MULTI CROP VALUE CHAIN PHASE II
ETHIOPIA SORGHUM

August 1, 2014
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Conclusions</td>
<td>4</td>
</tr>
<tr>
<td>1. Sector Fundamentals</td>
<td>5</td>
</tr>
<tr>
<td>2. Value Chain Opportunities</td>
<td>29</td>
</tr>
<tr>
<td>3. Interventions &amp; Impact</td>
<td>50</td>
</tr>
<tr>
<td>4. Partner Profiles</td>
<td>70</td>
</tr>
<tr>
<td>Appendix</td>
<td>78</td>
</tr>
</tbody>
</table>
**SCOPE OF THIS STUDY**

**Study Methodology**

41 sector interviews covering actors across the value chain (NGOs, farmers associations and unions, processors, financial institutions, input providers, research institutes and government officials):
- Processing/Marketing: 12
- Village Production: 21
- Production Inputs: 8

**Hypotheses Confirmation**

- Adoption and Implementation of Input Productivity Package and farmer training for improved farm practices
- Group aggregation, handling and marketing through union capacity building

**Analysis**

- Reality check/verification of intervention hypotheses of Phase 1 and possible adaptations (where applicable)
- Triangulation of data from various sources: stakeholder interviews, government bodies, publications
**PHASE 2 ETHIOPIA SORGHUM EXECUTIVE SUMMARY**

1. **SECTOR FUNDAMENTALS**

Sorghum is an important crop in lowland and intermediate altitudes in Ethiopia, covering an area of 1.7MM Ha. production of 3.6MM MT and 4.9MM SHF are engaged in its production.

- Sorghum is mainly a food security crop. The majority is consumed in rural households.
- Only 13% of the grain is marketed, and 7% is processed.
- Yields are 2.1 MT/ha., which is low by comparison with the crop's potential.

2. **VALUE CHAIN OPPORTUNITIES**

Logistics and infrastructure challenges constrain the current value chain. Sorghum marketability is limited. There are few short-term processing and demand sink opportunities.

- Immediate opportunities – addressing major production constraints, to both satisfy increased demand from rising population and expand marketable surpluses.
- Medium to long term opportunities – other factors need to be addressed before the long term viability of sorghum exports, commercial brewery production, animal feed, and increased domestic processing can be promoted.

3. **INTERVENTIONS & IMPACT**

Interventions focus on boosting production and offering capacity building opportunities for SHFs through coops and unions; combined interventions could raise SHF income by ~250%.

- Intervention #1: Facilitating the adoption of input productivity package - $513 net benefit
- Intervention #2: Group storage and marketing - net $63 net benefit
- Expected to impact 320,000 SHFs in the major sorghum producing zones.

4. **STAKEHOLDER PROFILES**

The intensification of sorghum production in Ethiopia, and the development of group storage and marketing will require a bilateral approach of credit and grant programs that will leverage several key stakeholders for successful implementation:

- NGOs: Sasakawa Global 2000, GIZ, SNZ, ACDI/VOCA, Technoserve
- Finance: Dashen Bank, Commercial Bank of Ethiopia, Oromia International Bank
- Government: extension agents; research,
- Farmer organizations: primary cooperatives and cooperative unions.
1 SECTOR FUNDAMENTALS
PHASE 2 ETHIOPIA SORGHUM EXECUTIVE SUMMARY

1 SECTOR FUNDAMENTALS

Sorghum is an important crop in lowland and intermediate altitudes in Ethiopia, covering an area of 1.7MM Ha. production of 3.6MM MT and 4.9MM SHF are engaged in its production
- Sorghum is mainly a food security crop. The majority is consumed in rural households. Only 13% of the grain is marketed, and 7% is processed.
- Yields are 2.1 MT/Ha., which is low by comparison with the crop’s potential.

2 VALUE CHAIN OPPORTUNITIES

Logistics and infrastructure challenges constrain the current value chain. Sorghum marketability is limited. There are few short-term processing and demand sink opportunities
- Immediate opportunities – addressing major production constraints, to both satisfy increased demand from rising population and expand marketable surpluses
- Medium to long term opportunities – other factors need to be addressed before the long term viability of sorghum exports, commercial brewery production, animal feed and increased domestic processing can be promoted

3 INTERVENTIONS & IMPACT

Interventions focus on boosting production and offering capacity building opportunities for SHFs through coops and unions; combined interventions could raise SHF income by ~250%
- Intervention #1: Facilitating the adoption of input productivity package - $513 net benefit
- Intervention #2: Group storage and marketing - net $63 net benefit
- Expected to impact 320,000 SHFs in the major sorghum producing zones

4 STAKEHOLDER PROFILES

The intensification of sorghum production in Ethiopia, and the development of group storage and marketing will require a bilateral approach of credit and grant programs that will leverage several key stakeholders for successful implementation
- NGOs: Sasakawa Global 2000, GIZ, SNZ, ACDI/VOCA, TechnoServe
- Finance: Dashen Bank, Commercial Bank of Ethiopia, Oromia International Bank
- Government: extension agents; research,
- Farmer organizations: primary cooperatives and cooperative unions
Sorghum in Ethiopia plays a strategic role in ensuring food security and the government remains heavily involved.

**Global Role**
- Ethiopia is the 2nd largest producer of sorghum in Africa
- Globally ranks 6th in production (3.6MM MT), 5th in area harvested (1.7MM Ha), but 34th in yield (2.1MT/Ha)
- Ethiopia’s share of the total COMESA sorghum production is about 22%

**Current Market Overview**
- 65% or 2.3MM MT is consumed on-farm
- Sorghum accounts for 18% of cereal consumption in Ethiopia
- Sorghum is the single most important cereal in drought prone areas
- Serves as food security crop and imports are largely food aid

**Sorghum in Ethiopia**
- Largely deemed a subsistence crop, mainly used for human consumption
- 4th most important cereal crop representing 17% of total cereal production and 15% of cereal hectares
- 4.5MM SHF and 100 commercial farmers in concentrated areas

**Major Value Chain Constraints**
- Limited group storage and marketing
- Low yields from biotic constraints, limited input use (finance and availability), and soil degradation
- Few opportunities for processing and marketing of final product
THE IMPORTANCE OF SORGHUM IN ETHIOPIA IS HIGHLIGHTED BY THE PRODUCTION, FARMER INVOLVEMENT, AND AREA DEDICATED TO THE CROP

Farmers: 2012 World Bank; Guttmacher Institute of Family Planning; Ethiopia Central Statistical Agency; Context Network Analysis from research findings


ETHIOPIA HAS ONE OF THE FASTEST GROWING ECONOMIES IN AFRICA AND AGRICULTURE PLAYS A KEY ROLE ACCOUNTING FOR OVER 50% OF GDP/CAPITA

GDP per capita (constant 2005 US$) & Agriculture Contribution % 1960-2012

85% of the Ethiopian population is active in agriculture

- Minister of Industry Ethiopia

- In 2012 Ethiopia GDP = $23 billion
- Agriculture represents the highest contribution to the country GDP with a relatively constant share of ~50%
- Arable land comprised 16.2% (14.6mil hectares) of total land by 2012
- The collapse of the revolutionary government led to the devaluation of the Ethiopian Birr in 1993
- The last decade Ethiopia has enjoyed close to double-digit GDP growth
AND WITHIN ETHIOPIA SORGHUM IS NOW RANKED THE 4TH CROP CONTRIBUTING TO GROSS PRODUCTION VALUE AFTER TEFF, ROOTS AND TUBERS AND MAIZE

Gross Production Value
Top 10 Agricultural Products, Constant $

Share of Ethiopian farmers that grow crop Based on top 6 cereal crops

- Sorghum ranked #4 in total production value at $554 MM (12% of top 10 total), preceded by Maize ($872 MM, 17%) & Teff ($915 MM, 20%)
- As of 2012 there were 5.2 million sorghum farmers which ranks 3rd amongst all cereal crops

Source: 1 - FAO STAT (excludes livestock and dairy production); 2 -Source: CSA [2005/06 - 2011/12]
Note: Given FAO crop classifications Other Cereals includes Teff; Root and tuber includes Cassava, Taro and Godere
ETHIOPIA HAS THE OPPORTUNITY TO SERVE GLOBAL AND REGIONAL DEMAND IF INTERNAL NEEDS ARE MET BY INCREASED PRODUCTION

2012 Global Top 10 Gross Sorghum Producing Nations by Production (in MT) with area harvested (Ha)

Sorghum production in Ethiopia ranks 6th globally and 2nd on the continent and is 88% more than the next-largest African producer.

- In 2012 total sorghum production volume was 3.6MM MT over a harvest area of 1.7 MM HA
- Over the last decade production has increased by 133% while the harvest area increased by 55%
- In terms of total sorghum yields, in 2012 and 2002, Ethiopia globally ranked #34 and #46 respectively

Source: 1 - FAO STAT; 2 – ATA Sorghum Strategy Documentation; 3 – Context interviews with the Minister of Agriculture
HOUSEHOLD FOOD CONSUMPTION PRESENTS THE LARGEST IMMEDIATE MARKET OPPORTUNITY, WHILE OTHER SEGMENTS OFFER FUTURE POTENTIAL WITH STRONGER MARKET LINKS

<table>
<thead>
<tr>
<th>Estimated Demand Share for Sorghum¹</th>
<th>~5.6 million MT²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>10%</td>
</tr>
<tr>
<td>Domestic Industry (Processed, Breweries, etc.)</td>
<td>12%</td>
</tr>
<tr>
<td>Household consumption</td>
<td>60%</td>
</tr>
<tr>
<td>Saved seed</td>
<td>3%</td>
</tr>
<tr>
<td>Post-Harvest Storage Losses</td>
<td>20%</td>
</tr>
</tbody>
</table>

Regional instability and high demand from Djibouti and Sudan will drive increased export opportunities.

Domestic Industry household sectors will increase to ~12% share; driven by increased demand in processed sorghum (from injera consumption, commercial beer production and snacks production)

~20% of sorghum is lost through inefficient post harvest handling and storage practices

~65% of sorghum is consumed in households. As other segments develop, market share will decrease although still remain dominant segment

Sources: 1) Context Network Interviews  2) FAOSTAT 2013 4) 2007/2009 Agriculture Survey

Note: Based on a 6.23% compounded annual growth rate over last 5 years and since 1990, FAOSTAT 2013
THE GROWING POPULATION AND THE CONTINUAL PROJECTED UNMET NEED FOR SORGHUM ENSURES THAT RISING DEMAND WILL ABSORB PRODUCTION INCREASES

Ethiopia Sorghum Demand

- Over the last decade Ethiopia has been a net sorghum import market with current supply unable to meet demand
- In 2010, 350,000 MT ~10% of sorghum was imported
- Rural population has grown at rate of 2.5% and is projected to increase and drive continued demand for Sorghum

Sorghum Consumption in MT From 1993 - 2011

Since 2008 there is a ~10% gap between demand and supply

THOUGH SORGHUM REPRESENTS 10% OF TOTAL CALORIC CONSUMPTION, IT IS NOT POPULAR IN URBAN AREAS GIVEN THE PERCEPTION IT IS THE “POOR PEOPLE FOOD”

Daily Caloric Intake by Foods
2012*, Total = 2,655 KCal

- Sorghum is mostly consumed on-farm in the rural parts of Ethiopia
- Consumed as injera (more sorghum than teff), porridges, breads and traditional alcoholic and non-alcoholic beverages
- Rising price of teff has led to increasing amounts of sorghum flour being mixed with teff to produce the widely popular traditional bread injera

Notes: *FAO STAT food balance sheet extrapolation of production data corrected for population and assumes no change in exports and non-food uses
Sources: 1. large millers around Addis Ababa, 2. Context field interviews in high production zones
LIMITED MARKET AVAILABILITY AND STRONG DEMAND HAVE KEPT SORGHUM PRICES STEADY THROUGH THE YEARS

Ethiopian wholesale prices of major cereals\(^1\)
2004-2014, nominal basis, USD per MT

<table>
<thead>
<tr>
<th>Year</th>
<th>Wheat</th>
<th>Teff</th>
<th>Maize</th>
<th>Sorghum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-04</td>
<td>$1,200</td>
<td>$1,000</td>
<td>$800</td>
<td>$600</td>
</tr>
<tr>
<td>Jan-06</td>
<td>$1,100</td>
<td>$900</td>
<td>$700</td>
<td>$500</td>
</tr>
<tr>
<td>Jan-08</td>
<td>$1,000</td>
<td>$800</td>
<td>$600</td>
<td>$400</td>
</tr>
<tr>
<td>Jan-10</td>
<td>$900</td>
<td>$700</td>
<td>$500</td>
<td>$300</td>
</tr>
<tr>
<td>Jan-12</td>
<td>$800</td>
<td>$600</td>
<td>$400</td>
<td>$200</td>
</tr>
<tr>
<td>Jan-14</td>
<td>$700</td>
<td>$500</td>
<td>$300</td>
<td>$100</td>
</tr>
</tbody>
</table>

Sorghum price trends

- Sorghum is often a blend with the more expensive Teff in traditional Injera
- Sorghum is mainly consumed on farm, and as only 13% is marketed it is considered a less profitable crop for sale by many farmers
- Given reduced supply, the prices of sorghum remain consistently higher than other staple crops further limiting substitution and marketing opportunities

Ethiopian farm gate price for cereals\(^3\)
2012, USD per MT

<table>
<thead>
<tr>
<th>Cereal</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teff</td>
<td>$560</td>
</tr>
<tr>
<td>Sorghum</td>
<td>$390</td>
</tr>
<tr>
<td>Wheat</td>
<td>$263</td>
</tr>
<tr>
<td>Maize</td>
<td>$103</td>
</tr>
</tbody>
</table>

1. FAO GIEWS, Addis Ababa market
2. FAOSTAT for wholesale price
3. Averages among growers, excludes value of home consumption
4. FAO GIEWS for domestic wholesale price
Source: IFPRI 2013 Agriculture Production in Ethiopia

Local Trader at Markato Square market
ETHIOPIANS CONSUMED 4 MM TONS OF SORGHUM IN 2010; RURAL HOUSEHOLDS CONSUME AND SPEND MORE ON SORGHUM PRODUCTS THAN URBAN HOUSEHOLDS

<table>
<thead>
<tr>
<th>% of Daily Calories</th>
<th>Urban household consumption</th>
<th>Rural household consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16MM individuals total¹</td>
<td>76MM individuals total¹</td>
</tr>
<tr>
<td>Quantity consumed (per capita)</td>
<td>9kg/year</td>
<td>36kg/year</td>
</tr>
<tr>
<td>Calories (per capita)</td>
<td>95 calories per year from sorghum (1,290 calories per year from cereals)</td>
<td>365 calories per year from sorghum (1,739 calories per year from cereals)</td>
</tr>
<tr>
<td>% of total budget</td>
<td>3% on sorghum food items (51% of total budget spent on cereals)</td>
<td>11% on sorghum food items (46% of total budget spent on cereals)</td>
</tr>
</tbody>
</table>

Uses of Sorghum

- **Sorghum Grain**
  - *Injera*, fermented flatbread
  - *Dabo*, loafed bread
  - *Tella*, traditional beer
  - *Aريك*, traditional alcohol

- **Sorghum Stover**
  - Fuel sources (cooking & heating)
  - Animal feed
  - Rural construction

Cross price elasticity analysis by IFPRI shows teff and sorghum are complementary, highlighting the practice of mixing teff with sorghum especially in poor urban markets.

