MULTI CROP VALUE CHAIN PHASE II
TANZANIA / UGANDA
Cooking Banana
(Revisions)

September 11, 2014
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SCOPE OF THIS STUDY

Study Methodology

- Over 100 sector interviews with experts, agencies, NGOs, farmers, traders and companies
- Interviewed personnel at all levels of the value chain

Stakeholder Interviews

Hypotheses Confirmation

- Confirmed the value of identified interventions
- Refined interventions to address key constraints

Analysis

- Integration of desk study findings with field research
- Estimated impact of interventions based on results of on-the-ground interviews
- Vetted potential partners for identified interventions

Key Deliverables include:

- Situational assessment of crop constraints, detailed market maps and in-depth value chain analysis to verify Phase I findings and refine recommended interventions
- Recommended refinements and focus for interventions
- Assessment of impact for key interventions at the SHF level
- Results of partner identification and vetting analysis
SECTOR FUNDAMENTALS

• East African Highland Banana (EAHB) is the primary staple crop for over 13 million Ugandans (=35% of the population), but less critical in Tanzania where 3.3 million (about 7% of the population) consume it as a staple.
• National production is estimated at 10-12M and 3M tons in UG and TZ, respectively.
• EAHB is grown by roughly 55% of SHFs (from 2-3 million smallholders) on 1.8 million Ha in Uganda. Total production area is only 440,000 Ha in Tanzania.

VALUE CHAIN OPPORTUNITIES

• Perishability and access to markets are major constraints for rural SHFs.
• 70% of cooking bananas are grown in the Southwest, hundreds of kilometers from Kampala. In between farm and terminal market, there are numerous players.
• Prices in terminal markets are often 5-8 times higher than farmgate due to high transportation costs, and the complexity of the intermediary value chain.
• Still, there are opportunities for increased efficiency in the supply chain.

INTERVENTIONS & IMPACT

• Interventions have been refined to focus on access to clean planting materials (tissue culture), business and technical assistance, and organization of farmer / trader groups.
• Farmer groups are essential to the success of any program or intervention.
• Effective uptake of tissue culture will necessitate training and outgrower nurseries.
• Business and technical assistance will also need to flow through the group structure.
• Other elements such as financing and market information systems can be linkages.

STAKEHOLDER PROFILES

• Each intervention has strong partner candidates, below are several examples for each proposed intervention:
  • Tissue Culture – AGT, BioCrops, Crop Bioscience and NsigoTech
  • Business and Technical Assistance – Bioversity, UDET, IITA, AMA
  • Farmer Groups – MBADIFA, BUCADEF, UDET, VEDCO, World Vision
1 SECTOR FUNDAMENTALS
PHASE 2 UGANDA / TANZANIA EAST AFRICAN HIGHLAND BANANA (EAHB) EXECUTIVE SUMMARY

SECTOR FUNDAMENTALS

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EAST AFRICAN HIGHLAND BANANA (EAHB) IS A STAPLE CROP ACROSS UGANDA, RWANDA, BURUNDI AND PARTS OF TANZANIA

Production Region (East Africa)

EAHB Facts

- The East African Highland Banana (EAHB) is one of the most important staple food crops, integral to the livelihoods of rural poor in the Great Lakes region of East Africa.

- **Uganda:**
  - Has highest per capita annual consumption (0.7kg daily)\(^1\)
  - EAHB is particularly important in the southern half of the country where a bimodal rainfall pattern dominates.\(^2\)
  - Has roughly 120 EAHB varieties, including cooking (matooke), juice (kayinga), and beer (mbidde) bananas.

- **Tanzania:**
  - Less reliant on EAHB nationally, but still a staple for 20-30% of the population in select rural regions.
  - Six primary regions include: Kagera, Kilimanjaro, Arusha, Mbeya, Kigoma and Tanga.\(^3\)
  - A variety of EAHB, mchare (or ‘mshare’) is grown around Kilimanjaro and in Arusha.
  - It can be extremely profitable, fetching farmgate prices 2-4x higher than matooke.\(^3\)

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1. “Going bananas – the East African Highland bananas experience”, May 2013 (http://eastafricanhighlandbananas.org)
3. Based on primary research interviews in Tanzania
UGANDA NATIONAL PRODUCTION IS 10 MILLION TONS, GROWN ON OVER 1.8 MILLION HECTARES

SECTOR FUNDAMENTALS

EAHB Integral to Food Security in Uganda

- Uganda is one of the largest producers of bananas in the world, second only to India.
- It is estimated that 75% of the country’s farmers grow bananas, a staple food in Uganda.
- EAHB are a staple to an estimated 13 million Ugandans, with 66% of the country’s urban population depending on it.¹,²
- Culturally, matooke is essential to diet. If you have not had matooke yet, people say, “you haven’t eaten today.”
- It is typically grown in smallholder conditions using traditional agronomic practices.
- Reported yields vary dramatically, but there is clear room for improvement even within traditional systems.

Primary Production Districts include:
- **Southwest** (Mbarara, Isingiro, Bushenyi, Ibanda)
- **Central** (Rakai, Masaka, Mpigi, Mubende)
- **East** (Mbale) – consumed in and around Mbale and Mt. Elgin, also one of the sources for fresh market exports

¹ [http://www.promusa.org/Uganda](http://www.promusa.org/Uganda)
IN UGANDA, MATOOKE IS A NATIONAL STAPLE CROP, WITH THE MAJORITY OF PRODUCTION LOCATED IN THE SOUTHWEST AND CENTRAL REGIONS

**Production Regions (Uganda)**

- **Share of Production**
  - 70%: 1,750
  - 20%: 500
  - 10%: 240
  - <1%: 1

- **# of SHFs (000's)**
  - 1,750
  - 500
  - 240
  - 1

**Farmers**

- **Total Population:** 36,000,000
- **Avg. Family Size:** 5.0 persons
- **Total SHFs:** 4,550,000
- **SHFs (Matooke):** 2-3,000,000
- **% of SHFs:** 55%

**Land**

- **Total Land:** 20,000,000 Ha
- **Arable Land:** 5,500,000 Ha
- **Land Under EAHB:** 1,800,000 Ha
- **% of Arable Land (under EAHB):** 33%

**Crop**

- **Total Production:** 10-12,000,000 tons
- **# of SHFs (EAHB):** 2-3,000,000
- **Total Area (EAHB):** 1,800,000 Ha
- **Avg. Farm Size:** 0.73 Ha
- **Yield per Ha:** 5.5 tons/Ha

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Farmers: Context Network Analysis from aggregated primary and published source research findings
Crop: Ministry of Agriculture, 2010 Statistics; Context Network Analysis
1 Uganda National Household Survey, 2012/13 (7 million HHs, 65% in agriculture)
2 Economic Significance of Banana Varieties Other than Cavendish – Uganda Case Study; Bioversity, CIRAD, IITA, [http://www.fao.org/docrep/meeting/022/ma801e.pdf](http://www.fao.org/docrep/meeting/022/ma801e.pdf)
TANZANIA NATIONAL PRODUCTION IS 3 MILLION TONS, GROWN ON OVER 440,000 HECTARES

EAHB is a Regional Staple within Tanzania

- EAHB is a staple to an estimated 3.3 million Tanzanians, with 30% of the regional rural populations depending on it.1
- In Kagera and Kilimanjaro regions where over 60% of bananas are grown, it is a staple food for 75–95% of the population.2
- Estimated yields3 are extremely low (5.7-7.5 tons/Ha), though IITA indicates that these are closer to 15-30 T/Ha by region.
- Estimated yields are highest in Kilimanjaro and Arusha, where IITA research shows yields range from 20-30 T/Ha.
- Major production coincides with the bimodal weather system on northern fringe along the Kenyan and Ugandan borders.

Major Production Districts include:
- **Primary**: Kagera, Kilimanjaro
- **Secondary**: Arusha, Mbeya and Kigoma
- **Other**: Tanga, Mara, Morogoro

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3 FAOSTAT and Tanzanian Ministry of Agriculture estimates
IN TANZANIA, EAHB IS CONCENTRATED IN SEVERAL DISTRICTS, WITH MATOOKE IN KAGERA AND MCHARE AROUND KILIMANJARO

Production Districts (Tanzania)

- Total Population: 45,000,000
- Avg. Family Size: 8 persons
- Total SHFs: 5,800,000
- SHFs (EAHB): 520,000
- % of SHFs: 9%

- Total Land: 88,580,000 Ha
- Arable Land: 8,800,000 Ha
- Land Under EAHB: 440,000 Ha
- % of Arable Land: 5%

- Total Production: 3,000,000 tons
- # of SHFs (EAHB): 520,000 SHFs
- Total Area (EAHB): 440,000 Ha
- Avg. Farm Size: 0.85 Ha
- Yield per Ha: 8.4 tons/ Ha

Farmers: Context Network Analysis from aggregated primary and published source research findings
Crop: Ministry of Agriculture, 2010 Statistics; Context Network Analysis
THERE IS WIDE DISCREPANCY ACROSS DATA SOURCES AND LACK OF CONSENSUS ON EAHB PRODUCTION STATISTICS

Matooke in Uganda

- FAOSTAT information is widely cited within other sources, and is good as an indicator of trends. However, new research presents a much different picture (especially with regards to production per hectare).
- IITA research estimates **yield at 9.7 to 25.5 tons per hectare per year** in farmer plots in UG. They say:
  
  "Our results suggest that banana production and consumption in Uganda is far greater than previously thought."

Key EAHB Statistics by Country

1. FAOSTAT, accessed June 2014

- **Uganda**
  - Yield (tons per Ha): 5.4 t/ha
  - Production Area ('00,000's Ha): 1.7M Ha
  - Production ('000,000's tons): 9.2M tons

- **Tanzania**
  - Yield (tons per Ha): 5.7 t/ha
  - Production Area ('00,000's Ha): 440K Ha
  - Production ('000,000's tons): 2.5M tons
INTRODUCTION OF FHIA VARIETIES IN KAGERA HAS BEEN EXTREMELY SUCCESSFUL IN RAISING YIELDS AND SHF INCOMES

FHIA-25 is a high-yielding cooking banana resistant to Black Sigatoka

- Honduras Foundation for Agricultural Research (Fundación Hondureña de Investigación Agrícola or FHIA) is a not-for-profit research facility which seeks to develop new disease-resistant breeds of banana and plantain.
- They are famous for developing FHIA-01 (Goldfinger banana) which was tolerant/resistant to fusarium wilt, a disease that threatened the widely cultivated Gros Michel banana.
- FHIA-25 was a variety selected in 1997 that has gained acceptance in Kagera via efforts by Belgian NGOs.

FHIA Benefits

- Resistant to Black Sigatoka
- Resistant to Fusarium Wilt
- Large Bunches (38-45kg)
- Grows at Low Altitude (0m to >1,000m)
- Performs Better in Poor Soil (roots are up to 90cm vs. 60cm for traditional)
- Less Area Required (recommended spacing of 6.25sqm vs. 7.5-9sqm)
- More Resistant to BXW (anecdotal)
- Long “Green Life” (less perishable post harvest)

Increased Yields up to 40% 

REPORTED YIELDS ARE MUCH LOWER THAN ACTUAL PLOT RESEARCH INDICATES IN BOTH UGANDA AND TANZANIA

Matooke in Uganda

- IITA plot research places yield at 9.7 to 25.5 tons per hectare per year\(^1\) in farmer plots in UG
- In TZ, IITA plot research estimates yield 10-20 T/Ha in Arusha and 20-30 T/Ha in Bukoba\(^2\)
- This discrepancy may be caused by using number of bunches to calculate yield, rather than weight.
- These reports obviously call into question national statistics, and may indicate that current production levels are much higher than previously thought.

Yields in Uganda Banana Plots\(^1\)

Reported UG Production: 10-12 million MT

Adjusted UG Production\(^3\): 17-34 million MT

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\(^1\) Management Practices and Opportunities in East African Highland Banana (Musa spp. AAA-EA) Production in Uganda, Lydia Wairegi, 2010

FARMER: average yields from actual farmer plots in various regions (n=52 in Central; n=43 in South; and n=64 in Southwest); CONTROL: APEP study control plots which were originally paired near the demo plots; DEMO: APEP plots where learning groups of 10 farmers were given free fertilizer and mulch incentives

\(^2\) “2011 Agriculture, Forest and Fisheries of Tanzania”, Promar Consulting, 2010

\(^3\) Range based on: lowest control plot yield (9.7) times 1.8M Ha for the low end and region-weighted average yield for the high end (34 million MT)
EAHB PRIMARILY CONSUMED ON-FARM; FRESH MARKET IS THE LION’S SHARE OF THE MARKETED PORTION OF PRODUCTION

Uganda Market Share (by Usage)\textsuperscript{1}  
\begin{itemize}
\item Eaten On-Farm: 70%  
\item Fresh Market: 20%  
\item Beer, Juice: 7%  
\item 0.6% (Fresh Export)
\end{itemize}

10-12 Million MT Production

Tanzania Market Share (by Usage)\textsuperscript{2}  
\begin{itemize}
\item Eaten On-Farm: 55%  
\item Fresh Market: 25%  
\item Beer: 18%
\end{itemize}

3 Million MT Production

- Primary market is on-farm consumption
- In Tanzania, beer supposedly accounts for 18% of total production of EAHB
- “Processed” in Tanzania is roasted and typically eaten with meat (mchare)
- “Processed” for Uganda refers to dry goods – dried chips, strips, flours, etc.
- Distinction between Processed (dry) and Processed (liquid) in Uganda
- Presidents Initiative on Banana Processing has discouraged other efforts in the processing space
- Juice processing is hampered by supply issues and consistency
- Alcohol presents an array of extremely profitable products for processors

\textsuperscript{1} Based on interviews, FAOSTAT 2013, 2007/2009 Agriculture Survey, Kilimo Trust Report  
\textsuperscript{2} Based on interviews, FAOSTAT 2013, 2007/2009 Agriculture Survey, Kilimo Trust Report
HOUSEHOLD CONSUMPTION ACCOUNTS FOR THE MAJORITY OF PRODUCTION, THOUGH EAHB IS A STRONG INCOME SOURCE AS WELL

55-70% on-farm consumption of EAHB

In UG, 7-8.5 million MT is consumed on farm as steamed, roasted, stewed or boiled matooke.

