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SCOPE OF THIS STUDY

Study Methodology

89 multi-crop interviews covering actors across the value chain (NGOs, farmers associations + unions, processors, financial institutions, input providers, research institutes and government bodies):
- Processing/Marketing: 32
- Village Production: 32
- Production Inputs: 25

Analysis

- Confirmed economics of commercial sector
- Evaluated value chain constraints
- Net farmer impact of potential interventions of Processing Industry

Recommendations

Recommended interventions span the value chain and consist of risk mitigation of adoption of inputs, local aggregation facilities, and upgrading of processing industry.
Maize area has expanded 8x within the past 20 years, to become a major cereal crop in Burkina, encroaching on sorghum and millet in western BF higher rainfall areas
- A minority of SHFs already use input-intensive production systems:
  - ~40% use improved varieties, but <10% apply recommended fertilizer rates
- Production and consumption have accelerated by ~11%/yr. since the grain price rise of 2008
- Maize 7% cheaper than sorghum, and consumed increasingly on-farm in West and in cities

Maize was developed as a food security crop first, then as cash crop by cotton companies in Burkina. A greater share (~50%) is still marketed in high producing regions than is the case with sorghum & millet
- Hybrid maize takes <5% of the seed market now, but high-yielding products are on offer
- Processing absorbs 20% of maize sales
- Poultry feed makes up almost half processing share and is expanding at ~9%/yr.

Most promising interventions focus on reinforcing trend to intensification and high input use by expanding SHF numbers empowered to participate
- INT #1 Risk Mitigation of Adoption of Inputs
- INT #2 Local Aggregation Facilities
- INT #3 Upgrading of Processing Industry
- $463/annum average benefit projected for 190,000 SHFs (28% of total) at Year 10 (base)

The intensification of maize production requires a network of cooperating stakeholders who straddle the technical, financial, risk-mitigation and market access areas
- Farmer associations (UGCPA; COPSA-C; UPPA Hauts Bassins, FNZ,
- NGO’s (SNV, IFDC, Oxfam etc.)
- Processing (Afrique Verte, GRET, ATCB)
- Micro-finance groups (Caisse Populaire; Graine; Microfinance Plus)
- Banks (Ecobank; Orabank; Coris Bank)
- Crop insurance (PlaNet Guarantee)
1 SECTOR FUNDAMENTALS
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OVERVIEW OF MAIZE SECTOR FUNDAMENTALS

Supply

- There are ~560k maize farmers covering an area of 850k hectares located mostly in the south west of Burkina Faso, where rainfall is the highest.
- Farmers in Burkina Faso are part of farmer organizations that are crucial for our interventions.
- Maize production for 2013 reached 1.6Mn tons and has been growing rapidly at 12.4% CAGR since 1995 (17 years) as opposed to 2.5% for sorghum and 2.3% for millet.
- Maize yields have been relatively flat but are almost double sorghum and millet yields.
- Prices of maize have been lower than sorghum and millet prices for the past two decades.

Demand

- Maize consumption has almost doubled in past decade and is now the highest contributor (at 26%) to caloric intake in Burkina.
- Urbanization and an increase in women’s employment rates will drive demand for quick-to-prepare maize-based foods.
- Demand for maize will also be driven by the growth in the poultry feed market, where in 2012 29% of birds were vaccinated (a proxy for intensive production) up from 9% a decade earlier.
- Regional demand for Burkina maize exports coming from Niger, Mali, Ivory Coast and Ghana will continue strong, but this “informal” market cannot be quantified.
- BF serves as a strategic procurement location for aid organizations.
BURKINA ECONOMY IS GROWING FAST: MAIZE IS NOW THE 3RD RANKED CROP IN VALUE TERMS, AFTER ONLY SORGHUM & COTTON

GDP/capita & Agriculture Contribution\(^1\)
1960-2012, constant 2005 $ / capita, % of GDP

- 2012 GDP = $8.1 Bn
- Agriculture plays an important role in the economy of Burkina Faso with a relatively constant share of GDP of ~35%
- Arable land comprised 20.8% (5.7Mn hectares) of total land by 2011

Gross Production Value\(^2\)
Top 10 Agricultural Produces, Constant $

- Total production value = 2.6 Bn US
- In 2012, Maize ranked #3 in total crop production value at $220 Mn (8% of total), preceded by Sorghum ($296 Mn, 11%) & cotton lint ($294 Mn, 11%)
- In 2000 and 1990, maize ranked #6 and #9 respectively

Source: 1-World Development Indicators (World Bank), 2-FAO STAT
MAIZE PRODUCTION HAS EXPANDED RAPIDLY IN BURKINA FASO, MAINLY DUE TO AREA EXPANSION; YIELD IS WELL ABOVE SORGHUM AND >DOUBLE THAT OF MILLET

Maize Production Burkina Faso
1996-2013, M tons

Cereal Yield Burkina Faso
1996-2013, tons/Ha

- Maize production (like other cereals) is very prone to fluctuations resulting from seasonal rainfall variation, but has generally been increasing over the past two decades
- Maize yields fluctuate more than those of sorghum and millet, because maize is less drought tolerant
- 12.4% CAGR since 1995 (17 years) as opposed to 2.5% for sorghum and 2.3% for millet
- Being the lowest priced of all cereals, consumption of maize increased in response to the rise in cereal prices
- Increase in maize production (and other cereals) in Burkina is a result of area expansion as no overall yield improvement has occurred – production area doubled from 472k in 2008 to 847k hectares in 2013

RESPONSE TO RAINFALL CHANGES SHOWS BOTH THE HIGHER RISK AND HIGHER YIELD POTENTIAL OF MAIZE VS. SORGHUM AND MILLET

Maize requires 800mm of seasonal rainfall, well distributed over the cropping period, to produce good yields. Water and heat stress impact yield severely.

