MULTI CROP VALUE CHAIN PHASE II
ETHIOPIA – Enset

September 11, 2014
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SCOPE OF THIS STUDY

Study Methodology

Stakeholder Interviews
• Over 75 sector interviews with experts, agencies, NGOs, farmers, traders and academics
• Interviewed personnel at all levels of the value chain

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
PHASE 2 ETHIOPIA ENSET EXECUTIVE SUMMARY

1 SECTOR FUNDAMENTALS

- Enset is a primary staple crop for over 20% of Ethiopia’s population (~18M people), with production and consumption centralized in the Oromia and SNNPR regions.
- Roughly 114 million enset plants are harvested per year. The average dry matter production per plant is 20 kg placing total production at 2.28 million metric tons.
- Enset is grown by over 4 million smallholder farmers.

2 VALUE CHAIN OPPORTUNITIES

- Current value chain has not been successfully analyzed by previous studies and is not well understood.
- While demand continues to rise in terminal markets, farmers show little awareness of the potential value of enset products as a valuable revenue stream.
- Inefficient value chains and low marketing understanding of farmers provide significant opportunities to improve SHF incomes.

3 INTERVENTIONS & IMPACT

- Interventions have been refined to focus on enset parks, prototyping processing tools, and marketing groups.
- Enset parks provide a platform for maintaining genetic diversity, training farmers on best practices for production, processing and marketing, as well as ecotourism.
- Prototyping will address tools for the four major labor-intensive processing steps.
- Marketing groups will provide education, market awareness, and organization.

4 STAKEHOLDER PROFILES

- Each intervention has strong partner candidates; we have focused on those with strong existing platforms that can be used as a springboard.
- Gamo Highlands – Enset Park and Farmer Organizations
- Wolaita-Sodo – Research and Prototyping Hub
- Metsar Village – Enset Park and Marketing Groups
1 SECTOR FUNDAMENTALS
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**Enset in Ethiopia**

- Enset is indigenous to Ethiopia, the only country where the plant is domesticated.
- Though an integral food source in the southern regions, it was only declared a national crop in 1997 – making it eligible for research and funding.
- Ethiopia has an estimated total population of around 90 million, of which 18-20% rely on enset as their primary staple crop.
- It is grown primarily in SNNPR and Oromia regions (which collectively account for 60% of the total population of Ethiopia).

**The Culture of Enset**

- Women are solely responsible for harvest, processing and marketing of enset.
- Enset is an integral piece of the cultural and traditional patterns of life within the community of the southern regions.
- SHFs view it as an on-farm consumption and food security crop rather than a commercial commodity.
- The plant itself is used as a windbreak as well as a canopy for household shade and intercropping (coffee).
- It is quite literally kept “close to home”.

**Enset Reliant Population**

<table>
<thead>
<tr>
<th>Calculation Methodology</th>
<th># of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Research (Appendix 1a)</td>
<td>15 - 20M</td>
</tr>
<tr>
<td>National Approach (Appendix 1c)</td>
<td>16.6 - 18.4M</td>
</tr>
<tr>
<td>Regional Approach (Appendix 1b)</td>
<td>18M</td>
</tr>
<tr>
<td>Farmer / Family Proxy (Appendix 1c)</td>
<td>21.9M</td>
</tr>
<tr>
<td>Kilocalorie Calculation* (Appendix 1c)</td>
<td>11.4 – 15.9M+</td>
</tr>
</tbody>
</table>

* Understated because it assumes 100% of calories consumed are enset.
ENSET IS ONLY CULTIVATED ON 300,000 HA, BUT ACCOUNTS FOR 20% OF NATIONAL CARBOHYDRATE NEEDS DUE TO PRODUCTIVITY

Enset Footprint Area

<table>
<thead>
<tr>
<th>Calculation Methodology</th>
<th>Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published Sources (Appendix 2a)</td>
<td>300,000 Ha</td>
</tr>
<tr>
<td>Other Commentary (Appendix 2a)</td>
<td>302,091 Ha</td>
</tr>
<tr>
<td>Research Officers (Appendix 2a)</td>
<td>319,000 Ha</td>
</tr>
<tr>
<td>Area Conversion* (Appendix 2b)</td>
<td>307,800 Ha</td>
</tr>
</tbody>
</table>

* Planting Density = 2,222 plants /Ha

Enset Covers Small Total Area

- Enset is cultivated primarily in the SNNPR and Oromia regions.
- Within each farm, the enset garden takes up a small piece of the cultivated land and is situated close to or surrounding the home.
- While the total area (by sq km) considered to be enset production region is large, the actual cultivated Ha for enset is only 300,000.
- CONSTRAINT: Calculation for exact productivity of enset per area unit is difficult due to complexity and variability of growth factors.

Caloric Productivity of Enset Exceeds Cereal Crops

- Enset produces more calories than cereal (double to 20 times greater) - 4,000 calories per square meter per year.
- Enset yields 6.6 to 23 metric tons, equivalent in terms of energy to 3.9 to 13.7 metric tons of grain under smallholder conditions.
- Enset yields 1.3 to 3.5 times as much food energy per hectares per year as does maize under smallholder conditions.
- OPPORTUNITY: High productivity of enset helps address food security in areas with land scarcity issues.

FOOD MATH

- Consumption1: 150 kg/person/year
  (*) Yield: 15-25 kg/plant
  Plants: 6-10 plants/person/year
  (*) Family Size: 5-6 persons
  Plants/Family: ≈50 plants/year
  (*) Maturity: 4-7 years
  Plants/Garden: ≈300 plants
  (*) Plant Spacing2: 4.5m²/plant

Total Area per Family: 0.135 Ha

1. Total required caloric consumption per year (2,200 calories) translated to kg of kocho (dry matter).
2. Based on ideal spacing of 3m by 1.5m = 4.5sqm (approximately 2,222 plants per Ha).
THE DIFFERENCE BETWEEN AN ENSET-BASED PRODUCTION REGION AND THE FOOTPRINT OF THE CROP ITSELF CAN BE A FACTOR OF 10
ENSEN GARDENS COMPRIZE A SMALL BUT INTEGRAL FOOTPRINT WITHIN THE SMALLHOLDER SYSTEM; QUITE LITERALLY “CLOSE TO HOME”
## Sector Fundamentals

**Total Value of Current Small Quantity Sold Exceeds $100 Million in Value (Based on Volume-Weighted Price)**

### Production

Production calculations come from both published research and primary interviews.

<table>
<thead>
<tr>
<th>Trees Harvested(^1)</th>
<th>114M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Weight/Tree(^2)</td>
<td>20 kg</td>
</tr>
<tr>
<td>Total Production</td>
<td>2.28B kg</td>
</tr>
<tr>
<td>% Consumed</td>
<td>90-95%</td>
</tr>
<tr>
<td>% Sold</td>
<td>5-10%</td>
</tr>
</tbody>
</table>

**Total Production Sold (10%)**

228M kg

### Price

Price ranges and volume weightings by value chain stage come almost exclusively from stakeholder interviews.

<table>
<thead>
<tr>
<th>Value Chain Stage</th>
<th>Price Range (b)</th>
<th>Average Price (b)</th>
<th>Volume Sold</th>
<th>Weighted Average Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmgate</td>
<td>2.5-4</td>
<td>3.25</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Local</td>
<td>6-8</td>
<td>7</td>
<td>125,400</td>
<td>3.85</td>
</tr>
<tr>
<td>Regional</td>
<td>9-13</td>
<td>11</td>
<td>84,360</td>
<td>4.07</td>
</tr>
<tr>
<td>Terminal</td>
<td>25-40(^*)</td>
<td>30</td>
<td>18,240</td>
<td>2.40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>228,000(^a)</strong></td>
<td><strong>10.32 b</strong></td>
<td>(MT sold)</td>
<td>(per kg)</td>
</tr>
</tbody>
</table>

\(^*\) High end of price range was an outlier.

### Market Size

Market size reflects value of production sold, not of the total amount produced.

<table>
<thead>
<tr>
<th>Total Sold (MT)</th>
<th>228,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sold (kg)</td>
<td>228M</td>
</tr>
<tr>
<td>Average Price per kg</td>
<td>10.32 b</td>
</tr>
<tr>
<td>birr to USD</td>
<td>19.47</td>
</tr>
</tbody>
</table>

**Total Market Size (Value)**

$121M

\(^1\) Source: CSA Ethiopia

\(^2\) Only considers kocho – the primary enset product sold.

\(^3\) Based on assumption of 114M trees harvested at 20kg dry weight per tree with 10% of production being sold to markets.
ALTERNATIVE METHOD OF CALCULATION BASED ON PERCENTAGE OF FOOD EXPENDITURE INDICATES EVEN HIGHER MARKET VALUE

### Method #2: Share of Total Food Expenditures

**Share of Major Cereals and Enset in Total Food Expenditures by Region, 2004/05**

<table>
<thead>
<tr>
<th>REGIONS</th>
<th>Total Annual Food Expenditures (b)</th>
<th>Share of Expenditures</th>
<th>Personal Enset Expenditure (b)</th>
<th>Total Enset Expenditure (b)</th>
<th>Total Enset Expenditure ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>Urban</td>
<td>Total</td>
<td>Total Cereals</td>
<td>Enset</td>
</tr>
<tr>
<td>SNNP</td>
<td>1,525</td>
<td>2,340</td>
<td>1,594</td>
<td>33.1%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Oromiya (sic)</td>
<td>1,641</td>
<td>2,583</td>
<td>1,737</td>
<td>45.0%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Addis Ababa</td>
<td>2,042</td>
<td>2,584</td>
<td>2,577</td>
<td>41.2%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

**Market Size**

- **$121M** (Method #1)
- **$309M** (Method #2)

---

1 Source: IFPRI/EDRI Report, “Foodgrain Consumption and Calorie Intake Patterns in Ethiopia”, (May 2011)
2 Source: CSA Ethiopia (estimated 2012 population)
WHILE URBAN DEMAND IS GROWING, ENSET IS STILL PRIMARILY CONSUMED ON-FARM BY SMALLHOLDER FARMERS

Production Primarily for On-Farm Use

- 90-95% of enset production goes to on-farm use and consumption.
- Farmers are not aware of the market prices and demand in terminal markets.
- Excess kocho and bulla is sold, but not seen as a primary income stream.
- Farmers are almost completely unaware of the value of enset fiber.

