



MULTI CROP VALUE CHAIN PHASE II **ETHIOPIA – Enset**

September 11, 2014

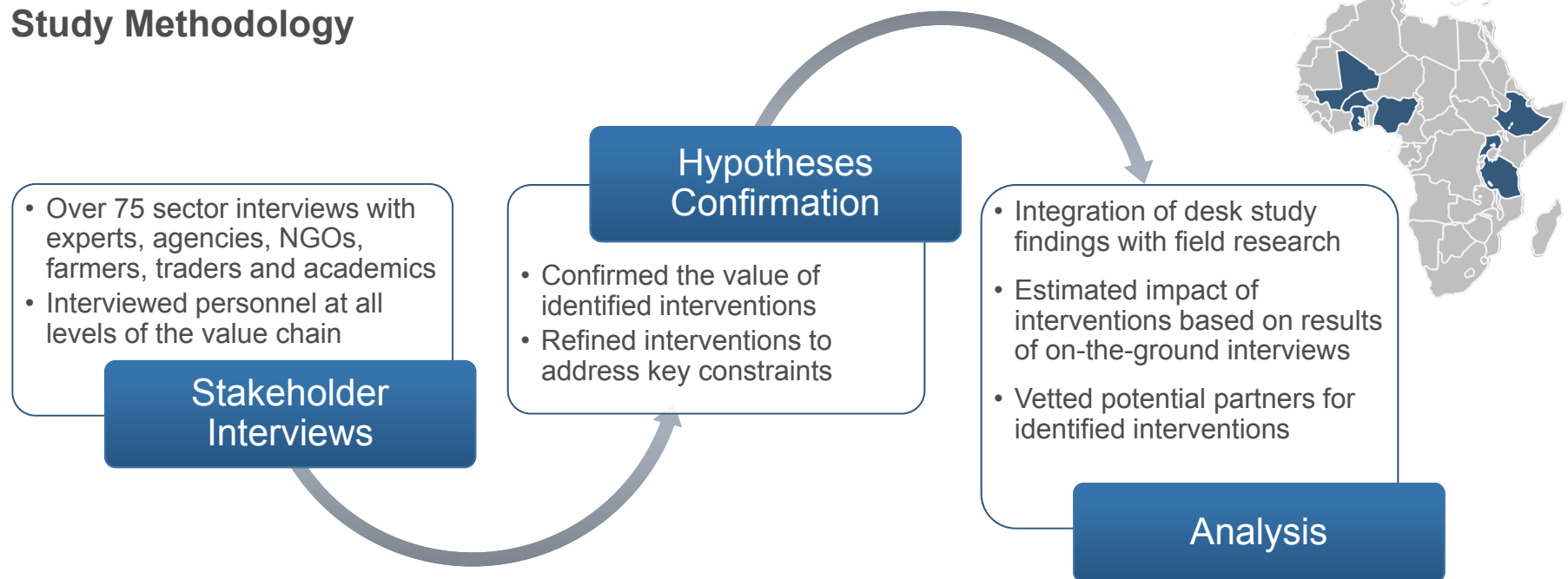


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SCOPE OF THIS STUDY

Study Methodology



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
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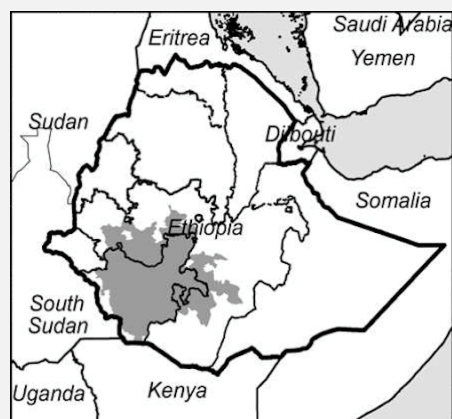
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ENSET IS THE CRITICAL STAPLE CROP FOR 15-20 MILLION PEOPLE IN ETHIOPIA'S POOREST AND MOST DENSELY POPULATED REGION



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 a 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

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

* 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

Calculation Methodology	Total Area
Published Sources (Appendix 2a)	300,000 Ha
Other Commentary (Appendix 2a)	302,091 Ha
Research Officers (Appendix 2a)	319,000 Ha
Area Conversion* (Appendix 2b)	307,800 Ha

* 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

Consumption ¹ :	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 Spacing ² :	4.5m ² /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).
8 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



ENSET GARDENS COMPRISE A SMALL BUT INTEGRAL FOOTPRINT WITHIN THE SMALLHOLDER SYSTEM; QUITE LITERALLY “CLOSE TO HOME”



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.

Trees Harvested¹	114M
Dry Weight/Tree ²	20 kg
Total Production	2.28B kg
% Consumed	90-95%
% Sold	5-10%
Total Production Sold (10%)	228M kg

PRICE

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

Value Chain Stage	Price Range (b)	Average Price (b)	Volume Sold	Weighted Average Price
Farmgate	2.5-4	3.25	---	---
Local	6-8	7	125,400	3.85
Regional	9-13	11	84,360	4.07
Terminal	25-40*	30	18,240	2.40
TOTAL			228,000³	10.32 b

* High end of price range was an outlier. (MT sold) (per kg)

MARKET SIZE

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

Total Sold (MT)	228,000
Total Sold (kg)	228M
Average Price per kg	10.32 b
birr to USD	19.47
Total Market Size (Value)	\$121M

228M kg
(dry weight sold to markets)



10.32 birr
(average volume-weighted price)



\$121M
(market value of amount sold)

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 Expenditures¹

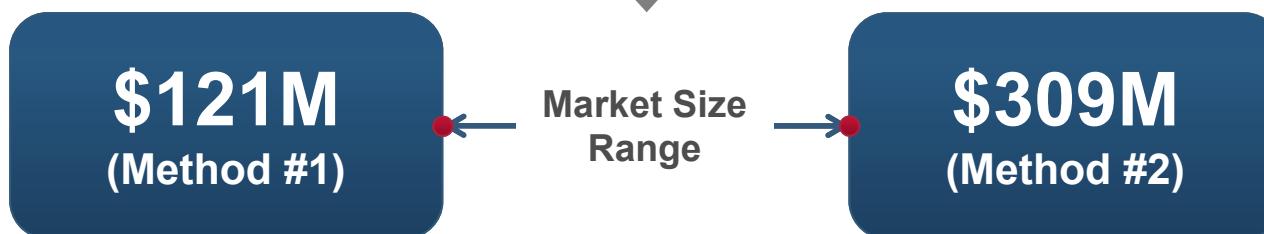
Share of Major Cereals and Enset in Total Food Expenditures by Region, 2004/05

REGIONS	Total Annual Food Expenditures (b)			Share of Expenditures	
	Rural	Urban	Total	Total Cereals	Enset
SNNP	1,525	2,340	1,594	33.1%	12.1%
Oromiya (sic)	1,641	2,583	1,737	45.0%	4.9%
Addis Ababa	2,042	2,584	2,577	41.2%	0.1%

	Personal Enset Expenditure (b)	Total Population	Total Enset Expenditure (b)	Total Enset Expenditure (\$)
SNNP	192.9	17,359,008	3,348,101,309	\$171,962,060
Oromiya (sic)	85.1	31,294,992	2,663,610,654	\$136,805,889
Addis Ababa	2.6	3,041,002	7,836,662	\$402,499

51,695,002²

\$309,170,448



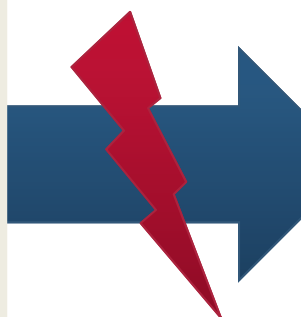
¹ Source: IFPRI/EDRI Report, "Foodgrain Consumption and Calorie Intake Patterns in Ethiopia", (May 2011)

¹² 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.

THE ENSET-PRODUCING HIGHLANDS HAVE THE HIGHEST DAILY CALORIC INTAKE OF ANY ZONE AND THE LOWEST COST OF FOOD

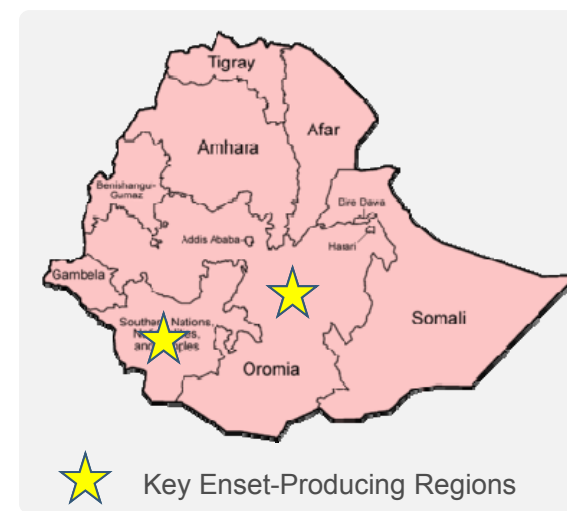
Enset Provides Food Security at Low Cost

- 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	Per Capita Expenditure on cereals and enset (Birr)	Total calories per capita per day (adult equivalent)	Cost per kg in Birr (adult equivalent)
Humid Lowland	368.9	2857.1	0.71
Humid Highland (cereals)	414.8	2812.6	0.82
Humid Highland (enset)	344.3	3197.5	0.67
Drought Prone	409.2	2890.3	0.78
Pastoralist Areas	374.1	2632.1	0.96

SOURCE: IFPRI and EDRI, "Foodgrain Consumption and Calorie Intake Patterns in Ethiopia", (May 2011)

