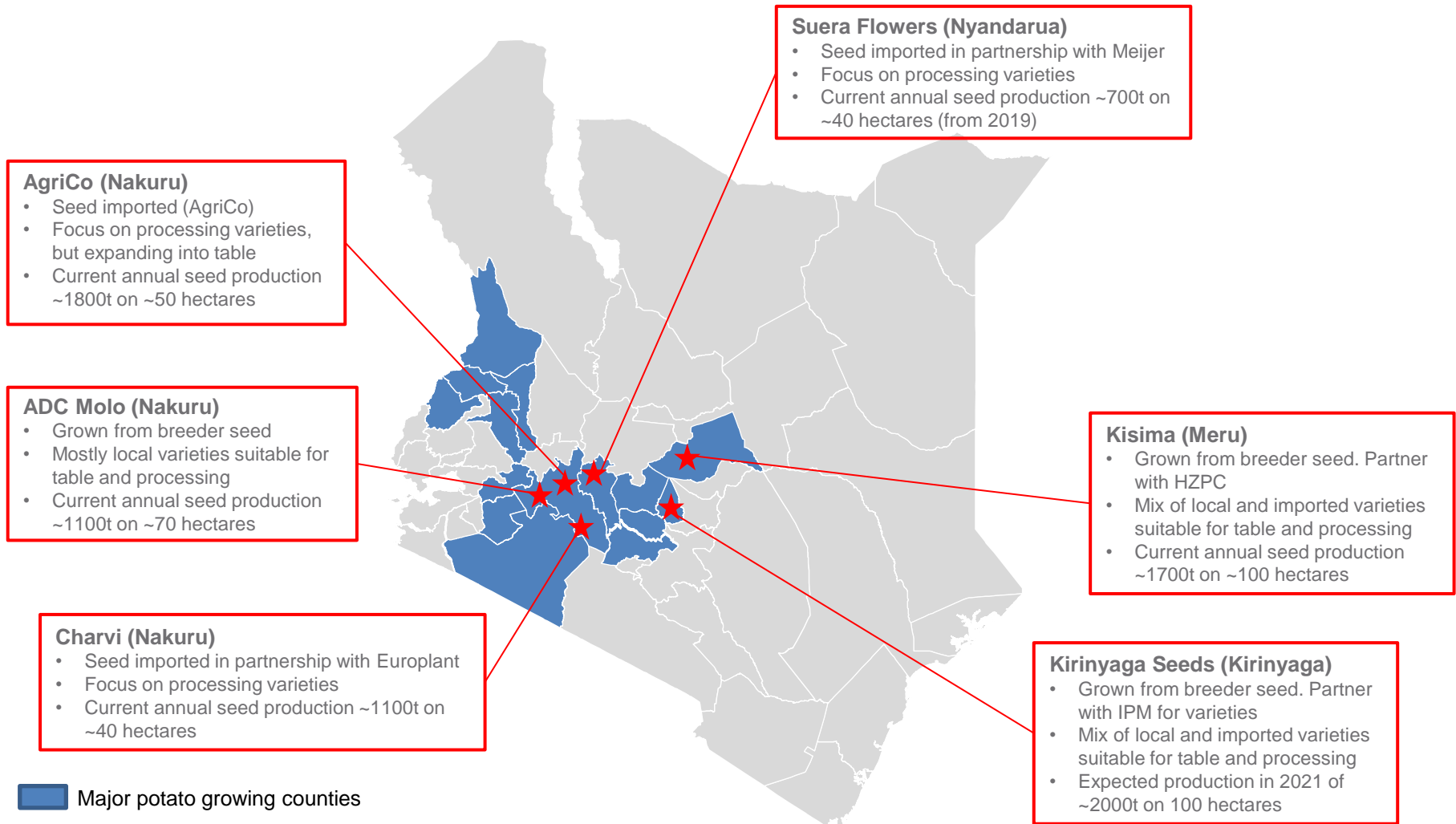
Expected 2000t in seed expected to be added by Kirinyaga Seeds in 2021