In TZ, 1.7 million MT is consumed on farm as steamed, roasted, stewed or boiled matooke.

**Subsistence SHF**
- Consume 100% of banana production
- May be food insecure and need additional protein intake to balance diet
- Traditional methods, low yields,

**Surplus SHF**
- Consume ~60-80% of production, depending on season
- Generally produce enough for home consumption with some surplus
- Sell surplus for extra income
- Traditional or low input model

**Semi-Commercial SHF**
- Consume 20-40% of production
- Produce significantly more bananas with higher yields and a large surplus to sell
- Often use inputs and located nearer to markets
- Farm as a business
UNMET DEMAND FOR FRESH MARKET IN KAMPALA CAN ABSORB MORE THAN DOUBLE THE CURRENT SUPPLY

Matooke in Uganda

- On-farm consumption varies from 100% to less than 5% based on the total production of the farmer, size of land, number of people in the family and level of sophistication in farming methods.
- In total, 20%-25% of the production is sold into the fresh market and bought in regional or urban markets (1.6 million tons after losses).
- In Kampala, only about half of the total demand is satisfied with the current supply levels.
- For the fresh market as a whole, there is demand for more close to double the current supply.¹

Unmet Fresh Market Demand²

**OPPORTUNITY**
The largest “demand-pull” for matooke bananas is still from the fresh market. Existing demand can absorb more than double the current supply.


² Updated to reflect follow-up commentary from Dr. Nowakunda and to account for production losses.
FRESH MARKET DEMAND STILL REMAINS AS THE LARGEST MARKET OPPORTUNITY FOR MATOOKE (BOTH DOMESTIC AND EXPORTS)

Demand in Uganda (Kampala in particular) Outstrips Current Supply¹

• Current demand, based on surveys conducted in the main markets in Kampala, is **3,052,632 tons per year**.
• At present, there is about half of the supply required to meet the existing demand.
• In addition, prices are 15-35,000UGS or $6-14 (Farmgain Africa) retail which is becoming too high for consumers.
• If supply volumes were to increase to meet this demand, prices would theoretically decline, pricing more customers into the market.
• Dr. Nowakunda (NARO) believes that this scenario is still compelling for farmers though.
• Much of what is priced into Matooke reflects complexities in the value chain and current market distortions.
• As production becomes more sophisticated and marketing links more organized, prices can decline without making production unprofitable for farmers.
• Instead, more farmer-buyer relationships should develop that skip steps in the value chain and add value to both ends of the transaction, even under a lower market price scenario.

Local Export Markets are Under Utilized¹

• Also, Ugandan export potential is not utilized. “Uganda has no competitor for the Eastern Kenya and Southern Sudan market, yet they are only utilizing 0.3% of the export and regional market potential.”

NOTE: Additional detail on methodologies for calculating fresh market demand and price sensitivity to be detailed in separate proposal.

¹ “Business Opportunities in the Banana Value Chain”, Kephas Nowakunda, NARO – Uganda, unpublished report
PROCESSED BANANA GOODS ARE SMALL, BUT GROWING SEGMENT OF OVERALL PRODUCTION – LED BY BEVERAGES

Processed Goods Remain a Small Portion of Production

- Problems with scale, consistency of supply, flavor, production quality and access to capital hamper processor growth. Demand and growth of existing nascent efforts is encouraging though and continued uptick is expected.

7-18% is processed to make juices, beer, wine, and gin

≈2.5% is processed for snacks, chips, flour, vacuum-sealed, etc.

Juice and Beer

- Juice processors have not reached large scale yet.
- Juice and beer are produced from specific varieties that are not cooked for food.
- According to official statistics, banana beer accounts for 5% of total production in Kagera.¹
- In TZ, alcoholic drinks account for a larger portion of production.

Dried Fruit Market Share (Uganda)²

- Fruits of the Nile: 76%
- Amfri Farm: 10%
- Masaka Organic Producers: 9%
- Tefu Limited: 4%
- Flona Commodities: 1%

¹ KCDP Banana Project (http://www.biw.kuleuven.be/DTP/TRO/Tanzania/banpj.htm)
² Fresh Fruit & Vegetable Sub Sector / Value Chain Analysis Tanzania; Match Maker Associates Ltd.; March 2008
Export market is small and disconnected from average SHFS, but also organized, profitable and growing.

- Work with large farmers, rarely groups.
- Pay double the local farmgate price.
- Complete vertical integration.
- Packaged into 10kg boxes on-farm.
- 60/30/10 split between London/Montreal/Vancouver
- Indians in UK are fastest growing customer segment.
- Market Value: $30-35 million USD

Prices per kg (USD):

- London: $2.89
- Montreal: $3.57
- Vancouver: $5.04

Volume: 10,000 MT/year

Market Size: $30-35 million USD

Growth Rate: 25% CAGR over the last 10 years

Account for 60% of space on planes they load. 250 flights per year at 40T per trip out of 70T max load.

Context Network Interviews with HPOU (Horticulture Producers organization of Uganda)
SEASONAL PRODUCTION PATTERNS CAUSE LOWER FARMGATE PRICES DURING PEAK PRODUCTION PERIODS

DECLINE IN FARMGATE SELLING PRICE IS CORRELATED WITH RAINFALL

- Bananas are ready to harvest three months after peak rainfall, creating a glut in the market, depressing prices
- Matooke prices reflect the changes in volumes in the market through the year (impact is on a ~3 months lag)
- Ugandan bimodal weather pattern creates additional price volatility
- Farmers can correct and manipulate this by timing their planting of suckers

OPPORTUNITY
De-suckering practices aimed at timing production and evening out the seasonal volatility can help farmers harvest more bunches during low season and get better farmgate prices.

Matooke Mean Seasonal Wholesale Price, 1989-2000, Ugandan Shilling/kg vs. Kampala Rainfall

http://www.foodnet.cgiar.org/scrip/docs&databases/ifpriStudies_UG_nonScrip/pdfs/more_reports/Banana_Marketing_in_Uganda_Foodnet_03.pdf

LOSSES OCCUR PRIMARILY ON-FARM IN REMOTE RURAL AREAS WHERE POOR ACCESS ROADS LIMIT TRADERS ATTENTION IN HIGH SEASON

**On-Farm (20-25%)**
- Smaller farms, traditional
- Poor access roads, far from main roads, or distant local markets
- Minimal contact from traders, especially in glut season
- Majority of losses occur at peak production, when bicycle traders do not venture far off the main roads

**In Transit (5-10%)**
- Bruising and ripening occur in transit
- Physical or mechanical damage can harm bunches
- Rough roads and poor handling increase the losses
- Ripening of even one finger can trigger a whole load
- Labor and lorry drivers are paid regardless of losses

**Collection / POS (2-5%)**
- There is little or no storage at collection points in rural areas
- Sun exposure causes more accelerated ripening
- At POS, vendors who cannot sell their bunches must leave them overnight
- Ripened, unsold bunches are more infrequent, usually traders just lower the price

*Source: Context Network analysis based on interviews with farmers, collectors, traders and vendors.*
PERISHABILITY AND TRANSPORTATION COSTS ACCOUNT FOR LARGE REGIONAL VARIATION IN FARMGATE PRICES

Proximity to Market is a Key Limitation to Farmgate Prices

- **Proximity to Market** – farmers closer to market receive the best farmgate prices since it costs less for traders to get their product to market.

- **Transportation Cost** – most (70%) of banana production is grown 250-400km away from Kampala
  1. Perishability – bananas can ripen quickly (7-10 days) and represent possible losses to farmers/traders
  2. Bulk – due to high water content and the practice of transporting bananas as whole bunches, it requires six (6) truckloads of bananas to ship the equivalent dry matter as one (1) truck of maize

Proximity to market can account for a 143% price increase

Interventions should be catered to regional market differences / opportunities

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1 Management Practices and Opportunities in East African Highland Banana (Musa spp. AAA-EA) Production in Uganda, Lydia Wairegi, 2010
WHILE FARMERS WANT TO GROW BIG BUNCHES, PRICING INDICATES THAT AVERAGE BUNCHES ARE MORE PROFITABLE

Matooke in Uganda

- Best prices per kilogram cluster around 15 kg bunches.
- Larger bunches may look nice and be more desirable, but provide lower prices per kg.
- This reflects the psychology of negotiated pricing, consumption patterns and affordability.
- Consumers negotiate toward the average price they would expect for a bunch and can afford to pay for that bunch.

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OPPORTUNITY

Farmers should focus less on growing bigger bunches, and more on producing larger numbers of average size bunches in order to get best prices.

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1 Optimizing Desuckering and Spacing, Van Asten et. al., 2011
CURRENT PRICING HIGHLIGHTS REGIONAL DIFFERENCES AND SHOWS OPPORTUNITY TO INCREASE PROFITS SELLING BY WEIGHT

Matooke in Uganda

**Prices:**
- Prices in the Central region are lowest, reflecting *cost of transportation*.
- In the Western region, they are next lowest, reflecting *amount of production*.
- In the Eastern and Northern regions, high pricing is indicative of *scarcity*.

**Margins:**
- Retail margin per bunch is 15% on average, nationally.
- On a per kg basis, it is one and a half times higher – at 38%.

**Sample Prices by Region**

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<th>Average</th>
<th>Central</th>
<th>Eastern</th>
<th>Northern</th>
<th>Western</th>
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<td><strong>Matooke (bunch)</strong></td>
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<tr>
<td>RP</td>
<td>19,350</td>
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<td>20,950</td>
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<td>18,600</td>
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<td>WP</td>
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<td>14,800</td>
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<td><strong>Matooke (kg)</strong></td>
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<tr>
<td>RP</td>
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<tr>
<td>WP</td>
<td>800</td>
<td>600</td>
<td>950</td>
<td>950</td>
<td>700</td>
</tr>
</tbody>
</table>

*RP = Retail Price; WP = Wholesale Price*

**OPPORTUNITY**
*Retailers (and traders) could achieve improved prices by selling on a per kg basis (i.e. in hands or fingers), rather than by bunch.*

1 Weekly Pricing Report 06/11/2014, from [www.infotradeuganda.com](http://www.infotradeuganda.com) (not meant to represent annual average prices by region)
PERCEPTIONS OF FERTILIZER HIGHLIGHT THE NEED FOR ADDITIONAL EXTENSION AND TRAINING ON AGRONOMIC PRACTICES

Soil Fertility is a Critical Limitation to Long-Term Yield Improvement

- Regional field tests showed that low soil fertility had the largest impact on yield in the Southern regions.¹
- Low adoption of fertilizer use in Uganda has been attributed to high fertilizer prices, poor availability and lack of knowledge on fertilizer use.
- Mulching, fertilizer and other external inputs are not widely adopted which results in substantial nutrient mining.

Without improvement, yields will decrease and land can become fallow or be used for other crops.

Proper soil management practices and inputs are required to balance the significant nutrients bananas remove.

¹ Management Practices and Opportunities in East African Highland Banana (Musa spp. AAA-EA) Production in Uganda, Lydia Wairegi, 2010
PEST AND DISEASE (BXW) PRESSURES ARE MAJOR PRODUCTION CONSTRAINTS FOR MATooke

Banana Xanthomonas Wilt (BXW)

Up to 100% Yield Reduction

Traditional methods use weevil traps to lure pests out of existing plants. These can be very effective, but involve additional time and labor costs. The best solution is clean planting material.

Banana Weevil

30-70% Yield Reduction

Nematodes

30-50% Yield Reduction

Nematodes are particularly difficult to eradicate. Once soil is infected, new suckers have a high likelihood of experiencing reduced yields as well.

Difficult to reduce impact once established without access to clean planting material. Improving the strength of the plant with better practices can help lower spread on plantations.

Other main banana diseases are Black Sigatoka, Fusarium Wilt and Banana Bunchy Top Virus. There are resistant strains for Black Sigatoka; matooke is tolerant to fusarium wilt; banana bunchy top wasn’t mentioned as a major constraint,
LIMITED ACCESS TO CREDIT, POOR RESEARCH LINKAGES AND RESTRICTIVE GOVERNMENT POLICIES HAMPER MARKETS

Constraints in the enabling environment and infrastructure

- National roads are good, but coverage is limited to main thoroughfares.
- Unreliable and inaccessible local roads for transportation of crops by farmers to collection points or markets.
- Electronic market information systems are available for market pricing on bananas.