ETHIOPIA SUFFERS PER CAPITA CALORIE DEFICIENCY > 300 KCAL/DAY, AND INCREASED SORGHUM PRODUCTION PLAYS A KEY ROLE IN FOOD SECURITY

“Sorghum is a strategic commodity for food security in Ethiopia”
– Minister of Agriculture

Calorie deficiency in sorghum production areas within Ethiopia

- Deficiencies vary by region but range between 38% and 50% across the zones
- Safety net assistance maps show that deficits are highly variable within zones
- High sorghum production zones suffer from calorie deficiencies and marginal increases in production can help meet these needs
- Increased prices during the food crisis of 2008, highlighted the importance and current gap in national food security within Ethiopia

1 World Bank Data, Depth of the food deficit (kilocalories per person per day)
2 ATA Sorghum Strategy Work Sector Development 2013-2017; Overlaid with CSA 2012-2013 production shares
3 IFPRI: A Sub-National Hunger Index for Ethiopia: Assessing Progress in Region-Level Outcomes 2009, Data from 2005
4 CIMMYT press release
TO MEET STRONG INTERNAL AND REGIONAL DEMAND SORGHUM IN ETHIOPIA MOVES FROM SURPLUS ZONES TOWARDS DEFICIT AREAS AND EXPORT MARKETS

65% of sorghum production is consumed on farm
Trading in sorghum has not been attractive given long distances between the major surplus and deficit areas, and the susceptibility to storage pests

6% of sorghum production is exported
The vast majority of the Sorghum exported from Ethiopia is from the northern regions of the country and 32% are considered informal exports

60% of marketable sorghum is sold to traders and wholesalers
25% is sold to traders, 35% is sold to wholesalers, 15% is sold directly to consumers, and 25% sold to union cooperatives

1. IFPRI 2011 Agriculture Production in Ethiopia,
2. USAID 2010 Staple Food Value Chain Analysis
Source: FEWSNET, Context Network stakeholder interviews and analysis
EAST AFRICA DEMAND IS STRONG AND GROWING, WITH DEFICIT AREAS CENTERED IN THE SOUTH (KENYA), NORTHWEST (SUDAN) AND NORTHEAST (DJIBOUTI)

Sorghum surplus (green) and deficit (orange) areas for East Africa, 2011¹

East Africa Demand and Trade Opportunities

• East Africa’s 1.85 million MT Sorghum deficit in 2010 is expected to rise to 4.2 million MT in 2020²

• **Strong demand** in neighboring Kenya and Sudan means producer prices are 85 -100% higher than Ethiopia producer prices

• Major **export destinations** are Kenya, Sudan and Djibouti (which also feeds middle eastern and south Asia markets)

• Major **imports of sorghum** in Ethiopia largely serve food-aid recipients and are from Italy and USA

“There is a regional demand for resilient Sorghum crop, especially in drought prone East Africa. Ethiopia is positioned to meet this demand”

- Minister of Agriculture Ethiopia

Sources: 1) East Africa Trade Bulletin WFP 2011 -
2) FAO Sorghum Value Chain report 2012
3) SARI interviews 4) IITA interview
INTERVENTIONS ARE PROPOSED IN THE LOW AND INTERMEDIATE ALTITUDES IN DROUGHT PRONE AREAS OF ETHIOPIA WHERE SORGHUM IS MOSTLY GROWN

Criteria for selecting intervention regions:
1) Potential for seed production on irrigated land; 2) Potential for linkages to surplus-deficit grain trade 3) Potential for reinforcing primaries and unions; 4) Enhanced productivity with ISFM 5) High Production zones

- High sorghum production zones are in the East, North West, North-central and in the West regions
- Sorghum is a resilient crop requiring less than 600mm annual rainfall
- Total Sorghum area in 2012 was 1.6 million hectares

Source: USAID and Gov of Ethiopia. 2011. The Livelihoods Atlas for Ethiopia. The Livelihoods Integration Unit
Sorghum production is largely concentrated in three major high production regions which represent ~78% of sorghum SHFs.

2012 Total Sorghum Small Holder farmers by region (in millions) and Harvest Area (in thousand Ha)

- The 3 regions selected for the interventions encompass 85% of total area allocated to sorghum production.
- 78% of SHF (~3.4MM) are located in Amhara, Tigray & Oromia regions.
- The majority of sorghum production area and SHFs population are located in North East and North West Oromia.
- With a yield of 2.4MT per Ha the Tigray region has the highest yield of the high producing areas largely due higher concentration of commercial and large farms.

Source: 1) CSA Crop Production Report 2012 2) Context Network Analysis
Assumed number of Sorghum hectares per farmer at 0.35 ha
...AND THESE HIGH PRODUCTION ZONES REPRESENT 68% OF THE TOTAL SORGHUM PRODUCTION IN ETHIOPIA

Distribution of major sorghum producing zones (in MT)

- **NW. & W. Tigray**: 275k MT, 8%
- **N. Gonder**: 455k MT, 13%
- **Shewa**: 531k MT, 15%
- **N. & S. Wollo**: 357k MT, 11%
- **E. & W. Harerghe**: 571k MT, 16%
- **Tigray**:

Sorghum volumes by main production zones

- All Other
- Harerghe
- Shewa
- Gonder
- Wollo
- NW. & W. Tigray

<table>
<thead>
<tr>
<th>Production in MT</th>
<th>N. &amp; S. Wollo</th>
<th>Shewa</th>
<th>E. &amp; W. Harerghe</th>
<th>N. Gonder</th>
<th>Harerghe</th>
<th>Wollo</th>
<th>NW. &amp; W. Tigray</th>
<th>All Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>10 - 50</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>50 - 150</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>150 - 300</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>300 - 400</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- In 2012 production was 3.6MM MT, a 133% increase over 2002 production of 1.5MM MT
- Total sorghum harvested area was 1.7 million hectares of which the main sorghum producing zones account for 72%
- Rainfall fluctuations represent 70% of historical reasons for production variability

Sources: 1) FAOSTAT 2013 2) USAID Sorghum & Rice Policy Study June 2012 3) WFP Ethiopia 2012 4) ATA Sorghum Study
PRODUCTION VOLUMES HAVE IMPROVED MAINLY AS A RESULT OF INCREASED AREA, BUT AN OPPORTUNITY EXISTS TO INCREASE VOLUMES AS CURRENT YIELDS ARE COMPARATIVELY LOWER THAN OTHER TOP SORGHUM PRODUCERS

Increased Sorghum Production

- Starting in 1991, large investments were made in agriculture, including farmer training centers improving agricultural practices which led to the gradual yield improvements.
- Since 1993, the overall boosts in production can mostly be attributed to harvest area expansion than to increased yields.
- In 2010-2011, less than 35% of farmers used some form of fertilizer and only 10% used improved seed.

Improved productivity packages have the potential to increase average yields of 2.1 MT/ha, with high producing areas achieving 3-4 MT/ha.

FARMERS PREFER THE LOWER YIELDING LONGER MATURING VARIETIES OF SORGHUM AS THE BIOMASS IS KEY IN THE LOCAL ECONOMY AND HAS DIVERSE USES

**Fuel Source**
- Limited access to **electricity** in the rural areas of Ethiopia
- **Depleted forestation** and reduced vegetative cover limit alternative fuels
- Sorghum stover a key **fuel for cooking** and **heating** purposes in rural Ethiopia

**Animal Nutrition**
- In the sorghum producing areas of rural Ethiopia **animal feed is scarce**
- Sorghum stover provide **nutrition year-round** for livestock in the area
- Recent SNV studies have proven that **fermenting** sorghum stover can increase **nutritional value for cattle**

**Rural Construction**
- **Limited infrastructure** constrains the transportation and availability of building materials
- Sorghum stover are a key component of **construction materials** that support the growth of the population in rural Ethiopia

Stover accounts for 37% of crop value in Ethiopia, compared to 26% in the rest of Africa.

Source: FAO GIEWS, Addis Ababa market, IFPRI 2013 Agriculture Production in Ethiopia, Context Field Interviews and observations with Ethiopia zonal authorities
SORGHUM PRODUCTION IS DOMINATED BY MALE FARMERS WITH WOMEN ONLY LARGELY PART OF POST HARVEST HANDLING ACTIVITIES IN ETHIOPIA

Key constraints on women sorghum farmers

- More limited access to agricultural machinery and inputs
- Extension services mainly offered to male farmers only
- Time and resource burdens given household and family responsibilities
- Land ownership inequality
- Reduced market access opportunities
- Culturally entrenched gender roles
- Labor intensive traditional farming methods

Women farmer utilizing animal traction for ploughing

BUT CONTRARY TO REGIONAL TRENDS MEN ARE PRIMARILY RESPONSIBLE FOR SORGHUM PRODUCTION AND MARKETING

**Women Sorghum farming trends**

- Strong cultural norms limit opportunities for women to access inputs and agricultural equipment (e.g. animal traction)
- Cultural expectation is women prioritize household duties and their husband’s crop before their own crop production
- Women control most post-harvest production, they typically grow the grain on plots owned by their husbands
- Addressing this land inequality, the Government of Ethiopia has legislated laws that provide equal rights to spouses in land and asset ownership

![Women Assisted Demonstration (WAD) plot of sorghum at maturity in Chewaka Woreda of Oromia](image)

**Production activities by family member (%)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Men</th>
<th>Women</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>53%</td>
<td>36%</td>
<td>12%</td>
</tr>
<tr>
<td>Kenya</td>
<td>25%</td>
<td>42%</td>
<td>13%</td>
</tr>
<tr>
<td>Uganda</td>
<td>28%</td>
<td>33%</td>
<td>15%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>30%</td>
<td>45%</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Post-harvest activities by family member (%)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Men</th>
<th>Women</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>35%</td>
<td>50%</td>
<td>15%</td>
</tr>
<tr>
<td>Kenya</td>
<td>6%</td>
<td>15%</td>
<td>12%</td>
</tr>
<tr>
<td>Uganda</td>
<td>12%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>33%</td>
<td>45%</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Marketing activities by family member (%)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Men</th>
<th>Women</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>48%</td>
<td>37%</td>
<td>15%</td>
</tr>
<tr>
<td>Kenya</td>
<td>73%</td>
<td>22%</td>
<td>5%</td>
</tr>
<tr>
<td>Uganda</td>
<td>50%</td>
<td>33%</td>
<td>16%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>63%</td>
<td>37%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source:
1. University of Washington, Gender and Cropping Sub-Saharan Africa
2. University of Nebraska, Atlas of Sorghum in E. and S Africa
**THREE MAIN DONOR INITIATIVES AND GOVERNMENT STRATEGIES IMPACT SORGHUM IN ETHIOPIA TO VARYING DEGREES**

<table>
<thead>
<tr>
<th></th>
<th><strong>PSNP</strong></th>
<th><strong>AGP</strong></th>
<th><strong>SLMP</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity Safety Net Program</strong></td>
<td>WFP, World Bank, Ethiopian gov.</td>
<td>World Bank, Ethiopian gov., USAID, ATA, IDA</td>
<td>World Bank, KFW, CIDA, Ethiopian gov. EU</td>
</tr>
<tr>
<td><strong>AGP</strong></td>
<td>Agriculture Growth Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SLMP</strong></td>
<td>Soil Land Management Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Key stakeholders</strong></td>
<td><strong>Overview</strong></td>
<td><strong>Program goals</strong></td>
<td><strong>Program size</strong></td>
</tr>
<tr>
<td></td>
<td>• Assist chronically food insecure and poor households</td>
<td>• Increase ag productivity and market access by targeting high potential areas and value chains for export</td>
<td>• Focuses on soil and water conservation measures to reduce soil degradation and increase productivity</td>
</tr>
<tr>
<td></td>
<td>• Able bodied aid recipients participate in community development activities to establish future resiliency</td>
<td>• “AGP II” (strategy refresh) is under dev.</td>
<td></td>
</tr>
<tr>
<td><strong>Program goals</strong></td>
<td>• Support rural transformation process</td>
<td>• Focus on farmer capacity building and investment on small scale rural infrastructure, irrigation, rural roads, and market centers</td>
<td>• Reduction of soil erosion through measures to rehabilitate watersheds</td>
</tr>
<tr>
<td></td>
<td>• Prevent long-term consequences of short-term food aid insecurities</td>
<td>• Raising agricultural productivity by using appropriate production technologies</td>
<td>• Raising agricultural productivity by using appropriate production technologies</td>
</tr>
<tr>
<td></td>
<td>• Promote market development by increased purchasing power</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td><strong>Program size</strong></td>
<td>• $2.3B, 5 year program (end in 2015)</td>
<td>• $280MM, 5 year program (end 2015)</td>
<td>• $103MM in Ethiopia, 6 year program (end 2019)</td>
</tr>
<tr>
<td><strong>Geographic scope</strong></td>
<td>• 670 woredas in Oromia, Amhara, Tigray</td>
<td>• 96 woredas in Amhara, Oromia, SNNP, Tigray</td>
<td>• 235 woredas in Oromia, Amhara, Tigray, SNNP, Gambela and Benishangul Gumuz</td>
</tr>
</tbody>
</table>

See appendix for additional information

Source: Program press releases and materials, Context Network interviews and analysis
OVERVIEW OF THE SORGHUM SECTOR FUNDAMENTALS

Supply

- Sorghum is mostly produced for household consumption and only 13% of Sorghum is marketed and sold
- Sorghum production for 2012 reached 3.6MM MT and has been growing since 1998 (16 years), mainly as a result of expanded sorghum hectares, another 350k MT is imported
- Ethiopia sorghum yields are higher than regional averages, but remain significantly lower than other top global sorghum producing nations

Demand

- Sorghum consumption is increasing and is now one of the highest contributors to caloric intake, however imports have to help satisfy the 10% demand gap that still exists
- Growth in demand for sorghum is driven by the continued population growth
- There is strong regional demand for sorghum exports to Sudan, Kenya and Djibouti. Currently this demand is met mostly by large and commercial farms

Source: Context Network Analysis on primary and secondary research data
Value Chain Opportunities
Sorghum is an important crop in lowland and intermediate altitudes in Ethiopia, covering an area of 1.7MM Ha. production of 3.6MM MT and 4.9MM SHF are engaged in its production. 
• Sorghum is mainly a food security crop. The majority is consumed in rural households. Only 13% of the grain is marketed, and 7% is processed.
• Yields are 2.1 MT/ha., which is low by comparison with the crop’s potential.