## Kenyan Seed Industry Overview

- Most seed recycled by farmers, with **Shangi dominant**. Limited adoption of other varieties
  - Most certified seed being produced is for varieties without a clear market
- **3 main business models** for growing seed
  - **From breeder seed:** license local or international varieties, grow them from mini-tubers through to C2 (e.g. Kisima, ADC)
  - **Buy basic seed:** followed by 1-2 multiplications (e.g. AgriCo, Charvi, Suera)
  - **Clean seed multiplication:** buy from certified producer, before multiplying on local scale
- **Recent investment** with Charvi, AgriCo, Suera, Kirinyaga ramping up, and others considering (Bubayi, AgriVentures)
- “Clean Seed” has come in & out of popularity – currently not promoted (or fully legal)
- KEPHIS responsible for regulation and certification

Source: TNS Analysis, Seed Producer Interviews, FAOSTAT, KEPHIS Interviews

# Certified Seed Producers



# Investment Model Summary

**\$1.1B investment need with aeroponics and \$700M with imported seeds, if we were to meet 100% demand**

#1

To meet the country's 100% demand

## Potato Seed Required

<b>GOAL KENYA ANNUAL WARE PRODUCTION</b>	Tons	6,000,000
Ware yield per Ha	Tons/ha	40
Hectares needed for annual production	ha	150,000
Average seed potato (t) needed per Ha	Tons/ha	2.5
<b>Tons of C2 seed potato needed</b>	<b>Tons</b>	<b>375,000</b>

## Aeroponics Scenario

How many 1ha aeroponic + C1/C2 Farm Needed	#	681
Investment per Farm	Ksh	167,531,333
<b>Total Investment Required</b>	<b>Ksh</b>	<b>114,153,580,376</b>

## Imported Seed Multiplication Scenario

How many xxxha farms needed	#	397
Investment per Farm	Ksh	179,920,033
<b>Total Investment Required</b>	<b>Ksh</b>	<b>71,513,792,397</b>

#2

To meet the country's 10% demand

## Aeroponics Scenario

How many 1ha aeroponic + C1/C2 Farm Needed	#	68
Investment per Farm	Ksh	167,531,333
<b>Total Investment Required</b>	<b>Ksh</b>	<b>11,415,358,038</b>

## Imported Seed Multiplication Scenario

How many xxxha farms needed	#	40
Investment per Farm	Ksh	179,920,033
<b>Total Investment Required</b>	<b>Ksh</b>	<b>7,151,379,240</b>



**Please see page 7-11 for detailed modeling assumptions**

There are other considerations like (i) will there be enough technically-capable entrepreneurs, (ii) given that it is unrealistic to assume funding to be done via 100% debt, whether the entrepreneurs come up with adequate equity; (iii) if needed what soft funding/subsidy stakeholders are prepared to provide, etc.

# Investment Model – Aeroponics (1/1)

## Volume/Farm Size Assumptions

Source: Agrico

Seasons per Year

Seasons/Year **2**

### Pre-Basic (Genetic Material) -> Minitubers (Basic)

Greenhouse Ha (Net)	m <sup>2</sup>	10,000	1ha
# of Pre-Basic Minituber Plants / m2	#/m <sup>2</sup>	100	
# of Minitubers from One Pre-Basic Minituber Plant	#	1.4	
# of Minitubers Produced	#	1,400,000	

What is production lead time?



### Minitubers (Basic) -> C1 (Certified 1) Seed Potato

# of Minitubers Planted per Ha	#/ha	120,000
Farm Size (Ha) of Minitubers Planted to Produce C1 Seed	Ha	12 ha
Yield/Ha Seed Potato (C1) Out of Minitubers	Tons/ha	15
<b>Production Volume of C1 Seed Potato</b>	<b>Tons</b>	<b>175</b>

### C1 Seed Potato -> C2 (Certified 2) Seed Potato

Volume of C1 Seed potato Needed for C2 Seed Production	Tons/ha	5
Farm Size (Ha) of C1 Seeds Planted to Produce C2 Seed	Ha	35 ha
Yield/Ha Seed Potato (C2, Incl. Ware) Production	Tons/ha	20
<b>Production Volume of C2 (Incl. Ware) Seed Potato</b>	<b>Tons</b>	<b>700</b>