Urban Demand is Under-Served

- Cultural shifts have changed the tastes of the urban elites.
- Kitfo, a spiced raw meat dish, is a delicacy with high demand in cities.
- Kitfo is traditionally eaten with kocho or bulla, often at ceremonial events.
- With rising incomes, enset products are gaining popularity in urban markets.

Problems Caused by Disconnected Supply

- Products that do get to urban markets are low quality.
- Prices are significantly higher at terminal markets (900%+ more).
- Farmers do not benefit from the high prices.
Enset Provides Food Security at Low Cost

- Despite being the poorest and most densely populated, the rural enset-producing highlands have the highest daily caloric intake of any zone, as well as the lowest cost per kilo of food – even higher than Addis Ababa.

- Also, the IFPRI/EDRI report also states that of the 10 regions in Ethiopia, SNNPR and Oromia have the highest daily caloric intake and lowest cost per kilo of food.

- These two regions account for roughly 60% of Ethiopia’s population (over 50 million).

- They are also the two primary growing regions for enset.

### Agroecological Zones

<table>
<thead>
<tr>
<th>Agroecological Zones</th>
<th>Per Capita Expenditure on cereals and enset (Birr)</th>
<th>Total calories per capita per day (adult equivalent)</th>
<th>Cost per kg in Birr (adult equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humid Lowland</td>
<td>368.9</td>
<td>2857.1</td>
<td>0.71</td>
</tr>
<tr>
<td>Humid Highland (cereals)</td>
<td>414.8</td>
<td>2812.6</td>
<td>0.82</td>
</tr>
<tr>
<td>Humid Highland (enset)</td>
<td>344.3</td>
<td>3197.5</td>
<td>0.67</td>
</tr>
<tr>
<td>Drought Prone</td>
<td>409.2</td>
<td>2890.3</td>
<td>0.78</td>
</tr>
<tr>
<td>Pastoralist Areas</td>
<td>374.1</td>
<td>2632.1</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Source: IFPRI and EDRI, “Foodgrain Consumption and Calorie Intake Patterns in Ethiopia”, (May 2011)
ENSET’S AGRICULTURAL PRODUCTION SYSTEM REQUIRES MINIMAL LABOR AND NO FINANCIAL INPUTS

**Production Benefits**

- **ZERO Cash Outlays** (manure from on-farm)
- **Minimal Labor** (for production, not processing)
- **Little Land** (one-tenth of a hectare)
- **Soil Protection** (prevents runoff and traps water)

**Opportunities**

- Low-Cost System
- High Caloric Production
- Addresses Land Scarcity
- Benefits Agro-Ecological Environment

Graphic from Christensen Fund, www.christensenfund.org
AN INEFFICIENT VALUE CHAIN AND POOR MARKET AWARENESS OF FARMERS REPRESENT OPPORTUNITIES FOR IMPROVING SHF INCOMES

Low Market Awareness by Farmers

- Farmers grow primarily for on-farm use.
- Excess is sold at local level.
- Sales occur individually and in small quantities.
- Farmers transport product long distances, just to end up selling to traders.
- Farmers are not aware of value/price for products in terminal markets.

Value Chain Is Overly Complex

- Local and regional markets rely heavily on assemblers, traders and collectors.
- High redundancy of players at market level.
- Very low participation in markets by farmers.
- Terminal markets source from separate catchment areas than local and regional.

OUTCOME

Farmers do all the work, and much of the transportation, but realize little of the value.

CONSTRAINTS

1. Lack of Market Awareness
2. Lack of Marketing Training
3. Lack of Organization

OPPORTUNITY

Can enhance SHF incomes through education, training and organization.
CULTURAL NORMS AND GOVERNMENT INITIATIVES ARE ALREADY ALIGNED WITH POTENTIAL INTERVENTIONS

Enset Parks
- Categorize and manage enset diversity
- Organize kebeles into associations
- Partially funded by ecotourism

Improved Processing Tools
- Prototype new tools with farmers
- Give farmers buy-in to design process
- Reduce labor-intensive processing for women

Marketing Groups and Training
- Develop market awareness
- Train on marketing and sales
- Organize into associations, unions and marketing groups

- Gamo Highlands Enset Park already co-funded by government.
- Government is investing in research and organization of enset efforts.

- Farmers eager to use better methods to reduce time spent processing.
- Tradition of “debo” community labor-sharing groups.

- Government promoting unions and associations due to tax purposes.
- Tradition of community-based groups and associations can be tapped into.
- Downstream actors want to buy direct from farmers for quality/price reasons.
2 Value Chain Opportunities
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TOTAL ENSET PRODUCTION IS 2.28 MILLION MT, OF WHICH OVER 90% IS CONSUMED ON-FARM

Ethiopia Enset Subsector Map
Expressed as percentage of total enset production

- Over 90% of enset’s 2.28 million MT production is consumed on the farm.
- Excess is sold to market through a variety of paths: as simple as a farmer selling directly to local buyers, or by a three-step farmer-assembler-trader path.
- Very little product makes it past the local level to the regional markets (roughly 2-3% of total production).
- Each market level (local, regional, terminal) has its own nodal supply system, or catchment radius.
- The catchment radius for products flowing to Addis Ababa is disconnected from upstream actors.

Source: Context Network analysis based directly on value chain interviews.
ENSEN CONRAINTE AND OPPORTUNIES CLUSTER POST-PRODUCTION AND IN DOWNSTREAM MARKETS

Proposed strategy and model along value chain

**MINIMAL CONSTRAINT**

- No Cash Outlays for Production
- No seed costs – propagation exclusively on-farm
- No commercial fertilizer – integrated livestock system
- No irrigation necessary – leaf water capturing system
- No hired labor – community labor-sharing groups
  - Embryonic efforts for provision of improved varieties

**HIGHLY CONSTRAINED**

- Major time and effort requirements
- Not hygienic – exposed to external conditions
- Exclusively conducted by women
- Largest time sink for women in enset regions
- Injurious conditions

**NOT CONSTRAINED**

- Labor is family provided or through community sharing
- Transplanting occurs once, or twice, by family labor
- Minimal crop maintenance for enset
- Distribution of manure occurs as needed
- Disease control through clean mgmt. and sterilizing tools

**HIGHLY CONSTRAINED**

- Not well-developed or understood by farmers
- Small percentage of production goes to markets
- Excessive margins not captured by farmers
- Adulteration by middlemen

Red Signifies Constraints
SUSTAINABLE MANAGEMENT OF LAND RACES NECESSARY TO ENSURE GENETIC DIVERSITY AND SELECT OPTIMAL VARIETIES

No shared knowledge base for enset land races

- Land races being lost due to land fragmentation, disease, and accidental neglect
- Varietal benefits are not well known beyond the local community
- Farmers are cognizant of varietal traits, but the knowledge is not being shared across regions or with new generations
- Danger of losing knowledge base and land races

Enset parks provide a platform for other interventions

- Living field gene bank (provided by farmers)
- Characterization and categorization of varietal attributes
- Identification of optimal land races (productivity, early maturing, disease tolerant, medicinal, etc.)
- Distribution of improved enset varieties and lost land races
- Currently organizing farmer associations around the park
- Partially funded by ecotourism (like Peru’s Potato Parks)
PROCESSING REPRESENTS THE LARGEST PRE-MARKET CONSTRAINT TO THE ENSET VALUE CHAIN

Tree Preparation  Corm Pulverizing  Leaf Scraping

Note: Processing is the most time-consuming activity for rural enset-farming women. The four highlighted steps have prototypes already developed that could save time and effort for these women.
CURRENT PROCESSING METHODS ARE COMPLETELY MANUAL LEAVING OPEN THE POSSIBILITY OF MECHANIZED IMPROVEMENTS

We expect processing efficiency to improve with the introduction of mechanical methods - both manual and engine-driven.

1. Yeast preparation overlaps minimally with processing, but typically occurs in advance.
2. Men are responsible for digging the storage pits for processed kocho.
3. This time calculation does not include crop management, storage, pit management, or cooking. Only processing steps for kocho and bulla are included.

77% of Total Time Spent could be Mechanized
UNUSUAL PATH TO MARKET FOR ENSET PRODUCTS BASED ON NODAL CATCHMENT AREAS; DISCONNECT WITH GROWING TERMINAL MARKETS

Downstream Market Systems Diagram

ETHIOPIA
DISCONNECTED NODAL MARKET SYSTEMS ALLOW ENORMOUS PRICE DIFFERENCES IN TERMINAL MARKETS

Sale economics for enset products (kocho) $USD per metric ton
(Conversion: 19.3birr = $1USD)

1 Assumes zero cash outlay for production. Opportunity cost comes primarily from processing time as well as minimal crop maintenance.
2 Margin represents the combined price increases from players at the local markets. Costs at this level were low (7%) – primary labor and time.
3 Costs increased at the regional level due to higher competition, some stall costs, labor and increased time and labor requirements. 15% cost.
4 Margin reflects the willingness of more affluent urban consumers to pay a premium for “delicacies”. Costs were highest at the terminal level (30%) to account for stall fees, transport costs, government taxes, repackaging materials, transport labor (big packages), stall labor and time.