Logistics and infrastructure challenges constrain the current value chain. Sorghum marketability is limited. There are few short-term processing and demand sink opportunities.
• Immediate opportunities – addressing major production constraints, to both satisfy increased demand from rising population and expand marketable surpluses.
• Medium to long term opportunities – other factors need to be addressed before the long term viability of sorghum exports, commercial brewery production, animal feed and increased domestic processing can be promoted.

Interventions focus on boosting production and offering capacity building opportunities for SHFs through coops and unions; combined interventions could raise SHF income by ~250%.
• Intervention #1: Facilitating the adoption of input productivity package - $513 net benefit.
• Intervention #2: Group storage and marketing - net $63 net benefit.
• Expected to impact 320,000 SHFs in the major sorghum producing zones.

The intensification of sorghum production in Ethiopia, and the development of group storage and marketing will require a bilateral approach of credit and grant programs that will leverage several key stakeholders for successful implementation.
• NGOs: Sasakawa Global 2000, GIZ, SNZ, ACDI/VOCA, Technoserve.
• Finance: Dashen Bank, Commercial Bank of Ethiopia, Oromia International Bank.
• Government: extension agents; research,
• Farmer organizations: primary cooperatives and cooperative unions.
13% of sorghum is marketed and 65% is consumed on farm; reducing storage losses will increase volumes for consumption and marketing.

### Sorghum Market Model Based on Preliminary Market Research

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum Domestic Production</td>
<td>10%</td>
</tr>
<tr>
<td>Imports</td>
<td>10%</td>
</tr>
<tr>
<td>Market Sales</td>
<td>7%</td>
</tr>
<tr>
<td>Export (4%) &amp; Institutional sales (2%)</td>
<td></td>
</tr>
<tr>
<td>67% On-Farm Use</td>
<td>67%</td>
</tr>
<tr>
<td>(65% Food and 2% Seed Production)</td>
<td></td>
</tr>
<tr>
<td>20% Post Harvest Loss</td>
<td>20%</td>
</tr>
<tr>
<td>4% Home Consumption</td>
<td>4%</td>
</tr>
<tr>
<td>3% Processing</td>
<td>3%</td>
</tr>
<tr>
<td>1% Traditional Beer</td>
<td>1%</td>
</tr>
<tr>
<td>3% Food Products</td>
<td>3%</td>
</tr>
</tbody>
</table>

The high transportation costs and the underdeveloped infrastructure have historically stifled marketability of sorghum.

Sorghum is marketed in grain form and processed either by traditional methods at the household level or small-scale processing mills.

There are no commercial processing plants but as of 2010 ~ 20,000 small scale processing mills exist.

As the majority of sorghum is consumed on-farm, the significant post harvest losses reduces food availability on-farm.

Exports are to Sudan, Djibouti and to Kenya.

Sudan trade routes represent the largest informal trade (35% trade), given the border proximity of the high production area.

Source: Context Field interviews and data collection
HIGH COSTS AND TRANSPORT LOGISTICS PRESSURE MARGINS AND REDUCE MARKETABILITY OF SORGHUM IN ETHIOPIA

Sorghum Value Chain Based on Preliminary Market Research

XX % Percentage output from Value Chain Player

Source: Context Field interviews and data collection, FAO STAT (2012); USAID Chief economist; ATA Baseline data
SEVERAL CONSTRAINTS EXIST, BUT THE CONSTRAINTS IN PRODUCTION AND MARKET ARE MOST IMPACTFUL AND REPRESENT ‘LOW HANGING FRUIT’

Overview of the sorghum value chain challenges in Ethiopia

**Access to appropriate inputs & technical knowledge:**
- Lack of locally adapted improved seeds
- Low agricultural input use due to limited cash availability and access to credit
- Poor knowledge and implementation of effective post-harvest handling & conditioning techniques
- Lack of technical knowledge (agronomic practices, farm management)

**Marketing Issues:**
- Weak aggregation & marketing strategy at primary cooperative and union levels
- Traders & assemblers are price-setters
- Limited storage capacity - village to processor
- Minimal quality control and grain cleaning leading to unreliable supply and quality
- Limited market information reduce profit and trading opportunities

**Sorghum processing is limited to largely domestic and household processing**
- There are no commercial mills within the country that process sorghum on an industrial scale
- Majority of sorghum is traded in grain form and processed at household level (largely traditional methods) or at one of the ~20,000 small mills.
- There has been little production development to increase product diversity (snacks, malted drinks, etc)

**Sorghum consumption is largely concentrated in the high-production zones in the rural parts of the country**
- Grain moves from surplus areas to deficit areas, largely to satisfy rural demand for sorghum in Ethiopia
- There is great export demand for sorghum grain through Sudan, Kenya and Djibouti
- Limited range of sorghum products and limited uses, restrict the demand pull from commercial production

**Relative degree of constraint**

More constrained | Less constrained
ADDRESSING CURRENT VALUE CHAIN CONSTRAINTS COULD IMPACT OVER 2 MILLION SORGHUM SHFS AND PROVIDE SEVERAL GRAIN MARKETING OPPORTUNITIES

**Major Constraints**

- **Inputs & Production**
  - Low yields due to limited access to quality inputs
  - Limited technical knowledge of efficient agronomic practices

- **Storage & Aggregation**
  - Inappropriate post-harvest handling and storage, resulting in ~20% reduce available grain
  - Lack of significant group storage and marketing at farmer cooperative and union levels

- **Processing**
  - Limited product diversity to stimulate production and marketing
  - Limited commercial milling infrastructure reduces processing margins making sector development less attractive

- **Market**
  - Export market dominated by commercial producers and (significant informal exports)
  - Limited market demand for non-grain forms of sorghum stifling domestic market expansion

**Total Farmer Impact**

- **+1.5 million** could benefit from improved input usage and availability

- **+750 thousand** could benefit from improved access to markets

Note: 1) Based on 4.9 million Sorghum SHFs of whom ~40% market sorghum. 2) SHFs utilizing inputs represent over 80% of production volumes in Ethiopia. 3) Context estimates are that surplus production will yield additional marketability of sorghum raising to ~20% at full adoption.
FOUR FARMER SEGMENTS EXIST, WITH ~65% SHFs PRODUCING SOLELY FOR
HOUSEHOLD CONSUMPTION

<table>
<thead>
<tr>
<th>Total # Farmers(^2)</th>
<th>Avg Size of Sorghum farm(^2)</th>
<th>Sold(^2)</th>
<th>Farming Practices</th>
<th>Yields (MT / ha)(^2)</th>
<th>Total Production (MT)(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>196,000 (&lt;4%)</td>
<td>&gt;2 ha</td>
<td>&gt; 40 %</td>
<td>Full package</td>
<td>&gt; 3.4</td>
<td>1,010,000</td>
</tr>
<tr>
<td>1.4 million (28%)</td>
<td>1 - 2 ha</td>
<td>15-40%</td>
<td>Improved seed + fertilizer</td>
<td>2.1-3.4</td>
<td>1,372,000</td>
</tr>
<tr>
<td>1.6 million (32%)</td>
<td>0.5 – 1.0ha</td>
<td>5-15%</td>
<td>Limited fertilizer + improved seed</td>
<td>1.0 –2.1</td>
<td>785,000</td>
</tr>
<tr>
<td>1.8 million (36%)</td>
<td>&lt;.05 ha</td>
<td>0-5%*</td>
<td>Traditional</td>
<td>&lt;1</td>
<td>490,000</td>
</tr>
</tbody>
</table>

*Farmers sell sorghum from consumption stock when they need cash because there is always demand for sorghum in rural and urban markets in the sorghum consumption zones

Based on Context estimates from field visits 2) Interview with zonal and woreda unions in 4 regions of Ethiopia 3) Central Statistical Agency Study on Cereal Production in Ethiopia
SIX BIOTIC AND ABIOTIC FACTORS IMPACT THE YIELD GAP AND ACCOUNT FOR ~2MT/Ha IN LOST PRODUCTIVITY EACH YEAR

Value Chain Opportunity
Interventions address most of these constraints and have the potential to impact up to ~2MT/Ha each year

Major Biotic Productivity Constraints

- **Pests** – Stem borers and Shootfly account for the largest impact on reduced crop productivity in Ethiopia, given limited pesticide use

- **Birds** – Birds such as the dreaded Quelea quickly reproduce and average flocks of 20 million can consume over 20MT per day

- **Weeds** – Striga weed is debilitating for sorghum crops; while there are Striga resistant varieties available, they are not widely diffused

- **Rainfall Fluctuations** – sorghum is a resilient crop however low adoption of improved varieties limit yields from rainfall fluctuations

- **Soil Fertility** – prolonged unfavorable farming practices (such as no crop rotation) has contributed to degraded soil conditions which coupled with limited fertilizer use drop yields

- **Fungi** – Smut disease is particularly dangerous as it can spread easily through wind and rain to the soil and other crop causing internal rotting

*Impact

- 0.5 MT/Ha
- 0.4 MT/Ha
- 0.4 MT/Ha
- 0.3 MT/Ha
- 0.2 MT/Ha
- 0.2 MT/Ha

*2010 Impact shown in MT/Ha

ALSO GOOD QUALITY SEED OF IMPROVED VARIETIES ADAPTED TO LOCAL CONDITIONS IS NOT WIDELY AVAILABLE

% of farmers purchasing seed or using improved seed

2012, cereal crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Purchased seed</th>
<th>Improved seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>15%</td>
<td>41%</td>
</tr>
<tr>
<td>Wheat</td>
<td>4%</td>
<td>28%</td>
</tr>
<tr>
<td>Teff</td>
<td>3%</td>
<td>24%</td>
</tr>
<tr>
<td>Barley</td>
<td>1%</td>
<td>21%</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source of purchased sorghum seed

2012, % of purchased seed

- Farmer: 88%
- Grain trader: 12%
- Other: 0%
- Bureau of Ag: 0%
- Coop: 0%

Limited improved seed available

- Each year only 10% of farmers purchase seed and a preference is given to local varieties
- Farmers view overall production (grain and stover), grain yield and color, and drought tolerance as the most important qualities in selecting a new variety
- Typically seed is purchased every 4 to 8 years with farmers saving seed in the interim years
- Of 33 sorghum varieties released for multiplication and sale, 2 are dominant with an average age of 16 years
- Public seed enterprises produce small amounts of sorghum seed, so new varieties and good quality seed do not easily reach SHF

Value Chain Opportunity

Facilitating the multiplication and dissemination of quality seeds would boost yields from 2.1MT to 2.8MT

---

1. Purchased seed does not guarantee usage of improved seed
2. Improved seed usage based on purchases from official sources including cooperative, BoA

Sources: IFPRI 2011 Ag Production in Ethiopia; IFPRI 2011 Seed, Fertilizer, and Agriculture Extension in Ethiopia; ATA Seed System Road Map
FERTILIZER USE ON SORGHUM IS VERY LOW COMPARED TO OTHER CROPS

- Current rate of application (6kg/Ha) is below the recommended rate of 100kg/Ha
- Sorghum is grown in semi-arid low-rainfall areas that are less responsive to fertilizer application than the higher rainfall areas
- Fertilizers distributed by unions and coops are not received in a timely manner
- In 2012 ATA Baseline Survey, 56% of respondents said “fertilizer expense” was top reason for not applying it to their fields

Value Chain Opportunity

Per IFPRI, relieving financial constraints on fertilizer usage could boost yields from 2.1 MT to 3.4MT per Ha.

Land under fertilizer usage by crop (in million Hectares)

- **64%** Teff: Total land under fertilizer = 1.8, Total land under crop = 2.8
- **40%** Maize: Total land under fertilizer = 0.8, Total land under crop = 2.0
- **11%** Sorghum: Total land under fertilizer = 0.2, Total land under crop = 1.9
- **69%** Wheat: Total land under fertilizer = 1.1, Total land under crop = 1.6
- **40%** Barley: Total land under fertilizer = 0.4, Total land under crop = 1.0

Source: 1. ATA Baseline Survey Data; 2. IFPRI Input Analysis Study Ethiopia
IMPROVED SOIL FERTILITY MANAGEMENT CAN DRIVE BETTER YIELDS BY ADDRESSING SOIL DEFICIENCIES

- Currently soil organic matter is very low in many Ethiopian soils (< 1.5%)
- Organic matter mitigates the effects of soil acidity and improves soil structure and soil fertility
- Diversion of organic matter to serve multiple household uses has contributed to soil degradation
- Effectiveness of chemical fertilizers is reduced in the absence of soil organic matter

Value Chain Opportunity

Integrated Soil Fertility Management will contribute to increased production, increase the effects of organic fertilizer improve soil structure

Average soil organic carbon content in different areas of Ethiopia (%)

<table>
<thead>
<tr>
<th>Location</th>
<th>Carbon Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areka</td>
<td>3.2</td>
</tr>
<tr>
<td>Agaro</td>
<td>3.1</td>
</tr>
<tr>
<td>Awassa</td>
<td>2.8</td>
</tr>
<tr>
<td>Tepi</td>
<td>2.8</td>
</tr>
<tr>
<td>Wondogenet</td>
<td>2.4</td>
</tr>
<tr>
<td>Jijigga</td>
<td>1.8</td>
</tr>
<tr>
<td>Adet</td>
<td>1.7</td>
</tr>
<tr>
<td>Melkassa</td>
<td>1.6</td>
</tr>
<tr>
<td>Pawe</td>
<td>1.3</td>
</tr>
<tr>
<td>Mekelle</td>
<td>1.2</td>
</tr>
<tr>
<td>Alamata</td>
<td>1.1</td>
</tr>
<tr>
<td>Debrezeit</td>
<td>1.1</td>
</tr>
<tr>
<td>Kulumsa</td>
<td>1.0</td>
</tr>
<tr>
<td>Sekota</td>
<td>0.7</td>
</tr>
<tr>
<td>Enewaer</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: 1. Context Network field interviews and primary data analysis; 2. ATA Soils Study
OPPORTUNITIES EXIST TO INCREASE PRODUCTIVITY THROUGH BETTER ACCESS TO PLOUGHING SERVICES AND INCREASED OWNERSHIP OF ANIMAL TRACTION

Regional levels of mechanization

<table>
<thead>
<tr>
<th>Country</th>
<th>Human Labor</th>
<th>Draft Animals</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>57%</td>
<td>31%</td>
<td>12%</td>
</tr>
<tr>
<td>Kenya</td>
<td>77%</td>
<td>18%</td>
<td>5%</td>
</tr>
<tr>
<td>Malawi</td>
<td>31%</td>
<td>69%</td>
<td>0%</td>
</tr>
<tr>
<td>Mozambique</td>
<td>90%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Rwanda</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>42%</td>
<td>52%</td>
<td>6%</td>
</tr>
<tr>
<td>Uganda</td>
<td>61%</td>
<td>32%</td>
<td>7%</td>
</tr>
<tr>
<td>Zambia</td>
<td>65%</td>
<td>35%</td>
<td>0%</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>56%</td>
<td>42%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Though Ethiopia leads region in mechanization rates, it lags behind other top global producers.