Unreliable

- Since the President’s Initiative for Bananas began in 2004, additional focus has been put toward the banana sector.
- However, the lack of progress in the President’s Initiative (PIBID) toward making profitable dry goods from bananas has discouraged other efforts in the space.
- Uganda has not formed an official stance on using GMO varieties; BXW-resistant varieties developed and not used.

Restrictive

- Access to finance is extremely poor for individual farmers; bank rates are excessively high as well (20-30%).
- Government import duties on plastic packaging materials have severely hampered the growth of locally-sourced, processed agricultural goods.
- Cultural aversion to contract-based business dealings leads to additional risk for serious players.

Constrained

- EAHB is one of NARO’s primary focus crops, however, dissemination of improved varieties has been limited.
- The National Banana Research Program (NBRP) and other organizations, have developed plenty of materials on improving banana production.
- Extension services are virtually non-existent for banana; there are a few selected programs in the sector.

Needs Better Linkage
2 Value Chain Opportunities
PHASE 2 UGANDA / TANZANIA EAST AFRICAN HIGHLAND BANANA (EAHB) EXECUTIVE SUMMARY

1 SECTOR FUNDAMENTALS

- East African Highland Banana (EAHB) is the primary staple crop for over 13 million Ugandans (≈35% of the population), but less critical in Tanzania where 3.3 million (about 7% of the population) consume it as a staple.
- National production is estimated at 10-12M and 3M tons in UG and TZ, respectively.
- EAHB is grown by roughly 55% of SHFs (from 2-3 million smallholders) on 1.8 million Ha in Uganda. Total production area is only 440,000 Ha in Tanzania.

2 VALUE CHAIN OPPORTUNITIES

- Perishability and access to markets are major constraints for rural SHFs.
- 70% of cooking bananas are grown in the Southwest, hundreds of kilometers from Kampala. In between farm and terminal market, there are numerous players.
- Prices in terminal markets are often 5-8 times higher than farmgate due to high transportation costs, and the complexity of the intermediary value chain.
- Still, there are opportunities for increased efficiency in the supply chain.

3 INTERVENTIONS & IMPACT

- Interventions have been refined to focus on access to clean planting materials (tissue culture), business and technical assistance, and organization of farmer / trader groups.
- Farmer groups are essential to the success of any program or intervention.
- Effective uptake of tissue culture will necessitate training and outgrower nurseries.
- Business and technical assistance will also need to flow through the group structure.
- Other elements such as financing and market information systems can be linkages.

4 STAKEHOLDER PROFILES

- Each intervention has strong partner candidates, below are several examples for each proposed intervention:
  - **Tissue Culture** – AGT, BioCrops, Crop Bioscience and NsigoTech
  - **Business and Technical Assistance** – Bioversity, UDET, IITA, AMA
  - **Farmer Groups** – MBADIFA, BUCADEF, UDET, VEDCO, World Vision
TOTAL MATOOKE PRODUCTION IS 13-15 MILLION MT (FOR UG AND TZ), OF WHICH OVER 60-70% IS CONSUMED ON-FARM

Uganda/Tanzania Cooking Banana Subsector Map
Expressed as percentage of total production

_Source: Context Network analysis based primarily on value chain interviews._

_1 “The Extent and Causes of Banana Market Distortions in Uganda”; NBRP, NACCRI, NARO; 2010_
THE MAJORITY OF BANANA FARMERS SELL INDIVIDUALLY THROUGH MIDDLEMEN AND ARE AFFECTED BY BANANA MARKET PRICE DISTORTIONS

In Uganda, both farmers and consumers are “price takers”

- Infrequency of access to bicycle traders or other avenues to market, lack of access to reliable market information and perishability of the product, all lead to farmers selling at whatever price they can, whenever possible.
- Additionally, some of the direct causes of variability are out of farmers control (i.e. seasonality and distance to market).
- Consumers are subject to the prices available in the markets, though prices are negotiable to an extent.

Direct Causes of Farmgate Price Variability

1. Size (bunches)
2. Season
3. Distance to Market

Indirect Causes of Farmer’s Price Distortions

1. Lack of Market Access
2. Type of Buyers
3. Source of Market Information
4. Farmers as Price Takers
5. Traded Volume
6. Poor Infrastructural Facilities
7. Poverty

% Farmers Selling to Player Type

- Bicycle Traders: 36%
- Brokers/Agents: 44%
- Wholesale Buyers: 7%
- Contract Buyers: 11%

1 “The Extent and Causes of Banana Market Distortions in Uganda”; NBRP, NACCRI, NARO; 2010
**FARMER SEGMENTATION CENTERS ON CONSUMPTION PATTERNS AND PROXIMITY TO MARKETS**

**PRELIMINARY FIGURES (PENDING REVISION)**

<table>
<thead>
<tr>
<th>Total # SHFs</th>
<th>Avg. Size of Farm</th>
<th>Agronomic Practices</th>
<th>Total Amt. Produced</th>
<th>Consumed / Sold*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1% (15,000)</td>
<td>&gt;3 Ha</td>
<td>High Input</td>
<td>60-75 MTs (20-25 T/Ha)</td>
<td>20/80% ≈14/56 MT</td>
</tr>
<tr>
<td>10% (420,000)</td>
<td>1-3 Ha</td>
<td>Low Input</td>
<td>10-45 MTs (10-15 T/Ha)</td>
<td>40/60% ≈10/15 MT</td>
</tr>
<tr>
<td>40% (1,185,000)</td>
<td>0.5-2.0 Ha</td>
<td>Traditional</td>
<td>3-16 MTs (6-8 T/Ha)</td>
<td>90/10% ≈9/1 MT</td>
</tr>
<tr>
<td>50% (1,500,000)</td>
<td>&lt;0.5 Ha</td>
<td>Traditional</td>
<td>2,000-3,000 kg (4-6 T/Ha)</td>
<td>100/0% ≈2,500 kg</td>
</tr>
</tbody>
</table>

*NOTE: “Consumed/Sold” amounts used for calculations lead to higher production estimates since on-farm wastage has not yet been factored into total production amounts. Once the estimate of 40% wasted has been removed from the equation, production estimates are in-line with reported figures.*
MATOOKE VALUE CHAIN IS CONSTRAINED ALONG THE MAJOR SEGMENTS; LARGEST DISCONNECT IS BETWEEN PRODUCTION AND MARKET

Proposed strategy and model along value chain

- **Inputs**
  - **Clean planting material** – pest and disease pressure increase in vegetatively propagated banana plantations
  - **Mulching is often opportunistic** – use plant refuse and some grasses where available
  - **Low fertilizer usage** – minimal composting and manure; livestock cannot handle fertilizer requirements
  - **Highly Constrained**

- **Production**
  - **Labor** – plot mgmt. requires intensive labor
  - **Water** – need to do water harvesting or be in a high rainfall area, yields decline and increase in disease susceptibility
  - **Crop Management** – need training on spacing, desuckering (not well timed), disease mgmt. (remove leaves and plants, male buds, clean pangas), harvesting
  - **Highly Constrained**

- **Processing**
  - **Processors far from production areas**
  - **Consistency of supply is an issue due to seasonal volatility**
  - **Demand for processed goods has not been fully proven**
  - **High capital investment required for scaling production**
  - **Manual methods still frequently used, limits scaling and reduces hygiene.**
  - **Highly Constrained**

- **Market**
  - **Demand for Bananas is Strong**
  - **High Transportation Costs** – bananas take six truckloads to transport equivalent dry matter as one truckload of maize
  - **Numerous middlemen and brokers**
  - **Retailers purchase on verbal credit** – often do not pay their suppliers by saying that they haven’t sold bunches yet
  - **Opportunity for Growth**

Relative degree of constraint:
- More constrained
- Less constrained
- Not constrained
SIGNIFICANT MATOOKE YIELD IMPROVEMENT POSSIBLE WITH BETTER PRACTICES AND INPUTS

Impact

- Control plots show that yields can shift from reported figures of **5.4 MT/Ha** to **9.7 MT/Ha** *(low control scenario)* up to **20 MT/Ha** *(high control scenario)* when fertilizer and mulch are used along with improved management.

<table>
<thead>
<tr>
<th>Current production</th>
<th>Potential (Low Control)</th>
<th>Potential (High Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Million MT</td>
<td>High yield</td>
<td>Low yield</td>
</tr>
</tbody>
</table>

Increasing SHF Yields to Control Plot Levels Would Double Production\(^1,2\)

**+ 2-4 times yield increase opportunity**

Constraints

- Limited access to finance to pay for inputs
- Limited access to inputs
- Lack of knowledge of the benefits of improved inputs
- Embedded perspectives on traditional farm practices

However, interventions to increase yields must be accompanied with linkage to markets to justify investment in surplus production

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\(^1\) Management Practices and Opportunities in East African Highland Banana (Musa spp. AAA-EA) Production in Uganda, Lydia Wairegi, 2010

\(^{1,2}\) Assumes that 70% of current production comes from farms producing at low yields; 30% from farms with improved practices already
TISSUE CULTURE GREATLY IMPROVES BANANA PRODUCTION, BUT YIELD IMPROVEMENT IS PRIMARILY INDIRECT

Tissue Culture (TC) Benefits

1. Primary benefit of TC is clean planting material (free from pests and diseases)
2. Combining TC with other inputs (especially mulch) had additional benefits compared to untreated suckers (123%+)
3. Farmers who were trained in combination with TC usage experienced the best yields (200%+)
4. First crop cycle with TC can improve bunch weights 34-57%¹

**Yield (T/Ha/cycle)¹**

<table>
<thead>
<tr>
<th></th>
<th>Low Input Model</th>
<th>High Input Model*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Suckers</td>
<td>5.5</td>
<td>7.3</td>
</tr>
<tr>
<td>TC Plants</td>
<td>9.1</td>
<td>17.7</td>
</tr>
</tbody>
</table>

**Yield (T/Ha/year)²**

<table>
<thead>
<tr>
<th></th>
<th>Suckers</th>
<th>TC</th>
<th>TC trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>+65%</td>
<td>5.5</td>
<td>9.1</td>
<td>17.7</td>
</tr>
<tr>
<td>+142%</td>
<td>7.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+200%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overall yield for tissue-cultured plants was **123% higher when mulch was applied** compared with non-mulched tissue-cultured plants.

Farmers who grew TC banana **and received training** harvested twice the yield compared to the other two groups.

---

¹ Main difference between High and Low input models was the application of mulch.
² Performance of tissue-cultured versus sucker-derived East African highland banana under high and low input systems in Uganda; Niera, Gold, Coyne, Dubois and Sikora; IITA and University of Bonn; November 2013

Tissue Culture Banana for Smallholder Farmers: Lessons Learnt from East Africa; Dubois et. Al.; IITA et. Al., 2011
SIMILAR TO OTHER INPUTS, TISSUE CULTURE PROFITABILITY IS SUBJECT TO PROXIMITY TO MARKET

Tissue Culture Profitability Inversely Correlated to Distance from Market

Gross Margins (UGX/Ha/year)\(^1\)

Profitability crossover is about 100km+

\(^1\) Tissue Culture Banana for Smallholder Farmers: Lessons Learnt from East Africa; Dubois et. Al.; IITA et. Al., 2011 (chart data from 2009)
REPORTED TISSUE CULTURE DISTRIBUTION MODELS IN UGANDA INCLUDE PLANS FOR REGIONAL LAB-RUN NURSERIES TO LOWER RISK

Nursery Success Factors

- Nursery Location / Proximity to Planting Sites
- Management Practices
- Nursery Input Quality
- Local Demand / Competition
- Other Farm Input Access
- Transportation Costs
- Ability to Sell High % of Plantlets

Reported Challenges

- Access to Funding / Financing
- Local Perceptions
- Theft of Suckers from Early Adopters
- Cost of Un-weaned Suckers from Lab
- Distance from Main Lab
- Low Adoption

Material flow in banana tissue culture production

1 Success Factors in the operation of Banana Tissue Culture Nurseries in Kenya; Stefan Burkhart; master thesis for University of Hohenheim; 2009
2 In-person presentation to Context field research team, June 2014
TISSUE CULTURE COST MODELS VARY GREATLY BASED ON INPUTS, LOCATION, DISTANCE TO LAB, AND LOCAL LABOR RATES

Operating cost model for TC nurseries in Kenya

Table 2: Cost record example for three cultivars of a banana tissue culture nursery in Kenya

<table>
<thead>
<tr>
<th>Cost center</th>
<th>Cultivar 1 KSh for 1000 plantlets</th>
<th>Cultivar 2 KSh for 1000 plantlets</th>
<th>Cultivar 3 KSh for 1000 plantlets</th>
<th>Average % of total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propagation supplies</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>0.9</td>
</tr>
<tr>
<td>Polyethylene bags</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>4.8</td>
</tr>
<tr>
<td>Growing media</td>
<td>60000</td>
<td>45000</td>
<td>50000</td>
<td>41.7</td>
</tr>
<tr>
<td>Plantlets + Transport</td>
<td>1000</td>
<td>1600</td>
<td>1000</td>
<td>0.9</td>
</tr>
<tr>
<td>Water</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1.2</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>0.4</td>
</tr>
<tr>
<td>Pesticides</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>1.0</td>
</tr>
<tr>
<td>Plant hormones</td>
<td>20000</td>
<td>20000</td>
<td>20000</td>
<td>16.1</td>
</tr>
<tr>
<td>Other supplies</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1.2</td>
</tr>
<tr>
<td>Utilities</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>0.4</td>
</tr>
<tr>
<td>Firewood</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>3.2</td>
</tr>
<tr>
<td>Fuel for soil sterilization</td>
<td>10000</td>
<td>10000</td>
<td>10000</td>
<td>8.1</td>
</tr>
<tr>
<td>Part-time (2 persons)</td>
<td>15000</td>
<td>15000</td>
<td>15000</td>
<td>12.1</td>
</tr>
<tr>
<td>Misc. expenses</td>
<td>10000</td>
<td>10000</td>
<td>10000</td>
<td>8.1</td>
</tr>
<tr>
<td>Total cost per 1000 plantlets</td>
<td>132200</td>
<td>117700</td>
<td>122200</td>
<td>100</td>
</tr>
<tr>
<td>Total cost per crop (6000 plantlets)</td>
<td>1057600</td>
<td>941600</td>
<td>977600</td>
<td>100</td>
</tr>
</tbody>
</table>