- **Risk:** Maize yields drop below sorghum & millet when rainfall is <800mm. At <500mm complete maize crop failure is likely.
- **Reward:** With adequate rainfall & fertilizer rates, maize yields can be double the millet potential and 50% above sorghum.

Maize can be water-stressed due to high night temperatures, when open stomata result in excessive water loss through respiration.
- Sorghum leaf stomata close at night, which conserves water, but maize lacks this adaptation to low-rainfall patterns.

Water stress at maize tasseling time is particularly damaging, causing irreversible poor seed set.
- Unlike millet, which can produce additional tillers if the initial shoots fail to set seeds.

The effective maximum yield potential is assumed in this model to be 6.0MT/ha for maize.
- This compares with 4.5MT/ha for sorghum and 3.0MT/ha for pearl millet.

In western Burkina, SHFs who used recommended fertilizer rates (250kg/ha) and improved varieties reported yields of 3.0-4.5MT/ha.
- In 31 crop budget interviews conducted by Context.

---

1 Context estimate
2 Communication from Tom Hash, ICRISAT, on experience in India with Pearl millet’s performance under water stress
3 Communications with Erik van Oosterom, Univ. of Queensland (ex-ICRISAT)
SELECTION OF MAIZE REGIONS WITHIN BURKINA FOR INTERVENTIONS FOCUSED FIRST ON YIELD POTENTIALS & THEN ON LIVELIHOOD ZONES

Principal areas of maize production

Proposed areas for maize interventions

< 900 mm

900 mm rainfall limit

> 900 mm

Maize production can be found where rainfall is adequate to support good yields (>900mm)


Note: Water availability for a crop is lower than measured rainfall due to run-off and uneven distribution within seasons and between seasons. This makes the 900mm line a better indicator of high-productivity maize areas than the 800mm line.

Full list available in appendix

Detailed Agro-ecological zone mapping available in the appendix.
**THE FOUR MAIZE INTERVENTION REGIONS PRODUCE 60% OF NATIONAL MAIZE PRODUCTION, COUPLED WITH INTENSIVELY GROWN COTTON**

Maize Production  
2013 harvest, ’000 tons

<table>
<thead>
<tr>
<th>Region</th>
<th>4-year CAGR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boucle du Mouhoun</td>
<td>10%</td>
</tr>
<tr>
<td>Cascades</td>
<td>11%</td>
</tr>
<tr>
<td>Centre</td>
<td>24%</td>
</tr>
<tr>
<td>Centre-Est</td>
<td>36%</td>
</tr>
<tr>
<td>Centre-Nord</td>
<td>16%</td>
</tr>
<tr>
<td>Centre-Ouest</td>
<td>24%</td>
</tr>
<tr>
<td>Centre-Sud</td>
<td>12%</td>
</tr>
<tr>
<td>Est</td>
<td>5%</td>
</tr>
<tr>
<td>Hauts-Bassins</td>
<td>5%</td>
</tr>
<tr>
<td>Nord</td>
<td>9%</td>
</tr>
<tr>
<td>Plateau Central</td>
<td>18%</td>
</tr>
<tr>
<td>Sahel</td>
<td>10%</td>
</tr>
<tr>
<td>Sud-Ouest</td>
<td>8%</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>11%</td>
</tr>
</tbody>
</table>

*Including 2007/8 will increase CAGR to 24%

Since the dramatic rise in grains prices in 2007/8, BF has responded by increasing maize production rapidly.

Most maize in Burkina is grown in the cotton-cereal livelihood zones where rainfall is relatively high and where farmers are accustomed to using fertilizers.

Source: L’institut national de statistiques et de démographie, Context Network Analysis
~75% of maize small holder farmers in Burkina Faso are located in those regions, of which we expect intervention to impact ~40%.

Total Maize Acreage and SHF in Burkina Faso 2012 ('000s)

- 2012 Burkina Faso:
  - ~560k maize farmers
  - ~850k hectares

Hectares dedicated to maize

- Boucle du Mouhoun
- Hautes-Bassins
- Centre-Ouest
- Sud-Ouest
- Centre-Est

Focus regions for maize interventions

- 150+ ha
- 100 to 150 ha
- 75 to 100 ha
- 50 to 75 ha
- 25 to 50 ha
- < 25 ha

Source: L’Institut national de statistiques et de démographie, Context Network Analysis

Assumed number of maize hectares per farmer at 1.2 ha

- The four regions selected for the intervention encompass 65% of total acreage allocated to maize production.
- 75% of SHF (~400,000) are located in Boucle du Mouhoun, Hautes-Bassins, Sud-Ouest, and Centre-Ouest.
- Though Est region has a significant number of maize farmers, yields and yield potentials are low due to limited rainfall.
- Assuming a 1.8Ha. per SHF, there are ~470k maize farmers.
- Collectively, the interventions are expected to impact 30% of maize Ha, i.e. 187k SHF.
A MAJORITY OF MAIZE SHFs ARE PART OF FARMER ORGANIZATIONS, STRUCTURES THAT MUST BE CO-OPTED TO SUPPORT PROJECT INTERVENTIONS

Two types of Farmers’ Organization are common in Burkina Faso

1. The FEPA-B Model

   **FEPA-B**
   
   National level

   **FEPA-B Regional Coordinator**
   
   Region level

   **FEPA-B Provincial Union**
   
   Province level

   **Commune Union**
   
   Commune level

   **Farmers Group**
   
   Village level

2. Commodity – Specific Producer Union (e.g. cotton, cowpeas, maize)

   **National Union**
   
   National level

   **Regional Union**
   
   Region level

   **Provincial Union**
   
   Province level

   **Commune Union**
   
   Commune level

   **Farmers Group**
   
   Village level

### Services offered to members

- CEF\(^1\) (farm operations training) and technical support
- Input credit
- Aggregated storage & group marketing
- Facilitate linkages between local groups and local MFI for credit