Regional Map of Ethiopia



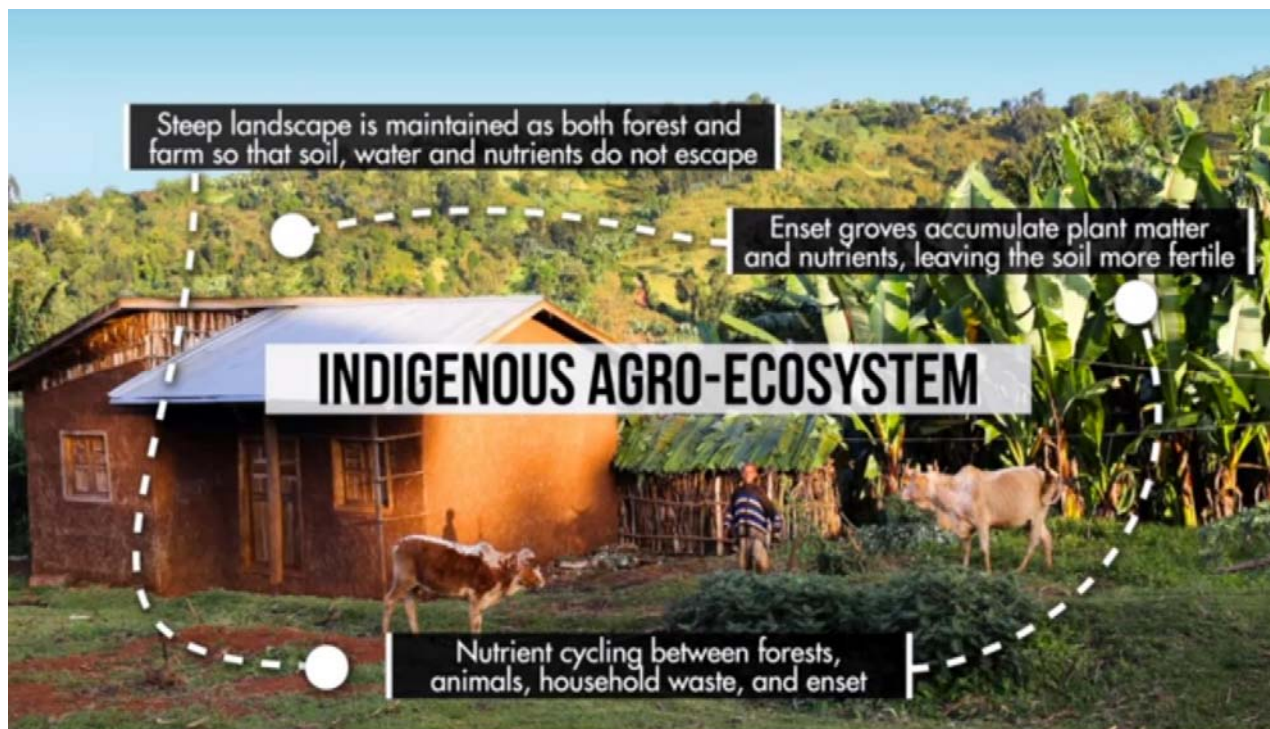
ENSET'S AGRICULTURAL PRODUCTION SYSTEM REQUIRES MINIMAL LABOR AND NO FINANCIAL INPUTS

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



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

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

Improved Processing Tools

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

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

Marketing Groups and Training

- Develop market awareness
- Train on marketing and sales
- Organize into associations, unions and marketing 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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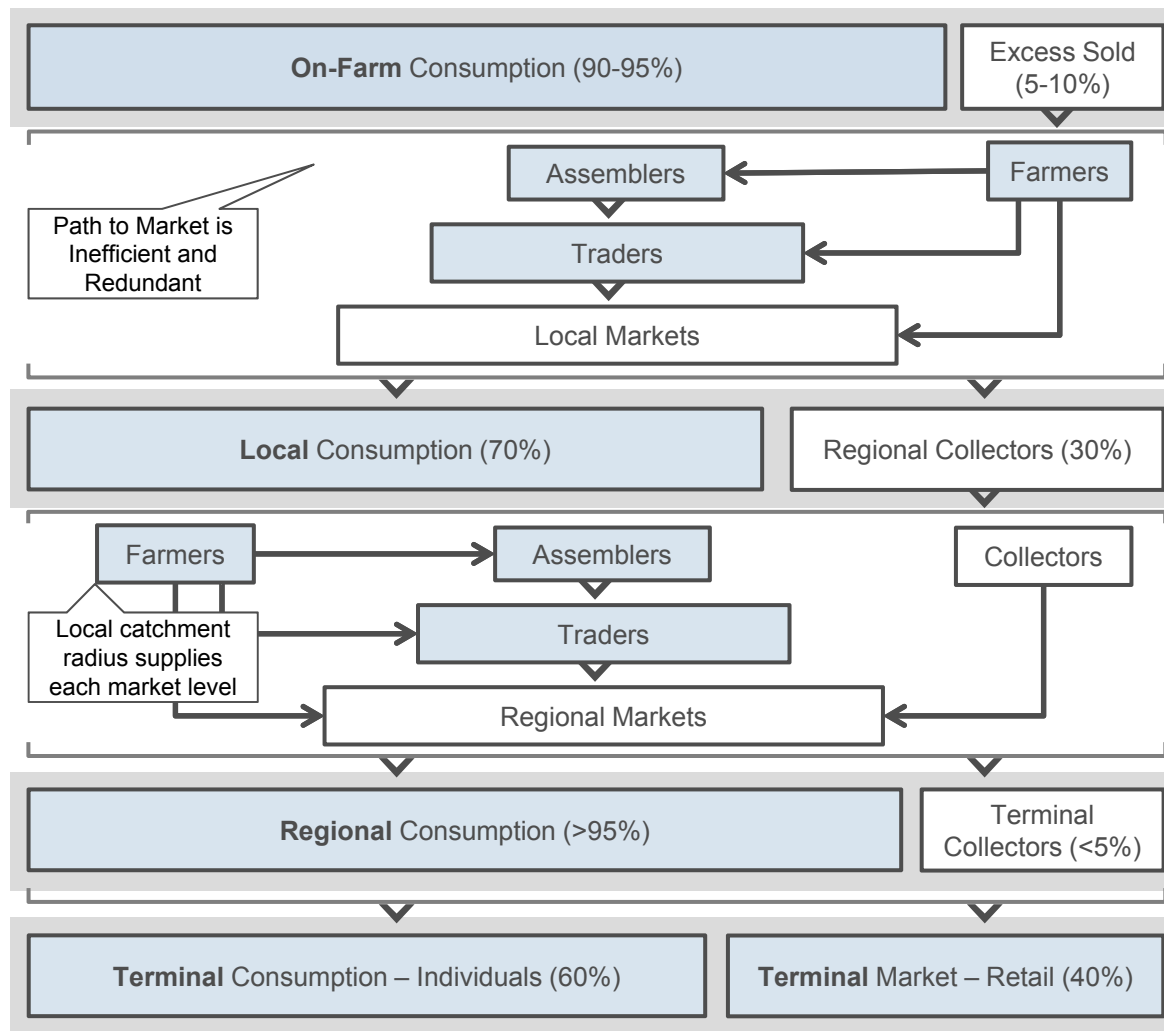
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TOTAL ENSET PRODUCTION IS 2.28 MILLION MT, OF WHICH OVER 90% IS CONSUMED ON-FARM

Ethiopia Enset Subsector Map

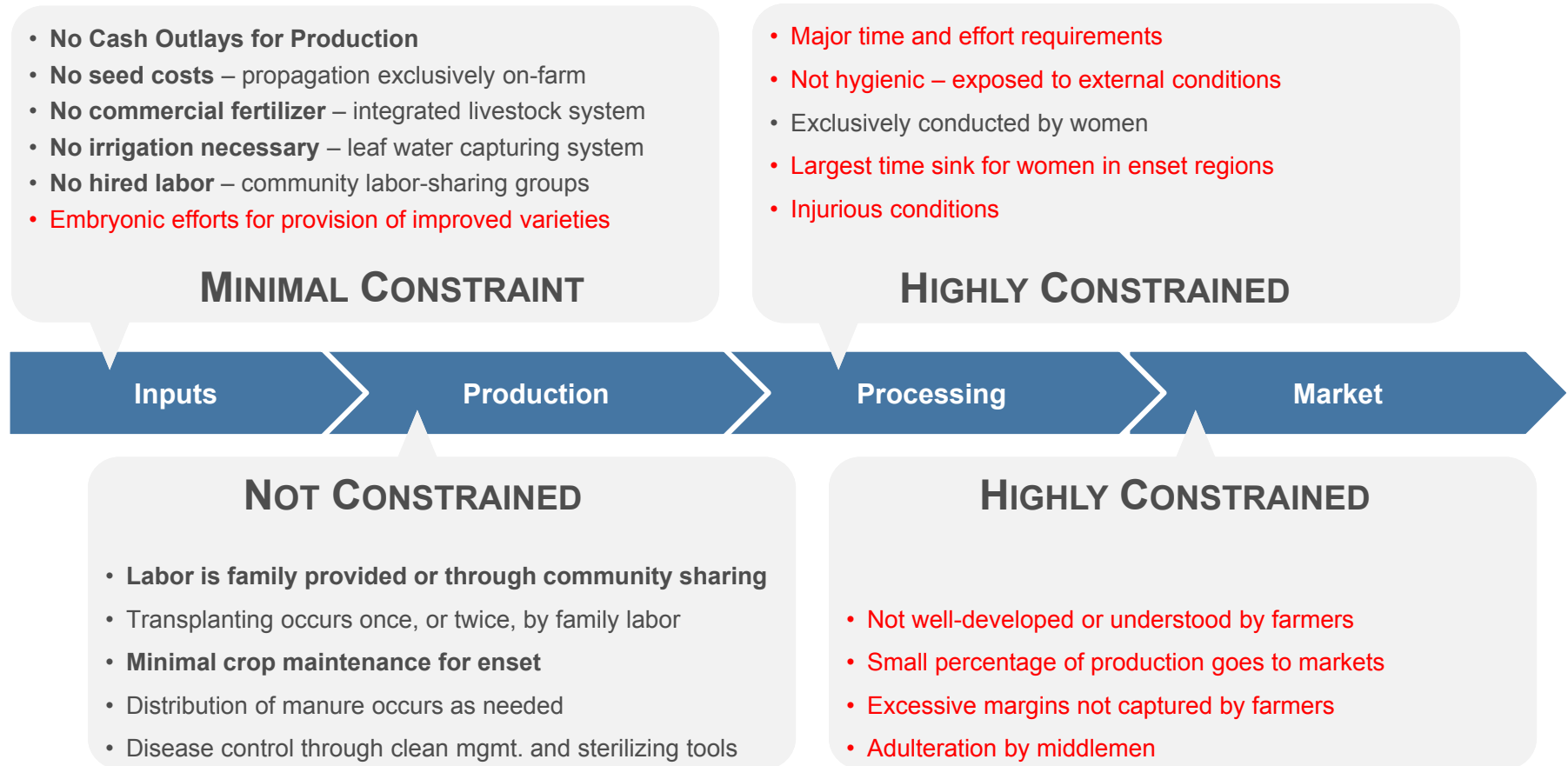
Expressed as percentage of total enset production



- 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.