Cautions: other supplies are e.g. expenses for office supplies etc.; services and rentals are e.g. expenses for extension or marketing, land rent etc.; misc. expenses are expenses for other things which cannot be included in other categories

Estimated Setup Costs for Screen House (70m²)

<table>
<thead>
<tr>
<th>Cost</th>
<th>KSh</th>
<th>USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen</td>
<td>33,280</td>
<td>$375</td>
</tr>
<tr>
<td>Ballast</td>
<td>2,880</td>
<td>$32</td>
</tr>
<tr>
<td>Posts</td>
<td>6,000</td>
<td>$68</td>
</tr>
<tr>
<td>Humidity Chamber</td>
<td>5,150</td>
<td>$58</td>
</tr>
<tr>
<td>TOTAL (without HC)</td>
<td>42,160</td>
<td>$475</td>
</tr>
<tr>
<td>TOTAL (with HC)</td>
<td>47,310</td>
<td>$533</td>
</tr>
</tbody>
</table>

Major Problems for TC Nurseries

(n = 17 evaluated nurseries in Kenya)

- Material from TC Lab
- Handling of Plantlets
- Timing
- Financing
- Customers
- Environment
- Availability of Inputs
- Other

“Most operators did not pay for nursery setup.” Largest variable costs were: Plantlets + Transport, “Other Supplies” and Labor

Success Factors in the operation of Banana Tissue Culture Nurseries in Kenya; Stefan Burkhart; master thesis for University of Hohenheim; 2009
**FARMGATE PRICES ARE INVERSELY CORRELATED TO DISTANCE TO MARKET (I.E. CENTRAL FARMERS GET HIGHER PRICES)**

Farmgate Prices also Affect Profitability of Adopting Fertilizer

- Farmgate prices shift downwards quickly as correlated to average distance of farms at the district level to the main market (in Kampala), dropping almost 60% (from about $0.17 to $0.07).
- This decrease impacts the profitability of adopting fertilizer for farmers further from the main market.
- Fertilizer appears to be profitable within 100-175 km of Kampala (once again highlighting the Central region).

---

**Relationship between Distance to Main Market and Farmgate Price**

Declining price further from market means less capital for distant farmers

**Based on Farmgate Prices and Cost of Fertilizer (2006-2007)**

@100% MRR the profitability radius is between 100-175km
Across regions, management practices was the primary biophysical limitation

<table>
<thead>
<tr>
<th>Primary Biophysical Constraints by Proportion of Plots (%)&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Central</th>
<th>South</th>
<th>Southwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pests</td>
<td>30.8%</td>
<td>6.8%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Soil Fertility</td>
<td>25.6%</td>
<td>48.9%</td>
<td>32.2%</td>
</tr>
<tr>
<td>Management</td>
<td>43.7%&lt;sup&gt;2&lt;/sup&gt;</td>
<td>35.0%&lt;sup&gt;2&lt;/sup&gt;</td>
<td>37.3%&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Climate</td>
<td>0.0%</td>
<td>9.3%</td>
<td>14.4%</td>
</tr>
</tbody>
</table>

**Pests:** Study measured the impact of nematodes and weevils.

**Soil Fertility:** Factors assessed were pH, SOM, N-Total, K(Ca+Mg), and Clay

**Management:** Included fertilizer use, mulching, weeding and mat population.

**Climate:** Was equivalent to regional rainfall.

Most notably, this research excludes the impact of diseases in their regional analysis.

---

<sup>1</sup> Management Practices and Opportunities in East African Highland Banana (Musa spp. AAA-EA) Production in Uganda, Lydia Wairegi, 2010

<sup>2</sup> The largest constraint to management in the Southwest and Central regions was Mulch; in the South it was Weeds
LABOR FOR TRADITIONAL FARMERS ARE ACTUAL COSTS OR LABOR EQUIVALENTS, SINCE THEY USE HOUSEHOLD LABOR

Production cost economics for matooke
$USD per Hectare
(Conversion: 2,500 Ugandan Shillings = $1USD)

Regional Traditional Farmer Examples
Based on field research with farmers in the Sheema and Isingiro districts; conducted by AMA

NOTE: TIC = Total Input Costs, TLC = Total Labor Costs, TVC = Total Variable Costs
LOW INPUT FARMERS SELECTIVELY CHOOSE INPUTS AND LABOR PRACTICES TO IMPLEMENT BASED ON IMPACT

Production cost economics for matooke
$USD per Hectare
(Conversion: 2,500 Ugandan Shillings = $1USD)

Regional Low Input Farmer Examples
Based on field research with farmers in the Sheema and Isingiro districts; conducted by AMA

NOTE: TIC = Total Input Costs, TLC = Total Labor Costs, TVC = Total Variable Costs
INPUTS REPRESENT A MAJORITY OF VARIABLE COST FOR “HIGH INPUT” FARMERS; MULCH IS MOST EXPENSIVE INPUT

Production cost economics for matooke
$USD per Hectare
(Conversion: 2,500 Ugandan Shillings = $1USD)

Regional High Input Farmer Examples
Based on field research with farmers in the Sheema and Isingiro districts; conducted by AMA

NOTE: TIC = Total Input Costs, TLC = Total Labor Costs, TVC = Total Variable Costs
Production economics for matooke
$USD per Hectare
(Conversion: 2,500 Ugandan Shillings = $1USD)

Farm Budget Example by Farmer Type
Based on field research with farmers in the Sheema district; conducted by AMA

<table>
<thead>
<tr>
<th>Farmer Type</th>
<th>Total Input Cost</th>
<th>Total Labor Costs</th>
<th>Total Variable Costs</th>
<th>Total Revenue</th>
<th>Gross Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Input</td>
<td>2,101</td>
<td>1,648</td>
<td>3,749</td>
<td>7,062</td>
<td>3,309</td>
</tr>
<tr>
<td>Low Input</td>
<td>332</td>
<td>883</td>
<td>1,215</td>
<td>3,110</td>
<td>1,894</td>
</tr>
<tr>
<td>Traditional</td>
<td>35</td>
<td>266</td>
<td>300</td>
<td>683</td>
<td>390</td>
</tr>
</tbody>
</table>

Margin %
- High: 47%
- Low: 61%
- Trad: 57%
FINANCIAL ANALYSIS HIGHLIGHTS THE BENEFITS OF THE VARYING LEVELS OF FARMER INTENSIFICATION

<table>
<thead>
<tr>
<th>Cost Benefit Ratio ((TR/TVC)^1)</th>
<th>Margins ((GM/TR)^2)</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High Input: (1.88)</td>
<td>• High Input: (47%)</td>
<td>• High Input: ($7,062)</td>
</tr>
<tr>
<td>• Low Input: (2.56)</td>
<td>• Low Input: (61%)</td>
<td>• Low Input: ($3,110)</td>
</tr>
<tr>
<td>• Traditional: (2.27)</td>
<td>• Traditional: (57%)</td>
<td>• Traditional: ($683)</td>
</tr>
</tbody>
</table>

**TRADITIONAL** methods achieve a very high cost benefit ratio (in some districts, it was the highest).

Farmers with low access to personal funds, group savings, or financial assistance continue to farm at these levels since they can be quite profitable without meaningful cash outlays.

**LOW-INPUT** methods achieve the highest gross margin percentage using analysis across multiple regions.

Farmers who have some access to funds or capital for investing back into their farms, can get the best “bang for their buck” by selectively choosing which inputs and additional labor activities to purchase.

**HIGH-INPUT** methods are expensive and less efficient at a marginal level, but provide by far the highest revenue levels.

Farmers with larger land plots, better access to markets, and some personal wealth can invest heavily to improve their plantations and achieve TR more than double that of low-input farmers.

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1 Cost Benefit Ratio calculated as Total Revenue \((TR)\) divided by Total Variable Costs \((TVC)\); higher ratio indicates increased cost efficiency

2 Margins calculated as Gross Margin \((GM)\) divided by Total Revenue \((TR)\); higher percent indicates more profitable investments to inputs and labor
SMALLHOLDER YIELDS AND INCOMES CAN BE SIGNIFICANTLY RAISED WITH IMPROVED PRACTICES AND INPUTS

Farmer Income Economics for Three (3) Farmer Segments
$USD per Ha, based on primary sources and published data

<table>
<thead>
<tr>
<th></th>
<th>Traditional farming systems (low cash outlay)</th>
<th>Low-Input farming systems (moderate cash outlay)</th>
<th>High-Input systems (extensive input purchases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Production Cost</td>
<td>$300</td>
<td>$1,215</td>
<td>$3,749</td>
</tr>
<tr>
<td>Average yield per Ha</td>
<td>7.9 MT</td>
<td>31.3 MT</td>
<td>66.0 MT</td>
</tr>
<tr>
<td>Farmgate price per kg</td>
<td>$0.086</td>
<td>$0.099</td>
<td>$0.107</td>
</tr>
<tr>
<td></td>
<td>215 UGX</td>
<td>248 UGX</td>
<td>268 UGX</td>
</tr>
<tr>
<td>Total Revenue (value of production)</td>
<td>$683 (sells &lt;30%)</td>
<td>$3,110 (sells &gt;60%)</td>
<td>$7,062 (sells &gt;80%)</td>
</tr>
<tr>
<td>Gross Margins²</td>
<td>$390</td>
<td>$1,894</td>
<td>+$3,309 (47%)</td>
</tr>
<tr>
<td>Per Capita Income³</td>
<td>$506</td>
<td>$506</td>
<td>$506</td>
</tr>
<tr>
<td>Banana Margin as Multiple of PCI</td>
<td>77%</td>
<td>374%</td>
<td>654%</td>
</tr>
</tbody>
</table>

1 Production Costs and Gross Margins for Banana Enterprise under the Three Production Technology Levels, Agribusiness Management Associates, 2013
2 Assumes 100% of production sold; traditional farmers would need to sell 44% of production to breakeven
3 The World Bank, Uganda Overview, 2012
EXISTING PROCESSING EFFORTS ARE SMALL-VOLUME OPERATIONS FACING NUMEROUS CONSTRAINTS

**Existing Processors (Dry/Pkgd. Goods)**
- tropical wholefoods
- AMFRI FARMS LTD.
- TOOKE
- AF Group
- Afri Banana

**Dry and Packaged Goods**

**Constraints**
- Sufficient training and organization of out-growers
- Consistent supply channels and quality control
- Securing the markets (i.e. Fair Trade certification)
- Most companies are distant from supply origin
- Packaging taxes are exorbitant, which makes competing with foreign goods very difficult
- Aligning with consumer taste preferences

**Existing Processors (Beverages)**
- Mali Juice
- Excel Hort Consult
- jakana.

**Beverage Products**

**Constraints**
- Farm methods still used to produce concentrate
- Non-mechanized production is slow to scale
- Capital investment is a huge constraint for scaling production levels (i.e. Jakana)
- Transportation costs and cold storage
COMPLEXITY OF DOWNSTREAM VALUE CHAIN CAPTURES OVER 80% OF BANANA REVENUE

- **Rural Farms**: Typically the only way rural farms can access markets; may not travel far from markets in glut seasons.

- **Bicycle Traders**: Mark up is 50-100%. Bicycle traders are typically the only way rural farms can access markets; and may not travel far from markets in glut seasons.

- **Local Collectors/Stage Agents**: Mark up is 40%. Stage agents, aggregators, and brokers add complexity to local collection points; create the most steps at any one point in the chain.

- **Wholesalers/Truck Transport**: Mark up is 60%. Wholesalers and truck transport absorb the most costly stage in the value chain; can bring bananas over 300 km to market.

- **Urban Retailers**: Mark up is 20-30%. Retailers take on the rental costs and levies for operating booths and occupying space at markets.

Middlemen capture the wide majority of revenue along the chain.