- CEF\(^1\) and technical support
- Grain conditioning, small-scale aggregated storage, & group marketing
- Transition to warehouse receipts for credit, financing
- Group solidarity guarantee for member credit
- Literacy training (PAGEA\(^2\) or other system)

- Access to credit through local savings and credit systems at the village level or through commune union
- Cereal bank for food security- transitioning to warehouse receipts for credit (IGA)

Note: Only national cotton producers union and hierarchical structures are operational; little organization around commodities at any level. Most FEPA-B and other nonaligned provincial unions multi-crop to better serve needs of members;

\(^1\) CEF – Conseil en Exploitation Familiale (Farm Operation Conselling) is counseling and support for SHF aimed at increasing income with better operations management

\(^2\) PAGEA – Programme d’Alphabétisation à la Gestion des Exploitations Agricoles is a Literacy Program in Agricultural Operations Management for SHF operations
PRICE OF MAIZE IS LOWER THAN THOSE OF S-M AND ITS CONSUMPTION IS ON THE RISE IN BF, REFLECTING ITS INCREASING FOOD SECURITY ROLE

Monthly Consumer Price of Cereals¹
1998-2013, CFA/kg

Cereal Consumption² - BF
1965-2011, % of total calories consumed

2012 price ranges (consumer)
• Maize: 154-211 CFA/kg (Δ=57)
• Sorghum: 183-233 CFA/kg (Δ=50)
• Millet: 215-299 CFA/kg (Δ=84)

• Share of dry-land cereal in total calories consumed has declined (69% in 1965 to 53% in 2011)
• Maize has expanded its share in total calories from cereals (12% in 1965 to 38% in 2011)
• Maize is expected to have surpassed millet consumption to reach 26% of calorie consumption by 2013

Source: 1-Service Informatique sur la sécurité alimentaire, base SIM de la SONAGESS, 2-FAO STAT April 2014 Extract of the Food Balance Sheet 1961 to 2009, 2010 and 2011 were extracted in June 2014 after the FAO STAT update on 29th May 2014, the initial data changes made in the new version are suspect and we have decided not to update the years prior to 2011, 2012-2013 consumption data based on extrapolation of production data corrected for population growth and assuming no change in exports and non-food uses.
MAIZE HAS LIKELY BECOME THE LARGEST CONTRIBUTOR TO CALORIC INTAKE AMONG CEREALS, EVEN IN DEFICIT REGIONS, AND PREFERENCE IS GIVEN TO YELLOW MAIZE

Maize consumption is higher in the growing regions but has increasingly become popular in urban centers like Ouagadougou, Bobo-Dioulasso etc. In those regions, maize is being substituted for sorghum and millet in some local dishes like Tô and porridges.

Demand is for yellow maize, driven by:

- Human consumption: Unlike most other African countries, preference is for yellow maize and seems to be based on yellow being a more attractive color for Burkinabes.
- Animal feed: yellow maize is preferred due to its impact on the color of the egg yolk.

Notes: *FAO Stat 1965-2011 food balance sheet extrapolation of production data corrected for population growth and assuming no change in exports and non-food uses, Field interviews

Sources: 1- SONAGESS (national cereal stock management entity), Sokindustries (maize processor), and more than 10 women’s groups

Daily Caloric Intake by Foods 2013*, Total = 2,655 KCal

<table>
<thead>
<tr>
<th></th>
<th>Surplus Regions &amp; urban centers</th>
<th>National Average</th>
<th>Deficit Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1,195</td>
<td>1,195</td>
<td>1,195</td>
</tr>
<tr>
<td>Sorghum</td>
<td>288</td>
<td>372</td>
<td>422</td>
</tr>
<tr>
<td>Millet</td>
<td>309</td>
<td>398</td>
<td>452</td>
</tr>
<tr>
<td>Other</td>
<td>863</td>
<td>+25%</td>
<td>587</td>
</tr>
</tbody>
</table>

Cereal Consumption by region

We assume that consumption of other foods stays unchanged.

Maize-based Tô, typically done with Sorghum
URBAN HOUSEHOLD’S EXPENDITURE SHARE ON MAIZE HAS INCREASED SINCE 1994 AS OPPOSED TO A DECREASING SHARE FOR SORGHUM, MILLET, AND RICE – THIS TREND IS LIKELY TO CONTINUE

Changes in Household Expenditure Shares on Food 1994 & 2003, %

- Proportion spent on maize as a share of total food expenditures has increased primarily in urban areas.
- Spend on sorghum & millet-based products has more than halved in urban areas but has increased in rural areas.
- Data shows expenditure changes from 1994 to 2003, however we expect the trend to have accelerated since 2003.