Over 900% price increase between farmgate and terminal market price.
### Farmer Segmentation Centers on Consumption Patterns and Proximity to Markets

<table>
<thead>
<tr>
<th>Total # SHFs</th>
<th>Avg Size of Farm</th>
<th>Distance to Market</th>
<th>Total Amt. Produced</th>
<th>Consumed / Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>&gt;1.0 Ha</td>
<td>20 km</td>
<td>1,200-1,800 kg</td>
<td>70/30% ≈1,000/500 kg</td>
</tr>
<tr>
<td>10%</td>
<td>0.5 – 1.0 Ha</td>
<td>30-80 km</td>
<td>1,000-1,500 kg</td>
<td>85/15% ≈1,000/300 kg</td>
</tr>
<tr>
<td>10%</td>
<td>0.25-0.50 Ha</td>
<td>20 km</td>
<td>300-500 kg</td>
<td>120/0% ≈480/0 kg</td>
</tr>
<tr>
<td>15%</td>
<td>0.25-0.50 Ha</td>
<td>30-80 km</td>
<td>300-500 kg</td>
<td>110/0% ≈440/0 kg</td>
</tr>
<tr>
<td>60%</td>
<td>&gt;0.5 Ha</td>
<td>n/a</td>
<td>600-900 kg</td>
<td>100%/0% 600-900 kg</td>
</tr>
</tbody>
</table>

Marketing Intervention Recommended Focus:
- **Top of Pyramid**
- **Base of Pyramid**

Processing Intervention Recommended Focus:
- **Top of Pyramid**
- **Base of Pyramid**

Assumption: Farm consumption estimates based on 150kg of dry matter eaten per person per year.
PROMISING DEVELOPMENTS IN GOVERNMENT-SUPPORTED RESEARCH AND COMMUNITY INITIATIVES

Enabling Environment and Infrastructure

**MAJOR CONSTRAINT**

- National roads have been improved significantly, but still do not allow long-distance transportation easily
- Extensive construction efforts are underway, and further exacerbate the transportation issues and delays
- Communications infrastructure is often unreliable
- Electronic market information platforms (effective for coffee) are non-existent for other crops

**BENEFICIAL**

- Ministry of Trade is supportive of enset assembler and farmer unions
- Community-based associations are also actively encouraged by Ministry of Agriculture
- In 1997, enset was declared a national commodity and became eligible for research and funding

**LIMITED ACCESS**

- Nationally supported and promoted microfinancing is available at low rates (4%) on a crop or project specific basis
- Contract-based seller groups can arrange for electronic deposit of payments upon delivery
- Alignment with government agenda is critical for access to financial services and other support

**LIMITED**

- Since 1997, research has increased for enset, via regional research and technology centers
- Collaboration with existing enset research efforts and co-funding of new initiatives has grown
- Strong established links with universities (Addis Ababa, Arba Minch and Awassa)
- Minimal extension services available for enset

Red Signifies Constraints
KEY CONSTRAINTS UNDERLYING THE UNREALIZED POTENTIAL

Constraints on enset market map

**Varietal Diversity:** Valuable land races are being lost due to land fragmentation and poor crop management.

**On-Farm Consumption:** Strong dependence on enset as a food crop lowers priority to sell.

**Processing:** Processing is injurious, unhygienic, and the most time-consuming task for rural women.

**Farmer Awareness:** Lack of market awareness causes farmers to not sell products or get low prices for what they do sell.

**Marketing Training:** Farmers that do sell excess have no training, and often sell to middlemen for little profit.

**Decentralized selling:** Strong dependence on assemblers and traders to facilitate selling.

**Predatory Middlemen:** Traders aggressively pursue farmers to buy their products and control market prices.

**Nodal Supply:** Each progressive down-stream channel has a separate nodal supply as well as upstream flow.

**Adulterated Supply:** Traders are well known for selling mixed products and diluting the final products.

**Disconnected Markets:** Retail customers in terminal markets pay a premium that is unrecognized by upstream actors.
### Total Opportunity for Enset:

<table>
<thead>
<tr>
<th>1 Enset Parks</th>
<th>Increased Overall Crop Resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Formation of Farmer Groups</td>
</tr>
<tr>
<td></td>
<td>• Identification and Distribution of Improved Varieties</td>
</tr>
<tr>
<td></td>
<td>• Saving Lost Land Races</td>
</tr>
<tr>
<td></td>
<td>Over 100 new groups</td>
</tr>
<tr>
<td></td>
<td>Six bacterial wilt tolerant varieties ready for distribution(^1)</td>
</tr>
<tr>
<td></td>
<td>Over 60 races(^2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 Processing Technology</th>
<th>Time and Effort Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• 14+ hours per plant to process</td>
</tr>
<tr>
<td></td>
<td>• 77% of labor could be mechanized</td>
</tr>
<tr>
<td></td>
<td>• Time savings of up to 5.5 hours</td>
</tr>
<tr>
<td></td>
<td>330 hours of processing time saved per year.(^3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 Marketing Groups</th>
<th>Increase in SHF Incomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Skip middlemen</td>
</tr>
<tr>
<td></td>
<td>• Capture better prices</td>
</tr>
<tr>
<td></td>
<td>• Tap into larger markets</td>
</tr>
<tr>
<td></td>
<td>$172 of new income per SHF per year.(^4)</td>
</tr>
</tbody>
</table>

---

\(^1\) The new varieties were identified at the Areka Research Station. They are looking for partners for varietal dispersion to farmers.

\(^2\) Based on farmer identification.

\(^3\) Assumes that processing technologies could reduce four key steps by 50%.

\(^4\) Assumes top-producing farmers capture 42% of downstream margin.
3 Interventions & Impact
PHASE 2 ETHIOPIA ENSET EXECUTIVE SUMMARY

1. SECTOR FUNDAMENTALS

- Enset is a primary staple crop for over 20% of Ethiopia’s population (≈18M people), with production and consumption centralized in the Oromia and SNNPR regions.
- Roughly 114 million enset plants are harvested per year. The average dry matter production per plant is 20 kg placing total production at 2.28 million metric tons.
- Enset is grown by over 4 million smallholder farmers.

2. VALUE CHAIN OPPORTUNITIES

- Current value chain has not been successfully analyzed by previous studies and is not well understood.
- While demand continues to rise in terminal markets, farmers show little awareness of the potential value of enset products as a substantial revenue stream.
- Inefficient value chains and low marketing understanding of farmers provide significant opportunities to improve SHF incomes.

3. INTERVENTIONS & IMPACT

- Interventions have been refined to focus on enset parks, prototyping processing tools, and marketing groups.
- Enset parks provide a platform for maintaining genetic diversity, training farmers on best practices for production, processing and marketing, as well as ecotourism.
- Prototyping will address tools for the four major labor-intensive processing steps.
- Marketing groups will provide education, market awareness, and organization.

4. STAKEHOLDER PROFILES

- Each intervention has strong partner candidates, we have focused on those with strong existing platforms that can be used as a springboard.
- Gamo Highlands – Enset Park and Farmer Organizations
- Wolaita-Sodo – Research and Prototyping Hub
- Metsar Village – Enset Park and Marketing Groups
THREE HIGH LEVEL INTERVENTION STRATEGIES HAVE BEEN VALIDATED THROUGH FIELD RESEARCH AND GROUND TRUTHING

Key

1. Enset Parks for Diversity Mgmt.

2. Processing Equip. to Save Time & Effort

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.
THEY SPAN THE VALUE CHAIN, ARE INTERDEPENDENT AND REINFORCING, AND NEED TO BE CONSIDERED ON A SYSTEMS LEVEL

<table>
<thead>
<tr>
<th>1. Enset Parks as a Platform</th>
<th>2. Improved Processing Equipment</th>
<th>3. Organization of Marketing Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Currently, efforts to identify and distribute improved varieties as well as manage genetic diversity are underdeveloped.</td>
<td>• Currently, processing time is the largest constraint for enset, placing an excessive time and health burden on women – the sole harvesters.</td>
<td>• Currently, huge unrealized market potential due to lack of awareness, education and organization amongst farmers.</td>
</tr>
<tr>
<td>• <strong>Enset parks</strong> address this constraint, serving as excellent platforms for managing genetic diversity and varietal improvement, and ensuring dispersion of knowledge and planting materials.</td>
<td>• <strong>Co-design and on-site prototyping</strong> is key to farmer acceptance and adoption</td>
<td>• <strong>Spring-boarding off of existing platforms</strong> (i.e. enset parks) will reduce time to impact, provide a conduit for training and technology and blueprint a successful model.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Testing and modification</strong> with end users ensures an optimal processing tool design</td>
<td>• <strong>Key nodal catchment areas</strong> with proximity to terminal markets represent low-hanging fruit due to:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Varying price point packages</strong> (i.e. manual vs. engine driven) will cater to farmer segmentation.</td>
<td>- Historically best business and growing practices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ability to capture the inflated terminal market margins</td>
</tr>
</tbody>
</table>

Integral to INT #3 Success
PROPOSED SUMMARY OF ENSET INTERVENTIONS

1. **Intervention #1**
   Enset parks for diversity mgmt. and improved varieties

   - **Enset park benefits are both direct and indirect**
     - Improved Varieties
     - Genetic Diversity
     - Farmer Organization
     - Platform / Conduit