### C2 Production Breakdown

% for seed sale	%	79%
% for ware sale	%	9%
% wastage	%	13%

Source: TechnoServe ISP Model

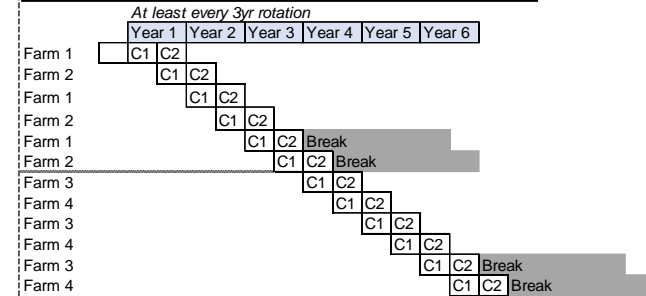
<b>C2 Seed Volume</b>	<b>Tons</b>	<b>550</b>
<b>Ware Volume</b>	<b>Tons</b>	<b>62</b>

### Total Farm Size Required

Rotation Assumptions?	
<b>Total Farm Size Required</b>	<b>140 ha</b>

If rotation/break needs to happen in every several years, we need large size?

## Rotation Gant Chart



## Sales Assumptions

Source: TechnoServe ISP Model

Seed Potato Sales Price (KSh / t)	Ksh/Ton	55,000
Ware Potato Sales Price (KSh / t)	Ksh/Ton	15,000
C2 Seed Sales	Ksh	30,269,167
Ware Sales	Ksh	930,364
<b>Total Sales</b>	<b>Ksh</b>	<b>31,199,530</b>

Grant - Ksh 80/kg?

## Capex Assumptions

Source: TechnoServe TSP Model

Land	Ksh	21,000,000	Land price to be checked
Cold Storage		34,070,133	Land size (assuming rotation) x \$1500/ha
Tractors and Equipment		99,928,500	1,000MT capacity
Packaging		9,921,400	Combine harvester and sorting machine
Aeroponics Greenhouse		2,611,300	Data from Kisima
<b>Total</b>		<b>167,531,333</b>	

Land size (assuming rotation) x \$1500/ha  
1,000MT capacity  
Combine harvester and sorting machine

Data from Kisima



# Investment Model – Aeroponics (2/2)

**Long payback and tight debt service coverage... With this level of return, entrepreneurs would use funds elsewhere that would generate better return**

## Opex Assumptions

Per Ha Cost	
<b>Pre-Basic -&gt; Minitubers   Cost per Ha</b>	
Pre-Basic Minitubers	Ksh/Ha 2,222,200
Production cost (excl. planting material)	400,000
Packaging & Distribution	3,047
Insurance & Licenses	1,020
Vehicles & Equipment	48,266
Services & Facilities	18,497
Office & Admin	2,535
Land Rent	-
<b>Total</b>	<b>Ksh/Ha 2,695,565</b>

## Minitubers -> C1 Seed Potato | Cost per Ha

### Fertilizer Assumptions

Fertilizer required per hectare (t / ha)	0.5
Fertilizer cost per bag - non subsidized DAP (50kg)	3,067
Fertilizer cost per t	61,333

Seed	Ksh/Ha -
Fertilizer	30,667
Chemicals (Pesticides etc.)	18,575
Packaging & Distribution	3,047
Insurance & Licenses	1,020

Vehicles & Equipment	48,266
Services & Facilities	18,497
Office & Admin	2,535
Land Rent	-
<b>Total</b>	<b>Ksh/Ha 122,606</b>

## C1 Seed Potato -> C2 Seed Potato | Cost per Ha

Seed	Ksh/Ha -
Fertilizer	30,667
Chemicals (Pesticides etc.)	18,575
Packaging & Distribution	3,047
Insurance & Licenses	1,020

Vehicles & Equipment	48,266
Services & Facilities	18,497
Office & Admin	2,535
Land Rent	-
<b>Total</b>	<b>Ksh/Ha 122,606</b>

## Royalties

Royalty Rate	% of Rev 8%
Royalties	Ksh 2,495,962

## Aggregate Cost

Aggregate Cost	Farm Size	Total
Pre-Basic -> Minitubers	1 ha	2,695,565
Minitubers -> C1 Seed Potato	12 ha	1,430,405
C1 Seed Potato -> C2 Seed Potato	35 ha	4,291,216
Royalties	% of Rev	2,495,962
<b>Total</b>	<b>Ksh</b>	<b>10,913,148</b>

C2 Seed Cost per Ton	Ksh/Ton	19,830
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Per 1ha of aeroponics. Source: TechnoServe ISP Mode  
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Source: TechnoServe ISP Mode

Cost already incurred at previous \*1/2 to make it per season  
 Source: TechnoServe ISP Mode

Includes KEPHIS inspections cost

Could go up to Ksh 150-160K per cycle?