Source: An Analysis of Maize Value Chain and Competitiveness in Burkina Faso, FAO (INDS)
DEMAND FOR MAIZE-BASED PRODUCTS IS EXPECTED TO RISE SIGNIFICANTLY GOING FORWARD

<table>
<thead>
<tr>
<th>Grain market size (MT)</th>
<th>Three main categories of maize products in Burkina Faso</th>
<th>Market</th>
<th>Likely trend</th>
</tr>
</thead>
</table>
| **A** 660              | Cleaned and/or packed grains                           | • Large institutional buyers:  
                      |                                                        | - SONAGESS*  
                      |                                                        | - WFP  
                      |                                                        | • Processors  
                      |                                                        | • Households |
| **B** 68               | Animal Feed                                           | • Commercial farms  
                      |                                                        | • Individual and group livestock producers and owners |
| **C** 55               | Processed and Semi-processed products                 | • Urban households for pre-cooked foods  
                      |                                                        | • Rural households for flour  
                      |                                                        | • Breweries (Brakina) for maize grits as input  
                      |                                                        | • Schools, hotels, catering companies for pre-cooked couscous  
                      |                                                        | • Women’s processing groups (artisanal) |

Source: Field interviews and market research

Note: *SONAGESS is the Burkinabe Government’s national cereal board and food security stock manager
MAIZE IN BURKINA FASO PLAYS A REGIONAL FOOD SECURITY ROLE AND IS A STRATEGIC BASE FOR NGO’S

The NE has Burkina Faso’s most vulnerable population, especially during the lean season (April & September) in addition to Malian refugees (~50,000) in North BF

Intensified food aid need in Mali:
- 1.7M people at risk of hunger (2012)
- Internally displaced population (~320,000) fleeing from the recent political events

Niger remains one of the poorest countries and one of the most vulnerable in the Sahel due to climate and poverty:
- Cereal deficit of >500,000 MT
- 10% deadly acute malnutrition

Burkina Faso is a strategic base for us serving Mali and Niger” – WFP BF logistics

**MAIZE DEMAND FOR POULTRY AND FORMULATED, PACKAGED FEED BLENDS IS EXPECTED TO RISE BY 216% by 2030**

*Potential demand for maize for poultry feed*¹,³,⁴,⁵<br>1980-2030, ‘000s MT

Assumptions:
- Conversion efficiencies of 4:1 for broilers and 3:1 for eggs are higher than US values but reflect Nigerian feeding trial data.³
- The 73% figure for the broiler carcass meat % is based on a Context investigation of the US rendering industry.⁴
- Maize ratio by weight: 60%.⁵
- Assumes that all poultry will require animal feed


---

Demand for poultry feed will be mainly driven by:
- **The increased demand for meat with an increasing GDP/capita (consumption will grow from 38.8 k MT in 2012 to 96.5k MT of meat in 2030 and 59.5k MT to 106.4k MT of eggs)**
- **The shift from free-range to commercial production**
- **Maize is also used for swine feed in Burkina, hence likely to be higher than 235k**
Today only 30% of poultry is fed on industrially formulated animal feed. We project expansion to 60% by 2030: poultry feed products to increase from 68 to 315k MT by 2030, CAGR 9%.

**Total Poultry in BF and vaccination rates¹**
2013-2013

- Poultry numbers have grown at 3% CAGR since 2003 and are assumed to maintain the same pace going forward.
- Poultry vaccination rates have been growing at 16% CAGR since 2003 and are assumed to slow down to half that rate to reach 62% by 2030.
- Poultry vaccination rates are a proxy for intensively farmed, enclosed poultry operations. That market is assumed to be using purchased animal feed blends (as opposed to free-range feeding).

**Total Demand vs. Actual**
2012 and 2030, ‘000s MT

Source: 1- Ministry of Agriculture, Livestock Statistics unit. 2012 and 2013 figures were calculated using extrapolation.
URBAN POPULATION GROWTH WILL DRIVE DEMAND FOR FAST-TO-PREPARE MAIZE-BASED FOODS IN CITIES

Population (urban vs. rural)\(^1\)
1960-2011, Mn

- Urban migration and higher living costs in cities will demand lower priced food products
- An increased employment rate for women\(^3\) (40% of female population in 1980, 44% in 2014) will drive demand for fast-to-prepare foods

Price of finished product in Ouagadougou vs. preparation time

- Rice is still by far the most convenient substitute on the market of quick foods
- Maize-based products come in 2\(^{nd}\)
- Products like couscous made from maize and cowpeas (or another ingredient) could potentially be more competitive, if production is scaled-up

Finished products selected for comparison include those typically eaten as main dish with side sauce & requiring only one cooking step after buying (typically boiling)

Source: 1- World Development Indicators (World Bank) 2- Market research: Bingo supermarket, Gaunghin market, side kiosks on Ouagadougou streets, 3-FAO STAT
PRICING, FAVORABLE PROCESSING FEATURES AND DEMAND WILL DRIVE MAIZE FLOUR PRODUCTION AND SALES

Maize Meal Demand Drivers

**Lower price of maize as raw material**: 1
- Higher yield / hectare than sorghum and millet makes it more profitable for farmers to grow
- In BF, maize has been consistently available at lower prices than sorghum or millet year-round

**End user demand for finished product**: 2:
- Taste & color: clear taste and color preference for maize in specific dishes like Tô (the main staple)
- Better features for baking: maize has relatively high levels of starch after wheat, wheat being higher

**Product competition**: 3
- Availability of maize-based products in the market will drive competition on prices and quality
- Product differentiation and development are likely to create more demand for maize

**Favorable processing**: 2, 3
- Easier processing: Maize is softer than sorghum & millet & hence less costly to mill
- Cereal of choice for blending with wheat (most popular cereal in BF for bread making)
- Growing market for by-products

New product development (requiring maize as ingredient) may have a multiplier effect on demand for maize

Industrial processors are still not able to match demand for specific taste preferences due to milling technology used - detailed in section 2