   - **Enset park organization examples**

   - **DIRECT**: Enset parks will help distribute improved varieties and manage genetic diversity (benefiting yields and other outputs)
   - **INDIRECT**: Parks organize farmer groups, which make them a great starting platform for other INTs

2. **Intervention #2**
   Processing equipment to save time & effort

   - **Annual time savings per female farmer**
     - 330 hours¹
     - ($43 value)

   - **Alt. activities overview**
     - Reduced time requirement provides huge opportunity for women to pursue other productive activities
     - Mechanizing processing also reduces rigor of workload and number of injuries while improving hygiene

3. **Intervention #3**
   Marketing groups to increase SHF income

   - **Annual net financial benefit per farmer**
     - $172²

   - **Example of downstream value capture**

   - **Farmers lack the awareness, education and organization to benefit from the huge difference in farmgate and terminal market prices**
   - **Even capturing a low percentage of these gains will have a huge impact on these SHFs who have some of the lowest incomes in the world**

---

¹ Based on 5.5 hour time savings per tree upon mechanization of four primary steps, and applied to annual average of 60 trees harvested.
² Based on the calculation that SHFs could capture 42% of the downstream margin (mostly at the local level).
ENSET PARKS OFFER THE OPPORTUNITY TO LEVERAGE EXISTING PLATFORMS FOR GENETIC DIVERSITY, DISTRIBUTION CONDUIT, AND ORGANIZATION

INTERVENTION #1: ENSET PARKS AS A PLATFORM

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yields Have Plateaued</td>
<td><strong>A</strong> Field Gene Bank: Land and varieties donated by farmers and maintained by government and academic support</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>B</strong> Initiate Distribution of Improved Varieties: Release of faster-maturing, higher-yielding, disease and pest-tolerant varieties already identified by research programs</td>
<td></td>
</tr>
<tr>
<td>Loss of Genetic Diversity</td>
<td><strong>C</strong> Organize Farmer Groups: Structure associations of local farmers centralized around gene banks for training and efficient distribution of improved varieties</td>
<td></td>
</tr>
<tr>
<td>Poor Land Race Management</td>
<td></td>
<td>Cultural landscape and government attitudes provide a favorable environment:</td>
</tr>
<tr>
<td>Slow Release of Improved Varieties</td>
<td></td>
<td>- Traditional tendency to organize at community level</td>
</tr>
<tr>
<td>Bacterial Wilt Reduces Yields</td>
<td></td>
<td>- Existing gov’t. funding for enset research efforts</td>
</tr>
<tr>
<td>Limited Farmer Associations or Other</td>
<td></td>
<td>- Gov’t. desire to organize small business groups for tax purposes</td>
</tr>
<tr>
<td>Distribution Channels</td>
<td></td>
<td><strong>Suggested Implementation:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>ENSET PARKS provide an excellent platform to increase yields and maximize the potential profitability of this traditional crop.</em></td>
</tr>
</tbody>
</table>

Note: Enset Parks are platforms that encompass field gene banks, self-funded research efforts, and farmer associations.
## INTERVENTION #1: ENSET PARKS AS A PLATFORM

<table>
<thead>
<tr>
<th>Key Intervention Elements</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creation of field gene banks</td>
<td></td>
<td>• Village Garden: 1 village, ≈35 farmers</td>
</tr>
<tr>
<td>• Categorization and management of land races</td>
<td></td>
<td>• Enset Park: 12 kebeles, ≈250 farmers</td>
</tr>
<tr>
<td>• On-site enset research efforts</td>
<td></td>
<td>• 12-18 months to develop buy-in and form farmer associations</td>
</tr>
<tr>
<td>• Distribution of improved varieties</td>
<td></td>
<td>• 3-5 years to build on-site research facilities</td>
</tr>
<tr>
<td>• Establishment of farmer associations</td>
<td></td>
<td>• One farmer cooperative per kebele in order to form a cohesive union</td>
</tr>
<tr>
<td>• (Potential) Platform for training and distribution of processing equipment</td>
<td>Enset Parks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• University to coordinate and organize</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Funded by grants, government, and private sponsors</td>
<td></td>
</tr>
<tr>
<td>Village Garden</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Run by village leadership and farmers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Assisted and trained by university researchers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Funded through research grants and ecotourism</td>
<td></td>
</tr>
</tbody>
</table>

### Key Dependencies & Risks
- Dependent on farmer buy-in
- Requires continued long-term (5+ years) external funding
- Management training for farmer cooperatives and unions
- Legal registration assistance
- Bank accounts

### Gain to SHF (est.)
- Maintained Genetic Diversity
- Improved Varieties (early-maturing, higher-yielding, pest and disease-tolerant)
- Increased Productivity (25-50%)¹
- Newly Organized Farmer Association
- Improved varieties can yield more than double local types

### Potential Partners
- **Christensen Fund** – focuses on biological and cultural diversity in the Rift Valley and is currently the primary donor for enset park development
- **Awassa University** – project distributing improved suckers to 10,000 farmers in Awassa region in partnership with Christensen Fund
- **Arba Minch University** – a field gene bank in the Gamo Highlands run in collaboration with local farmers (12 organized kebeles¹) and co-financed by Christensen Fund and Ethiopian government
- **Metsar Enset Village** – a display garden with field gene bank, micro-industries for enset paper, starch, stationery as well as kocho and bulla flour.
- **Kyoto University** – key partner to Metser Enset Village

¹ The smallest administrative unit, below the “worede” (district) level
Enset Park Example Structure; in addition to maintaining genetic diversity, improved varieties can be shared with members.

In the Gamo Highlands example, the farmers of 12 separate kebeles (250 farmers in total) donated land to the park itself, as well as opted-in to a Peruvian “potato park” model where their own land becomes part of a living park.
**IMPROVED VARIETIES PRESENT SUBSTANTIAL YIELD GAINS OVER LOCAL TYPES IN EARLY FINDINGS**

Performance of the Six Released Improved Enset Varieties over Early and Late Set Local Checks

<table>
<thead>
<tr>
<th></th>
<th>EARLY SET VARIETIES</th>
<th>LATE SET VARIETIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YANBULE</td>
<td>GEWADA</td>
</tr>
<tr>
<td><strong>Unsqueezed Kocho (t/h/y)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research (on-station)</td>
<td>31.49</td>
<td>22.75</td>
</tr>
<tr>
<td>Farmers field</td>
<td>18.96</td>
<td>17.17</td>
</tr>
<tr>
<td><strong>Squeezed Kocho (t/h/y)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers field</td>
<td>12.54</td>
<td>11.31</td>
</tr>
</tbody>
</table>

Yield Increase over Local Varieties

<table>
<thead>
<tr>
<th></th>
<th>Research On-Station</th>
<th>Farmers Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Set</td>
<td>193%</td>
<td>198%</td>
</tr>
<tr>
<td>Late Set</td>
<td>231%</td>
<td>229%</td>
</tr>
</tbody>
</table>

Yield for improved varieties are more than double (213%)\(^2\)

---

1 Data regarding improved enset varieties currently being disseminated by the Areka Research Station; Mr Awol Zeberga, Sr. Research Scientist

2 Intervention #1 assumes that 25% of Tier 1 farmers adopt improved varieties on 10% of their land.
MECHANIZED PROCESSING WILL GREATLY REDUCE TIME INVESTMENT – THE BIGGEST CONSTRAINT FOR CREATION OF END PRODUCTS

INTERVENTION #2: DEVELOPMENT OF AFFORDABLE PROCESSING EQUIPMENT PROTOTYPES IN CLOSE COORDINATION WITH WOMEN

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-Consuming Processing: women spend up to 14+ hours per plant in individual processing time</td>
<td>Field Prototyping with Farmers</td>
<td>Development of improved processing tools has been previously unsuccessful:</td>
</tr>
<tr>
<td></td>
<td>Multiple Iterations to Achieve Viable Models and User Buy-In</td>
<td>- Never co-designed with end users/farmers</td>
</tr>
<tr>
<td></td>
<td>Working Prototypes for Four Main Processing Steps:</td>
<td>- Lack of iterative process</td>
</tr>
<tr>
<td></td>
<td>• Corm Pulverizing</td>
<td>- No quantification of benefits</td>
</tr>
<tr>
<td></td>
<td>• Leaf Scraping</td>
<td>- Minimal cost viability considerations</td>
</tr>
<tr>
<td></td>
<td>• Kocho Squeezing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Kocho Chopping</td>
<td>Suggested Implementation:</td>
</tr>
<tr>
<td></td>
<td>Multiple Price Point Packages:</td>
<td>PROCESSING TOOLS that have been co-designed and refined with farmers. Full field testing and cost minimization. Multiple price point packages.</td>
</tr>
<tr>
<td></td>
<td>Family (manual); Village (engine)</td>
<td></td>
</tr>
<tr>
<td>Labourious: current techniques are physically demanding (eg. hand and foot-held graters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injurious: pulverizing and chopping instruments often cause bodily harm (eg. broken finger and hand lacerations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhygienic: exposed to the elements and unwashed feet and hands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Wastage: no containment during processing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## INTERVENTION #2: IMPROVED PROCESSING EQUIPMENT

### Key Intervention Elements
- Co-design new equipment with farmers
- Repeated testing and modification of models until full acceptance
- Public or private sector prototyping
- Private sector multiplication
- NGO distribution and training

### Potential Programs Formats

#### Public Prototyping
- Utilize government funded technology centers for low-cost design
- Disseminate equipment design to private local manufacturers