• Concentration of commercial farmers in the Tigray lowlands in Ethiopia largely drives the high rates of tractor utilization.
• New government programs to promote youth employment is facilitating access to tractors for custom operation services.

Value Chain Opportunity

Increase SHF access to modern ag equipment and animal traction for more efficient production.

Sources: 1. INSORTMIL 2. USAID 3. Context field interviews 4. Sorghum Atlas study
ON TYPICAL FARMS FERTILIZER USAGE IS NON-EXISTENT; WEEDING COSTS REPRESENT HIGHEST COST AND ACCOUNT FOR OVER 26% OF TOTAL COSTS

Typical sorghum farmer economics
$USD per Farmer, per Hectare

- Land Preparation: $10
- Ploughing¹: $34
- Seed Purchases: $20
- Weeding: $116
- Guarding: $55
- Harvesting³: $94
- Total Harvest Cost: $329
- Threshing: $37
- Bagging⁴: $21
- Transport: $60
- Total Production Cost: $447

Note: Assumes an exchange rate of 20ETB per USD
Sources: Context Network stakeholder and field farmer interviews, IFPRI Input Market Analysis (2012), USAID Crop Analysis (2010)

1. Based on mainly limited animal traction (Oxen and cows); though many farmers still utilize manual wooden plows
2. Source: IFRI Input analysis based on ATA Baseline Survey
3. Includes labor for agriculturally active family members
4. Assumed bagging costs of 20ETB ($1.00) per 100kg bag with an average yield of 21 bags per hectare

In high rainfall areas, thinning, and up to three hand weedings are necessary. In low rainfall zones, this cost is reduced.

65% of Sorghum farmers do not utilize fertilizers stating financial and availability constraints.
THOUGH RECOMMENDED INPUT USAGE WOULD RISE COSTS 23%, THE RESULTING INCREASED YIELDS WOULD REPRESENT MORE MARKET OPPORTUNITIES

**Best practice sorghum farmer economics**

$USD per Farmer, per Hectare

<table>
<thead>
<tr>
<th>Land Preparation</th>
<th>Ploughing</th>
<th>Seed Purchases</th>
<th>Fertilizer</th>
<th>Weeding</th>
<th>Guarding</th>
<th>Harvesting</th>
<th>Total Harvest Cost</th>
<th>Threshing</th>
<th>Bagging</th>
<th>Transport</th>
<th>Total Production Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10</td>
<td>$34</td>
<td>$20</td>
<td>$10</td>
<td>$34</td>
<td>$20</td>
<td>$10</td>
<td>$447</td>
<td>$37</td>
<td>$21</td>
<td>$60</td>
<td>$672</td>
</tr>
</tbody>
</table>

**Note:** Assumes an exchange rate of 20ETB per USD

Sources: Context Network stakeholder and field farmer interviews, IFPRI Input Market Analysis (2012), USAID Crop Analysis (2010)

1. Based on mainly limited animal traction (Oxen and cows); though many farmers still utilize manual wooden plows
2. Source: IFRI Input analysis based on ATA Baseline Survey
3. Includes labor for agriculturally active family members
4. Assumed bagging costs of 20ETB ($1.00) per 100kg bag with an average yield of 21 bags per hectare

Harvest costs include expenses for agriculturally active family members participating in the harvest.

In high rainfall areas, thinning, and up to three hand weedings are necessary. In low rainfall zones, this cost is reduced.

Optimal input usage would increase costs 23% per Ha, but have potential to double yields.
BASED ON THE YIELD GAINS ALONE THESE INCREASED COSTS POTENTIALLY DRIVE IMPROVED MARGINS FOR THE BEST PRACTICE FARMERS

Farmer margins for Sorghum production in Ethiopia
$USD per Farmer per Hectare

Typical Farmer Economics

- Total cost of Production: $447
- Farmer Gross Margin: $373
- Potential Farmer Crop Value*: $820

Best-practice Farmer Economics

- Total cost of Production: $672
- Farmer Gross Margin: $968
- Potential Farmer Crop Value*: $1,640

*Represents the potential total revenue value if full stock were to be sold

1. Sources: Context Field Interviews and discussions with major value chain players; USAID 2010 Staple Food Value Chain Analysis: IFPRI Ethiopia Value Chain Analysis
2. Costs include: The major input costs include seed, labor, crop guarding (bird-loss mitigation), harvesting, threshing and transport to farm and to market.
3. Costs include: Payment to wholesalers, weighing, broker fees and stacking of the produce (approx $25.52/MT)
4. Costs include: Storage costs, rent, loading and unloading, sacks and twines, commission fees, weight and spillage allowances (approx $57.03/MT)
5. Costs include: Various handling and marketing costs (approx $21.35/MT)

Note: Assumes a yield of 2.1MT per Ha per farmer; analysis is agnostic of production consumed on farm; farmer household labor costs included

Prices were validated during field visits in June 2014
MODERN STORAGE PRACTICES REPRESENT AN OPPORTUNITY TO SIGNIFICANTLY REDUCE CURRENT ON-FARM STORAGE LOSSES

% of on-farm storage techniques

- Gudegade (pit in ground): 15%
- Within house without containers: 24%
- Within house in containers: 34%
- Gotera / granary: 39%

*All crops, can sum to greater than 100%

Ineffective storage practices

- As sorghum is largely stored on-farm and only 13% of total production is marketed, improved storage practices will directly impact SHF households
- Traditional methods of grain storage vary, but are relatively inefficient compared to modern storage, hence ~20% of current losses
- As observed through site visits the Gudegade represent the lowest on-farm storage losses; however, this practice requires grain to be kept underground for over 18 months

Value Chain Opportunity

Implementing modern storage techniques will significantly reduce storage losses potentially retaining 350k MT\(^1\) of available production

---

1. Conservative based on 50% reduction on current losses of 20% to 15% on 2012 production values of 3.6MM MT/YR

Source: IFPRI 2011 Ag Production in Ethiopia; IFPRI 2011 Seed, Fertilizer, and Agriculture Extension in Ethiopia
FARMER COOPERATIVES LACK THE CAPACITY TO EFFICIENTLY STORE AND MARKET MEMBER GRAINS

**Ethiopia’s Cooperative System**

Constrained farmer’s union/coops lack the technical expertise and financial wherewithal to provide critical services to farmers, specifically:

- **Improved seed and fertilizer for farmer purchase on a timely basis:** 1/3 of the time there are issues with input availability, largely due to late delivery
- **Aggregation, storage and effective marketing of member crops:** only 23% of agricultural coops provide grain marketing services
- **Poor quality storage and knowledge leads to large share of off-farm post-harvest losses**

**Value Chain Opportunity**

10% potential sales price premium on delayed sales from group storage and direct market access from group marketing practices

---

Source: IFPRI Cooperatives in Ethiopia: Results of the 2012 ATA Baseline Survey, Context Field Interviews
Estimate based on observed 50% price increase from post harvest to peak, and willingness of several industries to pay a premium contract grain
Market margins for Sorghum production in Ethiopia
$USD per Farmer per Hectare

<table>
<thead>
<tr>
<th></th>
<th>Value add</th>
<th>Net margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>$373</td>
<td>73.9%</td>
</tr>
<tr>
<td>Assembler</td>
<td>$23</td>
<td>4.6%</td>
</tr>
<tr>
<td>Wholesaler</td>
<td>$44</td>
<td>8.7%</td>
</tr>
<tr>
<td>Retailer</td>
<td>$65</td>
<td>12.8%</td>
</tr>
</tbody>
</table>

1. Sources: Context Field Interviews and discussions with major value chain players; USAID 2010 Staple Food Value Chain Analysis: IFPRI Ethiopia Value Chain Analysis
2. Costs include: The major input costs include seed, labor, crop guarding (bird-loss mitigation), harvesting, threshing and transport to farm and to market.
3. Costs include: Payment to wholesalers, weighing, broker fees and stacking of the produce (approx $25.52/MT)
4. Costs include: Storage costs, rent, loading and unloading, sacks and twines, commission fees, weight and spillage allowances (approx $57.03/MT)
5. Costs include: Various handling and marketing costs (approx $21.35/MT)

Note: Assumes a yield of 2.1MT per Ha per farmer; analysis is agnostic of production consumed on farm; farmer household labor costs included
TO BOOST PROCESSING THE GOVERNMENT IS BUILDING AGRO-PROCESSING PARKS TO DELIVER MORE VALUE ADDED PRODUCTS, BUT THESE ARE NOT EXPECTED FOR SEVERAL MORE YEARS

- Government hopes to transform to a manufacturing economy with the first Agro-processing park to open in 2016
- Plan is to develop strategically located integrated Agro Parks facilitated by the government but ultimately operated by private sector companies and investors
- Agro-processing parks are already in operation for other industries in Ethiopia (i.e. textile, fresh produce) and are considered key to the success AGP II
- Decisions are still being made on which cereal crops and which locations the agro-parks will be implemented

By setting up this infrastructure, our government hopes to boost processing and attract private industry and investors to Ethiopia

- Minister of Industry, Ethiopia
THERE IS AN OPPORTUNITY TO EXPORT SORGHUM GIVEN FAVORABLE PRICES AND STRONG REGIONAL DEMAND

Transformation of Ethiopia from sorghum importer to a regional exporter

1. Increase production
   - Increase farmer productivity to meet demand gap

2. Minimize imports
   - Reduce reliance on sorghum food aid imports

3. Solidify future supply
   - Ensure food security through Gov’t programs (food reserves of sorghum grain)

4. Ensure market prices
   - Improve and control production costs to ensure favorable trade prices

Export
   - After meeting domestic demand, export additional surplus to net import regions

Sorghum potential and grain import of regional African countries

<table>
<thead>
<tr>
<th></th>
<th>Area harvested ('000 MT)</th>
<th>Prod. ('000 MT)</th>
<th>Imports ('000 MT)</th>
<th>Producer Price (USD/MT)</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>1,711</td>
<td>3,604</td>
<td>350</td>
<td>$557</td>
<td>91 million</td>
</tr>
<tr>
<td>Eritrea</td>
<td>260</td>
<td>80</td>
<td>54</td>
<td>$1,951</td>
<td>6 million</td>
</tr>
<tr>
<td>Kenya</td>
<td>224</td>
<td>167</td>
<td>58</td>
<td>$585</td>
<td>43 million</td>
</tr>
<tr>
<td>Sudan</td>
<td>4,103</td>
<td>1,883</td>
<td>290</td>
<td>$630</td>
<td>37 million</td>
</tr>
<tr>
<td>Tanzania</td>
<td>839</td>
<td>839</td>
<td>1</td>
<td>$545</td>
<td>48 million</td>
</tr>
</tbody>
</table>

Future Value Chain Opportunity

Production increases can position Ethiopia to export and participate in the $4.2 billion gluten free market

1. Based on 2011 data (to drive alignment based on 2011 given the absence of Sudan data)
2. Demand gap as measured by difference between production and consumption
Source: FAOSTAT
VALUE CHAIN OPPORTUNITIES

DESPITE LIMITED CURRENT MARKETABILITY, THERE ARE DEMAND SINK OPPORTUNITIES THAT MAY BECOME VIABLE IN THE LONG TERM

Breweries

• Heineken has the technology and the interest in producing a sorghum based beer in Ethiopia but anticipates a costly PR campaign to change consumer attitudes.

• Local beer companies have stated, Ethiopian farmers don’t understand the benefits of a long-term contract farming relationship with an assured market making supply chain development (barley) difficult

Urban Food Processors and Bakeries

• Given the negative market perception of sorghum, many urban processors won’t admit to mixing sorghum with teff in their injera product

• Though in its infancy, food processors and bakers are working to develop and market new sorghum based snacks and they recognize the positive qualities of sorghum flour for composite flour blends

• It is for this reason that there is a higher demand for white sorghum for processing given its appearance

Animal Feed Industry

• Intensified poultry and beef production will drive expected increases in demand for feed as these industries become more sophisticated

• Initial animal feed preference will be for maize over sorghum given the favorable nutritional values and better economics

• Future sorghum prices relative to maize will also largely factor into the market uptake of sorghum for animal feed

Major Constraints

1. Unreliable supply
2. Poor Public Perception
3. Current focus on barley products

1. Limited product and market development
2. Market apathy from poor public perception
3. Lack of processing expertise

Projected Manufactured Feed Demand

1. Limited production volumes
2. Maize stronger alternative with better economics
3. Undeveloped feed industry (old practices)
3 Interventions & Impact
Sorghum is an important crop in lowland and intermediate altitudes in Ethiopia, covering an area of 1.7MM Ha. Production of 3.6MM MT and 4.9MM SHF are engaged in its production.

- Sorghum is mainly a food security crop. The majority is consumed in rural households. Only 13% of the grain is marketed, and 7% is processed.
- Yields are 2.1 MT/ha., which is low by comparison with the crop’s potential.

Logistics and infrastructure challenges constrain the current value chain. Sorghum marketability is limited. There are few short-term processing and demand sink opportunities.

- Immediate opportunities – addressing major production constraints, to both satisfy increased demand from rising population and expand marketable surpluses
- Medium to long term opportunities – other factors need to be addressed before the long term viability of sorghum exports, commercial brewery production, animal feed and increased domestic processing can be promoted

Interventions focus on boosting production and offering capacity building opportunities for SHFs through coops and unions; combined interventions could raise SHF income by ~250%.