MAIZE PROCESSING IS DOMINATED BY WOMEN’S GROUPS: SCALE-UP IS REQUIRED TO IMPROVE EFFICIENCY

Overview of current processor segments

<table>
<thead>
<tr>
<th>Processor Type</th>
<th>Size</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro Processors</td>
<td>Typical size ~4-8 FTEs*</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td>Each village has a local neighborhood mill that women use for a fee</td>
<td>Direct sale to rural households</td>
</tr>
<tr>
<td></td>
<td>Maize processing is also often done manually</td>
<td></td>
</tr>
<tr>
<td>Small Processors</td>
<td>Typical size ~9-25 FTEs*</td>
<td>Urban, some rural</td>
</tr>
<tr>
<td></td>
<td>Women-run processing units are present almost everywhere</td>
<td>Rural and urban households through supermarkets and local convenience store</td>
</tr>
<tr>
<td></td>
<td>Owns a small “Indian” mill</td>
<td>Also direct sales</td>
</tr>
<tr>
<td>Medium Processors</td>
<td>Typical size ~25-35 FTEs*</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>Almost non-existent in Burkina Faso</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Most women processing groups hire temporary women from the neighborhood during peak periods or when they receive a large order

Industrial processors have been excluded but would represent the next step up. Their current market is only the breweries
Value Chain Opportunities
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~50% OF MAIZE IS MARKETED IN BURKINA FASO, A SHARE THAT IS WELL ABOVE MARKETED SHARES FOR OTHER CEREALS

The majority of maize moves into the value chain as a marketed commodity in Burkina Faso

Maize Market Model Based on Preliminary Market Research

- Maize Production
  - Imports 1%
  - 46% Commercial Sales
  - 35% On-Farm Use (food & feed)
  - Post harvest loss 15%
  - 37% Household consumption
    - Institutional sales (2%)
    - & exports (2%)
  - 9% Commercial Processing
  - Industrial processing (large mills and brewery) represent only 2% of total production
  - Large mills 1%
  - Brewers 1%
  - Animal feed 5%
  - Small scale processors 2%
  - 75% of the maize is grown in the cotton/maize livelihood zones of SW Burkina, where the interventions are focused and this map reflects that environment. The sales proportion is probably closer to 50% in the East

1. Box sizes in the diagram illustrate the likely percent of maize volume through specific stages in the supply chain
2. Most processing assumed to have an urban market

Source: Field interviews and data collection
THE MAIZE GRAIN FLOW IS COMPLEX BUT SERVES MAINLY A DOMESTIC MARKET WITH OCCASIONAL EXPORTS...

Maize Grain Flow Diagram Burkina Faso

- Independent SHF
- Coops & Farmers Org.
- Collector
- Traders
- SONAGESS
- WFP (Other NGOs, ...)
- Large millers
- Animal feed producers
- Breweries
- Urban markets
- Food Aid
- Export Market
- Informal imports
- Formal imports

- Large institutional buyers and NGOs also process maize into flour at large miller’s facilities
- Large proportion of women’s groups & rural households mill their grain at the local neighborhood miller as needed
- Within the processed foods category, maize meal is the only maize product currently exported to Niger & Ivory Coast
INPUT FINANCE, PROCESSING AND MARKETING ARE THE MOST CONSTRAINED LINKS IN THE MAIZE VALUE CHAIN

Overview of the maize value chain challenges

**Access to appropriate inputs & technical knowledge:**
- Low farmer participation rates in farmer groups due to lack of confidence in structure
- Low cash input use due to lack of access to credit
- Poor knowledge of crop production & post-harvest handling & conditioning techniques
- Lack of skills in crop budgeting and farm management

**Inability to match market demand due to:**
- Lack of access to proper equipment and resources for small processing groups
- Lack of adequate financing for smaller processors to expand
- Inability of industrial mills to compete with local women’s groups for food products

**Marketing Issues:**
- Weak aggregation & marketing strategy at village levels
- Traders & assemblers are price-setters
- Limited storage capacity - village to processor
- Minimal quality control and cleaning
- Need for cash at harvest leads to dumping of grain

**Untapped demand for food products due to:**
- Underdeveloped product marketing and distribution
- Minimal new product development leading to competition and market saturation for basic products
- Inability to compete with substitutes like rice on product price and preparation time needs
- Limited government control over imports of finished products

**Relative degree of constraint**
- More constrained
- Less constrained
- Not accessed

1 **Market Constraints:** Small processors can compete. It is the industrial scale mills that face serious competition from flour and prepared food imports.
...AND APPROXIMATELY 0.7 MN (~50%) TONS IS EXPECTED TO REACH THE MARKET THROUGH INDUSTRIAL AND SMALL SCALE PROCESSING

Maize Value Chain Overview
Million tons, 2013

% of total Supply

<table>
<thead>
<tr>
<th></th>
<th>99%</th>
<th>1%</th>
<th>35%</th>
<th>15%</th>
<th>1%</th>
<th>2%</th>
<th>8%</th>
<th>39%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total maize production</td>
<td>1.6</td>
<td>0.0</td>
<td>0.5</td>
<td>0.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Imports</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>On-farm consumption</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Storage loss</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exports</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Institutional buyers*</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Processing</td>
<td>0.5</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Household processing</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: FAO STAT, Field Interviews: SNV Mali, Traders, Grands Moulins du Faso, animal feed and other medium-scale maize processors
Note: *SONAGESS (National stock) releases maize back into the market every year. The figures above represent the average net removals from the market of the past 4 years, figures for maize processed for breweries represents 55% of total processed. The rest is sold as by products and included in the animal feed figures
BF GOVERNMENT HAS SUBSIDIZED SEED AND FERTILIZER SINCE 2008: THIS SUPPLY-PUSH IS IMPORTANT FOR MAIZE, AS IT REDUCES THE PRICE OF HYBRID SEED

**Subsidy Distribution Procedure**

1. MoA* staff and a representative of the CRA** are present at local commercial shops to check identities of eligible beneficiaries at scheduled times.
2. Certified Seed: The commercial distributor sells seed to the farmer and charges the farmer the net price.
3. Fertilizer: The quantity allocated to individuals may be bulked by farmer organizations or village representatives for delivery and distribution to the beneficiaries.
4. The MoA and CRA representatives sign a receipt (see photo) that enables the merchant to claim from the government the difference between the subsidized price and the published retail price.
5. Merchants are content with the system and report prompt reimbursement from the government.
6. Most working capital needs are met by seed companies or seed production associations, rather than by dealers.