Farmgate prices are less than 20% of retail prices.
Prices by Value Chain Stage for Matooke and Mshare (UG/TZ)
$USD per bunch (estimated averages)
(Conversion: 2,500 Ugandan Shillings = $1USD; 1,700 Tanzanian shillings = $1USD)

Farmgate prices as a percent of retail prices vary between countries and banana varieties
Matooke (UG): <20%
Matooke (TZ): ≈30%
Mshare (TZ): ≈50%
Value Chain Cost Economics for Matooke
UGX per bunch (estimated averages)
(Conversion: 2,500 Ugandan Shillings = $1USD)

**Value and Subsequent Value Chain Costs Account for Less Than Half of Total Price Markup**

**(ILLUSTRATIVE PURPOSES ONLY)**

- **Bicycle Traders**
  - Markup: 82%
  - Avg. Markup: 50-100%
  - Net margin: 40%

- **Brokers/Collectors**
  - Markup: 40%
  - Avg. Markup: 40%
  - Net margin: 21%

- **Wholesalers**
  - Markup: 57%
  - Avg. Markup: 60%
  - Net margin: 18%

- **Retailers**
  - Markup: 27%
  - Avg. Markup: 20-30%
  - Net margin: 16%

"Market Costs" include government levies, rental space (for traders and retailers), wastage from transportation or not selling, and any materials or other costs. Storage losses are estimated at 5% for retailers. Transportation losses are 3-6% for wholesalers/lorries.
# ADDRESSING CURRENT VALUE CHAIN CONSTRAINTS COULD IMPACT OVER 2 MILLION MATOOKE SHFS IN UGANDA AND TANZANIA

### Constraints

**Inputs**
- Low yields due to minimal adoption of key inputs: mulch, fertilizer and tissue culture
- Economics are constrained especially for SHFs far from markets

**Production**
- Crop mgmt. practices not widely disseminated and maintained
- Weeding, spacing, desuckering and disease mgmt. can raise yields
- 20-40% wastage from on-farm and transport losses

**Processing**
- Processors run at small volumes and are disconnected from SHFs
- Access to capital constrains growth
- Consistency of supply limits as well
- Aligning with consumer preferences

**Market**
- Unmet demand in the fresh market due to supply levels
- Processed goods are at small scale
- Exports are small with niche markets

### Total Farmer Impact

<table>
<thead>
<tr>
<th>+2 million</th>
<th>+1.5 million</th>
<th>+2.2 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>could benefit from increased use of inputs</td>
<td>could benefit from improved agronomic practices</td>
<td>could benefit from business assistance and improved access to markets</td>
</tr>
</tbody>
</table>

**Lack of organization of VC is key limiting factor, with poor inputs and farm practices further constraining**

**Opportunity to tackle these constraints through the proposed interventions**

---

Source: Context Network analysis

1 Based on 2.5 million banana SHFs for Uganda and Tanzania, 80% could use additional inputs training, 60% could benefit from production support, and 90% from marketing training and market linkages. [http://www.banana2008.com/cms/details/acta/879_94.pdf](http://www.banana2008.com/cms/details/acta/879_94.pdf)
FARMER INTERVENTIONS MUST CONSIDER APPLICABILITY OF INPUT ADOPTION BASED ON PROXIMITY TO MARKETS AND RESOURCES

Market Accessibility

- In Uganda, 70% of bananas come from over 200km away from Kampala (in SW).
- Most TC labs, processors and urban demand is in Kampala though.
- In Tanzania, roads are better, but it is still a 40+ hour drive (Kagera to Dar).
- The only commercial TC lab is located in Arusha, close to major production in Arusha and Kilimanjaro.

Production areas face a dual dilemma: sourcing inputs from distant markets, and transporting and selling to those same markets.
TARGET AREAS FOR INTERVENTIONS WILL OVERLAP, BUT PROXIMITY TO LABS CURRENTLY LIMITS TISSUE CULTURE PROFITABILITY

In Uganda, INT #1 (TC) will be centered around TC labs in Kampala and include major production hubs in Central region. INT #2 and #3 will extend to Southwest.

In Tanzania, INT #1 (TC) will focus on Arusha and Kilimanjaro regions and include Mshare. INT #2 and #3 will also encompass Kagera. Kigoma and Mbeya are possible inclusions.
constraints on matooke market map

**Pests and Diseases:** Plant susceptibility to pests and diseases reduces yields by over 50% in many cases.

**Layers of Middlemen:** Generally 3-5 players involved prior to retail level; complex chain raises prices.

**Storage / Transportation:** Perishability, bulk and poor conditions lead products to deteriorate at ambient temps and increase cost.

**Retail Credit:** Retailers often insist on personal credit arrangements with suppliers, later not paying in full.

**Price Takers:** Strong consumption and dependence on matooke across all markets makes buyers price takers.

**Disconnected Markets:** Exporters have not fully capitalized on the export potential of matooke. Need addl. supply/custs.

**Fresh Market Exports:** Small % of market; disconnected from SHFs; buy exclusively from larger, semi-commercial farms.

**Processing:** Inconsistent supply and use of different varieties often requires dedicated growers.

**Disconnected Markets:** Processors are not in main value chain; they are less than 10% of the market; mostly in cities.

**Traditional Systems:** Lack of knowledge and incentive to use soil and crop improvement practices.

**On-Farm Losses:** Perishability and lack of access to local markets causes loss of ripe bananas prior to sale.

**Price Takers:** Limited ability to wait (perishable product) and lack of access reduce ability to negotiate prices.
3 Interventions & Impact
PHASE 2 UGANDA / TANZANIA EAST AFRICAN HIGHLAND BANANA (EAHB) EXECUTIVE SUMMARY

1 SECTOR FUNDAMENTALS

- East African Highland Banana (EAHB) is the primary staple crop for over 13 million Ugandans (≈35% of the population), but less critical in Tanzania where 3.3 million (about 7% of the population) consume it as a staple.
- National production is estimated at 10-12M and 3M tons in UG and TZ, respectively.
- EAHB is grown by roughly 55% of SHFs (from 2-3 million smallholders) on 1.8 million Ha in Uganda. Total production area is only 440,000 Ha in Tanzania.

2 VALUE CHAIN OPPORTUNITIES

- Perishability and access to markets are major constraints for rural SHFs.
- 70% of cooking bananas are grown in the Southwest, hundreds of kilometers from Kampala. In between farm and terminal market, there are numerous players.
- Prices in terminal markets are often 5-8 times higher than farmgate due to high transportation costs, and the complexity of the intermediary value chain.
- Still, there are opportunities for increased efficiency in the supply chain.

3 INTERVENTIONS & IMPACT

- Interventions have been refined to focus on access to clean planting materials (tissue culture), business and technical assistance, and organization of farmer / trader groups.
- Farmer groups are essential to the success of any program or intervention.
- Effective uptake of tissue culture will necessitate training and outgrower nurseries.
- Business and technical assistance will also need to flow through the group structure.
- Other elements such as financing and market information systems can be linkages.

4 STAKEHOLDER PROFILES

- Each intervention has strong partner candidates, below are several examples for each proposed intervention:
  - Tissue Culture – AGT, BioCrops, Crop Bioscience and NsigoTech
  - Business and Technical Assistance – Bioversity, UDET, IITA, AMA
  - Farmer Groups – MBADIFA, BUCADEF, UDET, VEDCO, World Vision
Three high level intervention strategies have been validated through field research and ground truthing.

Key

1. Access to Clean Planting Materials

2. Business and Technical Assistance

3. Marketing Groups to Increase SHF Income

NOTE: Intervention #3 is highlighted more on this diagram since it is a market map. Other factors covered by INT #1 and #2 aren’t emphasized.
RECOMMENDED INTERVENTIONS FOCUS ON ORGANIZATION OF FARMERS AND TRADERS TO IMPROVE PRODUCTION AND LINK TO MARKETS

1. Clean Planting Material
   Promote the benefits of using tissue culture, develop outgrower nurseries to improve access and train on proper usage:
   - **Clean** – pest and disease free tissue culture plantlets
   - **Improved** – new varieties with higher yields and disease resistance along with traditional cultivars
   - **Scalable** – demand far exceeds current supply levels in Uganda

2. Business and Technical Assistance
   Sensitize and teach farmers improved agronomic practices as well as managing their farms as a business enterprise:
   - **Technical Extension and Support** – spacing, desuckering, disease control, and crop mgmt.
   - **Business and Financial Training** – record keeping, profit analysis, negotiation skills and market awareness

3. Farmer and Trader Marketing Groups
   Organize farmers into marketing groups that allow them to improve activities across the value chain:
   - **Production Training**
   - **Marketing** – training, group transport, link to buyers
   Organize traders into assns. in order to more efficiently and profitably interact with farmers in meeting fresh market demands
   - **Group Storage**
   - **Marketing** – link traders to Farmer Groups and processors

4. Key Linkages: A) Financial Support and B) Market Information Systems
   a) Loan guarantees for TC nurseries, farmer and trader groups, and processors
   b) Increase use of MIS systems, develop database to help link traders to farmers (i.e. Esoko)
INTERVENTIONS AIM TO MOVE SHF UP THE PYRAMID, INCREASING THEIR INCOMES BY MARKETING MORE BANANAS AT A BETTER PRICE

Continued organization of **business farmers** enables access to finance and access to better markets (such as export markets, institutions, and processors)
- Shift to consistent quantity and quality bunches, link to exporters, institutions and processors

Organization of **surplus farmers** enables significant yield increases from input use, access to markets, selling larger portion of production, and up to 60% price increases (selling wholesale)
- Shift to farming as a business, better yields and prices

Organization of **traditional farmers** allows for improved banana production via better practices and coordinated marketing efforts
- Training on agronomic practices to improve yields
TISSUE CULTURE PRESENTS THE MOST COST EFFECTIVE AND SCALABLE WAY OF MULTIPLYING AND DISSEMINATING CLEAN PLANTING MATERIAL

INTERVENTION #1: CLEAN PLANTING MATERIAL (TISSUE CULTURE)

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drastically Reduced Yields</td>
<td><strong>A. Tissue Culture:</strong> Mass multiplication of banana suckers from clean banana tissue (either mother gardens or gene banks).</td>
<td>Challenging landscape for scalable production/dissemination of clean planting materials:</td>
</tr>
<tr>
<td><strong>Driven by</strong></td>
<td><strong>B. Macro-Propagation:</strong> In-field method of cleaning disease and pest-ridden planting materials by paring and dipping in hot water. (NOTE: Due to cost, time and training constraints, not thought to be currently realistic at scale.)</td>
<td>- Facilities and Capacity</td>
</tr>
<tr>
<td>Pests:</td>
<td></td>
<td>- Affordability of Materials</td>
</tr>
<tr>
<td>• Nematodes (up to 30-50% yield reduction)</td>
<td></td>
<td>- Training for Labs, Nurseries and Farmers to Achieve Significant Improvement</td>
</tr>
<tr>
<td>• Weevils (up to 30-70% yield reduction)</td>
<td><strong>C. Mother Gardens:</strong> Test and identify clean planting materials for mother gardens. Disseminate to local farmers.</td>
<td></td>
</tr>
<tr>
<td>Diseases:</td>
<td></td>
<td><strong>Suggested Implementation:</strong></td>
</tr>
<tr>
<td>• Bacterial Wilt (up to 100% yield reduction)</td>
<td></td>
<td>TISSUE CULTURE provides the most cost effective and scalable alternative for multiplying and disseminating clean planting material. Other options are less scalable or inefficient (in terms of time and cost).</td>
</tr>
<tr>
<td>(NOTE: Uganda has a GMO variety that is BXW tolerant.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fusarium Wilt (up to 100% yield reduction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Black Sigatoka (30-50% yield reduction)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The variety has already been developed but as a result of parliamentary delays it has not been approved for release.
# INTERVENTION #1: CLEAN PLANTING MATERIAL (TISSUE CULTURE)

<table>
<thead>
<tr>
<th><strong>Key Intervention Elements</strong></th>
<th><strong>Potential Programs Formats</strong></th>
<th><strong>Size, Scalability &amp; Timing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Access to improved genetic material</td>
<td><strong>Local Nurseries</strong></td>
<td>Local Nurseries</td>
</tr>
<tr>
<td>• Facilities and equipment for multiplication (at capacity)</td>
<td>• TC labs set up local distrib. network</td>
<td>• One acre for 10,000 plantlet capacity</td>
</tr>
<tr>
<td>• Training for laboratory staff to achieve low plant mortality rates</td>
<td>• Labs must financially support, train and coordinate local efforts</td>
<td>• 6-9 months for setup</td>
</tr>
<tr>
<td>• System for distributing TC locally</td>
<td><strong>Farmer Multiplication</strong></td>
<td>• Limitations are TC supply, nursery operations, and farmer demand</td>
</tr>
<tr>
<td>• Establishment of local nurseries</td>
<td>• Identify lead farmers</td>
<td><strong>Farmer Multiplication</strong></td>
</tr>
<tr>
<td>• Training of nursery staff</td>
<td>• Provide TC to lead farmers for multiplication</td>
<td>• At least one year for training and demo plot creation</td>
</tr>
<tr>
<td>• Sensitization and training of nursery clients (SHFs)</td>
<td>• Train them how to sell clean TC suckers to local farmers</td>
<td>• Less costly than nurseries but lower outreach and scalability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Key Dependencies &amp; Risks</strong></th>
<th><strong>Gain to SHF (est.)</strong></th>
<th><strong>Potential Partners</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Farmer Demand</strong> – dual issues of affordability and understanding of value</td>
<td>• Guaranteed Clean (can result in 65%+ yield bump in a low input farm model)</td>
<td>• AGT – has 20 traditional varieties of matooke plantlets with a seasonal capacity of 700,000 (1.4M+ per year). Largest TC provider in East Africa.</td>
</tr>
<tr>
<td>• <strong>Nursery Management</strong> – bad practices can introduce diseases and pests or result in lost planting material</td>
<td>• Scalability (large # of plantlets available)</td>
<td>• <strong>Bio Crops</strong> – began in 2008, currently has six local matooke varieties and one hybrid. Capacity is 500,000 but currently only producing 100,000.</td>
</tr>
<tr>
<td>• <strong>Training</strong> – without proper plant mgmt. TC won’t produce desired results</td>
<td>• Improved Varieties (pest and disease-tolerant - improved varieties tolerant to Black Sigatoka and nematodes.)</td>
<td>• <strong>NsigoTech</strong> – the newest entrant to the TC market, their facilities are the least sophisticated and capacity is only about 140,000 annually.</td>
</tr>
<tr>
<td>• <strong>TRUST</strong> – farmers have been burned by fake inputs in the past, and accepting new players and methods takes time</td>
<td></td>
<td>• <strong>Crop Bioscience Solutions</strong> – only commercial TC provider in Tanzania. Producing 250,000 plantlets annually. Has both matooke and mchare varieties.</td>
</tr>
</tbody>
</table>
TRADITIONAL PRODUCTION METHODS DRAMATICALLY CONSTRAIN POTENTIAL SMALLHOLDER YIELDS