- Intervention #1: Facilitating the adoption of input productivity package - $513 net benefit
- Intervention #2: Group storage and marketing - net $63 net benefit
- Expected to impact 320,000 SHFs in the major sorghum producing zones

The intensification of sorghum production in Ethiopia, and the development of group storage and marketing will require a bilateral approach of credit and grant programs that will leverage several key stakeholders for successful implementation:

- NGOs: Sasakawa Global 2000, GIZ, SNZ, ACDI/VOCA, Technoserve
- Finance: Dashen Bank, Commercial Bank of Ethiopia, Oromia International Bank
- Government: extension agents; research,
- Farmer organizations: primary cooperatives and cooperative unions
FEW DIRECT DONOR AND GOVERNMENT SORGHUM INTERVENTIONS EXIST, AND SORGHUM MOSTLY BENEFITS INDIRECTLY FROM EFFORTS IN OTHER CROPS

<table>
<thead>
<tr>
<th>Input &amp; Production</th>
<th>Storage &amp; Marketing</th>
<th>Processing</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Government Interventions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Seed Supply: limited farmer clusters of seed producers established</td>
<td>• Coop and Union capacity building: limited indirect benefits from “cash” crop aggregation and marketing (Teff, Coffee, Sesame, Wheat)</td>
<td>• No significant sorghum impacting programs</td>
<td></td>
</tr>
<tr>
<td>• Fertilizer Focus: blending plants to ensure appropriate and available fertilizer for SHF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Joint Interventions (gov’t &amp; donor)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SLMP: soil and water conservation management projects (World Bank, Canada, Germany)</td>
<td>• No significant sorghum impacting programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Donor/NGO Interventions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Seed variety development: HOPE Project (BMGF)</td>
<td>• Coop and Union capacity building: limited indirect benefits from “cash” crop aggregation and marketing (Teff, Coffee, Sesame, Wheat)</td>
<td>• AGP: small indirect benefits mainly from rural infrastructures initial focus on cash crops (eg wheat and sesame)</td>
<td></td>
</tr>
<tr>
<td>• Fertilizer Blending: AGRA fertilizer project (BMGF)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• PSNP – Household asset building (USAID)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Current Donor/NGO Interventions**

- **Product Development**: BioInnovate, market development of sorghum based snack foods (Swedish Gov’t)
- **No significant sorghum impacting programs**

*Government, currently focused on forex producing cash crops, thus limited focus on Sorghum*

SLMP – Soil Land Management Program; PSNP – Productivity Safety Net Program; ISFM – Integrated Soil Fertility Management
PROPOSED INTERVENTIONS COMPLEMENT EXISTING GOVERNMENT AND DONOR EFFORTS WITHIN THE SORGHUM SECTOR IN ETHIOPIA

**Inputs**
- Fertilizer Blending
  - Gov’t of Ethiopia & AGRA
- 1.a) Improved Seed Supply
- 1.b) Implement productivity package
- 1.c) Increased Farmer Training Programs

**Production**
- PSNP
  - World Bank, Canada, Germany, Gov’t of Ethiopia

**Aggregation & Storage**
- Seed Variety Development
  - Project HOPE (BMGF)
- SLMP
  - Gov’t of Ethiopia, World Bank, Canada, Germany

**Processing**
- Coop and Union Capacity building
  - limited indirect benefits from "cash" crop aggregation and marketing (Teff, Coffee, Sesame, Wheat)
- AGP
  - World Bank, Gov’t of Ethiopia, USAID, ATA, IDA

**Market**
- Product Development
  - BioInnovate, market development of sorghum based snack foods (Swedish Gov’t)
- Government ban of unprocessed grain, limits the marketability of Sorghum
- 2. b) Primary Cooperatives and Union Capacity building

Note: Only large programs and interventions included
Source: Context Network research and interviews
BOOSTING PRODUCTION TO A MARKETABLE SURPLUS REQUIRES 3 KEY ITEMS; OF WHICH WATER MANAGEMENT IS CURRENTLY ADDRESSED BY SLMP

<table>
<thead>
<tr>
<th>Soil Fertility Management</th>
<th>Quality Seed</th>
<th>Water Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention Key Elements</strong></td>
<td><strong>Recommended Approach</strong></td>
<td><strong>Recommended Approach</strong></td>
</tr>
<tr>
<td>Improve farming techniques and increase the access to agricultural inputs</td>
<td>Facilitate access to agricultural inputs and farming methods that combat systemic soil degradation in Ethiopia</td>
<td>Finance and train farmer clusters that will multiply and distribute developed seed</td>
</tr>
<tr>
<td>Improve the availability and distribution of locally adapted seeds</td>
<td>Expand irrigation in lower rainfall areas to mitigate exposure to rainfall fluctuations</td>
<td>No direct intervention proposed. Support the expansion of the SLMP area to cover sorghum production in intervention zones</td>
</tr>
</tbody>
</table>

**Direct interventions in water harvesting not proposed**

Recommend that water management be addressed through the expansion of the Soil Land Management Program (SLMP) to sorghum areas, given its current success and effectiveness.
## Proposed Interventions Are Focused on Increasing Production and Grain Marketing to Meet National and Regional Demand

### Input Productivity Package

- **Improved seed systems**
  - Multiply and distribute quality seed and implement sustainable seed production
- **Implementation of Productivity Package**
  - Facilitate input credit for adoption of fertilizer, seeds and other agricultural inputs
  - Integrated soil fertility management
- **Increased farmer training programs**
  - Train farmers from production to harvest, storage to fertility management techniques (i.e. intercropping, organic matter usage)

<table>
<thead>
<tr>
<th>Combined annual net financial benefit per farmer</th>
<th>$512</th>
</tr>
</thead>
</table>

### Aggregation Storage & Group Marketing

- **Capital for Purchase & Storage SHF Crops**
  - Set up loan guarantees to backstop consortium of local banks to ease working capital constraints and issue warehouse improvement loans
- **Capacitate Farmer Cooperative and Unions**
  - Develop management and financial capacity to enhance group storage and marketing, and service delivery to members

<table>
<thead>
<tr>
<th>Combined annual net financial benefit per farmer</th>
<th>$63</th>
</tr>
</thead>
</table>
AND PROPOSAL IS TO LOCATE THE INTERVENTIONS IN THE LOW AND MID ALTITUDE AREAS OF THE PRINCIPAL SORGHUM PRODUCTION ZONES IN ETHIOPIA

Proposed locations of intervention:

1. Input Productivity Package
   - Farmer seed production clusters
   - Input Productivity Package

2. Aggregated Storage & Group Marketing (Primary Cooperatives and Unions)

Seed clusters: N. Wollo and West Harerghe; will supply seed in NW, Central and Eastern Ethiopia

All others: West and East Harerghe (with jiijiga extension); N. and S. Wollo; N. and W. Shewa and N. Gondor and West and NW Tigray

Interventions are interrelated and dependent:
1. Production increases would only yield full benefits with increased aggregated storage and marketing
2. Aggregated storage and marketing can only be fully justified if increased volume and quality is produced
**INTERVENTIONS ARE AIMED AT LOW AND HIGH INPUT SHFs; HOWEVER, FARMER TRAINING ON AGRICULTURAL BEST PRACTICES ALSO REACH TRADITIONAL SHFs**

### Proposed Interventions Relative to Farmer Segments

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Low Input</th>
<th>High Input</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Input Productivity Package</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Aggregated storage and group Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Potentially up to 1.6MM SHFs could be impacted mainly in the middle low-input tier of farmer segments

- Low-input and high-input SHFs who can afford and mostly purchase quality seed will benefit from increased yields
- While the SHFs at the higher end of the Traditional tier can store and sell through the coops and unions, mostly Low and High input SHFs are affected

**NOTE:** All interventions are proposed for the high sorghum production zones

Though interventions are not focused on commercial farmers it is likely they will yield ancillary benefits from interventions (such increased market infrastructure from increased marketability of increased production)
INTERVENTION #1: SUPPORT INTENSIVE PRODUCTION SYSTEMS THROUGH THE IMPLEMENTATION OF A CROP PRODUCTIVITY PACKAGE

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
<th>Recommended Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reduced availability and high costs of crop inputs</td>
<td>- Increase access to input credit for fertilizer, seeds, agricultural equipment</td>
<td>- Mobilization of internal farmer organization resources through savings can reduce credit needs</td>
<td>- Link input credit to savings program for SHF collateral on loans</td>
</tr>
<tr>
<td>- Limited seed availability (adapted, acceptable, meeting farmer needs)</td>
<td>(production, harvesting, post harvest conditioning)</td>
<td>- The research system will have to expand its seed production volumes</td>
<td>- Identify and train farmer clusters for seed multiplication (3 new clusters and reinforce those which exist)</td>
</tr>
<tr>
<td>- Low yield due to biotic constraints: insect pests (stalk borer), striga (parasitic weed); and abiotic constraints (soil degradation; limited water availability)</td>
<td>- Support increased seed production by farmer clusters’ on irrigated soils</td>
<td>- Intensive farmer technical training will be needed to yield productivity gains</td>
<td>- Establish grant fund so that cooperatives, union, and NGOs can provide farmer training in order to implement improved agronomic practices (such as soil and water conservation, intercropping and improved organic matter management)</td>
</tr>
<tr>
<td></td>
<td>- Promote Integrated Soil Fertility Management (ISFM), and effective agronomic techniques</td>
<td>- Diversion of organic material from soils fertility to household usage in major production areas, should be reduced to improve soil structure</td>
<td></td>
</tr>
</tbody>
</table>
# DETAILED INTERVENTION DESCRIPTION

## INTERVENTION #1: CROP PRODUCTIVITY PACKAGE (SEED PRODUCTION)

### Key Intervention Elements

#### Precondition for Intervention
1. National Sorghum Program of the Ethiopian Inst. of Agricultural Research (EIAR) is able to identify improved varieties adapted to the principal agro-ecological conditions and which are acceptable to farmers
2. EIAR is able to produce sufficient foundation seed to supply a minimum of 6 farmer seed producer clusters

#### Key Elements
- Identification of three additional farmer clusters which have access to irrigated land and are willing to produce sorghum seed.
- Training of farmers in seed production, post harvest handling, management, financial management and marketing.

#### Key Dependencies & Risks
1. Government will change its policy of technical support for the production of declared quality seed by farmer seed producers
2. Risk is that farmers will not be willing to pay for the improved seed produced by the Farmer Clusters
3. Overall farmer risk aversion could lead to low adoption rates for improved seed varieties

### Potential Programs Formats

- Support decentralized participatory variety selection and foundation seed production of varieties chosen by farmers
- Identify and train seed production clusters in both seed production and management so that they will be able to sell their production to farmers, cooperatives, and unions
- Enable seed multipliers to access credit for investments in agricultural equipment and equipment for cleaning, sorting and conditioning seed

### Size, Scalability & Timing

- 3 original and 6 additional farmers clusters will be identified and begin producing seed by the end of the first year
- An estimated 350MT of seed per group will be available for sale and distribution to farmers unions
- Successful clusters will begin producing varieties of other crops adapted to the agro ecological conditions after one year as a risk mitigation strategy
- The equipment credit for seed production will be $10,000-$15,000 USD

### Gain to SHF (est.)

- Improved access to pest resistant, high yielding, locally adapted varieties
- With increased availability and productivity, farmers will be able to save and multiply their own seed of their preferred varieties

### Stakeholders

- **Ethiopian Institute of Agricultural Research, Ministry of Agriculture (MoA)** develops new seed varieties for different agro-ecological zones within Ethiopia. It has been instrumental in establishing the seed producer clusters to ensure greater accessibility of sorghum seed to small farmers
- **Ethiopian extension agents** at the Woreda and Kabele levels who accompany the farmers by inspecting the fields and providing on-the-job training and support as needed
## DETAILED INTERVENTION DESCRIPTION

### INTERVENTION #1: CROP PRODUCTIVITY PACKAGE (SOIL FERTILITY MANAGEMENT)

<table>
<thead>
<tr>
<th>Key Intervention Elements</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
</table>
| **Key Elements**          | • Competitive Grant program to train farmers in new ISFM techniques and facilitate their adoption.  
                           | • Credit to establish revolving fund for coops and unions to procure and distribute fertilizer, seed and other agricultural inputs to union and coop members | • 3 regions; 3 grants per year each  
                           |                             | • Complementary activity?    |
| **Key Elements**          |                           |                           |
| • Facilitate input credit for coops and coop unions to purchase fertilizers, seeds, and agricultural inputs for members;  
                           |                           |                           |
| • Train farmers to use integrated soil fertility management methods (intercropping, green manure, crop rotations etc) on sorghum fields.  
                           |                           |                           |
| • Expand the use of demonstrations, field days, and farmer field schools to increase adoption of the proposed technologies. |                           |                           |
| **Gain to SHF (est.)**    | • Improved productivity as a result of an integrated approach to soil fertility and water management  
                           | • Effectiveness of chemical fertilizers and soil amendments increased reducing the cost of production and increasing income |                           |
| **Stakeholders**          |                           |                           |
| **GIZ**                   |                           |                           |
| Experience in managing grants to small or medium NGO/Unions  
                           | Currently providing technical assistance to the management structure of the SLMP |                           |
| **SNV**                   |                           |                           |
| Experience with capacity building activities for farmers; participates in VC household asset building of PSNP; |                           |                           |
| **Sasakawa**              |                           |                           |
| Experience setting up extension systems and activities in support of agricultural activities |                           |                           |
| **Banks**                 |                           |                           |
| 3 major banks with the expertise, capital reserves and ability would be key finance stakeholders |                           |                           |
# Intervention #2: Aggregated Storage and Group Marketing

## Constraints Addressed
- Weak aggregated storage and marketing capacity at primary cooperative and union levels
- Limited storage capacity at primary and union levels
- Poor harvest and post harvest methods result in lower quality grain for marketing

## Potential Solutions
- Support credit for working capital to purchase members’ grain
- Support credit to purchase equipment for post harvest handling
- Capacity building for post harvest handling, marketing, financial management, stock and inventory management

## Issues + Considerations
- Mobilization of internal farmer organization resources through savings can reduce credit needs
- Many primary cooperatives do not market grain and only provide members with basic input supplies
- Cooperatives and unions purchase grain for consumption upon demand but have not developed strategies for more profitable handling
- Training in management and marketing will improve both services offered to members and grain marketing functions and operations

## Recommended Approach
- Identify and train primary cooperatives and unions which demonstrate interest in improving marketing capacity and activities
- Link structure and equipment credit to group savings program
DETAILED INTERVENTION DESCRIPTION
INTERVENTION #2: SUPPORT AGGREGATION AND GROUP MARKETING

<table>
<thead>
<tr>
<th>Key Intervention Elements</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan guarantee fund:</td>
<td>BMGF provides a guarantee and grant fund behind multi-bank facility for cooperative union loans</td>
<td>Can be targeted to sorghum, but would positively affect any commodity of interest to the selected coops and unions.</td>
</tr>
</tbody>
</table>
| • working capital loans for selected coops and unions to buy in and sell grain to traders, institutional buyers, and members.  
• Term loan & grant program for warehouse and infrastructure and equipment upgrades  
• Provides possibility of cost-sharing grants to serve as a catalyst for priority investments in group storage  
• Capacity building to improve harvest and post-harvest handling; management (organizational, financial and commodity/warehouse), strategic planning, and marketing | • Strategic capacity building program to improve coop and union consumer provision and aggregated group marketing activities. | |

**Gain to SHF (est.)**
- Increased income from sales of surplus production;  
- Reduced spending on food during the hungry period (own stock, coop providing grain at a below market price)