ENSET CONSTRAINTS AND OPPORTUNITIES CLUSTER POST-PRODUCTION AND IN DOWNSTREAM MARKETS

Proposed strategy and model along value chain



● 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



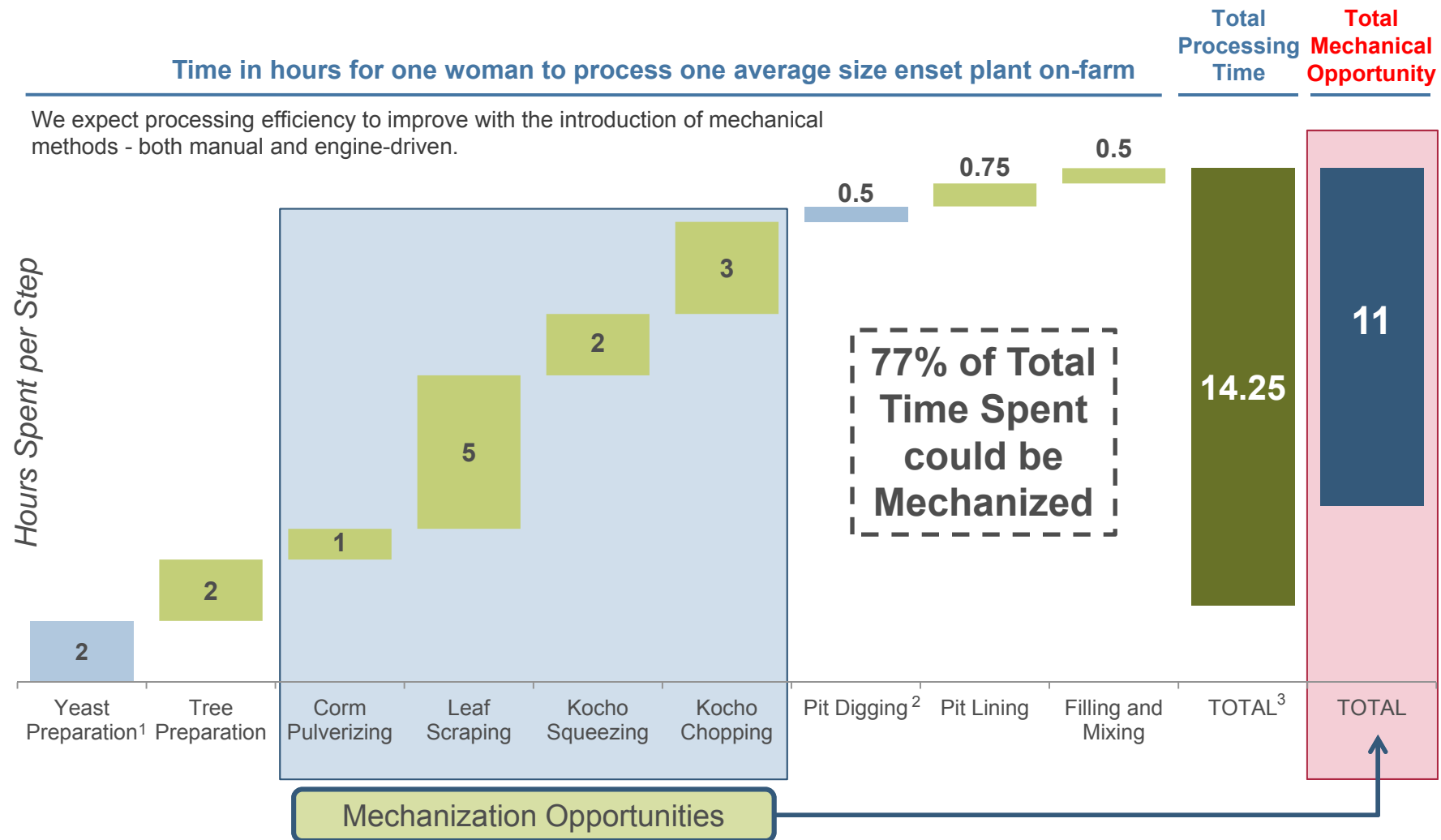
Kocho Squeezing

Kocho Chopping

Storage Pit Mgmt.

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

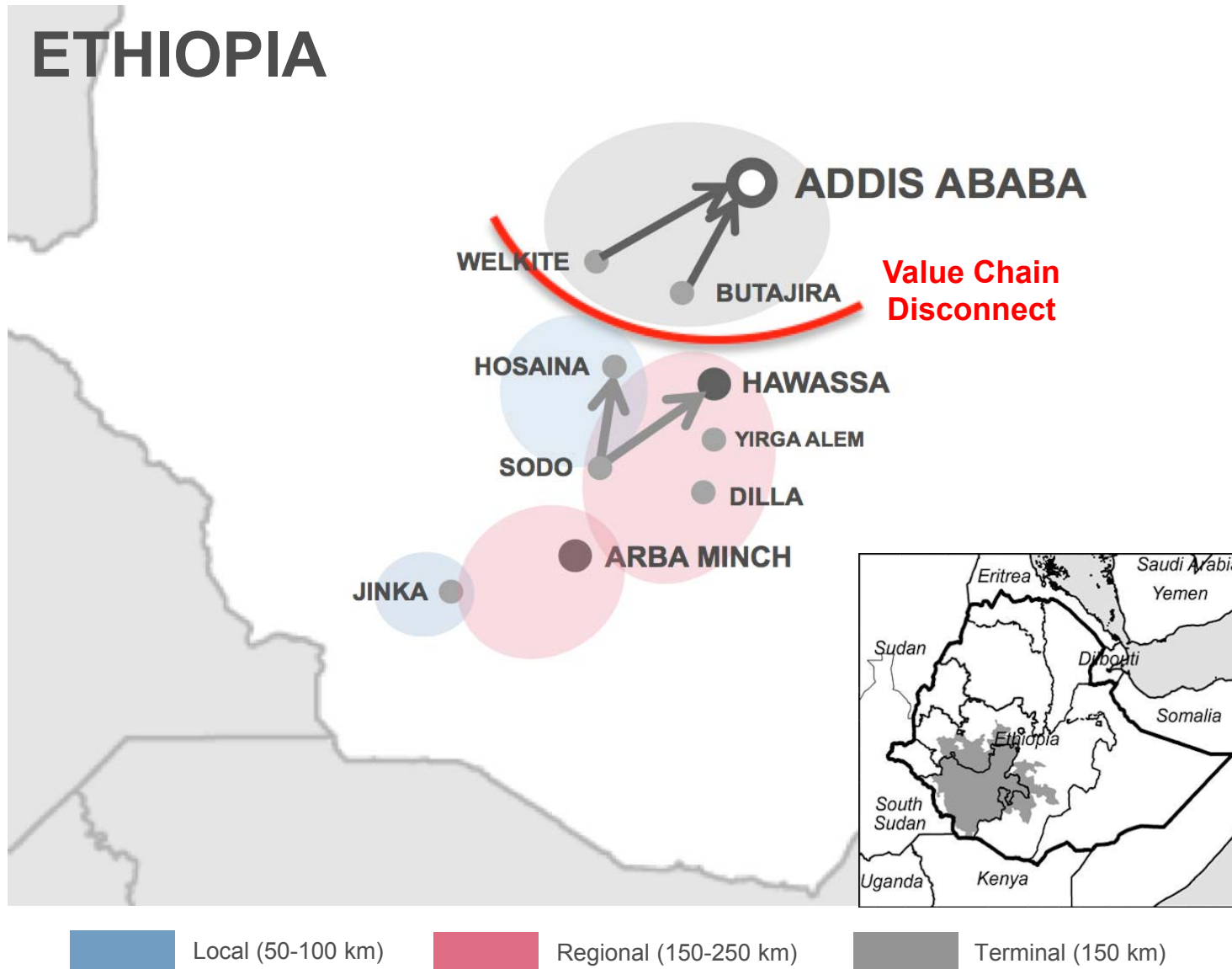


We expect processing efficiency to improve with the introduction of mechanical methods - both manual and engine-driven.

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.

UNUSUAL PATH TO MARKET FOR ENSET PRODUCTS BASED ON NODAL CATCHMENT AREAS; DISCONNECT WITH GROWING TERMINAL MARKETS

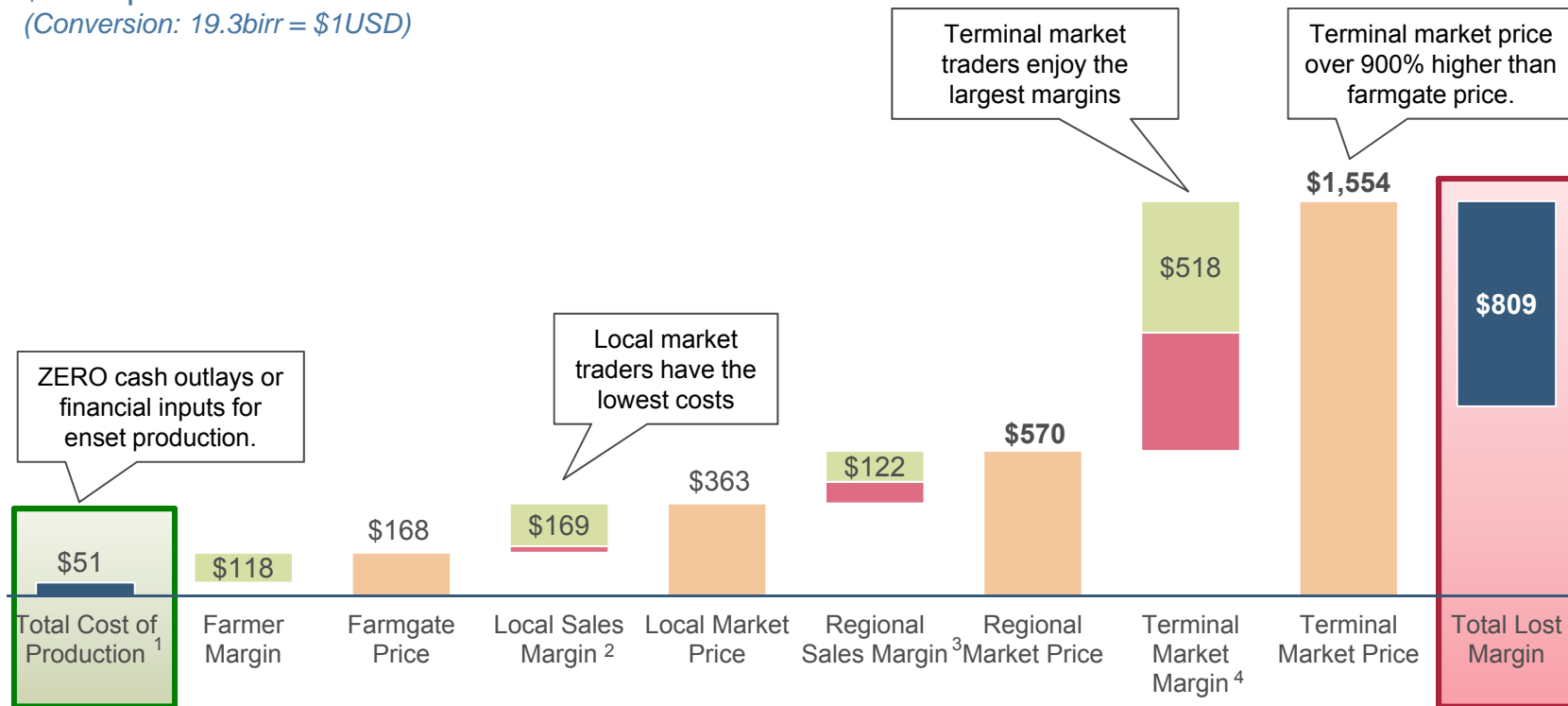
Downstream Market Systems Diagram



DISCONNECTED NODAL MARKET SYSTEMS ALLOW ENORMOUS PRICE DIFFERENCES IN TERMINAL MARKETS

Sale economics for enset products (kocho)