Cost already incurred at previous round

Source: TechnoServe ISP Model

## P&L

Per Season	
C2 Seed Sales	Ksh 30,269,167
Ware Sales	Ksh 930,364
<b>Total Sales</b>	<b>Ksh 31,199,530</b>
Total Expenses	Ksh 10,913,148
<b>Gross Profit</b>	<b>Ksh 20,286,382</b>

Per Annum	
Sales	Ksh 62,399,061
Gross Profit	40,572,765
Overhead Cost	10% 6,239,906
EBITDA	34,332,858
Interest Expenses	15% 15,077,820
Profit Before Tax	19,255,038

Debt/(Debt+Equity)	60%
Debt Tenor	4.0 years

Pre-Tax Profit/Asset	% 11%
Payback = Capex/Pre-Tax Profit	Years 8.7 years

Debt/EBITDA	x 2.9x
Debt Service Coverage Ratio	x 0.9x

It seems like cost captures direct cost only.  
 Might need to include management overhead cost, SG&A.

10% of sales

15% interest rate assuming 60:40 D:E

**ROA: 11%**

**Payback: 8.7 Years**

**Debt/EBITDA\*: 2.9x**

**Debt Service Coverage Ratio\*: 0.9x**

\* Assuming Debt : Equity of 60:40.



# Investment Model – Imported Seed (1/1)

## Volume/Farm Size Assumptions

Source: Agrico

Seasons per Year Seasons/Year 2

### Imported Basic Seed -> C1 Seed Potato

# of Minitubers Planted per Ha	#/ha	120,000
Farm Size (Ha) of Minitubers Planted to Produce C1 Seed	Ha	20 ha
Yield/Ha Seed Potato (C1) Out of Minitubers	Tons/ha	15
<b>Production Volume of C1 Seed Potato</b>	<b>Tons</b>	<b>300</b>

### C1 Seed Potato -> C2 Seed Potato

Volume of C1 Seed potato Needed for C2 Seed Production	Tons/ha	5
Farm Size (Ha) of C1 Seeds Planted to Produce C2 Seed	Ha	60 ha
Yield/Ha Seed Potato (C2, Incl. Ware) Production	Tons/ha	20
<b>Production Volume of C2 (Incl. Ware) Seed Potato</b>	<b>Tons</b>	<b>1,200</b>

### C2 Production Breakdown

% for seed sale	%	79%
% for ware sale	%	9%
% wastage	%	13%

<b>C2 Seed Volume</b>	<b>Tons</b>	<b>943</b>
<b>Ware Volume</b>	<b>Tons</b>	<b>106</b>

### Total Farm Size Required

Rotation Assumptions?		
Total Farm Size Required		240 ha



Source: TechnoServe ISP Model

← Sync with storage size

If rotation/break needs to happen in every several years, we need large size?

## Sales Assumptions

Seed Potato Sales Price (KSh / t)	Ksh/Ton	55,000
Ware Potato Sales Price (KSh / t)	Ksh/Ton	15,000
C2 Seed Sales	Ksh	51,890,000
Ware Sales	Ksh	1,594,909
<b>Total Sales</b>	<b>Ksh</b>	<b>53,484,909</b>

Source: TechnoServe ISP Model

Grant - Ksh 80/kg?

## Capex Assumptions

Land	Ksh	<b>Capex</b>
Cold Storage		36,000,000
Tractors and Equipment		34,070,133
Packaging		99,928,500
		9,921,400
<b>Total</b>		<b>179,920,033</b>

Source: TechnoServe ISP Model

150ha (assuming rotation) x \$1500/ha

1,000MT capacity

Combine harvester and sorting machine

# Investment Model – Imported Seed (2/2)

More commercially acceptable returns and debt service coverage...