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**Notes:**

MoA refers to the Ministere de l’Agriculture et de la Securite Alimentaire in Burkina Faso; CRA is the Regional Chamber of Agriculture.

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**Value Chain Opportunities**

**Production**

**Beneficiary Selection**

MinAg extension staff assess SHF eligibility in conjunction with local govt. officials. Criteria include:

- Farm size
- Number of agriculturally active family members
- Evidence of need
- Presence of compost pit and soil and water conservation measures on fields
SEED SUBSIDIES MAKE MAIZE PRODUCTION INTENSIFICATION A MORE ATTRACTIVE PROPOSITION – ALMOST 40% OF MAIZE SEED PLANTED IS PURCHASED – HIGHER THAN OTHER CROPS

**Burkina Faso Seed Supply Status**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Millet</th>
<th>Sorghum</th>
<th>Maize</th>
<th>Cowpea</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012/2013 (M ha.)</td>
<td>1.27</td>
<td>1.79</td>
<td>0.85</td>
<td>0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>Seed Rate (kg./ha.)</td>
<td>8</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>80</td>
</tr>
<tr>
<td>Seed Need (MT)</td>
<td>10.18</td>
<td>17.89</td>
<td>12.70</td>
<td>2.00</td>
<td>10.95</td>
</tr>
<tr>
<td>Govt. Subsidy Sales (MT)</td>
<td>0.39</td>
<td>1.50</td>
<td>3.00</td>
<td>0.17</td>
<td>3.20</td>
</tr>
<tr>
<td>Commercial Sales (MT)</td>
<td>0.00</td>
<td>0.16</td>
<td>1.85</td>
<td>0.10</td>
<td>0.56</td>
</tr>
<tr>
<td>Seed Supply (MT)</td>
<td>0.39</td>
<td>1.66</td>
<td>4.85</td>
<td>0.27</td>
<td>3.76</td>
</tr>
<tr>
<td>Farm-saved Seed (MT)</td>
<td>9.79</td>
<td>16.23</td>
<td>7.85</td>
<td>1.73</td>
<td>7.19</td>
</tr>
<tr>
<td>Purchased Seed %</td>
<td>4%</td>
<td>9%</td>
<td><strong>38%</strong></td>
<td>13%</td>
<td>34%</td>
</tr>
</tbody>
</table>

- Since 2008, Burkina Faso has subsidized selected field crop seeds by up to 90% of the retail price – mostly rice, maize and sorghum
- Seed industry contacts see an expansion of the seed market rather than a cannibalization of commercial sales
- Their sales of unsubsidized seed are significant only for maize and cowpea

**Burkina Faso Certified Seed Production Trend**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rice, Sesame etc.</th>
<th>Groundnut</th>
<th>Cowpea</th>
<th>Millet</th>
<th>Sorghum</th>
<th>Maize</th>
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</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.2</td>
<td>11.3</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
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<tr>
<td>2005</td>
<td>0.6</td>
<td>8.6</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
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<tr>
<td>2006</td>
<td>2.8</td>
<td>4.2</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
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<tr>
<td>2007</td>
<td>4.1</td>
<td>2.8</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
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<tr>
<td>2008</td>
<td>2.8</td>
<td>5.5</td>
<td>4.2</td>
<td>0.5</td>
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<tr>
<td>2009</td>
<td>5.5</td>
<td>0.5</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
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</tr>
<tr>
<td>2010</td>
<td>11.3</td>
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<td>4.2</td>
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<td>2011</td>
<td>8.6</td>
<td>0.5</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
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<tr>
<td>2012</td>
<td>4.2</td>
<td>0.5</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
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<tr>
<td>2013</td>
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<td>0.5</td>
<td>4.2</td>
<td>0.5</td>
<td>0.0</td>
<td>12.4</td>
</tr>
</tbody>
</table>

The government seed support program has included ambitious certified seed production targets, but industry opinions differ on the extent to which targets have been achieved, and on what proportion of the certified seed effectively reaches farmers.

Source: Context estimates, based on CORAF data provided in D. Bassole report to Context, May, 2014
MAIZE FERTILIZER USE IS SIGNIFICANT, ESPECIALLY IN THE COTTON/MAIZE LIVELIHOOD ZONES, WHERE MAIZE BECAME MORE PROFITABLE THAN COTTON POST-2008

Total Burkina Faso Fertilizer Use
100%=160,000 MT (2013)

BURKINA FERTILIZER CONSUMPTION PATTERN
- ~67% of the fertilizer applied in Burkina Faso is applied on cotton
- Maize fertilizer consumption is concentrated on farms that are affiliated with cotton companies,
  - Maize became more profitable than cotton after 2008
  - Fertilizer provided by cotton companies was increasingly diverted for use in maize fields
  - Cotton farmer unions supply fertilizer on credit for maize fields, and this is repaid from the income received for cotton

NOTES ON FERTILIZER SUBSIDY PROGRAMS
- Burkina government subsidies for food crop fertilizer were initiated in 2008
- ~12,000 MT (7% of total volume) was subsidized in 2011, as well as all of the 100,000 MT applied to cotton
- The assistance was designed to encourage rice, maize and cowpea farmers to increase their fertilizer use
- The program has been administered by the MoA and AGRODIA, the AGRA-supported association of input distributors, with the assistance of IFDC

- Applications for subsidized fertilizer exceed supply
- Many maize farmers are rejected
- The result is reported to often be counter-productive, because SHFs who assume they will get cheap fertilizer are then unwilling (or have not set aside enough cash) to purchase at the commercial price
- Additional input credit is needed if this problem is to be addressed