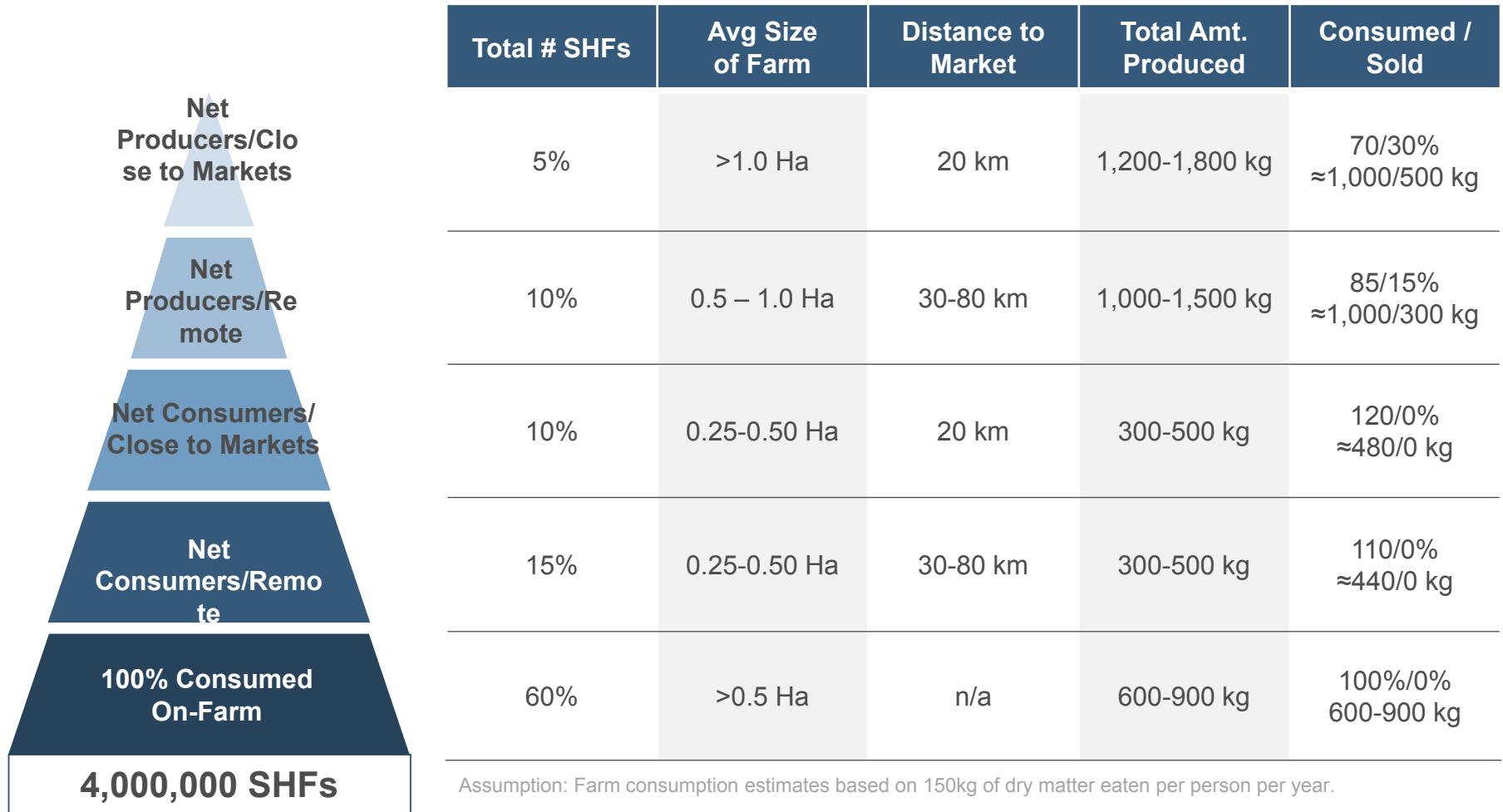
\$USD per metric ton
(Conversion: 19.3birr = \$1USD)



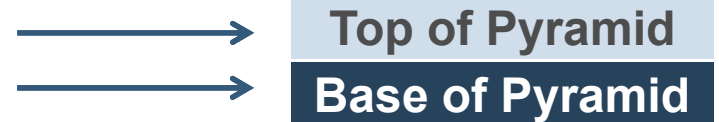
Over 900% price increase between farmgate and terminal market price.

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.

FARMER SEGMENTATION CENTERS ON CONSUMPTION PATTERNS AND PROXIMITY TO MARKETS



Marketing Intervention Recommended Focus
 Processing Intervention Recommended Focus