#### Private Prototyping
- Faster development at a higher cost
- Faster scalability and release to distribution channels

### Size, Scalability & Timing
- New Prototype Development: 1 month
- Prototype Modification: 2 weeks
- Production of 100 Models: 1 month

#### Cost:
- Varies based on machine complexity, manual vs. engine as well as public vs. private manufacturer
- **Ex 1:** Kocho squeezing proto for $25
- **Ex 2:** Kocho chopping proto for $80
- **Ex 3:** Leaf Scraping (engine) for $1,030

### Key Dependencies & Risks
- Cost to the Farmer
- Design Aspects (maneuverability, ease of use, user friendly, etc.)
- Easy to Clean
- Doesn’t Clog or Jam
- Low Maintenance Costs (i.e. engine)

### Gain to SHF (est.)
- **Reduced Time Spent**
  - Average Hours per Plant/Woman: 14.25
  - Four selected steps represent 11 hours
  - New equipment can reduce time by 50%  
  - Overall reduction of 5.5 hours per plant
- **Translates to 337 hours per year per woman ($43/year).**

### Potential Partners
- **Selam Awassa Business Group Plc.** – privately funded, prototype for leaf scraping
- **Selam Children’s Village** – privately funded, machines that could be adapted for kocho squeezing and chopping
- **Sodo Rural Technology Center** – government funded, prototype for kocho squeezing and chopping
- **Melkasa Agricultural Research Center** – government funded; prototype for corm pulverizing
- **PAMARK Business Plc.** – technology prototyping and potential farmer co-design leader and project coordination

---

1 Price for the prototype at the Sodo Rural Technology Center
2 Price for the prototype at Selam Awassa Business Group Plc
TIME SAVED BY WOMEN THROUGH PROCESSING IMPROVEMENTS CAN BE USED FOR A VARIETY OF PRODUCTIVE ACTIVITIES

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>Overview</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>• Ongoing education for herself and/or her children</td>
<td>• More qualified for higher earnings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Educated children can send home remittances</td>
</tr>
<tr>
<td>Selling Products in Local Markets</td>
<td>• A major hurdle for selling goods is having the time to sit at the market</td>
<td>• Additional income sources</td>
</tr>
<tr>
<td>Micro-Enterprises</td>
<td>• Selling animal products (eggs, milk, cheese, butter), weaving, processing for hire, etc.</td>
<td>• Additional income sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More diversified and nutritious diet</td>
</tr>
<tr>
<td>Production of Other Enset Goods</td>
<td>• Can process fiber, make bulla or kocho flour, bread, or gather leaves for sale</td>
<td>• Additional income sources</td>
</tr>
<tr>
<td>Other On-Farm Tasks</td>
<td>• Freed time to grow additional crops, raise animals or cover for children going to school</td>
<td>• Efficiency and productivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Less strenuous and injurious tasks</td>
</tr>
</tbody>
</table>

Additional free time empowers women with additional income, possibility of higher education, and ability to better provide for the family.

330 hour per year processing intervention benefit (41 days).
Estimated labor rate is 20 birr per day (≈$1). Estimates range from 20-80 birr per day.

**BENEFIT:** $43 per year
ADDITIONAL DOWNSTREAM MARGINS CAN BE CAPTURED BY PRODUCERS THROUGH CREATION OF MARKETING GROUPS

INTERVENTION #3: ORGANIZATION OF MARKETING GROUPS

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
</tr>
</thead>
</table>
| **Awareness:** unaware of market prices and downstream margins | **Organization of Marketing Groups:**  
  - Food Products (kocho, bulla)  
  - Enset Fiber  
  - Other Products (leaves, bread, flour, paper, etc.) | Marketing groups face internal management challenges as well as pushback from losing value chain players:  
- Formalizing group structure  
- Ongoing management of membership  
- Splitting of financial costs and profits  
- Pushback from Traders |
| **Education:** don’t know how to sell to end users directly or organize contracts with larger customers | **Formation of Assembler Unions**  
(CASE STUDY: Could set up a mirror of the coffee model: use organized grower associations, paired with downstream assembler unions to streamline the value chain as done in the 1980’s in Ethiopia.) | |
| **Organization:** don’t have the volume required to gain seller power from aggregation and collective sales |  | Suggested Implementation:  
MARKETING GROUPS need sustained, on-going financial and management training until fully ready to “graduate”. Facilitation of dialogue with downstream players is crucial. |

1 Dr. Gebre Ynitso, Addis Ababa University, Dean of the Department of Social Sciences
# INTERVENTION #3: ORGANIZATION OF MARKETING GROUPS

## Key Intervention Elements
- Identification of Existing Marketing Groups (i.e. Gurage Region)
- Formation of New Marketing Groups
- Arranging Transportation to Local or Regional Markets
- Transit Warehousing to Maximize Price
- Establish Broker Facilities at Markets
- Connect Groups to Collectors for Bulk Purchases

## Potential Programs Formats
### Platform-Based
- Leverage enset parks for associations, as well as a conduit for training and technology diffusion
- Expand farmer group base

### Major Nodal Catchment Areas
- Identify existing groups
- Enable, train and grow within close proximity to terminal markets

## Size, Scalability & Timing
- Village For-Profit Processing: 12 members
- Fiber Marketing Assoc.: 3,000+ farmers and 750 assemblers (unionized)
- Farmer Assoc. (Gamo Highlands): 250 members

- Grow farmer base around key platforms and within terminal market nodes
- Takes 12-18 months to organize groups, only 1 month to register

## Key Dependencies & Risks
- Failure of group structure
- Breakdown in management or leadership
- Membership complications (i.e. fees or new member addition)
- Profit-sharing and cost allocation issues
- Expected to be pushback from affected value chain groups (i.e. traders)

## Gain to SHF (est.)
- **Improved SHF Revenue**
  - Top producing farmers sell 500kg/yr
  - Lost margin per ton is ≈ $800
  - Groups can capture 50% of lost margin
  - **Half a ton at 42% margin capture is an increase of $172/yr.**

## Potential Partners
- Association for the Research and Conservation of Culture (ARCC) – appointed by the Enset Consortium and supported by Christensen Fund
- Addis Ababa University (Dept. of Social Sciences)
- Awassa University (Sidama/Gedeo Improved Seed Groups and Enset Park)
- Arba Minch University (Gamo Highlands Enset Park)
- Metsar Enset Village (Processing and Micro Industry Groups) – in collaboration with Kyoto University
MARKETING GROUPS CAN CAPTURE MILLIONS IN LOST DOWNSTREAM MARGINS

<table>
<thead>
<tr>
<th></th>
<th>Price Δ</th>
<th>Volume(^1)</th>
<th>% Capture(^3)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Local Market</td>
<td>+$169</td>
<td>125,400 MT</td>
<td>70%</td>
</tr>
<tr>
<td>2</td>
<td>Regional Market</td>
<td>+$122</td>
<td>84,360 MT</td>
<td>20%</td>
</tr>
<tr>
<td>3</td>
<td>Terminal Market</td>
<td>+$518</td>
<td>18,240 MT</td>
<td>5%</td>
</tr>
</tbody>
</table>

1. Volume assumes total of 2.28 million metric ton production (90% of which is consumed on farm) – based on 114M plants harvested @ 20kg dry matter
2. Local (55% of volume), Regional (37% of volume), Terminal (8% of volume)
3. The estimated likely percentage of margins that SHFs could capture at successively more distant downstream stages.

1. Volume assumes total of 2.28 million metric ton production (90% of which is consumed on farm) – based on 114M plants harvested @ 20kg dry matter
2. Local (55% of volume), Regional (37% of volume), Terminal (8% of volume)
3. The estimated likely percentage of margins that SHFs could capture at successively more distant downstream stages.
UNTAPPED POTENTIAL FOR NEW FIBER REVENUE STREAM FOR 125,000 SHF; UNSERVED DEMAND FOR FIBER IS 3-6X CURRENT VOLUME

Potential Marketing Group Benefits:

- Contract Purchasing
- Transport Included
- Higher Prices (56% to 210% increase)
  - Trader: 5-8 birr/kg; Factory Contract: 12.5 - 15.5 birr/kg
- Built-In Price Incentives and Disincentives
- Free Training at Factory (Collection and Processing)
- Electronic Transfer of Funds
- Establishing Factories Closer to Production Centers

Fiber market is projected to increase due to:

- Product Line Expansion (twine, rope, new bag SKUs)
- Plans to serve export markets (Kenya, Sudan, Somalia and Japan)

Topline demand of 5,700 MT is expected to more than double in the next 5-10 years (to 12,000 MT).

UN-SERVED DEMAND

**Current Situation**
Total Requirement: 5,700 MT
- 3,700 MT imported
- 2,000 MT locally procured

**Potential Situation**
Total Requirement: 5,700 MT
- 5,700 locally sourced

**Pricing (average):**
14,000 birr/MT ($700 MT)

**Un-Served Demand**
3,700 MT @ $700 MT
$2,590,000
≈ 125,000 SHF
(selling 40% of fiber / year)

SOURCE: Interview with Ato Nuredin, Owner of Meher Fiber and Ethio Fiber, the only enset fiber processing factory in Ethiopia
Enset Product | Overview
--- | ---
**Kocho** | • Must be processed and fermented  
• Consumed as a variety of breads, mixed with stews, or served with kitfo

**Bulla** | • A powdery byproduct of kocho squeezing  
• Eaten as a porridge, in a pancake (like injera), and other specialty dishes  
• Most expensive enset food product

**Amicho** | • Immature corm of young plants (<3yrs)  
• Boiled and eaten as potatoes

**Fiber** | • Layer of the leaf sheath behind the starch  
• High strength qualities make it excellent for sacks (coffee), rope, mats, bags, etc.