INTERVENTION #2: PROVISION OF TECHNICAL AND BUSINESS ASSISTANCE (BEST PRACTICES)

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Fertility: massive amounts of nutrients removed without replenishment</td>
<td>Technical Training:</td>
<td>Traditional production methods mine the soils and reduce potential yields dramatically.</td>
</tr>
<tr>
<td>Moisture Stress: lower yields from inadequate water supply</td>
<td>• Mulch, compost, manure, and fertilizer training</td>
<td>There is a clear need for improvement, but without market access, farmer motivation and incentives are low.</td>
</tr>
<tr>
<td>Pests and Diseases: can result in 100% loss</td>
<td>• Water harvesting and control techniques</td>
<td>To make these best practices scalable, organized farmer groups are the best conduit for training.</td>
</tr>
<tr>
<td>Poor Plant Mgmt.: sub-optimal land use planning</td>
<td>• Traditional pest and disease mgmt. techniques</td>
<td>Suggested Implementation:</td>
</tr>
<tr>
<td>Lack of Business-Oriented Approach to Banana Farming</td>
<td>• Agronomic best practices</td>
<td>BUSINESS &amp; TECHNICAL SUPPORT are necessary to raise production levels, meet existing market demand and improve SHF incomes. Groups are the best training platform.</td>
</tr>
<tr>
<td></td>
<td>Business Training:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Farming for Profit (expand food security focus to cash crop mindset)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Record Keeping (to track cost benefit of improved practices and inputs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Negotiation (input purchasing and sale of goods downstream)</td>
<td></td>
</tr>
</tbody>
</table>
### INTERVENTION #2: PROVISION OF TECHNICAL AND BUSINESS ASSISTANCE (BEST PRACTICES)

<table>
<thead>
<tr>
<th>Key Intervention Elements</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct Training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify key areas for training impact</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hold meetings on best practices and on-farm follow-up</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lead Farmers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify lead farmers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Train them and monitor their training of others via their demo plots</td>
<td></td>
</tr>
<tr>
<td>Radio Programs and Extension Messaging</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Key Dependencies & Risks

- **Training Methodology**: engagement strategy and customized to meet the needs of specific groups
- **Quality of Trainers**: trainers must be proficient in techniques for properly explaining new practices
- **Trust**: confidence building is key to successful uptake of new methods
- **Time**: disbelief and superstition play a huge role in diminishing uptake; giving time to see the benefits (i.e. demo plots) is a must

#### Gain to SHF (est.)

- **Improved Yields**: will result in 100%+ yield bump relative to baseline
- **Sustainability**: land resource base will remain fertile for much longer when properly managed
- **Increased Profits**: increased marketable surplus sold at better negotiated prices

#### Potential Partners

- **IITA (UG)** – primary resource for EAHB best practices and tissue culture nursery management training
- **Bioversity (UG)** – has well-developed pest and disease mgmt. strategies; also has run several farmer programs
- **NARO (UG)** – national research resource developing new hybrid varieties with resistance/tolerance
- **AMA (UG)** – consulting firm that specializes in business development training as well as M&amp;E
- **Kolping (TZ)** – excellent platform for farmer groups; TC-supported production; best practices training
- **Horta Tengeru (TZ)** – research center that runs local mchare efforts and disease programs
SERVING UNMET DEMAND REQUIRES MORE EFFICIENT LINKAGES BETWEEN FARMERS AND TRADERS

INTERVENTION #3: LINKING FARMERS TO MARKETS (FARMER AND TRADER GROUPS)

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
</table>
| **Production**: without improved yields, marketable surplus and quality of bunches will be undesirable for traders | **Organize Farmer Groups**:  
  - Collective Input Purchasing  
  - Market Information Systems  
  - Collective Marketing  
  - Village Savings and Loan Associations (VSLAs)  
  - Linkages to Financial Solutions (SACCOs / Banks) | Even with significant yield improvement and business practices, logistical hurdles remain.  
Access to markets is largely dependent on:  
- Proximity  
- Infrastructure  
- Transportation  

**Organize Trader Groups**:  
- Profile traders, overlay geographically, and link to farmers, processors and export markets  
- Create real time fulfillment database (see Esoko model)  
- Link to financing for group storage at collection points |

Suggested Implementation:  
**FARMER & TRADER GROUPS** are the necessary platforms for improving market efficiency through linkages and training.
# INTERVENTION #3: LINKING FARMERS TO MARKETS (FARMER AND TRADER GROUPS)

## Key Intervention Elements

<table>
<thead>
<tr>
<th>Farmer Groups</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leverage existing group networks and advertise to build new groups</td>
<td>• Enabling Rural Innovation (ERI) model developed CIAT, used by TRIAS</td>
<td>Farmer Groups</td>
</tr>
<tr>
<td>• Select groups within particular segmentation profiles</td>
<td>• World Vision model – lead farmer in charge of forming 30 person group</td>
<td>• BUGADEF: &gt;1M farmers; central region</td>
</tr>
<tr>
<td>• Cater programs to group type and capability level</td>
<td>• Direct group formation through ad response and homogenization</td>
<td>• TNS: 25,000 farmers; spread out</td>
</tr>
<tr>
<td>• Institute group processes (i.e. board members, VSLAs, etc.)</td>
<td>• VEDCO model – profile traders, group according to key attributes and align with geographic farmer areas</td>
<td>• MBADIFA: 19,000 farmers; SW region</td>
</tr>
<tr>
<td>• Begin training (i.e. group leadership, democracy, financial literacy, gender issues, etc.)</td>
<td></td>
<td>• Kolping: 5,000 farmers; Kagera (TZ)</td>
</tr>
</tbody>
</table>

## Key Dependencies & Risks

| Management: recordkeeping, leadership, and hierarchy |
| Engagement: continued motivation to participate and implement practices |
| Cohesiveness: acting as a group (i.e. no side-selling, honoring contracts) |
| Finances: financial literacy, access to loans, managing savings, etc. |
| Accountability: ensuring individual contribution to collective benefits (i.e. savings, bulk purchases, loan repayments, etc.) |

## Potential Programs Formats

| Farmer Groups |
| Trader Groups |

## Gain to SHF (est.)

| Access to Training (yield improvements through reliable inputs and methods) |
| Consistent Market (linking traders and farmers to create predictable supply) |
| Better Prices (bigger bunches and collective marketing drive higher farmgate prices) |

## Potential Partners

| TRIAS: international NGO, ran 6-year program in Mbarara with the MBADIFA farmers group |
| TNS: international NGO, ran a 5-year program with 25K matooke farmers from 2005-2009 |
| BUGADEF: development arm of the Buganda kingdom which encompasses the entire central region (1M+ SHF) |
| MBADIFA: farmer association in SW Uganda with 19,000 members, 762 groups, established in 1994 |
| Kolping: German religious association running farmer group project in Kagera, Tanzania (5,000+ members) |
MARKETING GROUPS PROVIDE SEVERAL OPPORTUNITIES FOR DRIVING REAL EFFICIENCIES IN THE VALUE CHAIN

Small Village Farmer Group
Traditional Farming System; Low Yields
(Group Members: n = 8-12)

Description
• Early stage farmer group improvement
• Low level aggregation at the village
• Identification of usual traders
• Proactive communication to coordinate sale of bunches (via mobile phones)
• No set prices
• Seller power still low

Benefits
• Higher # of trader visits
• Improved control of timing of sale
• Relationship development with traders
• Able to sell more bunches even at a low price (reduces on-farm wastage)

Mid-Size Farmer Group
Low-Input Farming System; Improved Yields
(Group Members: n = 20-30)

Description
• More established farmers group
• Some input usage and improved practices
• Higher yields and larger bunches
• Intervention assistance to link to wholesalers, supply organizers or companies to farmers
• Short-term, renewable contracts to build trust
• Negotiated pricing at contract rates
• Opportunity for improved price for both parties

Benefits
• Larger volume sales
• Better prices (60%+)$\textsuperscript{1}
• Contract-based sales (improved predictability and consistency)
• (Buyers) fewer points of supply = less transport cost; don't have to deal with MM/traders

---

$\textsuperscript{1}$ Example: Kaiba Matooke Farmers Group (MBADIFA) was linked to buyer, began with verbal agreement, after about a year formed a business contract (price, quality, frequency and terms of payment) with renewable three month duration. Increased price over 40% in first year.
FARMER GROUPS IN THE TRIAS PROGRAM IN MBARARA EXPERIENCED AN OVER 500% PRICE INCREASE AS A RESULT OF INTERVENTIONS

Results of TRIAS Matooke Program in Mbarara
TRIAS Matooke Marketing Groups and Return on Farmer Investment from Improved Practices and Linkages to Markets

(number of groups included in results = 16)

<table>
<thead>
<tr>
<th></th>
<th>BEFORE</th>
<th>AFTER</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Price per Bunch</td>
<td>1,925 UGS</td>
<td>9,969 UGS</td>
<td>518%²</td>
</tr>
<tr>
<td>Return per Bunch¹</td>
<td>$0.77</td>
<td>$3.99</td>
<td>518%²</td>
</tr>
</tbody>
</table>

average results of all 16 groups, before and after the program

Group Demographics

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># of Members</td>
<td>29</td>
<td>2008</td>
<td>6 years</td>
</tr>
</tbody>
</table>

Prices increased as a result of rising bunch weights and improved linkages to downstream buyers. Bunch weights are estimated to have risen from 10kg to 35kg (350%). This implies that improved quality, organized volumes, and better relationships with players further down the value chain resulted in a 168% increase.

¹ Converted from UGS to USD at conversion rates of 2,500 UGS = 1 USD
² Increase reflects effect of bunch weight increase and improved downstream linkages with buyers.
## Detailed Pricing Results from Some of the TRIAS Groups

Price increases reflect both bunch weight growth as well as improved linkages to downstream buyers. TRIAS helped identify and organize contract purchasing from collectors, wholesalers and even companies. Both parties then benefit from eliminating intermediary players and can enjoy improved pricing. **As farmers become more sophisticated it provides opportunities for larger value chain players to vertically integrate their sourcing.**

<table>
<thead>
<tr>
<th>GROUP NAME</th>
<th>LOCATION</th>
<th># FARMERS</th>
<th>START YEAR</th>
<th># YEARS AS GROUP</th>
<th>PRICE/BUNCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Kigaaga Farmers’ Cooperative</td>
<td>Mwizi</td>
<td>46</td>
<td>2006</td>
<td>8</td>
<td>3,000 - 12,000</td>
</tr>
<tr>
<td>2 Kitookye Mateoke</td>
<td>Rwanyamahembe</td>
<td>25</td>
<td>2005</td>
<td>9</td>
<td>2,000 - 12,000</td>
</tr>
<tr>
<td>3 Rwenshonzi Farmers ’Group</td>
<td>Rwanyamahembe</td>
<td>21</td>
<td>2006</td>
<td>8</td>
<td>3,000 - 12,000</td>
</tr>
<tr>
<td>4 Rwatukwire Development Association</td>
<td>Bubaare</td>
<td>13</td>
<td>2007</td>
<td>7</td>
<td>2,500 - 8,500</td>
</tr>
<tr>
<td>5 Rwamuhigi Farmers Group</td>
<td>Rubindi</td>
<td>20</td>
<td>2008</td>
<td>6</td>
<td>1,800 - 8,000</td>
</tr>
<tr>
<td>6 Rutuoma Parish Farmers Multipurpose Coop</td>
<td>Rwanyamahembe</td>
<td>38</td>
<td>2005</td>
<td>9</td>
<td>2,000 - 12,000</td>
</tr>
<tr>
<td>7 Orupea</td>
<td>Rwanyamahembe</td>
<td>130</td>
<td>2006</td>
<td>8</td>
<td>1,000 - 9,000</td>
</tr>
<tr>
<td>8 Kyantamba Tukwatanise</td>
<td>Bubaare</td>
<td>13</td>
<td>2009</td>
<td>5</td>
<td>1,500 - 10,000</td>
</tr>
<tr>
<td>9 Rugarama Farmer Field School</td>
<td>Bubaare</td>
<td>19</td>
<td>2010</td>
<td>4</td>
<td>1,500 - 12,000</td>
</tr>
<tr>
<td>10 Runengo Farmers group</td>
<td>Rwanyamahembe</td>
<td>16</td>
<td>2007</td>
<td>7</td>
<td>1,500 - 12,000</td>
</tr>
<tr>
<td>11 Katyazo Local Chicken Farmers</td>
<td>Rwanyamahembe</td>
<td>19</td>
<td>2008</td>
<td>6</td>
<td>1,500 - 8,500</td>
</tr>
<tr>
<td>12 Nyamiyaga Matooke Grower Group</td>
<td>Nyakayojo</td>
<td>30</td>
<td>2010</td>
<td>4</td>
<td>2,000 - 10,000</td>
</tr>
<tr>
<td>13 Kitooma Banana</td>
<td>Nyakayojo</td>
<td>12</td>
<td>2006</td>
<td>8</td>
<td>2,000 - 8,000</td>
</tr>
<tr>
<td>14 Bugashe Farmers Group</td>
<td>Nyakayojo</td>
<td>18</td>
<td>2008</td>
<td>6</td>
<td>2,000 - 8,000</td>
</tr>
<tr>
<td>15 Nyamitooma Farmers Group</td>
<td>Bubaare</td>
<td>26</td>
<td>2011</td>
<td>3</td>
<td>2,000 - 7,500</td>
</tr>
<tr>
<td>16 Rukandagye Group</td>
<td>Bugamba</td>
<td>18</td>
<td>2010</td>
<td>4</td>
<td>1,500 - 10,000</td>
</tr>
</tbody>
</table>