Source: 1. Dominique Bassole, IFDC Burkina; 2. ITC Trade Map, using mirror data for Burkina (i.e. the sum of exports from ROW)
FERTILIZER IMPORT TREND IS UP SINCE 2009, BUT THE NATIONWIDE MAIZE CROP RECEIVES ONLY 1/14TH OF THE RECOMMENDED OPTIMUM FERTILIZER APPLICATION AMOUNT

Fertilizer Imports to Burkina and Cotton Production 2003-2012

TREND DRIVERS
- In the early 2000’s, most fertilizer was applied on cotton.
- Disruptions surrounding the cotton industry in the mid-2000’s temporarily curtailed fertilizer use on that crop
- Although cotton production declined in 2010-2012 period, fertilizer imports increased, implying that use of fertilizer on non-cotton crops has been increasing

MAIZE FERTILIZER POTENTIAL
- The 15,000 ton fertilizer use estimate for maize in Burkina is correlated with 850,000 planted ha.
- This averages <18 kg per ha.
- The recommended application rate is 250 kg/ha, 14 times the amount currently used
- Even if all the fertilizer applied on maize were utilized in the SW region, that would still only reach about 10% of the recommended level of fertilizer use in that region

Source: 1. Trade Map, ITC, is the source. Burkina did not report imports in 2006. Mirror data have been used to fill that gap. – HS: Harmonized Commodity Description & Coding Systems.
HERBICIDE USE IS INCREASING IN BURKINA - LABOR SUBSTITUTION HAS BECOME COST-EFFECTIVE, BUT THIS INCREASES CREDIT NEED FOR CASH INPUT OUTLAYS

Note: Herbicide use in the developing world was assumed until recently to be the preserve of large-scale mechanized farms. But just as hand tillage is less cost-effective than mechanical even at very low wage rates, so now SHF’s are finding that chemical weed control is becoming cheaper than field labor.

The gold mining industry (formal and informal) attracts many young men in BF, creating labor shortages in farming areas.

The result is increasing purchase of chemical weed controls – replacing mostly family labor

Herbicides comprised 20-40% of sales of five agro-dealers visited (often more important than their fertilizer and seeds sale categories)

Herbicide Application Costs vs. Hand Hoeing

- Nicosulfuron is applied at a 2 liters per ha. rate, at a total cost of CFA12,000 (~$25/ha.)
- Hand weeding of 1 ha. with a hoe can require between 20 and 60 hours of labor, depending on soil type and weed density
- A herbicide spray application requires 3 miles of walking with a backpack, if the crop is less than waist high, this work should be accomplished within 4 hours
- Averaging these numbers, the breakeven cost of labor is roughly $0.70/hour (and the herbicide is likely to provide a better result)

The 4 main herbicides identified in Burkina (sold in Chinese and Indian brands)

- Glyphosate – broad-spectrum pre-emergence
- Nicosulfuron – a selective post-emergence product
  - A mutation unique to maize confers resistance to this chemical
- Acetochlor/Prometryne – pre-emergence in maize & cotton
- Haloxyfop – a grass herbicide used in legume crops

It is significant that one of the four products is certainly targeting maize fields – a sign of intensification of maize production.

Source: 1- Eva Weltzien-Rattunde, ICRISAT, Bamako, Mali, 2-Trade Map (ITC) – HS: Harmonized Commodity Description & Coding Systems. Mirror data used because neither importing country reported this category prior to 2008, 3- Visits to agro-dealers in Bobo Dioulasso, Dedougou, Ouahagouya and Ouagadougou
CEREAL CROPS HAVE BEEN SHUNNED UNTIL RECENTLY BY BANKS IN BURKINA. MOST MAIZE INPUT CREDIT PROVIDED HAS BEEN SECURED WITH COTTON COLLATERAL

THE MAIZE VALUE CHAIN OPPORTUNITY ASSOCIATED WITH THE CREDIT AND INSURANCE AREAS IS THE UNREALIZED YIELD POTENTIAL, WHICH CAN ONLY BE REALIZED IF SHFs INVEST $150-200/HA. FOR PURCHASED INPUTS

• The higher revenues from these yield gains amply compensate for the additional cash outlays in most years, but most SHFs are unwilling or unable to obtain input credit that would enable such a transformation
  – This is a large amount of money to borrow for people who mostly earn <$1,000/year
  – Because such farmers often have little or no collateral, such an investment in cash inputs is risky for both the SHF and the financial institution, due to the vagaries of weather
  – Several cycles of widespread loan defaults after drought years have made banks very cautious

MAIZE SHF CREDIT REACH
According to discussions with micro-finance groups and farmer associations, it is likely that <10% of maize farmers receive input purchase loans for that crop

• This conclusion is supported by fertilizer usage data, reinforced by field interviews, during which most farmers who did use fertilizer reported that they applied the full recommended rate
• Input dealers also commented that most of their fertilizer sales were made to farmer associations which had received credit for the recommended application amount on behalf of their members – cash sales of single sacks to individuals made up only a small portion of their business

SEVERAL BANKS IN BURKINA NOW OFFER INPUT CREDIT TO GROUPS INVOLVED WITH FOOD CROPS, BUT UNDER STRINGENT CONDITIONS

• They use micro-finance institutions as intermediaries
• The MFIs then require SHFs to form groups, each member of which pledges to share in repayment a defaulting individual’s loan amount
• In addition, MFI’s and farmer associations insist that each group member secure life insurance against the amount of their loan (this is a legal requirement in Burkina for micro-finance loans)
• Ecobank and Orobank have arranged with PlaNet Guarantee for crop insurance to be an integral part of each loan terms
PLANET GUARANTEE PILOT PROJECT FOR CROP INSURANCE IN BF NOW IN ITS FOURTH YEAR: SHOWS PROMISE