PROMISING DEVELOPMENTS IN GOVERNMENT-SUPPORTED RESEARCH AND COMMUNITY INITIATIVES

Enabling Environment and Infrastructure

- 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

MAJOR CONSTRAINT

- 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

BENEFICIAL



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

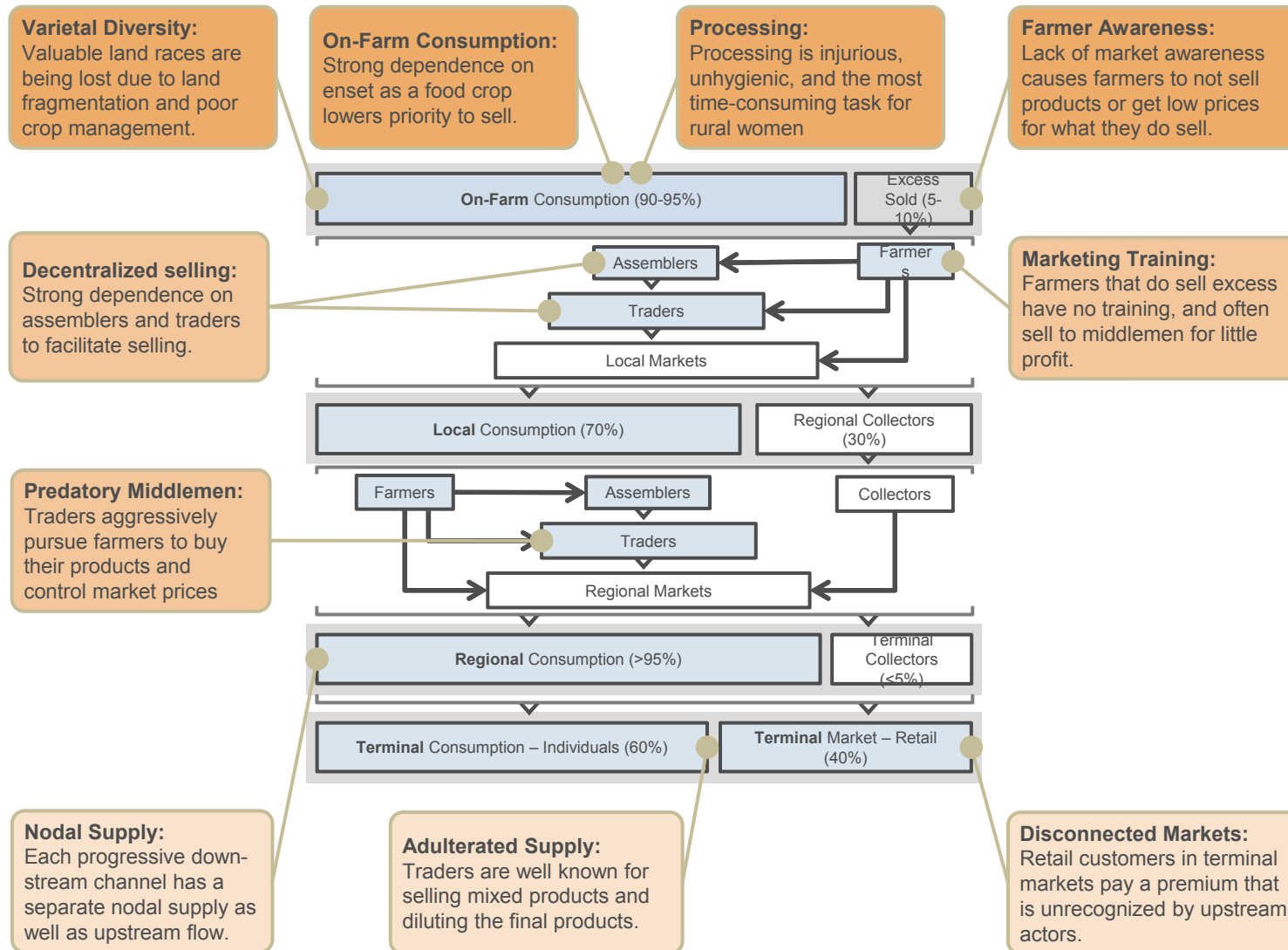
LIMITED

- 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

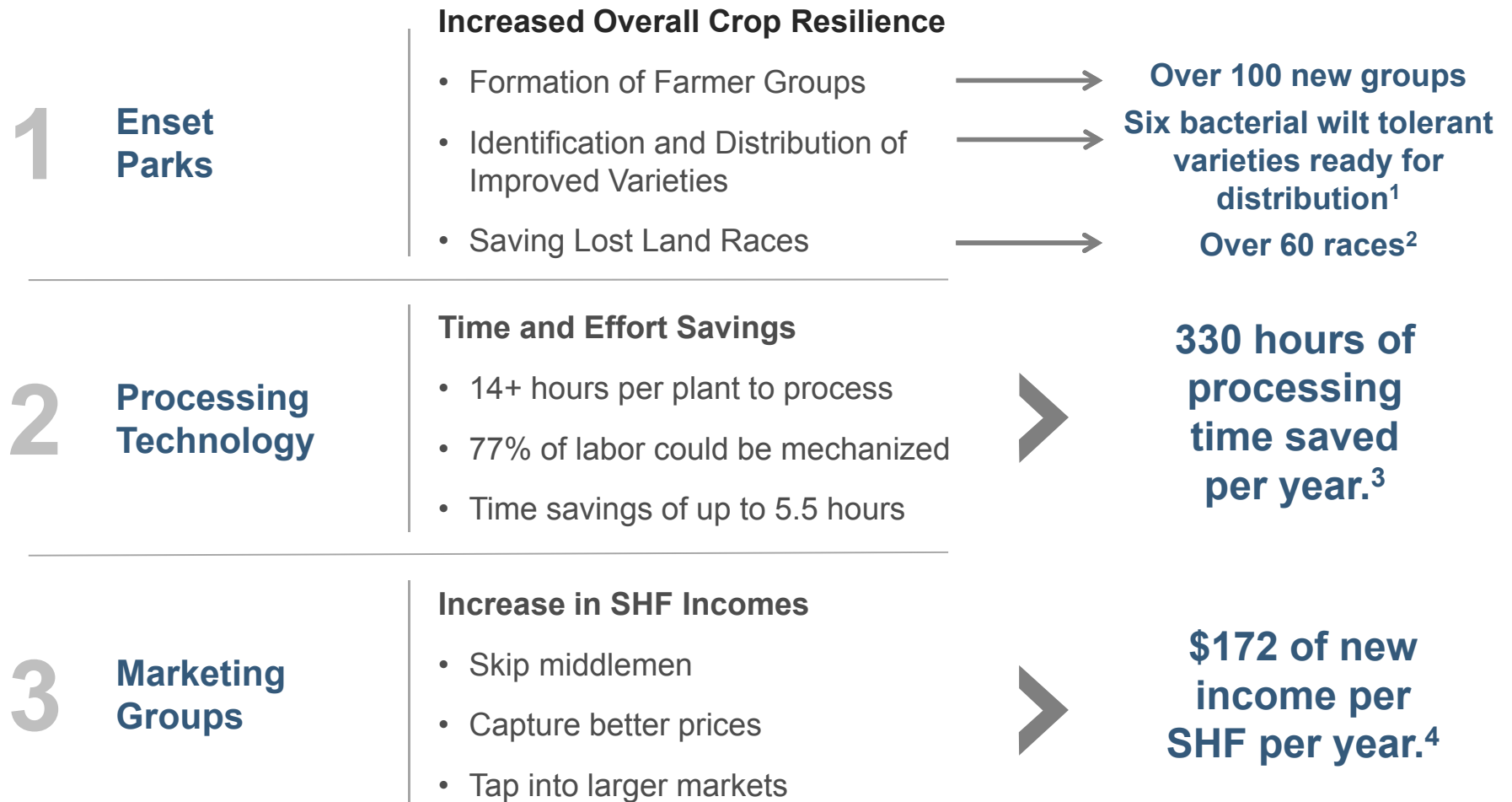
Constraints on onset market map



QUANTIFYING TOTAL OPPORTUNITY FOR ENSET INVESTMENT HIGHLIGHTS

FOOD SECURITY, TIME BENEFIT AND FINANCIAL GAINS

Total Opportunity for Enset:



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

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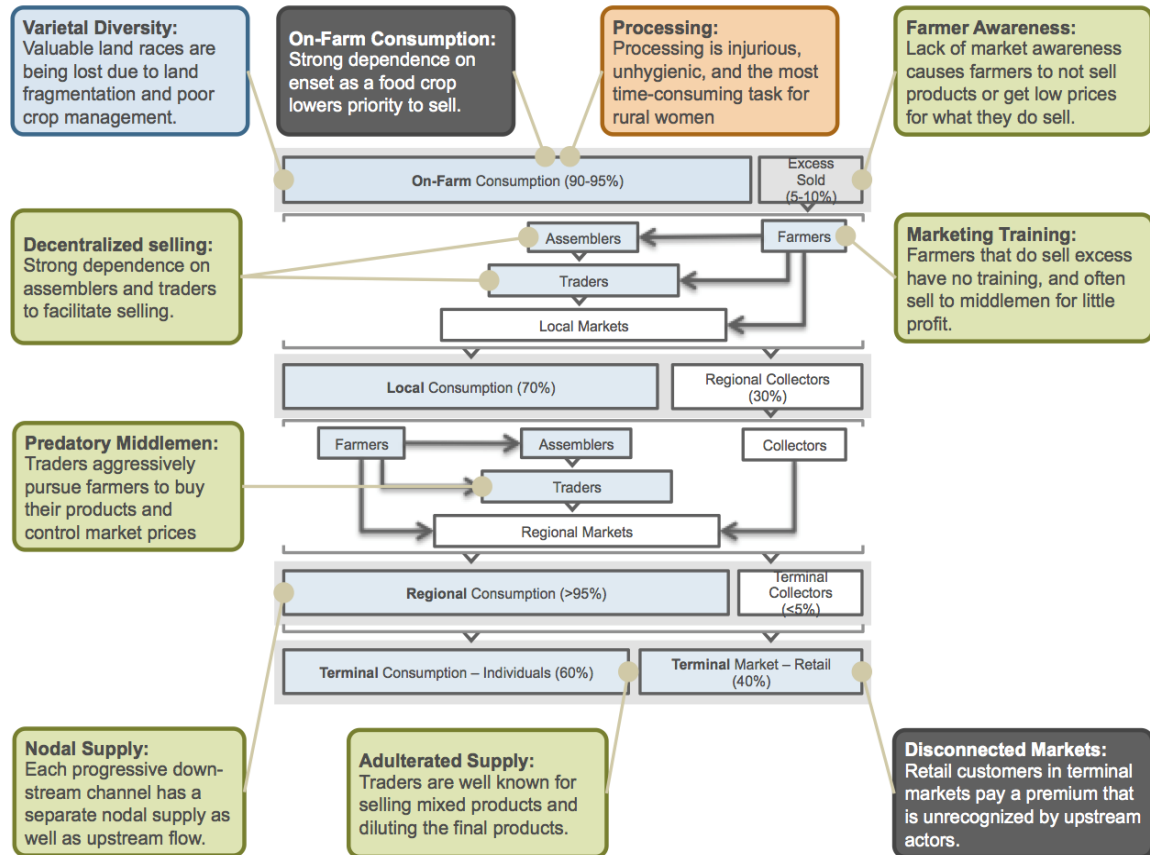
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THREE HIGH LEVEL INTERVENTION STRATEGIES HAVE BEEN VALIDATED THROUGH FIELD RESEARCH AND GROUND TRUTHING

Key

- 1. Enset Parks for Diversity Mgmt.
- 2. Processing Equip. to Save Time & Effort
- 3. Marketing Groups to Increase SHF Income



Represents Exogenous Constraints

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

1. Enset Parks as a Platform

- Currently, efforts to identify and distribute improved varieties as well as manage genetic diversity are underdeveloped.



- **Enset parks** address this constraint, serving as excellent platforms for managing genetic diversity and varietal improvement, and ensuring dispersion of knowledge and planting materials.



2. Improved Processing Equipment

- Currently, processing time is the largest constraint for enset, placing an excessive time and health burden on women – the sole harvesters.



- **Co-design and on-site prototyping** is key to farmer acceptance and adoption
- **Testing and modification** with end users ensures an optimal processing tool design
- **Varying price point packages** (i.e. manual vs. engine driven) will cater to farmer segmentation.

3. Organization of Marketing Groups

- Currently, huge unrealized market potential due to lack of awareness, education and organization amongst farmers.



- **Spring-boarding off of existing platforms** (i.e. enset parks) will reduce time to impact, provide a conduit for training and technology and blueprint a successful model.
- **Key nodal catchment areas** with proximity to terminal markets represent low-hanging fruit due to:
 - Historically best business and growing practices
 - Ability to capture the inflated terminal market margins

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

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

- 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

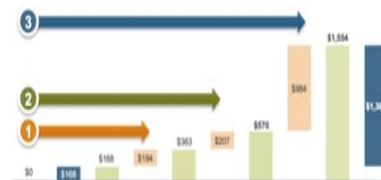
3

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

Note: detailed calculations and methodology for estimating time saving and financial benefit will be included in subsequent slides.

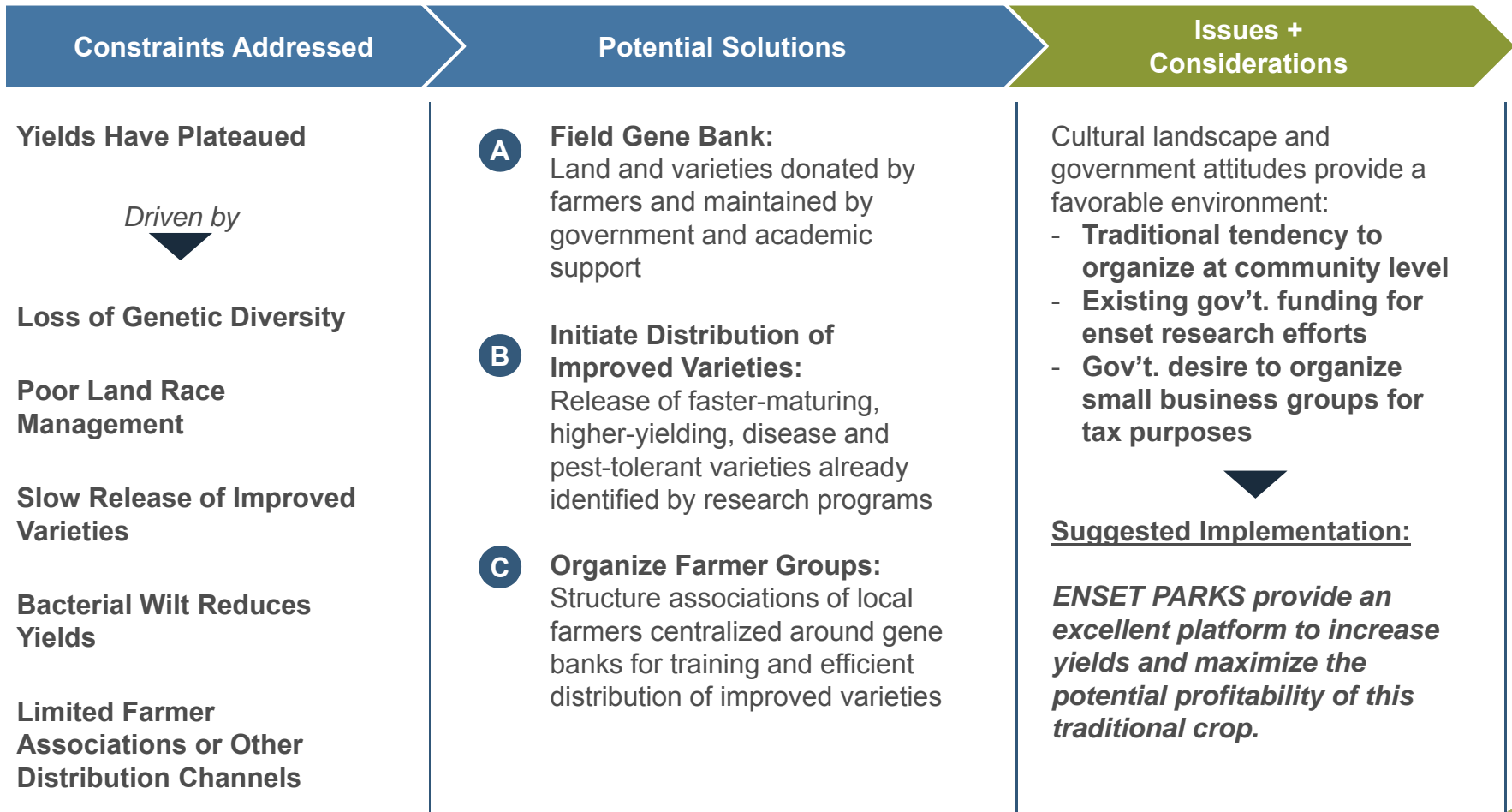
¹ Based on 5.5 hour time savings per tree upon mechanization of four primary steps, and applied to annual average of 60 trees harvested.