**Kocho Flour** | • Dried kocho that is chopped and refined into a flour  
• Very new product, minimal availability

**Bulla Flour** | • Dried bulla powder  
• Easily transported and stored, in high demand from the diaspora

**Leaves** | • Upper leaves used for fodder, storage, packing, lining the fermentation pits, cooking bread, and plates

**Suckers** | • Traded or sold in small quantities at the local level

---

Enset is a multipurpose plant that is eaten, processed, used on-farm and sold in many forms.

Markets for kocho and fiber were assessed in this report.

Total value of the plant byproducts exceeds even what we have already outlined.

Additional market research needed to assess product mix based on export targets.
POTENTIAL FARMER MARGIN IMPACT OF ENSET INTERVENTIONS AT FULL ADOPTION, REPRESENT ~410% INCREASE, INCLUDING SELLING FIBER

Enset Intervention Impact Waterfall
($USD/farmer)

- **Current Farmer Margin**: $84
- **Yield Gain**: $27
- **Time Savings**: $43
- **Price Gain**: $172
- **New Revenue Stream**: $346
- **Future Farmer Margin**: $485

**Intervention #1**: Increase yields from usage improved planting materials

**Intervention #2**: Time savings equivalent for reduced processing time from mechanization

**Intervention #3**: Price increase by selling product further downstream (mostly local gains)

Additional revenue from selling fiber to factory via existing contract structure

At full adoption the interventions would increase farmer margin over 410%
THE CUMULATIVE FINANCIAL IMPACT OF INTERVENTIONS COULD AMOUNT TO OVER $57MM ASSUMING SUCCESSFUL TARGETING OF TOP TIER PRODUCERS

| Benefit per farmer from Int. #1: | $27  | 50,000 |
| (yield from adoption of improved varieties) |
| Benefit per farmer from Int. #2: | $43  | 450,000 |
| (value of time saved by using processing equipment) |
| Benefit per farmer from Int. #3: | $172 | 200,000 |
| (revenue gained by capturing % of downstream margin) |
| Benefit per farmer from Int. #3: | $21  | 125,000 |
| (selling excess fiber to factory) |
| Net benefit per farmer per annum | $262 | |

Aggregate SHF benefit per annum

$57 MM

Assumptions of Context Network Analysis:
- 500kg sold by top producers (Tier 1)
- $168 farmgate price per ton estimate
- INT #1 – Increased yields from improved varieties in 10% of farmer plot area; 25% adoption by Tier 1 farmers
- INT #2 – 330 hours saved annually converted to labor equivalency of 20 birr/day; 75% of Tier 1 and 2 farmers
- INT #3 – capture 42% of downstream revenue, primarily at the local level; Tier 1 farmers
- INT #3 – sell 40% of fiber production per year (30kg) at 13.5 birr/kg
4 Stakeholder Profiles
PHASE 2 ETHIOPIA ENSET EXECUTIVE SUMMARY

1 SECTOR FUNDAMENTALS

- Enset is a primary staple crop for over 20% of Ethiopia’s population (~18M people), with production and consumption centralized in the Oromia and SNNPR regions.
- Roughly 114 million enset plants are harvested per year. The average dry matter production per plant is 20 kg placing total production at 2.28 million metric tons.
- Enset is grown by over 4 million smallholder farmers.

2 VALUE CHAIN OPPORTUNITIES

- Current value chain has not been successfully analyzed by previous studies and is not well understood.
- While demand continues to rise in terminal markets, farmers show little awareness of the potential value of enset products as a substantial revenue stream.
- Inefficient value chains and low marketing understanding of farmers provide significant opportunities to improve SHF incomes.

3 INTERVENTIONS & IMPACT

- Interventions have been refined to focus on enset parks, prototyping processing tools, and marketing groups.
- Enset parks provide a platform for maintaining genetic diversity, training farmers on best practices for production, processing and marketing, as well as ecotourism.
- Prototyping will address tools for the four major labor-intensive processing steps.
- Marketing groups will provide education, market awareness, and organization.

4 STAKEHOLDER PROFILES

- Each intervention has strong partner candidates, we have focused on those with strong existing platforms that can be used as a springboard.
- Gamo Highlands – Enset Park and Farmer Organizations
- Wolaita-Sodo – Research and Prototyping Hub
- Metsar Village – Enset Park and Marketing Groups
HIGHLIGHTED PARTNERS ARE THE STRONGEST OPTIONS IDENTIFIED THROUGH PRIMARY RESEARCH

<table>
<thead>
<tr>
<th>Intervention #1</th>
<th>Intervention #2</th>
<th>Intervention #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enset Parks as a Platform</td>
<td>Improved Processing Equipment</td>
<td>Organization of Marketing Groups</td>
</tr>
</tbody>
</table>

- **Admin**
  - Christensen Fund
  - ARCC

- **Research**
  - SARI / Areka Research Station
  - Addis Ababa Univ.

- **Enset Park Platforms**
  - Awassa Univ.
  - Arba Minch Univ.
  - Kyoto / Metsar Enset Village
  - Selam Children’s Village

- **Processing**
  - Selam Awassa Plc
  - Melkasa Agricultural Research Center
  - G-Seven Trading & Industry Plc

---

Source: Context Network interviews
## INTERVENTIONS #1 (ENSET PARKS) AND #3 (MARKETING GROUPS) SHARE OVERLAPPING 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>Christensen Fund¹</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>ARCC</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>ISD (Inst. For Sust. Devel.)</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Government</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SARI</td>
<td>Research</td>
<td>Medium</td>
<td>(Gov’t.)</td>
<td>Medium</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Areka Res. Station</td>
<td>Research</td>
<td>Medium</td>
<td>(Gov’t.)</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>Addis Ababa University²</td>
<td>Strong</td>
<td>---</td>
<td>(Gov’t.)</td>
<td>Medium</td>
<td>Medium</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Arba Minch University³</td>
<td>Strong</td>
<td>Low</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>Awassa University⁴</td>
<td>Enset Parks; Marketing Groups</td>
<td>Strong</td>
<td>Low</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyoto University⁵</td>
<td>Research; Enset Parks; Marketing Groups</td>
<td>Strong</td>
<td>Low</td>
<td>???</td>
<td>Strong</td>
<td>Strong</td>
</tr>
<tr>
<td>Metsar Enset Village</td>
<td>Enset Parks; Marketing Groups</td>
<td>Medium</td>
<td>Low</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
</tr>
</tbody>
</table>

¹ Dr. Tadesse Gossa Wolde (Admin); Dr. Tadesse Kipple (Admin)
² Dr. Gebre Ynitso (Admin); Dr. Zerihun Woldu (Research), Dr. Endashaw Bekele (Research)
³ Dr. Feleke Woldeyes (Enset Parks); Dr. Tessema Tanto (Research); Dr. Alemayehu Hallemicieel (Marketing Groups)
⁴ Dr. Kelsa Kena (Research); Dr. Bizuayehu Tesfaye (Enset Parks and Marketing Groups)
⁵ Dr. Masayoshi Shigeta (Research, Enset Parks, Marketing Groups)
POTENTIAL PARTNERS FOR INTERVENTION #2 (PROCESSING EQUIPMENT) ARE PREDOMINANTLY EQUIPMENT MANUFACTURERS

<table>
<thead>
<tr>
<th></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>
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</thead>
<tbody>
<tr>
<td><strong>Private</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christensen Fund¹</td>
<td>Intervention</td>
<td>Strong</td>
<td>Medium</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td></td>
<td>Administration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCC</td>
<td>Intervention</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>Administration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodo Rural Technology Center</td>
<td>Processing Equipment</td>
<td>Low</td>
<td>Medium</td>
<td>(Gov’t.)</td>
<td>Low</td>
<td>Medium</td>
<td>LOW</td>
</tr>
<tr>
<td>Melkasa Agri. Research Ctr.</td>
<td>Processing Equipment</td>
<td>Medium</td>
<td>Strong</td>
<td>(Gov’t.)</td>
<td>Medium</td>
<td>Strong</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>Selam Children’s Village</td>
<td>Processing Equipment</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
<tr>
<td>Selam Awassa Plc.</td>
<td>Processing Equipment</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>PAMARK²</td>
<td>Processing Equipment</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Strong</td>
<td>LOW</td>
</tr>
<tr>
<td>G-Seven Trading &amp; Industry Plc</td>
<td>Fiber Marketing Partner</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>STRONG</td>
</tr>
</tbody>
</table>

¹ Dr. Tadesse Gossa Wolde (Admin); Dr. Tadesse Kippie (Admin)
² Recently established, but founder also co-founded and ran Selam Awassa Plc for five years.
CHRISTENSEN FUND IS THE MOST ESTABLISHED PLAYER CURRENTLY INVESTING IN THE DEVELOPMENT OF ENSET IN ETHIOPIA

### Overview & History
- The Christensen Fund is a private foundation founded in 1957 and based in San Francisco, California.
- Over the next five decades, their mission evolved to encompass projects on biocultural diversity and ___ in five priority regions.
- In the early 2000s the Fund began an ordered transition away from being a family foundation. In 2002 it hired its first non-family Executive Director, Dr. Kenneth Wilson.

### Management / Leadership
- Dr. Ken Wilson – Executive Director and CEO
- Ms. Bea Calo – Director of Grant-Making
- Mr. Jeff Pace – Director Finance and Operations
- Dr. Tadesse Gossa Wolde – Program Officer, African Rift Valley

### Financials
- 20+ full-time staff members
- As of 2002, they are managed by a primarily by non-family Board and non-family Executive Director.
- Funding is derived from family endowments.