**Stakeholders**
- **Banks:** 3 major banks with the expertise, capital reserves and ability would be key financial stakeholders
- **SNV:** experience with capacity building activities for farmers; participates in VC household asset building of PSNP;
- **Other NGOs** with experience in Value Chains: ACDI VOCA, Technoserve, GIZ

**Key Dependencies & Risks**
- Dependent on the interest to move from distributing consumer goods (of which sorghum is one) to members to a dual function including group marketing of members’ surplus production.
- Establishing win-win relationships with institutional and private sector buyers.
- The major risk is that the government does not ease policies related to free movement of grain within Ethiopia and for export.
IMPLEMENTATION WILL OCCUR THROUGH TWO COMPONENTS COVERING CREDIT AND GRANT PROGRAMS (C4C & G2G ARE ONLY PROPOSED PROGRAM BRANDING NAMES)

<table>
<thead>
<tr>
<th>C4C Credit for Change</th>
<th>G2G Grants to Grow</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ease value chain constraints, market-based credit financing will be made available to select groups that drive increased throughput in the value chains</td>
<td>To enable growth opportunities for emerging value chain players, competitive grants for capacity building will be established</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 1</th>
<th>C4C</th>
<th>G2G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop input production system and training</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 2</th>
<th>C4C</th>
<th>G2G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregated group storage and marketing</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Through a bilateral approach of funding intervention activities through over-arching programs of grants and credit accessibility, effective implementation of the interventions can be achieved.
IMPROVED ACCESS TO CREDIT WILL EASE CURRENT VALUE CHAIN CONSTRAINTS AND OFFER SEVERAL MARKETABLE BENEFITS

C4C
Credit for Change

A market-based loan guarantee program that ensures the value chain players have the necessary means for optimal production and market uptake

C4C Program Details

- Cooperative unions and SHF receive credit and loans from banks
- Credit through a 50% loan guarantee fund only paid in default situations
- SHF would apply to local banking institutions for input credit to cover the amount of crop input
- To facilitate group marketing and storage cooperative unions will receive credit lines to purchase SHF grain

Implementing Partners

- Commercial Bank of Ethiopia
- Oromia International Bank
- Dashen Bank

Constraints Addressed

- Cooperative unions cannot buy and market significant amounts of member’s grains
- Fertilizer, seed and herbicide usage is limited
- Breaks the cycle and facilitates higher incomes through more grain sales

Potential Impact

- SHF – improved access to inputs drives increased yields and MT production
- Banks – income from interest expense
- Markets – group marketing & storage drives higher purchase capacity

IMPROVED ACCESS TO CREDIT WILL EASE CURRENT VALUE CHAIN CONSTRAINTS AND OFFER SEVERAL MARKETABLE BENEFITS
DEVELOPMENT THROUGH GRANTS WILL GROW KEY UNDER-SERVED SECTIONS OF THE SORGHUM VALUE CHAIN IN ETHIOPIA

**G2G Grants to Grow**

A competitive grant program that will promote improved soil and water conservation and management and integrated soil fertility management in areas outside the SLMP areas in order to increase production and marketable surpluses.

**G2G Program Details**

Grants to finance:
- Capacity building of coops and coop unions
- Farmer training in integrated soil fertility management (water harvesting; intercropping legume forage/grain crop; increased use of OM and crop residues:
- Promotion of alternative energy sources (bio-digesters, solar cookers) which result in reduced use of farm yard manure as a fuel source

**Implementing Partners**

- GIZ
- SNV
- Sasakawa Global 2000

**Constraints Addressed**

- Soil degradation and depleted soil fertility
- Limited farmer technical knowledge leading to poor agricultural practices
- Lack of aggregation and group marketing

**Potential Impact**

- **SHF** – improved techniques and crop yields
- **Unions** – increased access to marketable surpluses
- **Markets** – increased availability of sorghum

Most areas of the value chain grown
**Interventions & Impact**

At full adoption, 320,000 SHFs will be impacted by interventions, but several factors could affect how many SHFs are eventually impacted.

### Interventions & Impact

<table>
<thead>
<tr>
<th></th>
<th>Best Case</th>
<th>Expected Case</th>
<th>Worst Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Impacted SHFs</strong></td>
<td>384,000</td>
<td>320,000</td>
<td>256,000</td>
</tr>
<tr>
<td><strong>Intervention uptake</strong></td>
<td>60%</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Net Benefit per farmer</strong></td>
<td>$815</td>
<td>$575</td>
<td>$364</td>
</tr>
</tbody>
</table>

**Key Points**

- 4.9 million SHFs produce sorghum in Ethiopia.
- Up to 1.6 million SHFs grow sorghum with limited inputs but potential to increase production for surpluses.
- Proposed intervention regions represent 40% of total production in Ethiopia (640,000 SHFs).
- Of the farmers in these regions, it is conservatively expected that 50% would be impacted, resulting in 320,000 SHFs.

**Net Benefit**

- **Context Network qualitative analysis of aggregate implementation risks (adoption, political, technical and operational risks).**
- **Assumes entire crop is sold at $390/MT; ±10% shock on price and yield; analysis agnostic of price changes.**

*+10% on price and yield*
ASSUMING A TARGET OF 320,000 SHFs, THE FINANCIAL NET BENEFIT OF INTERVENTIONS FOR COULD AMOUNT TO +$184MM AT FULL ADOPTION IN YEAR 10

Number of target SHFs for interventions: 320,000

Net financial benefit per farmer

Benefit per farmer from Int. #1: $512

Benefit per farmer from Int. #2: $63

Net benefit per farmer Per annum $575

Aggregate SHF benefit Per annum $184 MM

Assumptions of Context Network Analysis:
• 1 ha of Sorghum grown per farmer in targeted zones
• $390/MT farm gate sale price
• 4.2 MT tons yield per Ha, less 15% storage loss
• 1.7 million hectares of maize in Ethiopia
• At full adoption in year 10

This represents total value increase of entire stock. Farmers will only realize portion that is sold (e.g. 13% = $24MM)
POTENTIAL FARMER MARGIN IMPACT OF SORGHUM INTERVENTIONS AT FULL ADOPTION, IN YEAR 10 REPRESENT ~250% INCREASE, IF ALL PRODUCTION IS SOLD

Sorghum net margin by farmer
$USD/Ha

Assumptions: Farmer margin valuations assume that total crop volume is sold. Realized margin will depend on percentages of grain sold. No speculation completed on future prices, held constant over full adoption period to year 10. Additional variable costs included in the future margin analysis.
SIMPLE RISK ANALYSIS ON THE CROP YIELD AND PRICE IMPACT BY +10% AND -10% SHOWS THAT LOW TO MEDIUM RISK EXISTS FOR OVERALL FARMER IMPACT

Summary of intervention impact to net farmer financial benefit

$USD, per Ha, per annum

<table>
<thead>
<tr>
<th>Intervention #1</th>
<th>Risk rating</th>
<th>Impact on net benefit</th>
<th>Sensitivity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits from adoption of full productivity package includes adoption of improved seed varieties, appropriate fertilizer application, and farmer technical training driving improvement of farming practices; collectively results in a 100% yield increase and storage loss reduction</td>
<td>Low</td>
<td>$512</td>
<td>$739 - $313</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention #2</th>
<th>Risk rating</th>
<th>Impact on net benefit</th>
<th>Sensitivity range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers' marketing association cleans, grades, stores and arranges bulk grain sale, assuming 10% price premium &amp; 5% fee deducted on sales</td>
<td>Low / Med</td>
<td>$63</td>
<td>$76 - $51</td>
</tr>
</tbody>
</table>

| Total net benefit uplift from interventions | - | $575 | $815 - $364 |

| Baseline farmer net margin | - | $373 | - |
| Total farmer net margin, including interventions | - | $948 | $1,188 - $737 |

Numbers may not match exactly due to rounding
Sensitivity range based on +/- 10% shock on price and yield
Crop valuation addition per farmer assumes that entire stock is sold at prevailing market price of $390/MT. Realized values will depend on the actual sales volumes as farmers are not likely to sell all stock. Analysis is agnostic of any price and cost increases.
4 Stakeholder Profiles
Sorghum is an important crop in lowland and intermediate altitudes in Ethiopia, covering an area of 1.7MM Ha. Production of 3.6MM MT and 4.9MM SHF are engaged in its production.

- Sorghum is mainly a food security crop. The majority is consumed in rural households. Only 13% of the grain is marketed, and 7% is processed.
- Yields are 2.1 MT/ha., which is low by comparison with the crop’s potential.

Logistics and infrastructure challenges constrain the current value chain. Sorghum marketability is limited. There are few short-term processing and demand sink opportunities.

- Immediate opportunities – addressing major production constraints, to both satisfy increased demand from rising population and expand marketable surpluses.
- Medium to long term opportunities – other factors need to be addressed before the long term viability of sorghum exports, commercial brewery production, animal feed and increased domestic processing can be promoted.

Interventions focus on boosting production and offering capacity building opportunities for SHFs through coops and unions; combined interventions could raise SHF income by ~250%.

- Intervention #1: Facilitating the adoption of input productivity package - $513 net benefit.
- Intervention #2: Group storage and marketing - net $63 net benefit.
- Expected to impact 320,000 SHFs in the major sorghum producing zones.

The intensification of sorghum production in Ethiopia, and the development of group storage and marketing will require a bilateral approach of credit and grant programs that will leverage several key stakeholders for successful implementation.

- NGOs: Sasakawa Global 2000, GIZ, SNZ, ACDI/VOCA, Technoserve
- Finance: Dashen Bank, Commercial Bank of Ethiopia, Oromia International Bank
- Government: extension agents; research,
- Farmer organizations: primary cooperatives and cooperative unions.
## KEY STAKEHOLDER PROFILES

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TechnoServe</strong></td>
<td>TechnoServe is supporting nine farmer-owned cooperative unions, which are umbrella organizations for primary cooperatives, to improve their access to markets. Through training and coaching, TechnoServe strengthens the cooperatives’ business and financial management skills as well as implementation capacity with the immediate objective of delivering on contract agreements to the World Food Programme’s Purchase for Progress (P4P).</td>
</tr>
<tr>
<td><strong>ACDI/VOCA</strong></td>
<td>ACDI is a prominent USAID contractor, and has provided similar services as Technoserve in support of P4P. ACDI is further engaged across a number of value chains in Ethiopia in an effort to boost smallholder farmer benefit and productivity. ACDI has strong country knowledge, and we observed a myriad of subject matter expertise in successfully implementing past sustainable interventions.</td>
</tr>
<tr>
<td><strong>Sasakawa Global 2000</strong></td>
<td>The SG 2000-Ethiopia initiative had as its main objective the more effective transfer of locally and externally available improved food production technologies appropriate to local farm-level circumstances. The goal was to increase production and productivity and help achieve food security and increase farmer incomes. The organization is viewed highly favorably by all stakeholders we have spoken with in the course of this study.</td>
</tr>
</tbody>
</table>
# KEY STAKEHOLDER PROFILES

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNV</td>
<td>A Dutch NGO that has extensive experience in Ethiopia serving as a key member of the household asset building for the Productivity Safety Net Program. In addition to other technical projects in Ethiopia SNV has extensive experience in executing grants.</td>
</tr>
<tr>
<td>GIZ</td>
<td>GIZ is a key implementing partner in the SLMP program which showcases their expertise and execution as an effective implementation partner, especially for high level interventions requiring other partnerships with technical stakeholders</td>
</tr>
<tr>
<td>Dashen Bank</td>
<td>Dashen Bank is a recently formed consumer focused branch that is known for adaptability and customer service. These attributes will be key in responding to the smaller aspects of the credit programs and sourcing competitive interest rates</td>
</tr>
<tr>
<td>Oromia International Bank</td>
<td>Oromia International Bank is a private bank established with commercial banking business objectives. It has since expertise in loan servicing and administration and could be key in the execution of the large credit portions of the interventions</td>
</tr>
<tr>
<td>Commercial Bank of Ethiopia</td>
<td>Largest bank in Ethiopia which is also government owned, could provide a key opportunity to expand the volume of financing available by leveraging its large reserves to impact increased populations of Small Holder Farmers</td>
</tr>
</tbody>
</table>
# KEY STAKEHOLDER PROFILES

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopian Institute of Agricultural Research</td>
<td>Ethiopian Institute of Agricultural Research, is part of the Ministry of Agriculture and works to develop new seed varieties for different agro-ecological zones within Ethiopia. It has been instrumental in establishing the seed producer clusters to ensure greater accessibility of improved seed to SHF</td>
</tr>
<tr>
<td>Ethiopian Unions, Coops and Extension Agents</td>
<td>Strong unions and cooperatives will play a key role in the implementation of increased services to SHFs. These unions will also increase the marketability of Sorghum through group marketing efforts. Extension agents in the targeted zones will also play a key role in not only implementing but refining the interventions.</td>
</tr>
</tbody>
</table>
### STAKEHOLDER INVOLVEMENT IN INTERVENTIONS

<table>
<thead>
<tr>
<th>Name</th>
<th>Intervention #1</th>
<th>Intervention #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technoserve</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ACDI/VOCA</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sasakawa Global 2000</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Name</td>
<td>Intervention #1</td>
<td>Intervention #2</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td><strong>SNV</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>GIZ</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Dashen Bank</strong></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Oromia International Bank</strong></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Commercial Bank of Ethiopia</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Name</td>
<td>Intervention #1</td>
<td>Intervention #2</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Ethiopian Institute of Agricultural Research</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Ethiopian Government Extension Agents</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Primary Cooperatives and Unions</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Appendix
FARMER FINANCIAL BENEFIT WILL ENCOMPASS THE FOLLOWING CONSIDERATIONS

Farmer financial gains

- From market price increase ($)
- From marketable surplus (MT)

Increased farmer expenses from inputs

From pre-planting
- E.g. Fertilizer, improved seeds, labor, other variables costs

From harvesting
- Labor, handling

From post-harvest
- Storage, transportation, bagging, threshing

From marketing
- Transaction costs

Farmer net financial benefit

- On a per hectare, per intervention basis
AT FULL ADOPTION, SORGHUM INTERVENTIONS COULD EVENTUALLY INCREASE TOTAL FARMGATE CROP VALUE TO ~$185 MILLION ANNUALLY

<table>
<thead>
<tr>
<th><strong>Base Yield</strong></th>
<th><strong>Yield Gain</strong></th>
<th><strong>Yield Gain</strong></th>
<th><strong>Gross Yield</strong></th>
<th><strong>Storage Loss %</strong></th>
<th><strong>Storage Loss MT</strong></th>
<th><strong>Net Yield</strong></th>
<th><strong>Price</strong></th>
<th><strong>Gross Rev.</strong></th>
<th><strong>Cash Outlay (Credit, Inputs, Fees)</strong></th>
<th><strong>Net Benefit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MT/ha</td>
<td>%</td>
<td>MT/ha</td>
<td>MT/ha</td>
<td>%</td>
<td>MT/ha</td>
<td>MT</td>
<td>$/MT</td>
<td>$/ha</td>
<td>$/ha</td>
<td></td>
</tr>
</tbody>
</table>