² Based on the calculation that SHFs could capture 42% of the downstream margin (mostly at the local level).

1 ENSET PARKS OFFER THE OPPORTUNITY TO LEVERAGE EXISTING PLATFORMS FOR GENETIC DIVERSITY, DISTRIBUTION CONDUIT, AND ORGANIZATION



INTERVENTION #1: ENSET PARKS AS A PLATFORM



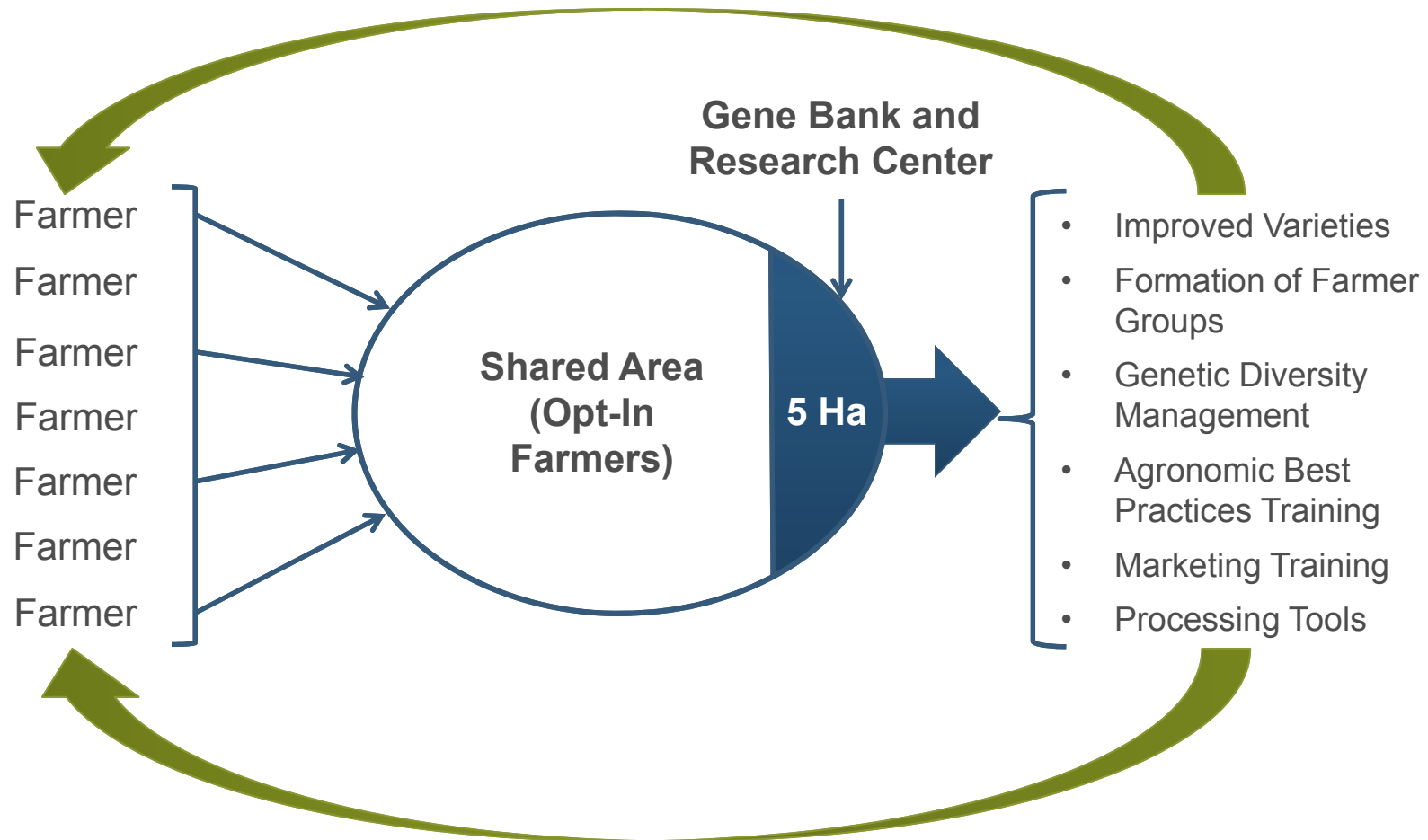
Note: Enset Parks are platforms that encompass field gene banks, self-funded research efforts, and farmer associations.

1 INTERVENTION #1: ENSET PARKS AS A PLATFORM

Key Intervention Elements	Potential Programs Formats	Size, Scalability & Timing
<ul style="list-style-type: none"> • Creation of field gene banks • Categorization and management of land races • On-site enset research efforts • Distribution of improved varieties • Establishment of farmer associations • (Potential) Platform for training and distribution of processing equipment 	<p>Enset Parks</p> <ul style="list-style-type: none"> • University to coordinate and organize • Funded by grants, government, and private sponsors <p>Village Garden</p> <ul style="list-style-type: none"> • Run by village leadership and farmers • Assisted and trained by university researchers • Funded through research grants and ecotourism 	<ul style="list-style-type: none"> • Village Garden: 1 village, ≈35 farmers • Enset Park: 12 kebeles, ≈250 farmers • 12-18 months to develop buy-in and form farmer associations • 3-5 years to build on-site research facilities • One farmer cooperative per kebele in order to form a cohesive union
Key Dependencies & Risks	Gain to SHF (est.)	Potential Partners
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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 “woreda” (district) level

ENSET PARK EXAMPLE STRUCTURE; IN ADDITION TO MAINTAINING GENETIC DIVERSITY, IMPROVED VARIETIES CAN BE SHARED WITH MEMBERS

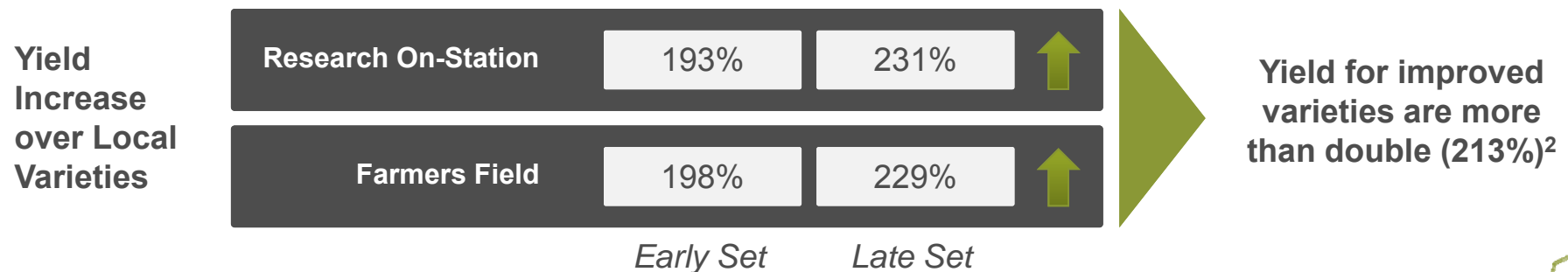


In the Gamo Highlands example, the farmers of 12 separate kebeles (250 farmers in total) donated land to the park itself, as well as opted-in to a Peruvian “potato park” model where their own land becomes part of a living park.

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 Checks¹

AVERAGE QUANTITATIVE VALUES AT MATURITY	EARLY SET VARIETIES (YEAR OF RELEASE 2009)				LATE SET VARIETIES (YEAR OF RELEASE 2010)			
	YANBULE	GEWADA	ENDALE	CHECK 1	KELISA	ZERITA	MESENA	CHECK 2
Unsqueezed Kocho (t/h/y)								
Research (on-station)	31.49	22.75	26.16	14.18	23.13	24.58	19.81	10.1
Farmers field	18.96	17.17	17.77	9.38	17.15	19.01	18.59	8.33
Squeezed Kocho (t/h/y)								
Research (on-station)	21.12	15.13	17.47	9.26	15.39	16.39	13.12	6.47
Farmers field	12.54	11.31	11.72	5.98	11.3	12.57	12.28	5.26



¹ Data regarding improved enset varieties currently being disseminated by the Areka Research Station; Mr Awol Zeberga, Sr. Research Scientist
³⁹ ² Intervention #1 assumes that 25% of Tier 1 farmers adopt improved varieties on 10% of their land.

2

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

Constraints Addressed

Time-Consuming Processing: women spend up to 14+ hours per plant in individual processing time

Laborious: current techniques are physically demanding (eg. hand and foot-held graters)

Injurious: pulverizing and chopping instruments often cause bodily harm (eg. broken finger and hand lacerations)

Unhygienic: exposed to the elements and unwashed feet and hands

Potential Wastage: no containment during processing

Potential Solutions

Field Prototyping with Farmers

Multiple Iterations to Achieve Viable Models and User Buy-In

Working Prototypes for Four Main Processing Steps:

- D** • Corm Pulverizing
- E** • Leaf Scraping
- F** • Kocho Squeezing
- G** • Kocho Chopping

Multiple Price Point Packages: Family (manual); Village (engine)

Issues + Considerations

Development of improved processing tools has been previously unsuccessful:

- **Never co-designed with end users/farmers**
- **Lack of iterative process**
- **No quantification of benefits**
- **Minimal cost viability considerations**



Suggested Implementation:

PROCESSING TOOLS that have been co-designed and refined with farmers. Full field testing and cost minimization. Multiple price point packages.

2 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 \$25¹
- **Ex 2:** Kocho chopping proto for \$80¹
- **Ex 3:** Leaf Scraping (engine) for \$1,030²

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

2 TIME SAVED BY WOMEN THROUGH PROCESSING IMPROVEMENTS CAN BE USED FOR A VARIETY OF PRODUCTIVE ACTIVITIES

ACTIVITIES	Overview	Impact
Education	<ul style="list-style-type: none"> Ongoing education for herself and/or her children 	<ul style="list-style-type: none"> More qualified for higher earnings Educated children can send home remittances
Selling Products in Local Markets	<ul style="list-style-type: none"> A major hurdle for selling goods is having the time to sit at the market 	<ul style="list-style-type: none"> Additional income sources
Micro-Enterprises	<ul style="list-style-type: none"> Selling animal products (eggs, milk, cheese, butter), weaving, processing for hire, etc. 	<ul style="list-style-type: none"> Additional income sources More diversified and nutritious diet
Production of Other Enset Goods	<ul style="list-style-type: none"> Can process fiber, make bulla or kocho flour, bread, or gather leaves for sale 	<ul style="list-style-type: none"> Additional income sources
Other On-Farm Tasks	<ul style="list-style-type: none"> Freed time to grow additional crops, raise animals or cover for children going to school 	<ul style="list-style-type: none"> Efficiency and productivity Less strenuous and injurious tasks

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

3 ADDITIONAL DOWNSTREAM MARGINS CAN BE CAPTURED BY PRODUCERS THROUGH CREATION OF MARKETING GROUPS



INTERVENTION #3: ORGANIZATION OF MARKETING GROUPS

Constraints Addressed

Awareness: unaware of market prices and downstream margins

Education: don't know how to sell to end users directly or organize contracts with larger customers

Organization: don't have the volume required to gain seller power from aggregation and collective sales

Potential Solutions

D Organization of Marketing Groups:

- Food Products (kocho, bulla)
- Enset Fiber
- Other Products (leaves, bread, flour, paper, etc.)