### Interest & Capabilities
- Since 2003, the focus of work has been biocultural diversity to support the resilience of living diversity at landscape and community level globally in partnerships with Indigenous peoples and others.
- Stewards and conservators of traditional art, indigenous cultural practices and vulnerable landscapes.

### Considerations and Preliminary Concerns
- The helped create and finance the only organization (ARCC) focused exclusively on supporting and maintaining enset agroecological and biocultural systems.
- African Rift Valley is one of their priority areas.
- They are also the primary donor for most existing enset projects and highly integrated within the enset space in Ethiopia.
- Christensen is working with Regional Government, Bureau of Culture & Tourism, ARCC and Arba Minch University to develop enset parks.
SARI IS A PUBLIC RESEARCH ORGANIZATION FOCUSED ON SNNPR; THEY CONDUCT GENETIC AND AGRONOMIC DEVELOPMENT RESEARCH

Overview & History

- The Southern Agricultural Research Institute SARI was established by the regional government in November 2002.
- Mission is to provide improved agricultural development, maintenance and improvement of the natural resources of the region; it is also mandated to coordinate agricultural research in the region.
- Purely academic research previously resulted in poor farmer uptake of released technologies.
- SARI ensures that the availed technologies address the problems of target beneficiaries by testing their suitability under different agro-ecologies and on farmers'/pastoralists’ conditions.

Management / Leadership

- Mr. Daniel Ambachew – Acting Director
- Dr. Woldeyesus Sinebo – Crop Science Research Director
- Mr. Zerihun Yemataw – National Enset Research Coordinator
- Mr. Yasin Goa – Center Coordinator (Areka)

Financials

- A public body in charge of establishing and coordinating the different research centers of the region as well as linking them with other relevant stakeholders.
- Runs six research centers in SNNPR with their own dedicated staff.

Interest & Capabilities

- Development of technologies for improving crop and livestock productivity as well as natural resources management in the SNNPR.
- Project to address integrated management of Enset Bacterial Wilt in collaboration with the McKnight Foundation.

Considerations and Preliminary Concerns

- SARI has the exclusive enset research mandate from the government.
- Their focus includes development of improved agronomic practices, identification and categorization of enset varieties, and the breeding and dissemination of improved varieties.
- Primary constraints are linkages to extension systems and distribution networks for optimal farmer uptake of research results.
KYOTO UNIVERSITY’S METSAR ENSET VILLAGE PROJECT IS AN EXCELLENT MODEL FOR VILLAGE-BASED ENSET PARKS AND MARKETING GROUPS

**Overview & History**

- In 2008, the enset project began by opening the people’s enset garden in order to encourage the cultivation and conservation of enset local varieties.
- The South Omo People’s Ensete Research Center (SOPERC) is located in Metsar Village of the South Ari werede (district).
- It is an Asia-Africa joint effort (AAJE) with The Center for African Area Studies of Kyoto University.

**Management / Leadership**

- Dr. Masayoshi Shigeta – leads Enset Village project and research
- Ato Yusuf – Metsar Mayor
- Ato Dawit Yonas – Deputy Head of Agriculture
- Ato Lennma Chigro – Extension OIC

Also, leaders of the enset fiber group and the separate enset processing group. The enset field gene banks have individual local caretakers to manage the plots.

**Financials**

- Enset Field Gene Bank in Metsar has 64 local varieties donated by the 300+ farmers in the village.
- Field gene bank is 1 Ha and expected to grow to 4 Ha.
- Enset processing group has roughly 12 members.
- Enset fiber group has roughly 8 members.

**Interest & Capabilities**

- Activities include:
  1. Conservation of local enset varieties (60 varieties from farmers)
  2. Multiplication and distribution of enset land races and improved enset varieties to farmers
  3. Education on best cultivation practices and information exchange platform for participating farmers (300+ just in Metsar)
  4. Development of new micro-industries for specialty enset products (i.e. paper, handicrafts, textiles, bulla and kocho flour)

**Considerations and Preliminary Concerns**

- Leading expert (Dr. Shigeta) who co-authored the book on Enset (“Tree Against Hunger”) has worked in Metsar for over 25 years.
- The model created in the village is an excellent platform for expansion and replication.
- The Metsar model integrates agronomic best practices with village-based organization and marketing groups.
- However, the current efforts are confined to a limited area.
SELAM CHILDREN’S VILLAGE HAS STRONG CAPABILITIES IN ENGINEERING AND AGRICULTURAL EQUIPMENT DESIGN AND FABRICATION

**Overview & History**
- In the 60’s and 70’s, a Swiss family (Roeschlis) lived in Ethiopia and adopted six Ethiopian children.
- They then left during the communist regime.
- During the famine of the 80’s, their eldest, Tsehay, returned to Ethiopia and helped start the Selam Children’s Village (SCV) with their Swiss funding.

**Management / Leadership**
- Ato Hailegiorgis Kassa – Executive Director
- Ato Hailegabriel Guta – Engineering and Design Dept. Head

**Financials**
- They have trained a total of 648 persons in various industries.
- 207 of these are industrial and agricultural engineers.
- Their charitable activities are supported by a variety of income generating activities: garment making, metal fabrication, aluminum and stainless steel production, and agricultural equipment manufacturing.

**Interest & Capabilities**
- Currently, the activities of SCV include: kindergarten, primary schools, technical and vocational training college, garment making training with income generating programs like metal fabrication, aluminum and stainless steel production and agricultural production.
- They work with orphans as well as widowed and single mothers.
- Their facilities and workshops have Swiss fabrication and machining equipment. Current products include: mills, presses, threshers, rice polishers, cross flow turbines, and other industrial-scale equipment.

**Considerations and Preliminary Concerns**
- They have extensive experience designing, prototyping, and manufacturing industrial and agricultural equipment (even larger scale machines).
- They have worked with World Vision and GIZ on fabrication on agricultural tools and equipment projects.
- They have the capacity to make hundreds of industrial-scale products on a monthly basis.
- Compared to other sites, their facilities and personnel are excellent.
Appendix

April 28, 2014
## APPENDIX 1a – POPULATION CALCULATION METHODOLOGIES

### PRIMARY RESEARCH

We have had interviews with 12+ contacts who estimate that enset is the primary food crop for **15-20 million** people in Ethiopia.

<table>
<thead>
<tr>
<th>Source</th>
<th># of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Steven Brandt, University of Florida, Dept. of Anthropology, Co-Author of “Tree Against Hunger”</td>
<td>&gt;10M (20% of total population as of 1997)</td>
</tr>
<tr>
<td>Dr. Gebre Ynitso, Addis Ababa University, Dean of Social Sciences</td>
<td>15-20M</td>
</tr>
<tr>
<td>Dr. Berga Lemaga, ATA (Ethiopia)</td>
<td>15-20M</td>
</tr>
<tr>
<td>Mr. Awol Zeberga, Southern Ethiopian Agricultural Research Institute (SARI)</td>
<td>20M</td>
</tr>
<tr>
<td>Mr. Belayneh Admassu, Coordinator of the National Agricultural Biotechnological Research Program</td>
<td>15-20M</td>
</tr>
<tr>
<td>Dr. Lemma Desalegne, Agricultural Researcher (Ethiopia)</td>
<td>20M</td>
</tr>
<tr>
<td>Dr. Zerihun Woldu, Addis Ababa University (Biology Dept.)</td>
<td>15M (two meals/day), 20M (one meal)*</td>
</tr>
<tr>
<td>Dr. Endashaw Bekele, Addis Ababa University (Genetics Dept. – Enset Research)</td>
<td>20M</td>
</tr>
<tr>
<td>Habtamu Hailu, National Project Coordinator, Agro-Biodiversity Conservation Project</td>
<td>10M (SNNPR)</td>
</tr>
</tbody>
</table>
APPENDIX 1b – POPULATION CALCULATION METHODOLOGIES

2 REGIONAL APPROACH\textsuperscript{1,2}

80% of the population in the SNNPR is dependent on enset.\textsuperscript{1} 20% of the population in Oromo region is dependent on enset. Oromo Region Population: 25,489,024 SNNPR Sub-Regions Population: 16,166,831 (16M * 80\% = 13M) Oromo: (25M * 20\% = 5M) TOTAL: 18 M

<table>
<thead>
<tr>
<th>ETHNIC GROUP</th>
<th>POPULATION</th>
<th>% of TOTAL</th>
<th>REMARKS (Alt. Name/ Spelling)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oromo</td>
<td>25,489,024</td>
<td>34.5</td>
<td>Oromia</td>
</tr>
<tr>
<td>Sidama</td>
<td>2,966,474</td>
<td>4.01</td>
<td>South Omo</td>
</tr>
<tr>
<td>Guragie</td>
<td>1,867,377</td>
<td>2.53</td>
<td>Gurage</td>
</tr>
<tr>
<td>Welaita</td>
<td>1,707,079</td>
<td>2.31</td>
<td>Wolayta, North Omo</td>
</tr>
<tr>
<td>Hadiya</td>
<td>1,284,373</td>
<td>1.74</td>
<td>North Omo</td>
</tr>
<tr>
<td>Gamo</td>
<td>1,107,163</td>
<td>1.5</td>
<td>North Omo</td>
</tr>
<tr>
<td>Gedeo</td>
<td>986,977</td>
<td>1.34</td>
<td>South Omo</td>
</tr>
<tr>
<td>Silte</td>
<td>940,766</td>
<td>1.27</td>
<td>Formerly a Gurage Sub-group</td>
</tr>
<tr>
<td>Kefficho</td>
<td>870,213</td>
<td>1.18</td>
<td>\textit{alias} Kafa, South Omo</td>
</tr>
<tr>
<td>Kembata</td>
<td>630,236</td>
<td>0.85</td>
<td>North Omo</td>
</tr>
<tr>
<td>Other</td>
<td>3,806,173</td>
<td>5.00</td>
<td>Various Smaller Groups</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>41,665,855</strong></td>
<td><strong>56.38</strong></td>
<td>Total Population of Enset Growing Regions</td>
</tr>
</tbody>
</table>