1 Performance results from the MBADIFA program coordinated by TRIAS; provided by Mr. Julius Barigye – Agro-Enterprise Development Advisor.
**POTENTIAL FARMER MARGIN IMPACT OF BANANA INTERVENTIONS AT FULL ADOPTION, REPRESENT ~1500% INCREASE, IF ALL PRODUCTION IS SOLD**

Banana Production Revenue Added  
*(assumes yield scenarios from AMA are feasible)*  
$USD/ha

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Yield Gain</th>
<th>Price Gain</th>
<th>Loss Improvement</th>
<th>Future Farmer Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>215</td>
<td>141</td>
<td></td>
<td>3309</td>
</tr>
<tr>
<td>#2</td>
<td>868</td>
<td>413</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>528</td>
<td>904</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Intervention #1**: Improve yields through better crop mgmt. practices and prices by growing larger bunches.
- **Intervention #2**: Increase yields from usage of clean planting materials.
- **Intervention #3**: Improve yields through group input purchases and better training.

Improved price from larger bunch sizes, more negotiating power, collective marketing and business training.

At full adoption the interventions would increase farmer margin over 1500%
INTERVENTION #1 IS PERCEIVED TO BE THE MOST RISKY DUE TO NON-ADOPTION (PERCEIVED COST) AND PARTNER RISK (OUTGROWER NURSERIES)

<table>
<thead>
<tr>
<th>RISK ASSESSMENT</th>
<th>Int #1: Clean Planting Material</th>
<th>Int #2: Business and Technical Assistance</th>
<th>Int #3: Farmer and Trader Marketing Groups</th>
<th>Int #4: Key Linkages – MIS and Access to Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>Complexity, Execution, Un-tested, Scale</td>
<td>Med.</td>
<td>High</td>
<td>Med.</td>
</tr>
<tr>
<td>Non-Adoption</td>
<td>Cultural, Conservatism, Lack of Perceived Benefit</td>
<td>High</td>
<td>High</td>
<td>Med.</td>
</tr>
<tr>
<td>Partner Risk</td>
<td>Compatibility, Management Experience</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Overall Risk</td>
<td>High</td>
<td>Med.</td>
<td>Med.</td>
<td>Low</td>
</tr>
</tbody>
</table>

QUALITATIVE FOUNDATION PRIORITIES

- Gender equality benefits: ✓
  - Group Awareness Building
- Environmental sustainability
  - Disease Resistance: ✓
  - Soil Management: ✓
- Health
  - Quality Prod.; Improved Nutrition: ✓
  - Quality Prod.; Improved Nutrition: ✓
  - More Income = More Balanced Diet: ✓

✓ Enables qualitative foundation priorities
### Number of target SHFs for interventions:

| Benefit per farmer from Int. #1: | $106 | 250,000 |
| Benefit per farmer from Int. #2: | $643 | 100,000 |
| Benefit per farmer from Int. #3: | $767 | 50,000 |

| Net benefit per farmer per annum | $1,516 |

**Aggregate SHF benefit per annum**

$130 MM

**Assumptions of Context Network Analysis:**
- 0.75 ha of banana grown per farmer
- $215 farm gate sale price
- INT #1 – 100% of yield gain captured
- INT #2 – 75% of yield gain achieved and 50% price gain realized
- INT #3 – 40% of incremental yield gain achieved and 80% price gain realized
Stakeholder Profiles
Executive Summary

- East African Highland Banana (EAHB) is the primary staple crop for over 13 million Ugandans (≈35% of the population), but less critical in Tanzania where 3.3 million (about 7% of the population) consume it as a staple.
- National production is estimated at 10-12M and 3M tons in UG and TZ, respectively.
- EAHB is grown by roughly 55% of SHFs (from 2-3 million smallholders) on 1.8 million Ha in Uganda. Total production area is only 440,000 Ha in Tanzania.

- Perishability and access to markets are major constraints for rural SHFs.
- 70% of cooking bananas are grown in the Southwest, hundreds of kilometers from Kampala. In between farm and terminal market, there are numerous players.
- Prices in terminal markets are often 5-8 times higher than farmgate due to high transportation costs, and the complexity of the intermediary value chain.
- Still, there are opportunities for increased efficiency in the supply chain.

- Interventions have been refined to focus on access to clean planting materials (tissue culture), business and technical assistance, and organization of farmer / trader groups.
- Farmer groups are essential to the success of any program or intervention.
- Effective uptake of tissue culture will necessitate training and outgrower nurseries.
- Business and technical assistance will also need to flow through the group structure.
- Other elements such as financing and market information systems can be linkages.

- Each intervention has strong partner candidates, below are several examples for each proposed intervention:
  - Tissue Culture – AGT, BioCrops, Crop Bioscience and NsigoTech
  - Business and Technical Assistance – Bioversity, UDET, IITA, AMA
  - Farmer Groups – MBADIFA, BUCADEF, UDET, VEDCO, World Vision
Based on proposed interventions and identified partners, we envision the following program partner hierarchy.

NOTE: Since tissue culture will be one of the agricultural practices disseminated in the program, these sections will be highly interrelated and administered by the same sub-apex organizations.

Provider of Business and Technical Best Practices

Training Subcontractor

TC Labs (Uganda)

TC Labs (Tanzania)

Organizations for Forming Groups

Large Existing Groups
STRONG INTERVENTION PARTNERS HAVE BEEN IDENTIFIED; FURTHER VETTING NEEDED TO IDENTIFY APEX CANDIDATES

APEX

UDET is one potential apex partner. Further research will need to be conducted to identify and vet appropriate apex partners.

SUB-APEX

TISSUE CULTURE

BEST PRACTICES

FARMER GROUPS

IITA:
Good fit for INT #1 and #2 based on their experience in tissue culture nursery management, research on agronomic best practices, and development of training literature.

1) AGT – Largest commercial TC company in UG; capacity of 1 million plantlets a year
2) BioCrops – Second biggest TC company in Uganda, capacity of 500,000 a year
3) Nsigo Tech – Newest entrant to the TC sector (UG); about 100,000 in capacity
4) Crop Bioscience Solutions – the only commercial TC lab in Tanzania; 250,000/year

1) IITA – nursery management & training, best practices
2) Bioversity – pest & disease management
3) AMA – M&E and business development
4) Kolping – TZ platform for marketing groups, TC support and best practices
5) NARO – improved varieties
6) Horta Tengeru – improved varieties

UDET:
Mandate to provide technical assistance to CBOs and SMEs in Uganda. Partners with USADF and AGRA.

1) BUCADF – Central region farmers (over a million SHFs)
2) TRIAS – Ran program in the Southwest with MBADIFA (19,000 farmers for 6 years)
3) TNS – ran a program working with 25,000 farmers for 5yrs
4) Kolping – ongoing farmer organization and improvement program in Tanzania (5,000 SHFs)
IN UGANDA, THERE IS A ROBUST SELECTION OF STRONG CANDIDATES FOR VALUE CHAIN INTERVENTIONS

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Tissue Culture</th>
<th>Best Practices</th>
<th>Farmer Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>IITA</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Bioversity</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>UDET</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>AGT</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>BioCrops</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Agribusiness Mgmt. Associates</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>NARO</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>TRIAS</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>TNS</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>BUGADEF</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>MBADIFA</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: Context Network interviews
IN TANZANIA, A SMALLER CADRE OF POTENTIAL PARTNERS ALIGNED WITH THE PRIMARY PRODUCING REGIONS EMERGE

<table>
<thead>
<tr>
<th>Stakeholder Profile</th>
<th>Intervention #1</th>
<th>Intervention #2</th>
<th>Intervention #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrators</td>
<td>IITA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tissue Culture Solutions</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Best Practices</td>
<td>Agricultural Research Institute (Kagera)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Horta Tengeru (Arusha)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Farmer Groups</td>
<td>Kolping</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Mgenzi Byabachwezi¹</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: Context Network Interviews

¹Dr. Byabachwezi is currently the international coordinator for bananas in Tanzania, and works closely with IITA currently. Currently works for ARI Kagera.

All Kolping “families” (farmer groups) currently use tissue culture suckers.
### INTERVENTIONS #1 (TISSUE CULTURE) AND #2 (BEST PRACTICES¹) HAVE STRONG POTENTIAL PARTNERS

<table>
<thead>
<tr>
<th>Target Intervention</th>
<th>Leadership / Management</th>
<th>Ability to Scale</th>
<th>Financial Sustainability</th>
<th>Existing Traction</th>
<th>Related Experience</th>
<th>Overall Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IITA²</td>
<td>Strong</td>
<td>---</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>Bioversity²</td>
<td>Medium</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>AGT</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>BioCrops</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Crop Bioscience</td>
<td>Strong</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>NsigoTech</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>LOW</td>
</tr>
<tr>
<td>Agribusiness Mgmt. Assoc.</td>
<td>Medium</td>
<td>---</td>
<td>---</td>
<td>Strong</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NARO</td>
<td>Best Practices</td>
<td>Medium</td>
<td>Strong</td>
<td>(Gov’t.)</td>
<td>Medium</td>
<td>STRONG</td>
</tr>
<tr>
<td>Agri. Research Inst. (Kagera)</td>
<td>Best Practices</td>
<td>Strong</td>
<td>Medium</td>
<td>(Gov’t.)</td>
<td>Medium</td>
<td>Strong</td>
</tr>
<tr>
<td>Horta Tengeru (Arusha)</td>
<td>Best Practices</td>
<td>Medium</td>
<td>Low</td>
<td>(Gov’t.)</td>
<td>Low</td>
<td>Medium</td>
</tr>
</tbody>
</table>

¹ Business and technical support and assistance – to include agronomic best practices training and business development support services.
² Will act as sub-apex intervention administrators for tissue culture and best practices interventions (#1 and 2).
POTENTIAL PARTNERS FOR INTERVENTION #3 (FARMER GROUPS) HAVE EXPERIENCE FORMING GROUPS OR MANAGE LARGE REGIONAL GROUPS

<table>
<thead>
<tr>
<th>Organizations and NGOs</th>
<th>Target Intervention</th>
<th>Leadership / Management</th>
<th>Ability to Scale</th>
<th>Financial Sustainability</th>
<th>Existing Traction</th>
<th>Related Experience</th>
<th>Overall Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDET¹</td>
<td>Farmer Groups</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>Medium</td>
<td>STRONG</td>
</tr>
<tr>
<td>TRIAS</td>
<td>Farmer Groups</td>
<td>Medium</td>
<td>Medium</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>TNS</td>
<td>Farmer Groups</td>
<td>Strong</td>
<td>Medium</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>World Vision</td>
<td>Farmer Groups</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>LOW</td>
</tr>
<tr>
<td>VEDCO</td>
<td>Farmer Groups</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>LOW</td>
</tr>
<tr>
<td>BUGADEF</td>
<td>Farmer Groups</td>
<td>Strong</td>
<td>Strong</td>
<td>(Gov’t.)</td>
<td>Strong</td>
<td>Low</td>
<td>STRONG</td>
</tr>
<tr>
<td>MBADIFA</td>
<td>Farmer Groups</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Strong</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Kolping</td>
<td>Farmer Groups</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
</tbody>
</table>

¹ Will act as sub-apex intervention administrators for farmer group intervention (#3).
# Stakeholder Profiles