E 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.)¹

Issues + Considerations

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**



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

3 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.)

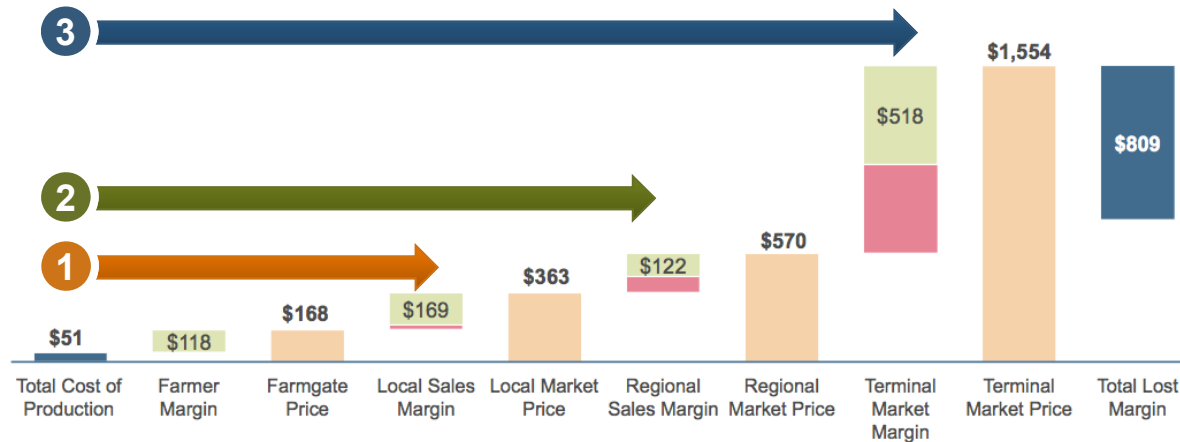
- **Improved SHF Revenue**
 - Top producing farmers sell 500kg/yr
 - Lost margin per ton is ≈\$800
 - Groups can capture 50% of lost margin
- **Half a ton at 42% margin capture is an increase of \$172/yr.**

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

3 MARKETING GROUPS CAN CAPTURE MILLIONS IN LOST DOWNSTREAM MARGINS

	Price Δ	Volume ¹ ₂	% Capture ³	
1 Local Market	+\$169	125,400 MT	70%	\$17.4 M Per Year (Marketing Groups Intervention Impact)
2 Regional Market	+\$122	84,360 MT	20%	
3 Terminal Market	+\$518	18,240 MT	5%	



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.

3 UNTAPPED POTENTIAL FOR NEW FIBER REVENUE STREAM FOR 125,000 SHF; UNSERVED DEMAND FOR FIBER IS 3-6X CURRENT VOLUME

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)

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).

3 TOTAL ENSET PRODUCTIVITY AND MARKET VALUE ASSESSMENT MUST INCLUDE THE FULL ARRAY OF PLANT PRODUCTS

Enset Product	Overview
Kocho	<ul style="list-style-type: none"> • Must be processed and fermented • Consumed as a variety of breads, mixed with stews, or served with kitfo
Bulla	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Immature corm of young plants (<3yrs) • Boiled and eaten as potatoes
Fiber	<ul style="list-style-type: none"> • Layer of the leaf sheath behind the starch • High strength qualities make it excellent for sacks (coffee), rope, mats, bags, etc.
Kocho Flour	<ul style="list-style-type: none"> • Dried kocho that is chopped and refined into a flour • Very new product, minimal availability
Bulla Flour	<ul style="list-style-type: none"> • Dried bulla powder • Easily transported and stored, in high demand from the diaspora
Leaves	<ul style="list-style-type: none"> • Upper leaves used for fodder, storage, packing, lining the fermentation pits, cooking bread, and plates
Suckers	<ul style="list-style-type: none"> • 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.

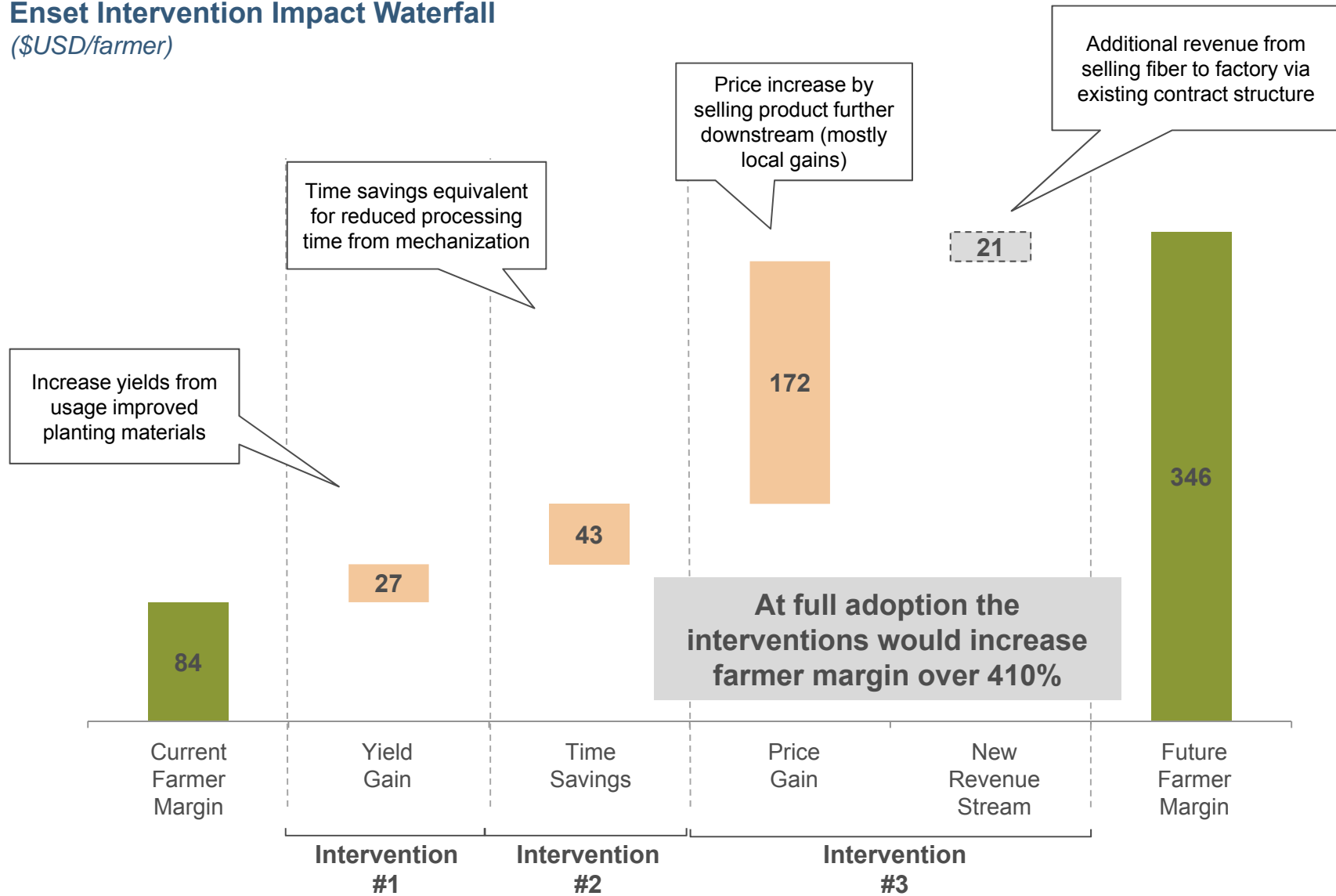
Markets for kocho and fiber were assessed in this report.

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)



THE CUMULATIVE FINANCIAL IMPACT OF INTERVENTIONS COULD AMOUNT TO OVER \$57MM ASSUMING SUCCESSFUL TARGETING OF TOP TIER PRODUCERS

	Annual Net Financial Benefit per Farmer	Target SHFs
Benefit per farmer from Int. #1: <i>(yield from adoption of improved varieties)</i>	\$27	50,000
Benefit per farmer from Int. #2: <i>(value of time saved by using processing equipment)</i>	\$43	450,000
Benefit per farmer from Int. #3: <i>(revenue gained by capturing % of downstream margin)</i>	\$172	200,000
Benefit per farmer from Int. #3: <i>(selling excess fiber to factory)</i>	\$21	125,000
Net benefit per farmer <i>per annum</i>	\$262	
Aggregate SHF benefit <i>per annum</i>		\$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 @ 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

		Intervention #1 Enset Parks as a Platform	Intervention #2 Improved Processing Equipment	Intervention #3 Organization of Marketing Groups
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		✓	✓

INTERVENTIONS #1 (ENSET PARKS) AND #3 (MARKETING GROUPS) SHARE OVERLAPPING PARTNERS

		Target Intervention	Leadership / Management	Ability to Scale	Financial Sustainability	Existing Traction	Related Experience	Overall Fit
Private	Christensen Fund ¹	Intervention Administration	Strong	Medium	Strong	Strong	Strong	STRONG
	ARCC	Intervention Administration	Medium	Low	Medium	Low	Strong	MEDIUM
	ISD (Inst. For Sust. Devel.)	Int. Admin; Marketing Groups	Medium	Low	Medium	Low	Low	LOW
Government	SARI	Research	Medium	---	(Gov't.)	Medium	Strong	MEDIUM
	Areka Res. Station	Research	Medium	---	(Gov't.)	Strong	Strong	STRONG
	Addis Ababa University ²	Intervention Administration; Research	Strong	---	(Gov't.)	Medium	Medium	MEDIUM
	Arba Minch University ³	Enset Parks; Marketing Groups	Strong	Low	Medium	Strong	Strong	STRONG
	Awassa University ⁴	Enset Parks; Marketing Groups	Strong	Low	Medium	Low	Medium	MEDIUM
Other	Kyoto University ⁵	Research; Enset Parks; Marketing Groups	Strong	Low	???	Strong	Strong	STRONG
	Metsar Enset Village	Enset Parks; Marketing Groups	Medium	Low	Strong	Medium	Strong	MEDIUM

¹ Dr. Tadesse Gossa Wolde (Admin); Dr. Tadesse Kippie (Admin)

² Dr. Gebre Yinitso (Admin); Dr. Zerihun Woldu (Research); Dr. Endashaw Bekele (Research)

³ Dr. Feleke Woldeyes (Enset Parks); Dr. Tessema Tanto (Research); Dr. Alemayehu Hailemiceel (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

		Target Intervention	Leadership / Management	Ability to Scale	Financial Sustainability	Existing Traction	Related Experience	Overall Fit
Private	Christensen Fund¹	Intervention Administration	Strong	Medium	Strong	Strong	Strong	STRONG
	ARCC	Intervention Administration	Medium	Low	Medium	Low	Strong	MEDIUM
Government	Sodo Rural Technology Center	Processing Equipment	Low	Medium	(Gov't.)	Low	Medium	LOW
	Melkasa Agri. Research Ctr.	Processing Equipment	Medium	Strong	(Gov't.)	Medium	Strong	MEDIUM
Private	Selam Children's Village	Processing Equipment	Strong	Strong	Strong	Strong	Strong	STRONG
	Selam Awassa Plc.	Processing Equipment	Medium	Medium	Medium	Medium	Medium	MEDIUM
	PAMARK²	Processing Equipment	Medium	Low	Low	Low	Strong	LOW
	G-Seven Trading & Industry Plc	Fiber Marketing Partner	Strong	Strong	Strong	Strong	Strong	STRONG

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.
- Five Priority Regions: 1) African Rift Valley, 2) Melanesia, 3) Central Asia and Turkey, 4) Northern Australia, and 5) Southwest US and Northern Mexico.
- 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.