\textsuperscript{1} Interview with Dr. Gebre Ynitso, Addis Ababa University, Dean of Social Sciences
\textsuperscript{2} Documentation from Dr. Endashaw Bekele, Addis Ababa University (Genetics Department – Enset Research)
**APPENDIX 1c – POPULATION CALCULATION METHODOLOGIES**

### KILOCALORIE CALCULATION

114M Enset Plants Harvested in 2012/13
1. a) 32 kg of Edible Dry Matter per Plant (*Dr. Tadesse Kippie, 5,000 Years of Sustainability*)
2. b) 30 kg of Edible Dry Matter per Plant (*Endashaw Bekele – high end*)
3. c) 21 kg of Edible Dry Matter per Plant (*Ethiopian CSA*)
4. d) 15 kg of Edible Dry Matter per Plant (“Tree Against Hunger”)

A) 3,648M kg/year divided by 150 kg/person = **24.3 million people**
B) 3,420M kg/year divided by 150 kg/person = **22.8 million people**
C) 2,394M kg/year divided by 150 kg/person = **15.9 million people**
D) 1,710M kg/year divided by 150 kg/person = **11.4 million people**

### FARMER / FAMILY APPROACH²

The number of enset producing smallholder farmers = 4.4M farmers
Average family size = 5 people
Total people primarily consuming enset on-farm = **21.9M people**

### NATIONAL APPROACH³

Percent of National Population Reliant on Enset = 18-20%
Ethiopian Population = 92 million people
Total Number of Ethiopians Reliant on Enset = **16.6 – 18.4M people**

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¹ (Multiple) “5,000 Years of Sustainability”, Interview with Dr. Endashaw Bekele, Ethiopian CSA, “Tree Against Hunger”
³ Linear Model Prediction Enset Yields & Assessment Kocho Production, Shank, Robert and Ertiro Chernet, UNDP, [http://www.africa.upenn.edu/eue_web/enset96.htm](http://www.africa.upenn.edu/eue_web/enset96.htm)
APPENDIX 2a – ENSET NOT LARGE BY AREA WITH 300,000 HA COVERED

Sources converge on a consistent number of hectares under enset.

1 PUBLISHED SOURCES\(^1,2\)

Published sources indicate that the total hectares covered by enset are roughly **300,000 Ha**.\(^1,2\)

2 OTHER COMMENTARY\(^3,4\)

Enset production per hectare (smallholder farms) = 2.3 tons
Total production for 2010/11 = 694,810 tons
Total hectares under enset = **302,091 Ha**

3 RESEARCH OFFICERS\(^5\)

Hectares of Enset Nationally: **319,000 Ha**
- SNNPR Enset Area: **217,000 Ha**
- Oromia Enset Area: **102,000 Ha**

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\(^1\) Linear Model Prediction Enset Yields & Assessment Kocho Production, Shank, Robert and Ertiro Chernet, UNDP, [http://www.africa.upenn.edu/eue_web/enset96.htm](http://www.africa.upenn.edu/eue_web/enset96.htm).
\(^2\) Interview with Dr. Daniel Ambachew, Director of SARI
\(^3\) Five Thousand Years of Sustainability: A Case study on Gedeo Land Use (Southern Ethiopia), Tadesse Kippie Kanshie, Tree Book Publishers, 2002.
\(^5\) Dr. Zenhun Zena, Bureau of Agriculture (SNNPR)
APPENDIX 2b – ENSET NOT LARGE BY AREA WITH 300,000 HA COVERED

Sources converge on a consistent number of hectares under enset.

4 AREA CONVERSION

Total Enset Plants Harvested per Year = 114 million¹
Average Spacing per Plant (1.5m x 3m) = 4.5 square meters²,³

(Planting Density = 2,222 plants /Ha)

Total Area Harvested per Year (sqm) = 513 square meters
Total Area Harvested per Year (Ha) = 51,300 Ha

Average Harvested Plant Age = 5-7 years²,⁴
Total Hectares under Enset (6 year age) = 307,800 Ha

¹ Ethiopian Central Statistical Agency 2011
² Five Thousand Years of Sustainability: A Case study on Gedeo Land Use (Southern Ethiopia), Tadesse Kippie Kanshie, Tree Book Publishers, 2002.
³ Mr. Zerihun Zena, Bureau of Agriculture (SNNPR)
⁴ Interviews with Dr. Zerihun Woldu, Dr. Endashaw Bekele et al.
APPENDIX 3a – CONTACTS (OVERVIEW)

TOTAL Contact Count = 75 Interviews
APPENDIX 3b – CONTACTS

COMPLETED DESK STUDY INTERVIEWS

Phase I
1. Dr. Steven Brandt, University of Florida, Dept. of Anthropology, Co-Author of “Tree Against Hunger”
2. Dr. Anita Spring, University of Florida, Prof. Emeritus, Co-Author of “Tree Against Hunger”
3. Dr. Elizabeth Hildebrand, Stony Brook University, Dept. of Anthropology, Co-Author of “Tree Against Hunger”, PhD on Honey, Enset and Yams
4. Dr. Masayoshi Shigeta, Kyoto University, Ethnobotanist, 20 years working on enset in Ethiopia
5. Dr. Berga Lemaga, ATA (Ethiopia)
6. Mr. Awol Zeberga, Southern Ethiopian Agricultural Research Institute (SARI)
7. Mr. Belayneh Admassu, Coordinator of the National Agricultural Biotechnological Research Program
8. Dr. Lemma Desalegne, Agricultural Researcher (Ethiopia)
APPENDIX 3c – CONTACTS

COMPLETED IN-COUNTRY INTERVIEWS (HIGHLIGHTS)

Phase II

9. Sue Edwards, Director of ISD (Institute for Sustainable Development)

10. Dr. Zerihun Woldu, Addis Ababa University (Biology Department – Enset Research)

11. Dr. Endashaw Bekele, Addis Ababa University (Genetics Department – Enset Research)

12. Dr. Gebre Ynitso, Addis Ababa University, Dean of Social Sciences

13. Isaak Nuredin, Owner and Managing Director of Meher Fiber and Ethio Fiber


15. Kebour Ghenna, Director of Initiative Africa NGO and President of the African Chambers of Commerce

16. Dr. Gemedo Dalle Tussie, Director General, Ethiopian Institute of Biodiversity; Chair of Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)

17. Habtamu Hailu, National Project Coordinator, Agro-Biodiversity Conservation Project

18. Dr. Bizuayehu Tesfaye, Hawassa University, Associate Professor, Enset Research funded by Christensen Fund

19. Dr. Daniel Ambachew, Director of Crops Research Southern Ethiopian Agriculture Research Institute (SARI)
**APPENDIX 3d – CONTACTS**

**COMPLETED IN-COUNTRY INTERVIEWS**

**Phase II**

20. Dr. Zerihun Zena, Bureau of Agriculture

21. Dr. Nigussie Dana, Director General of SARI

22. Ato Yusuf, Mayor – Metser City

23. Dr. Feleke Woldeyes, President of Arba Minch University

24. Dr. Tadesse Kippie, Former President of Dilla University

25. Dr. Bizuayehu Tesfaye, Awassa University

26. Ato Kelsa Kena, Awassa University

27. Mr. Atkelt Girmay, General Manager and Owner of PAMARK Business Plc

28. Dr. Tadesse Grosse Wolde, Program Officer – African Rift Valley (Christensen Fund)

29. Dr. Ken Wilson, Executive Director (Christensen Fund)

30. Ato Isaak Nuredin, Managing Director and Owner (G7 Fiber Manufacturing)

31. Ato Kassa Hailegiorgis, General Manager of Selam Children’s Village.

For further detail on interview contacts, please refer to the complete contact list in excel.
APPENDIX 4a – PUBLISHED SOURCES


25. Alternative Market Growth Stages, Dr. Andualem, Getie, Addis Ababa University, College of Commerce, 2010


APPENDIX 4b – PUBLISHED SOURCES


33. Tree Against Hunger, Brandt, Steve et al, Amerian Association for Advance of Science, Awassa Agricultural Research Center, Kyoto University Center for African Area Studies, University of Florida, 1997.


Backup or Alternate Slides

April 28, 2014
IRRELEVANCE OF THE TERM YIELD PER HECTARE IN THE CASE OF ENSET

Because of the above mentioned factors, the complex patterns of Enset cropping and the intermittent use of this multi-year crop, it is of little meaning to know the yield per hectare. The fact that Enset could produce as large or larger quantities of energy food per hectare than other crops is established. But the more important fact is that with dwindling family land holdings, reliable production of energy food with flexible consumption potential is of great utility. Energy foods are essential to the daily existence of the family caretakers regardless of the current cropping environment. Annual crops deteriorate in storage whereas Enset continues to grow until a few days before need necessitates harvest. No other crop provides the productive potential and the flexibility of consumption as that of Enset. Production per hectare at any one time in the year or across years will depend entirely upon the food status of the family relative to the production level of their other crops.

http://www.africa.upenn.edu/eue_web/enset96.htm
NODAL SYSTEM – High Level