Adoption of optimal production system, w/ input package incl. improved varieties & fertilizer, due to enablers increased availability and credit financing

<table>
<thead>
<tr>
<th>Adoption of optimal production system</th>
<th>2.1</th>
<th>100%</th>
<th>2.1</th>
<th>4.2</th>
<th>15%</th>
<th>0.63</th>
<th>3.57</th>
<th>$390</th>
<th>$1,392</th>
<th>$225</th>
<th>$1,167</th>
</tr>
</thead>
</table>

Traditional production system

| Traditional production system | 2.1 | 20%  | 0.42 | 1.68 | $390 | $655 | $655 |

### INTERVENTION #1 IMPACT

Farmers’ marketing association cleans, grades, stores and arranges bulk grain sale to processors, assuming 10% price premium & 5% fee deducted on sales

<table>
<thead>
<tr>
<th>Farmers’ marketing association</th>
<th>3.57</th>
<th>$429</th>
<th>$1,532</th>
<th>$77</th>
<th>$1,455</th>
</tr>
</thead>
</table>

Traditional price-taking sales

| Traditional price-taking sales | 3.57 | $390 | $1,392 |       | $1,392 |

### INTERVENTION #2 IMPACT

| INTERVENTION #2 IMPACT | $63 |

### TOTAL POTENTIAL FARMGATE CROP VALUE IMPACT PER HECTARE PER SMALL HOLDER FARMERS

- **Number of sorghum hectares (thousands) in Ethiopia**: 1,700
- **Assuming intervention measures eventually reach given % of sorghum hectares (in thousands)**: 20% 320

### POTENTIAL TOTAL FARMGATE CROP VALUE IMPACT OF SORGHUM INTERVENTIONS AT FULL ADOPTION ($ MILLIONS)

| **Potential Total Farmgate Crop Value Impact of Sorghum Interventions at Full Adoption ($ Millions)** | $185 |

Numbers may not match exactly due to rounding
1. Improved input adoption is expected to increased yield from 21 to 42 bags per hectare (as per IFPRI estimates and Context analysis)
2. Assumed that group storage with proper training would reduce total losses (field, threshing, storage, transport) to 15% from 20%
3. Additional costs for producing sorghum include mainly fertilizer at recommended application rate, improved seed varieties and increased variable costs
4. Delayed sales and direct group marketing opportunities represent a chance to boost prices received by farmers by 10%
5. Valuation assumes all stock is sold at prevailing market price

IMPLEMENTATION SUCCESS IS LIMITED BY RISK FACTORS

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>• Risk from sustainable and effective implementation</td>
</tr>
<tr>
<td>Adoption</td>
<td>• Risk from lack of initial or continued adoption by SHFs</td>
</tr>
<tr>
<td>Technical</td>
<td>• Risk from implementation technical developments (e.g. seed genetics, product development)</td>
</tr>
<tr>
<td>Political</td>
<td>• Risk of political government intervention at local, country, or regional levels (e.g. Government limits seed multiplication ability through policy change)</td>
</tr>
</tbody>
</table>

Aggregate risk assessment

Risk factors will be qualitatively assessed
SOLAR COOKERS COULD REPLACE ORGANIC MATTER USAGE IN HOUSEHOLDS AND INCREASE AVAILABILITY FOR USAGE IN SOIL FERTILITY MANAGEMENT BY SHFs

Organic Matter Alternative Uses

- Used as alternate source of fuel in several urban and rural households
- Primary source of fuel for cooking traditional Ethiopian bread, injera
- Source of income as sold to others requiring cheap organic fuel

Future Opportunity – Solar Energy

Solar energy would reduce the need for organic matter to be burned for household cooking and heating

Potential Benefits

- Improved soil fertility
- Reduced air pollution

Household solar cooker baking food

Source: Context Network analysis from primary interview and field studies
IN ETHIOPIA THE PRODUCTIVITY SAFETY NET PROGRAM COMBATS FOOD INSECURITY IN THE MOST VULNERABLE PARTS OF THE COUNTRY

Woredas receiving PSNP assistance

- Assists chronically food insecure households
- These households receive six months of assistance, and in times of crisis WFP can extend
- Able-bodied members of PSNP households must participate in community development activities
- These activities contribute to future resiliency and food security (i.e., building community infrastructure, and developing land and water resources)
- Between 2008 and 2012 - 500,000 people graduated (were made extensively food secure)

THE SUSTAINABLE LAND MANAGEMENT PROGRAM (SLMP) WAS CREATED TO REDUCE LAND DEGRADATION AND IMPROVE LAND PRODUCTIVITY IN ETHIOPIA

The Sustainable Land Management Program
Processes Mapping

Steering Processes
- Coordinators at different levels
- National SC and TC
- Regional SC and TC
- Woreda SC & TC and KWT

Core Processes
- SNRM in public & communal lands
- Homestead & farmland dev’t, livelihood improvements and CSA
- Rural land administration & certification
- Participatory land use planning
- Improvements to the NRM policy framework
- Institutional strengthening & CD
- SLM platform and cooperation management
- Knowledge generation and management

Output
- Public & communal lands treated
- Farmland treated & livelihood enhanced
- Enhanced tenure security
- Enhanced decision making for best land use
- SLM regulatory & legislative framework supported
- Enhanced inst. capacity
- Enhanced Communication & teamwork
- Knowledge & Info. for SLM up-scaling generated and shared

Objective
- Reduce land degradation & improve land productivity

Based on SLMP II PAD, October 2013
TOGETHER WITH THE GOVERNMENT OF ETHIOPIA MULTIPLE DONORS SUPPORT SLMP AND EACH HAVE SPECIFIC GEOGRAPHIC FOCUS AND SELECTION CRITERIA

- Focuses on soil and water conservation measures
- This includes watershed management with a component focusing farmland and homestead development
- SLMP framework is governed by the Ethiopian Ministry of Agriculture
- Operates in 235 woredas with an operating budget of $103M received from various donors
- Program was designed to address 500,000 watersheds and has so far reached 250,000
- Phase II of the SLMP is slated to start in 2015

Major sponsors include: World Bank; Canadian International Development Agency; EU; KFW.

SLMP WATERSHED DEVELOPMENT PROCESS INITIATES INFRASTRUCTURE WORK THAT LEADS TO ECONOMIC DEVELOPMENT OPPORTUNITIES

Source: GIZ, January 2014

APPENDIX

WATERSHED DEVELOPMENT PROCESS

Initiation         Rehabilitation                     Economic Development

Sensitization     Integrated SWC Works

Participatory Planning

Regular & Systematic Participatory Monitoring

Promotion of NRM/Community Based Income Generation Activities

Participatory Adjustment of Plans based on Monitoring Results

Widening Income Diversity

Institution Building

Value Addition & Marketing

Capacity Development

Independent Community WSM

External Resource Mobilisation

Source: GIZ, January 2014
NEW RAILROAD LINKS WILL PROVIDE MUCH NEEDED INFRASTRUCTURE AND HELP CONNECT HIGH PRODUCING SORGHUM REGIONS TO REGIONAL/EXPORT MARKETS

Source: ACDI/VOCA
OVER THE LAST 3 DECADES, ETHIOPIA HAS EXPERIENCED MORE DROUGHT CONDITIONS PRESSURING YIELDS AND EXCERBATING THE FOOD SECURITY ISSUES

Rainfall patterns of drought affected East African nations

1979-2011 March-May rainfall in southern Ethiopia, central-eastern Kenya and southern Somalia measured by the Standardized Precipitation Index (SPI). Boxes show drought affected seasons (those with SPI < 0).
AT MANY LEVELS THE GOVERNMENT REMAINS VERY INVOLVED IN AGRICULTURAL PRODUCTION IN ETHIOPIA

**Administrative Structure**

Extension & Research Ethiopia’s agricultural extension system is one of the largest in the world:
- With between 50,000 and 60,000 Development Agents (DAs)
- Working in all 18,000 Kebeles
- Across nearly 10,000 Farmer Training Centers (FTCs)

Each Kebele is allocated 3 Development Agents focused on:
1. Crops
2. Livestock,
3. Natural resources management.

Several government policies and incentives continue to impact national agricultural production.

Source: Context Network Analysis from field interviews
POPULATION DENSITY IS GREATER IN THE UPPER ALTITUDES AND IN THE HIGH POTENTIAL AGRICULTURAL ZONES

Because of high population density farm land sizes are limited to smaller plots, requiring more intensive production techniques.
LITERACY RATES REMAIN LOW IN ETHIOPIA ALTHOUGH SLIGHTLY INCREASED FROM PREVIOUS YEARS

Source: 1. Central Statistical Agency of Ethiopia; 2. IFPRI
WITH ONE OF THE WORLD'S HIGHEST PROPORTIONS OF YOUTH IN ITS POPULATION, THE ETHIOPIA POPULATION IS PROJECTED TO CONTINUE GROW

Source: UNICEF Ethiopia demographic and health survey
MAJORITY OF RURAL ETHIOPIANS ARE SMALLHOLDER FARMERS WHO ARE CASH ORIENTATED WITH A STRONG RELIANCE ON CROP SALES FOR INCOME

Source: USAID and Gov of Ethiopia. 2011. The Livelihoods Atlas for Ethiopia. The Livelihoods Integration Unit
Notes: Total income excluding aid. Total income (food and cash income) is converted into a common unit – kcals – and expressed as a % of minimum kcal requirements

- Overall 65% of the population receives the majority of household income from crop sales
- This indicates a very high level of rural-urban and rural-rural crop market activity
- Areas with low cash income from crops tend also to be those that are normally food-insecure and receive food aid
ETHIOPIAN FARMERS SPEND MONEY FOR INPUTS, PARTICULARLY FOR CASH CROPS

- Biggest expenditure of inputs tends to be in the most productive areas
- Some cash crop areas (coffee in Oromia and sesame/sorghum in the North West) invest heavily in inputs
- Inputs for Chat production and some of the southern coffee zones are not as important
- Those in low production potential areas do not think expenditures in inputs will make a difference

Source: USAID and Gov of Ethiopia. 2011. The Livelihoods Atlas for Ethiopia. The Livelihoods Integration Unit
THE SEED INDUSTRY IN ETHIOPIA INVOLVES A RANGE OF BOTH PUBLIC AND PRIVATE SECTORS, BUT DEMAND STILL OUTPACES SUPPLY

A schematic of the Ethiopian seed system

- Regional bureaus of agriculture
- MoARD
- Research centers and institutes of higher learning (for basic seed supply)
- Private seed companies
- Ethiopian Seed Enterprise (ESE) and regional seed companies
- Seed producers (ESE farms, state farms, cooperatives, private farms, smallholders)
- Cooperative Unions
- Regional input supply and extension
- Users (farmers)

Source: IFPRI inputs and extension services
Given the commitment the government of Ethiopia has to agriculture the investment in extension agents is indicative of this agricultural focus.
TO REDUCE LOSSES FROM BIRD ATTACKS SHORT CYCLE SORGHUM VARIETIES ARE PLANTED TO ENSURE SIMULTANEOUS HARVEST WITH LONGER CYCLE VARIETIES

### Sorghum Varieties in Ethiopia

1. **Longer maturing varieties**
   - Produce comparable lower sorghum grain yields but taller sorghum stover
   - Reach maturity in 6 – 8 months
   - Farmers preference as the sorghum stover is important to the rural economy

2. **Short cycle varieties**
   - Produce higher sorghum grain yields per Ha, but shorter sorghum stover
   - Reach maturity quicker in 3 – 4 months
   - Despite reduced Lack sorghum stover

*Indigenous variety

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Cycle*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Cycle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indigenous variety

Economies of scale on larger simultaneously maturing crop reduces costs (shared guarding costs)

Source: 1. Context Network analysis; 2. Field interviews with research institute
SORGHUM PRODUCTION CYCLES FOR TRADITIONAL FARMERS SHOW CASH INFLOWS ARE ONLY RECEIVED IN THE DEC/JAN MONTHS WHEN CROP IS SOLD

---Belg rains---

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input purchase</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Plowing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Planting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Growing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Harvesting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Post-harvest services (e.g. threshing)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Marketing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

---Meher rains---

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input purchase</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Plowing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Planting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Growing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Harvesting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Post-harvest services (e.g. threshing)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Marketing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Source: 1. Context Network Field Interviews; 2. Context Network analysis of primary field data
ETHIOPIA REGIONAL HUNGER INDEX AND UNDERLYING COMPONENTS BY REGION

<table>
<thead>
<tr>
<th>Region</th>
<th>Prevalence of Calorie Undernourishment (%)</th>
<th>Prevalence of Underweight among Children &lt; 5 years (%)</th>
<th>Under 5 Mortality Rate (%)</th>
<th>Regional Hunger Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addis Ababa</td>
<td>72.9</td>
<td>53.3</td>
<td>14.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Harari</td>
<td>65.2</td>
<td>47.6</td>
<td>27.1</td>
<td>26.7</td>
</tr>
<tr>
<td>Oromia</td>
<td>61.1</td>
<td>42.3</td>
<td>42.4</td>
<td>34.4</td>
</tr>
<tr>
<td>SNNP</td>
<td>77.6</td>
<td>45.5</td>
<td>53.7</td>
<td>34.7</td>
</tr>
<tr>
<td>Dire Dawa</td>
<td>68.5</td>
<td>51.3</td>
<td>30.8</td>
<td>29.6</td>
</tr>
<tr>
<td>Amhara</td>
<td>60.3</td>
<td>47.1</td>
<td>51.8</td>
<td>48.9</td>
</tr>
<tr>
<td>Tigray</td>
<td>72.6</td>
<td>59.3</td>
<td>47.9</td>
<td>41.9</td>
</tr>
<tr>
<td>Benishangul Gumuz</td>
<td>60.1</td>
<td>53.6</td>
<td>42.3</td>
<td>44.6</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>65.9</td>
<td>45.0</td>
<td>47.2</td>
<td>38.4</td>
</tr>
</tbody>
</table>

Source: IFPRI Hunger Index Study
LIVELIHOOD ZONES IN ETHIOPIA ARE DIVERSE AND AFFECTED AS MUCH BY ALTITUDE AS BY RAINFALL

Source: USAID, Livelihoods Integration Unit (LIU)/Ethiopian Ministry of Agriculture and Rural Development (MoARD)
AGROECOLOGICAL ZONES IN ETHIOPIA ARE DEFINED PRINCIPALLY IN TERMS OF ALTITUDE AND RAINFALL

While sorghum grows in most zones except the driest and the coldest, it grows predominantly in the KOLLA and WEINA DEGA agro-ecological zones.