## Opex Assumptions

### Per Ha Cost

#### Imported Seeds -> C1 Seed Potato | Cost per Ha

##### Fertilizer Assumptions

Fertilizer required per hectare (t / ha)	0.5
Fertilizer cost per bag - non subsidized DAP (50kg)	3,067
Fertilizer cost per t	61,333

Seed	Ksh/Ha	83,423
Fertilizer		30,667
Chemicals (Pesticides etc.)		18,575
Packaging & Distribution		3,047
Insurance & Licenses		1,020
Vehicles & Equipment		48,266
Services & Facilities		18,497
Office & Admin		2,535
Land Rent		-
<b>Total</b>	<b>Ksh/Ha</b>	<b>206,029</b>

#### C1 Seed Potato -> C2 Seed Potato | Cost per Ha

Seed	Ksh/Ha	-
Fertilizer		30,667
Chemicals (Pesticides etc.)		18,575
Packaging & Distribution		3,047
Insurance & Licenses		1,020
Vehicles & Equipment		48,266
Services & Facilities		18,497
Office & Admin		2,535
Land Rent		-
<b>Total</b>	<b>Ksh/Ha</b>	<b>122,606</b>

#### Royalties

Royalty Rate	% of Rev	8%
Royalties	Ksh	4,278,793

#### Aggregate Cost

	<b>Farm Size</b>	
Minitubers -> C1 Seed Potato	20 ha	4,120,581
C1 Seed Potato -> C2 Seed Potato	60 ha	7,356,370
Royalties	% of Rev	4,278,793
<b>Total</b>	<b>Ksh</b>	<b>15,755,744</b>

C2 Seed Cost per Ton	Ksh/Ton	16,700
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## P&L

### Per Season

C2 Seed Sales	Ksh	51,890,000
Ware Sales	Ksh	1,594,909
<b>Total Sales</b>	<b>Ksh</b>	<b>53,484,909</b>
<b>Total Expenses</b>	<b>Ksh</b>	<b>15,755,744</b>
<b>Gross Profit</b>	<b>Ksh</b>	<b>37,729,165</b>

### Per Annum

Sales	Ksh	106,969,818
Gross Profit		75,458,331
Overhead Cost	10%	10,696,982
EBITDA		64,761,349
Interest Expenses	15%	16,192,803
Profit Before Tax		48,568,546

Debt/(Debt+Equity)	60%
Debt Tenor	4.0 years

Pre-Tax Profit/Asset	%	27%
Payback = Capex/Pre-Tax Profit	Years	3.7 years

Debt/EBITDA	x	1.7x
Debt Service Coverage Ratio	x	1.5x

It seems like cost captures direct cost only.  
Might need to include management overhead cost, SG&A.

10% of sales

15% interest rate assuming 60:40 D:E

ROA: 27%

Payback: 3.7 Years

Debt/EBITDA\*: 1.7x

Debt Service Coverage Ratio\*: 1.5x

\* Assuming Debt : Equity of 60:40.

# 1<sup>st</sup> Step Recommendations – “Quick Wins”

- Regulatory review to be undertaken by the World Bank/IFC, **with support of experts like TechnoServe**. Benchmarking on other countries potato seed import policy/disease tolerance/**cost benefit analysis for the zero tolerance policy**
- KISIMA seems to have excess capacity of aeroponics. Help KISIMA to obtain more land. Or, KISIMA’s Basic Seeds could be multiplied at 30-acre medium scale farms that TWIGA is developing
- Allow seed companies to multiply up to C3/C4
  - If multiplication up to C3 is allowed, the investment model shows returns of aeroponics would dramatically improve.

ROA: 58%

Payback: 1.7 Years

Debt/EBITDA\*: 0.9x

Debt Service Coverage Ratio\*: 2.8x

*\* Assuming Debt : Equity of 60:40.*

- Land size would be constraints for the C3 scenario (1ha aeroponics greenhouse will result in 560ha\* land requirement)

*\* Based on assumptions like 20t/ha seed potato yield, every 3-year (or 6 seasons) rotation, etc.*

# Road Map – Harnessing both models would be important to increase seed supply...