## Potential Implementation Partners for Interventions in Both Uganda and Tanzania

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International Institute for Tropical Agriculture (IITA)</strong></td>
<td>IITA has seven (7) years of experience with tissue culture nurseries and turning them into viable businesses that also functioned as knowledge/training center for farmers. IITA can help in setting up, monitoring, evaluating and improving TC nursery and farmer marketing models as they progress. IITA has already developed training materials.</td>
</tr>
<tr>
<td><strong>Bioversity International</strong></td>
<td>Bioversity is one of 15 agricultural centers supported by CGIAR. They manage and coordinate several banana networks including BARNESA, Innovate Plantain and Pro-Musa. They have extensive knowledge on pests and disease control as well as agronomics best practices for bananas.</td>
</tr>
<tr>
<td><strong>Ugandan Development Trust (UDET)</strong></td>
<td>UDET is a Fund Manager for the United States African Development Foundation (USADF). UDET is mandated to provide technical assistance to any community based organizations and small and medium enterprises (SMEs) operating in Uganda, particularly those that are supported by USADF and Alliance For Green Agricultural Revolution in Africa (AGRA).</td>
</tr>
<tr>
<td><strong>Agro Genetics Technology (AGT)</strong></td>
<td>Established in 2001, AGT has the first private TC company in Uganda. Largest single producer of matooke TC in East and Central Africa: About 1 million matooke plantlets annually. Demand for 10 million annually. Currently has 27 TC centers and plans to reformat his network to provide TC nurseries in 15 districts (farmer group and private sector-owned) Currently exporting fresh, peeled, vacuum-sealed matooke.</td>
</tr>
<tr>
<td><strong>BioCrops</strong></td>
<td>BioCrops, established in 2005, produces TC for matooke and other crops. Current capacity is 1 million annually. Dr. Geoffrey Arinaitwe, Managing Director, proposes to established 12 TC nurseries in Uganda and Tanzania in collaboration with private sector partners.</td>
</tr>
<tr>
<td><strong>Agribusiness Management Associates</strong></td>
<td>Established in 2003, AMA provides business development services for small holders and farmer organizations. Conducts market research and investment feasibility analysis. Founder has fifteen (15) years of experience in plantain/banana value chains.</td>
</tr>
<tr>
<td><strong>The National Agricultural Research Organization (NARO)</strong></td>
<td>The National Agricultural Research Organization is the apex body for guidance and coordination of all agricultural research activities in the national agricultural research system in Uganda. Founded in 2005, it has developed several new varieties of EAHB that are resistant/tolerant to various diseases.</td>
</tr>
<tr>
<td><strong>TRIAS</strong></td>
<td>TRIIAS is a Belgian NGO that ran a program from 2006-2012 to develop the EAHB (matooke) value chain in Mbarara. They worked with MBADIFA and Ebo SACCO, as well as other local partners, to form farmer groups, improve farming practices and raise farmgate prices through collective marketing.</td>
</tr>
</tbody>
</table>
## POTENTIAL IMPLEMENTATION PARTNERS FOR INTERVENTIONS IN BOTH UGANDA AND TANZANIA

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TechnoServe</td>
<td>Technoserve’s Uganda matooke program started in 2005 and includes more than 17,000 farmers.</td>
</tr>
<tr>
<td>BUGADEF</td>
<td>BUGADEF is the government development arm of the Buganda kingdom. They are in charge of over 1,000,000 farmers in the Central region of Uganda. The new director has chosen to focus on improving the Central region by rolling out a coffee and banana intercropping initiative.</td>
</tr>
<tr>
<td>MBADIFA</td>
<td>The Mbarara farmers association has 19,000 members currently, though membership fluctuates. They worked with TRIAS to develop farmers groups and improve yields and prices through better practices, collective marketing and access to finance. They are looking to continue this progress and growth.</td>
</tr>
<tr>
<td>Crop Bioscience Solutions</td>
<td>Founded in 2011 (opened for business in 2012), CBS is the first commercial tissue culture provider in Tanzania. He currently sells matooke and mshare varieties. Volume is at 250,000 plantlets per year which are mostly bought by NGOs and government programs who distribute them to farmers.</td>
</tr>
<tr>
<td>Agricultural Research Inst. (Kagera)</td>
<td>ARI Kagera is an important research center for the booming banana industry in the Kagera region. They were formerly partnered with the Kolping initiative and have conducted extensive research on tissue culture, EAHB production, and best agronomic practices.</td>
</tr>
<tr>
<td>Horta Tengeru (Arusha)</td>
<td>Horta Tengeru is also conducting disease impact studies with a particular focus on BXW, and has tissue culture development initiatives as well as a new EAHB variety development program.</td>
</tr>
<tr>
<td>Kolping</td>
<td>Kolping International has run a highly successful banana value chain program. Their Kolping “families” are still operating and growing well. They used an interesting model that combined farmer groups with training, tissue culture, livestock assistance and marketing initiatives.</td>
</tr>
<tr>
<td>Dr. Mgenzi Byabachwezi</td>
<td>Mgenzi is responsible for international coordination of banana research efforts with Tanzania. He plays an important role within the EAHB research community in Tanzania and holds a staff position at the Maruka Research Station in Bukoba.</td>
</tr>
</tbody>
</table>
Appendix
APPENDIX 1 – CONTACTS (OVERVIEW)

TOTAL Contact Count = 103 Interviews
APPENDIX 2a – CONTACTS

COMPLETED DESK STUDY INTERVIEWS

Phase I


2. Dr. Piet van Asten, IITA/Agronomist. IITA has 7 year of experience with tissue culture nurseries and turning them into viable businesses that also functioned as knowledge/training center for farmers. IITA can help in setting up, monitoring, evaluating and improving TC nursery and farmer marketing models as they progress. IITA has available training materials.

3. Technoserve/Uganda matooke program started in 2005 and includes more than 17,000 farmers.

4. Mr. Stephen New, Chief of Party (Kenya), KAVES – 10 years experience with matooke in Uganda

5. Excel Hort Consult, established in 1999, specializes in agribusiness and agro-industry value chain development and trade in East and Central Africa. Associate company branches in other East African countries. Dr. Andrew Aninomugisha, CEO, interested in expanding his exports of (1) fresh, peeled vacuum-sealed matooke (current exports of 50 MT annually to US and UK, and (2) matooke juice (current exports of 1,200 liters/day to Rwanda and Kenya), and (3) provision of TC suckers and training on improved agronomic practices to TC clients.

6. Ms. Harriet Nantale, Owner, Paper Crafts Africa
APPENDIX 2b – CONTACTS

COMPLETED IN-COUNTRY INTERVIEWS

Phase I

1. Fresh Logistics has own cold storage and processing facilities, refrigerated trucks, pack houses and laboratories. James Ssemwanga, Owner, interested in establishing 6 rural-based facilities for fresh, peeled, vacuum-sealed matooke. PhD thesis in UK on matooke.

2. AfriBanana Products trains entrepreneurs in 6 matooke enterprises: tissue culture nurseries, vacuum-sealed products, juice/wine, animal feed, charcoal briquettes and fiber products.

3. AgroGenetics Technology (AGT), established in 2001, has the first private TC company in Uganda. Largest single producer of matooke TC in East and Central Africa: 1.5 to 2 million matooke plantlets annually. Capacity for 10 million annually. Currently has 27 TC centers and plans to reformat his network to provide TC nurseries in 15 districts (farmer group and private sector-owned) Currently exports 25 MT of fresh, peeled, vacuum-sealed matooke to Canada and The Netherlands.


5. Mr. John Adriko, Owner, Variety Plus

6. BioCrops, established in 2005, produces TC for matooke and other crops. Current capacity is 1 million annually. Dr. Geoffrey Arinaitwe, Managing Director, proposes to established 12 TC nurseries in Uganda and Tanzania in collaboration with private sector partners.

7. Mr. Ishak K. Lukenge, Owner, Kampala Domestic Store

For further detail on interview contacts, please refer to the complete contact list in excel.
APPENDIX 3 – INTERVENTION IMPACT ASSUMPTIONS ARE BUILT USING FARMER SEGMENT ECONOMICS

**Intervention #1 Assumptions:**
- TC increases yields from base level of 5.5 T/Ha to 9.1 T/Ha
- Additional income reflects the higher yield levels applied to gross margins of traditional level prices per ton.

**Intervention #2 Assumptions:**
- TC, additional inputs and improved practices increase yields to 31 T/Ha
- “**Yield Gain**” income reflects the higher yield levels applied to gross margins of low input level prices per ton.
- Average price also increases as a result of improved bunch weights and better marketing.
- Low Input average prices are 15% higher than Traditional level pricing.
- “**Price Gain**” reflects this increase.

**Intervention #3 Assumptions:**
- TC, high input levels and improved practices increase yields to 60+ T/Ha
- “**Yield Gain**” income reflects the higher yield levels applied to gross margins of high input level prices per ton.
- Average price also increases as a result of improved bunch weights, consistent supply and collective marketing.
- High Input average prices are 8% higher than Low Input level pricing, and 25% higher than traditional level pricing.
- “**Price Gain**” reflects this increase.
- Another benefit of improved collective marketing is a loss improvement.
- As groups become better linked to markets and organize more consistent demand for themselves (either by contracting to larger customer, or arranging group transport), on-farm wastage is reduced by about 8%.
- “**Loss Improvement**” reflects this drop.

NOTE: refer to Slide 47 (Farmer Income Economics) for farmer segment economics.
FCI’s four year $6 million proposal for sweet potatoes and bananas in Uganda, Tanzania and Ethiopia includes a focus on 24,500 banana households in Uganda and 15,000 households in Tanzania. Their overall program includes 100,000 households, 500 commercial villages and 300 private sector entities.

“SeFaMaCo” Model

Seed-Farmer-Market-Consumer (SeFaMaCo) is based on principle that seed systems and consumer market do not function in isolation rather their interdependence is reflected in the value chain interactions and participation.

Areas of commonality with Context:

• FCI’s identification of constraints (for seeds, farmers and markets) are similar to Context’s findings.
• Need to increase SHF competitiveness and strengthen farmer organizations
• Establish commercial seed enterprises.
• We propose training in improved agronomic practices to increase the likelihood of continuing high yields in the second generation from CPM.
• High impact regions for target interventions also largely overlap.

Areas where FCI does not overlap:

• FCI’s approach includes SHF commercialization – “entire village collective action”, whereas ours is oriented toward marketing groups.
• Forming farmers into marketing groups for fresh market will not necessarily include the entire village, but rather be self-selecting.
• Business and market partnerships with private sector (processors).
• Demand creation and expanded consumer markets.
Backup or Alternate Slides
(Value Chain)
MATOOKE MARKET MAP (PHASE 1)

Uganda/Tanzania Cooking Banana Subsector Map
Expressed as percentage of total production

Source: Context Network analysis based directly on value chain interviews.
Production cost economics for matooke

$USD per Hectare

(Conversion: 2,500 Ugandan Shillings = $1USD)

High Input Farmer Example

Mbarara District Farmer with Seven Acres of Land

Mulching cost was overstated in this example since it was included in startup cost, this will be prorated over the course of three (3) years.
Production cost economics for matooke
UGX (shillings) per Acre
(Conversion: 2,500 Ugandan Shillings = $1USD)

Regional Farmer Type Examples
Based on field research with farmers in the Sheema and Isingiro districts; conducted by AMA

<table>
<thead>
<tr>
<th></th>
<th>Total Input Cost</th>
<th>Total Labor Costs</th>
<th>Total Variable Costs</th>
<th>Total Revenue</th>
<th>Gross Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheema</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Input</td>
<td>$910</td>
<td>$745</td>
<td>$1,655</td>
<td>$2,706</td>
<td>$1,051</td>
</tr>
<tr>
<td>Low Input</td>
<td>$170</td>
<td>$438</td>
<td>$608</td>
<td>$1,295</td>
<td>$687</td>
</tr>
<tr>
<td>Traditional</td>
<td>$10</td>
<td>$104</td>
<td>$114</td>
<td>$340</td>
<td>$226</td>
</tr>
<tr>
<td>Isingiro</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Input</td>
<td>$790</td>
<td>$589</td>
<td>$1,379</td>
<td>$3,007</td>
<td>$1,628</td>
</tr>
<tr>
<td>Low Input</td>
<td>$99</td>
<td>$277</td>
<td>$376</td>
<td>$1,221</td>
<td>$845</td>
</tr>
<tr>
<td>Traditional</td>
<td>$18</td>
<td>$111</td>
<td>$129</td>
<td>$219</td>
<td>$89</td>
</tr>
</tbody>
</table>

1 Mulching cost was overstated in this example since it was included in startup cost, this will be prorated over the course of three (3) years.
Production cost economics for matooke
$USD per metric ton
(Conversion: 2,500 Ugandan Shillings = $1USD)

Uganda- Value Added Through Matooke Value Chain
Uganda Shilling per Bunch

“Market Costs” are included as a category in Table 3.3 (p.23) of the paper cited. The authors do not define these costs, but based on what is not explicitly covered by other cost categories, they may refer to wastage and materials.
KEY CONSTRAINTS UNDERLYING THE UNREALIZED POTENTIAL

Constraints on matooke market map

**Pests and Diseases:** Plant susceptibility to pests and diseases reduces yields by over 50% in many cases.

**Traditional Systems:** Lack of knowledge and incentive to use soil and crop improvement practices.

**On-Farm Losses:** Perishability and lack of access to local markets causes loss of ripe bananas prior to sale.

**Price Takers:** Limited ability to wait (perishable product) and lack of access reduce ability to negotiate prices.

**Layers of Middlemen:** Generally 3-5 players involved prior to retail level; complex chain raises prices.

**Storage / Transportation:** Perishability, bulk and poor conditions lead products to deteriorate at ambient temps and increase cost.

**Retail Credit:** Retailers often insist on personal credit arrangements with suppliers, later not paying in full.

**Price Takers:** Strong consumption and dependence on matooke across all markets makes buyers price takers.

**Disconnected Markets:** Exporters have not fully capitalized on the export potential of matooke. Need addl. supply/custs.

**Fresh Market Exports:** Small % of market; disconnected from SHFs; buy exclusively from larger, semi-commercial farms.

**Processing:** Inconsistent supply and use of different varieties often requires dedicated growers.

**Disconnected Markets:** Processors are not in main value chain; they are less than 10% of the market; mostly in cities.