### Agro ecological zone
- No data
- Wet Alpine Wurch
- Moist Alpine Wurch
- Dry Alpine Wurch
- Wet Wurch
- Moist Wurch
- Dry Wurch
- Wet Dega
- Moist Dega
- Dry Dega
- Wet Weina Dega
- Moist Weina Dega
- Dry Weina Dega
- Wet Kolla
- Moist Kolla
- Dry Kolla
- Moist Bereha
- Dry Bereha
- Lake
- Region boundary
- Zone boundary

<table>
<thead>
<tr>
<th>Altitude (masl)</th>
<th>Dega (&gt;2300)</th>
<th>Weina Dega (1500-2300)</th>
<th>Kolla (500-1500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall (mm)</td>
<td>Wet (&gt;1400)</td>
<td>Moist (900-1400)</td>
<td>Dry (&lt;900)</td>
</tr>
</tbody>
</table>

Note: Wurch and Bereha are the extremes of altitude (Wurch >3200 masl and Bereha < 500 masl)
Source: WFP 2013
MAJOR CASH CROPS INCLUDING STAPLE CEREALS WHICH FOR SMALL FARMERS IN THE MORE MARGINAL AREAS IS AN IMPORTANT SOURCE OF CASH

Note: Sorghum is an important secondary crop in each of the areas with a designated cash crop that is a priority for transformation and export (except Chat). This is why these sites have been Since Great Britain has banned the importation of Chat, it is unclear what effect that will have on the market dynamics of East and West Harerghe.

Source: USAID and Gov of Ethiopia. 2011. The Livelihoods Atlas for Ethiopia. The Livelihoods Integration Unit
DESPITE OVER 85% OF HOUSEHOLDS PARTICIPATING IN AGRICULTURAL ACTIVITIES ACROSS ALL REGIONS AND CROPS MEN REMAIN MORE ACTIVE

Self Reported Participation In Agricultural Activities

Farming gender inequality is perpetuated by constraints on women’s access to inputs, access to extension services and deeply cultural norms on gender roles in Ethiopia

Source; CSA Socioeconomic Survey 2013; IFPRI – Bridging the gender in Ethiopia Agriculture
SORGHUM PRODUCTION AND CONSUMPTION TRENDS IN ETHIOPIA

Sorghum Supply and Consumption in Ethiopia 2004-2009

<table>
<thead>
<tr>
<th>Description</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic production (MT)</td>
<td>1,739,184</td>
<td>1,724,763</td>
<td>1,976,249</td>
<td>2,325,424</td>
<td>2,599,935</td>
<td>2,666,897</td>
</tr>
<tr>
<td>Net domestic production (MT)</td>
<td>1,443,523</td>
<td>1,431,553</td>
<td>1,640,287</td>
<td>1,930,102</td>
<td>2,157,946</td>
<td>2,213,524</td>
</tr>
<tr>
<td>Commercial import (MT)</td>
<td>4,606</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial export (MT)</td>
<td>1,037</td>
<td>2,869</td>
<td>10</td>
<td>2,575</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food aid import (MT)</td>
<td></td>
<td></td>
<td>16,120</td>
<td></td>
<td>274,300</td>
<td></td>
</tr>
<tr>
<td>Net sorghum available for domestic consumption (MT)</td>
<td>1,447,092</td>
<td>1,444,804</td>
<td>1,640,277</td>
<td>1,927,527</td>
<td>2,432,246</td>
<td>2,213,524</td>
</tr>
<tr>
<td>Actual consumption (kg/capita)</td>
<td>21.14</td>
<td>20.58</td>
<td>22.77</td>
<td>26.08</td>
<td>32.07</td>
<td>28.45</td>
</tr>
<tr>
<td>Sorghum consumption as % of total cereal consumption</td>
<td>17.03</td>
<td>14.78</td>
<td>15.52</td>
<td>16.01</td>
<td>17.87</td>
<td>16.47</td>
</tr>
<tr>
<td>Domestic Production as % of Total Supply</td>
<td>99.75</td>
<td>99.08</td>
<td>100.00</td>
<td>100.13</td>
<td>88.72</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Major Production zones in Ethiopia

Source: USAID Staple Food Chain Analysis, CSA, Ethiopian customs data
SORGHUM AND OTHER CEREALS ARE RARELY CONSUMED BY THE HIGHEST 60 PERCENT OF URBAN RESIDENTS WHILE TEFF REMAINS AN URBAN STAPLE REGARDLESS OF INCOME

Source: IFPRI Urban Rural Analysis
## RURAL AND URBAN FOOD CONSUMPTION AND PRICE ELASTICITY DEMAND

### Budget shares, and own and income (expenditure) elasticities of demand for selected food items in rural and urban areas, 2004/05

<table>
<thead>
<tr>
<th>Food Items</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Total</td>
<td>% of Total</td>
</tr>
<tr>
<td></td>
<td>Budget Spent</td>
<td>Budget Spent</td>
</tr>
<tr>
<td></td>
<td>Own Price</td>
<td>Own Price</td>
</tr>
<tr>
<td></td>
<td>Elasticity</td>
<td>Elasticity</td>
</tr>
<tr>
<td></td>
<td>of Demand</td>
<td>of Demand</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teff</td>
<td>16.7</td>
<td>7.5</td>
</tr>
<tr>
<td>Wheat</td>
<td>4.9</td>
<td>9.6</td>
</tr>
<tr>
<td>Maize</td>
<td>1.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Sorghum</td>
<td>1.8</td>
<td>9.3</td>
</tr>
<tr>
<td>Pulses and other cereals</td>
<td>6.6</td>
<td>9.8</td>
</tr>
<tr>
<td>Animal products</td>
<td>12.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Fruits, vegetables, and root crops</td>
<td>7.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Other foods</td>
<td>10.5</td>
<td>8.9</td>
</tr>
</tbody>
</table>

Source: The elasticities are based on Tafere et al (2010). The budget shares are authors’ calculations. All based on the HICE 2004/05 dataset.

### Quantity of per capita food consumption in Ethiopia by location (Kg), 2004/05

<table>
<thead>
<tr>
<th>Location</th>
<th>Teff</th>
<th>Wheat</th>
<th>Barley</th>
<th>Maize</th>
<th>Sorghum</th>
<th>Other (incl. processed) Cereals</th>
<th>Total Cereals</th>
<th>Enset</th>
<th>Other food items</th>
<th>Total Foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>20.1</td>
<td>31.2</td>
<td>14.3</td>
<td>42.2</td>
<td>35.9</td>
<td>8.1</td>
<td>151.7</td>
<td>47.2</td>
<td>133.9</td>
<td>332.9</td>
</tr>
<tr>
<td>Urban</td>
<td>61.4</td>
<td>20.2</td>
<td>3.8</td>
<td>10.4</td>
<td>9.3</td>
<td>32.2</td>
<td>137.2</td>
<td>6.0</td>
<td>126.0</td>
<td>269.3</td>
</tr>
<tr>
<td>National</td>
<td>25.9</td>
<td>29.6</td>
<td>12.8</td>
<td>37.7</td>
<td>32.2</td>
<td>11.4</td>
<td>149.6</td>
<td>41.4</td>
<td>132.9</td>
<td>323.8</td>
</tr>
</tbody>
</table>

Source: HICES dataset
MOST OF THE SOIL LEVEL BOTTLENECKS TO INCREASED AGRICULTURAL PRODUCTION ARE LINKED TO ORGANIC MATTER DEPLETION OR ITS EFFECTS

<table>
<thead>
<tr>
<th>Soil-level bottlenecks</th>
<th>Negative impact to soil health</th>
<th>Higher negative impact to soil fertility</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physical</td>
<td>Chemical</td>
<td>Biological</td>
</tr>
<tr>
<td>Organic matter depletion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil fauna/flora depletion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient depletion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited biomass coverage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil compaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil erosion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salinity/sodicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterlogging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low moisture availability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical land degradation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 1. ATA Soil Study
FROM A NUTRIENT PERSPECTIVE SORGHUM IS WELL RANKED AND VERY COMPARABLE TO OTHER STAPLE FOOD CROPS

<table>
<thead>
<tr>
<th>Component (per 100g portion)</th>
<th>Sorghum</th>
<th>Maize</th>
<th>Rice</th>
<th>Wheat</th>
<th>Potato</th>
<th>Cassava</th>
<th>Soybean (Green)</th>
<th>Sweet potato</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water (g)</td>
<td>9</td>
<td>10</td>
<td>12</td>
<td>13</td>
<td>79</td>
<td>60</td>
<td>68</td>
<td>77</td>
</tr>
<tr>
<td>Energy (kJ)</td>
<td>1,419</td>
<td>1,528</td>
<td>1,528</td>
<td>1,369</td>
<td>322</td>
<td>670</td>
<td>615</td>
<td>360</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Carbohydrates (g)</td>
<td>75</td>
<td>74</td>
<td>80</td>
<td>71</td>
<td>17</td>
<td>38</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Sugar (g)</td>
<td>-</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>28</td>
<td>7</td>
<td>28</td>
<td>29</td>
<td>12</td>
<td>16</td>
<td>197</td>
<td>30</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>-</td>
<td>127</td>
<td>25</td>
<td>126</td>
<td>23</td>
<td>21</td>
<td>65</td>
<td>25</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>287</td>
<td>210</td>
<td>115</td>
<td>288</td>
<td>57</td>
<td>27</td>
<td>194</td>
<td>47</td>
</tr>
<tr>
<td>Potassium (mg)</td>
<td>350</td>
<td>287</td>
<td>115</td>
<td>363</td>
<td>421</td>
<td>271</td>
<td>620</td>
<td>337</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>6</td>
<td>35</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>14</td>
<td>15</td>
<td>55</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Copper (mg)</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Manganese (mg)</td>
<td>-</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>21</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Vitamin A (IU)</td>
<td>-</td>
<td>214</td>
<td>-</td>
<td>9</td>
<td>2</td>
<td>13</td>
<td>180</td>
<td>14,187</td>
</tr>
<tr>
<td>Vitamin E, alpha-tocopherol (mg)</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Saturated fatty acids (g)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Monounsaturated fatty acids (g)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Polyunsaturated fatty acids (g)</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Several government policies and incentives continue to impact national agricultural production

Source: United States Department of Agriculture, Nutrient Data Laboratory
FARMER UNION PROFILES – ERIKUM UNION

Erikum Union (est. 1985)
Manager: Mesfin Kasahun
S. Wollo Zone

Membership at establishment: 29 primary cooperatives; current: 100
Initial Share capital: 654,500 Birr; current: 16.5 million Birr
Declared total shares: 7594 and value of one share is 500 Birr (total= 3,797,000 Birr).
New Members: buy a minimum of 40 shares (200,000 Birr)
Maximum number of shares for one primary cooperative: 10% of the total declared shares
Geographic coverage: 11 Woredas in South Wollo (of which 5 to 6 are sorghum producing)
Services:
- Inputs distribution: Fertilizer (DAP and Urea); Seed (Wheat, Maize, Teff, Sorghum)
- Consumer goods: maize & sorghum to deficit farmers, sugar, oil, flour
- Credit: consumer goods (0% interest); inputs (7.5% interest rate); 80% repayment
Storage capacity: 17000-18,000 Qts capacity ware house.
Aggregated storage and marketing: Sesame and white bean through ECX
Livestock feed processing: plant producing for dairy cattle; installed with assistance of ACDI/VOCA.
Dividend payment: Last year dividend paid was 1.3 million Birr, 775 Birr/share capital (Min. 3607.29 Birr and Max. 84,067.29 Birr/Coop).

Source: Field visit Context Team June, 2014
FARMER UNION PROFILES – BORKENA UNION

Borkena Union (est. 1985)
Oromia Zone
Mr. Admasu Bililign, Manager

Membership at establishment: 16 primary cooperatives; current: 39 with 28,243 farmers
Initial share capital: 350,000 Birr; current: 979,499 Birr
Value of one share: 1000 Birr
New Members: buy a minimum of 15 previously; now 25 shares minimum
Maximum number of shares for one primary cooperative: 10% of the total declared shares
Geographic coverage: 11 Woredas in South Wollo (of which 5 to 6 are sorghum producing)

Services:
- Input distribution: Fertilizer (DAP, Urea); Pesticides (Endosulfan, Mancozeb, 2-4 D, Malathion); Seeds: Sorghum (Garana 1, Gobiye, Teju, Hormat, Sirinko) and Maize (Melkassa 2 and 4)
- Marketing of members produce: Teff last year; Sesame and Mungbean to be sold through Wodera Union for 1.5 % commission.
- Ploughing services in 7 woredas (3 tractors): differential prices for type of land and for members versus non-members

Storage Capacity: 3 sites of which 2 rented for 1500 Birr/month each; total 12,0000 Qts capacity.
Financial situation: Loan from Government 4 Million Birr for over 4 years unpaid.
Future Strategy: Increase storage capacity (Amhara Development Agency to construct a 5000 Qts capacity facility); collect surplus sorghum from 8 primary coops and sell to 2 deficit coops in Dawacheffa Woreda.

Source: Field visit Context Team June, 2014
FARMER UNION PROFILES – WODERA UNION

Wodera Union (est. 2004)
N. Shewa Zone
Mr. Yirdaw Alemu, Manager

Membership at establishment: 18 primary cooperatives; currently 74.
Initial share capital: 72,400 Birr initial share capital and currently 38,000,000 Birr.
Geographic coverage: 12 Woredas in N. Shewa Zone

Services:
- Input Distribution: Fertilizer: DAP 95,550 Qts @ 1063 Birr/Qt; Urea 130,000 Qts @ 886 Birr/Qt; NPS 33,600 Qts @ 982 Birr/Qt
- Distribution of consumer goods
- Marketing members produce: Wheat to consumers or own milling factory (wheat flour is sold to primary coops, Debre Birhan University and Addis Ababa); competition for flour market from Dessie Food complex and DH GEDA in Addis; Teff, 25,000Qts/year to Debre Birhan University; Sorghum to consumers; Chick pea 1500 Qts Kabul and 200 Qts Dessie; Mung bean 1200 Qts to ECX; White bean to ECX

Storage capacity: 2 Ware houses of 30,000 Qts and 20,000Qts capacity [the second one in Deneba about 49 Kms away]
Vehicles: truck of 90 Qts Capacity

Livestock feed processing: est in 2011. Marketing problem so functioning well below capacity at 70-80 Qts/day; Poultry feed production is under study by ACDI/VOCA

Agro processing: Wheat flour mill, bought from private through auction; original capacity: 150 Qts/day, but now 70 Qts/day because of age; Future plan is to replace by new one: Business plan prepared by African Alliance, TechnoServe Ethiopia

Source: Field visit Context Team June, 2014