SARI Ethiopia
Southern Agricultural
Research Institution

Interest & Capabilities

- Development of technologies for improving crop and livestock productivity as well as natural resources management in the SNNPR.
- Six research centers: 1) Hawassa, 2) Areka, 3) Jinka, 4) Bonga, 5) Arbaminch, and 6) Worabe.
- 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.



Kyoto University



Metsar Enset Village



Management / Leadership

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

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)

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.

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

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.

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.

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

1 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.

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

APPENDIX 1b – POPULATION CALCULATION METHODOLOGIES

2 REGIONAL APPROACH^{1,2}

80% of the population in the SNNPR is dependent on enset.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**

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

¹ Interview with Dr. Gebre Ynitso, Addis Ababa University, Dean of Social Sciences

² Documentation from Dr. Endashaw Bekele, Addis Ababa University (Genetics Department – Enset Research)

APPENDIX 1c – POPULATION CALCULATION METHODOLOGIES

3 KILOCALORIE CALCULATION

114M Enset Plants Harvested in 2012/13

a) 32 kg of Edible Dry Matter per Plant (*Dr. Tadesse Kippie, 5,000 Years of Sustainability*)

b) 30 kg of Edible Dry Matter per Plant (*Endashaw Bekele – high end*)

c) 21 kg of Edible Dry Matter per Plant (*Ethiopian CSA*)

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**

4 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**

5 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**

¹ (Multiple) “5,000 Years of Sustainability”, Interview with Dr. Endashaw Bekele, Ethiopian CSA, “Tree Against Hunger”

² Ethiopian Central Statistical Agency, Agricultural Survey, 2012/2013

³ Linear Model Prediction Enset Yields & Assessment Kocho Production, Shank, Robert and Ertiro Chernet, UNDP,

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 OFFICERS⁵

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

¹ Linear Model Prediction Enset Yields & Assessment Kocho Production, Shank, Robert and Ertiro Chernet, UNDP, 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.

⁴ Ethiopian Central Statistical Agency, *Agricultural Survey, 2012/2013*

⁵ Dr. Zerihun 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 meters^{2,3}

(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 years^{2,4}

Total Area Harvested per Year (at 5-7 year age) = **307,800 Ha**



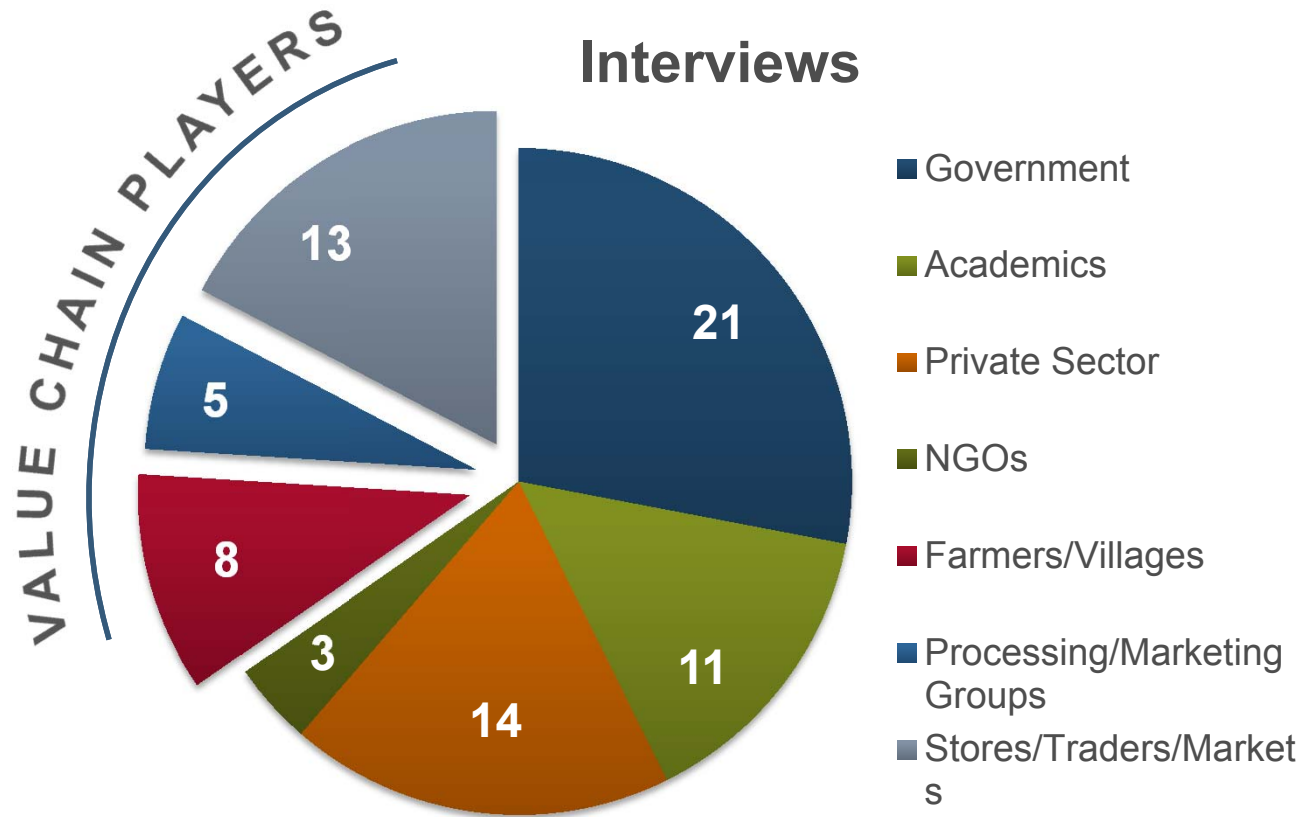
¹ Ethiopian Central Statistical Agency 2011

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
14. Atkelt Girmay, General Manager, Pamark Business Plc.
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, Preseident 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

20. Enset (*Ensete ventricosum* (Welw.) Cheesm.) in Subsistence Farming Systems in Ethiopia. Zippel, Karin. Humboldt-Universität zu Berlin, Fachgebiet Obstbau. 2000
21. Diversity, Challenges and Potentials of Enset (*Ensete ventricosum*) Production: In Case of Offa Woreda, Wolaita Zone, Southern Ethiopia Food Science and Quality Management, Shumbulo, Abrham et al, 2012.
22. Improved Decision-Making for Achieving Triple Benefits of Food Security, Income and Environmental Services through Modeling Cropping Systems in the Ethiopian Highlands, Amedea, Tilahun and Delveb, Robert, African Highlands Initiative Working Paper #20. CIAT Tropical Soils Biology and Fertility Institute, Harare, Zimbabwe. 2006
23. Optimizing Soil Fertility Gradients in the Enset Systems of the Ethiopian Highlands: Trade-offs and Local Innovations, Tilahun Amedea and Mulugeta Diro, African Highlands Initiative Working Paper, CIAT, Tropical Soils Biology and Fertility Institute of CIAT.
24. Growth, radiation use efficiency and yield potential of enset (*Ensete ventricosum*) at different sites in southern Ethiopia, Admasu, Tesegaye and Struik, P.D, *Ann. appl. Biol.*, 142:71-81, 2003
25. Alternative Market Growth Stages, Dr. Andualem, Getie, Addis Ababa University, College of Commerce, 2010
26. Genetic Variability and Biotechnological Studies for the Conservation and Improvement of Enset *ventricosum*, Birmeta, Genet, Doctoral Thesis, Swedish University of Agricultural Sciences, 2004.
27. Identification of Bacterial and Yeasts from In Vitro and Surface-Sterilized Field Samples of Enset *ventricosum* by rDNA Analysis, Birmeta, Genet et al. *Biotechnology Letters* 26: 1867-1872. 2004.

APPENDIX 4b – PUBLISHED SOURCES

28. Analysis of Enset Indigenous Production Methods and Farmbased Biodiversity in Major Enset-Growing Regions of Southern Ethiopia, Tsegaye, A and Struik, P.C., Expl Agric. (2002), volume 38, pp. 291-315, 2002.
29. Five Thousand Years of Sustainability: A Case study on Gedeo Land Use (Southern Ethiopia), Tadesse Kippie Kanshie, Tree Book Publishers, 2002.
30. Survey of Plant Parasitic Nematodes and Banana Weevil on Enset in Ethiopia. Bogalel, M. Sepije et al, Nenzatol. medit., 32: 223-227, Plant Protection Research Center, Arnbo, Ethiopia, 2004
31. Ethiopian Central Statistical Agency, Agricultural Survey, 2011/2012, Vol. 7
32. Ethiopian Central Statistical Agency, Agricultural Survey, 2012/2013
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.
34. Linear Model Prediction Enset Yields & Assessment Kocho Production, Shank, Robert and Ertiro Chernet, UNDP, http://www.africa.upenn.edu/eue_web/enset96.htm.
35. Development of Clonal Identification Marker for Conservation, and Sustainable Production of Starter, Disease Free, High Nutritional and Quality Fiber Enset (*Ensete ventricosum*) Using Engaged Area Study Approach, Bekele, Endashaw; Masyoshi, Shigeta and Birmeta, Genet, 2014.



Backup or Alternate Slides

April 28, 2014

IRRELEVANCE OF THE TERM YIELD PER HECTARE IN THE CASE OF ENSET

UNITED NATIONS DEVELOPMENT PROGRAMME Emergencies Unit for Ethiopia

A Linear Model for Predicting Enset Plant Yield and Assessment of Kocho Production in Ethiopia

“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