Key challenges for PlaNet Guarantee

- Insurance is available only for maize and cotton so far because the satellite imagery has to be correlated with yield assessments for the crop
- Dr. Michael Carter at the University of California, Davis, has developed such yield indices for these crops.
- Risks differ across a country. PlaNet Guarantee tried to standardize insurance cost rates, but for 2014 they are going back to a 3-tiered scale. This ranges from 7.5% to 10.85% in Burkina depending on the geographical location of the intervention zone.
- Narrow range of coverage inhibits diffusion:
  - Does not cover flooding
  - Period of coverage (120 days) insufficient at times
  - Does not cover grain stored under warehouse receipt systems
- Better indexing system is needed to account for highly variable rainfall regimes in several parts of Burkina Faso
- Minimal marketing and low customer service levels provided so far

Source: PlaNet Guarantee 2014 Business Plan
**PLANET GUARANTEE’S INSURANCE BOTH PROTECTS FARMERS FROM LOSS AND PROVIDES ACCESS TO CASH INPUT CREDIT TO INTENSIFY MAIZE PRODUCTION & DOUBLE YIELDS**

**CROP INSURANCE ECONOMICS**
For maize, the cash input package covered (primarily fertilizer and seed) is ~$200/ha
- For 2014, the cost of crop insurance for maize varies by zone, to take into account the differences in climatic risk
- Premiums range from 7.5% to 10.85%
- This adds $15-22/ha. to the input cost
- Bank credit through well established farmer associations costs ~10%
- This raises gross input cost to ~$240/ha
Application of 250kg of fertilizer can reliably double yields to 3.0MT/ha.
- At a CFA120/kg. farm-gate price, this provides additional revenues of $380/ha

**COMPUTATION OF INSURANCE COMPENSATION**
- PlaNet Guarantee relies on satellite remote sensing to monitor vegetation stress and instrumentation in villages to record rainfall and temperature
- Each dot on the map indicates a village in which rainfall gauges are sited
- Compensation is paid based on the extent to which harvests are calculated to be below normal

**MARKETING CROP INSURANCE**
- PlaNet Guarantee has experimented with various approaches to sell crop insurance, trying direct sales, working through agro-dealers
- They are now relying on alliances with banks, micro-finance and farmer associations. Insurance policies are integrated with the loan documents
- These banks insist on crop insurance as part of the loan package to limit risk
**Value Chain Opportunities**

**Grain Marketing & Trading**

**DELAYING SALES BY 3-6 MONTHS VIA WAREHOUSE RECEIPT SYSTEMS (POST-HARVEST CREDIT) CAN EARN FARMERS 20-30% MORE THAN SELLING STRAIGHT AFTER HARVEST**

Price of maize at farmer and retail levels  
CFA/kg, 2008-2013

### Annual Price Movement Impact on Warehouse Receipt System

- Prices are consistently lowest in November after the annual harvest.
- To cover costs, most farmers without access to warehouse receipt systems make most of their sales shortly after harvest.
- By delaying sales 3 to 6 months post-harvest farmers can sell for 20% to 30% higher prices.
- Prices are usually highest in the "hungry period" right before harvest - from July to September.
- Many SHFs buy grain to cover their subsistence shortfall during this period.

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**"Warrantage (warehouse receipt system) allows me to provide for my family until prices are more favorable to sell" – Farmer in Boucle du Mouhon region**

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Sources: 1. SONAGESS price database  
2. Context site visits and interviews
WAREHOUSE RECEIPT SYSTEMS ARE BEING USED TO INCREASE SHF ACCESS TO CREDIT BUT STILL FACE CHALLENGES

**Warehouse Receipt System – Village Level**

**Primary challenges**

- Market price at sale is too low to repay loan
- Lack of capacity to manage relationship with MFI and manage stored grain
- Lack of management abilities for risky grain speculation and for regional arbitrage (when to sell)
- Unfavorable loan terms offered by local financial institutions

**Secondary challenges**

- Dependence on NGO support at initial stages to construct storage facility
- Conflict between food security and loan objectives
- Bad governance (theft of cash, grains, etc.)

---

**Value Chain Opportunities**

- **Warehouse Receipt System – Village Level**
  - **Initial construction and financing supported by NGO**
  - **Farmer Organization Warehouse Storage**
    - 2. FO stores bags in warehouse at harvest
    - Both parties control sale of physical stock until loan is paid
  - **Markets**
    - 5. Sold at market price – slow market release
  - **Local MFI**
    - 6. Cash from sale
    - 7. Loan repayment
  - **Farmer Organization**
    - 1. Farmers hand bags to FO
    - 3. Loan 60% to 80% crop value
  - **Individual farmer**
    - 4. Farmer receives loan
  - **Cash movement**
  - **Decision/authority**
  - **Grain movement**

---

Source: Context Field visits and interviews
PRIVATE SECTOR 3rd PARTY WAREHOUSE RECEIPT SYSTEMS ARE INCREASINGLY REQUIRED AS A GUARANTEE FOR LARGE BANK LOANS TO PRODUCER UNIONS AND TRADERS

Private Sector Third Party Warehouse Receipt System – Union Level

No successful examples identified in Burkina; the example cited is the USCPMD in Dioilo, Koulikoro, Mali

Grain Marketing & Trading

Value Chain Opportunities

Bonded warehouse notice by Auxigages, a 3rd party storage management company. Segou, Mali

Key challenges

- Some banks require additional cash guarantee
- Costs associated with transport to storage site (often in the capital or major city) and warehousing fees reduce profit and return to farmers
- Market price at sale may be too low to repay loan and cover costs
THE UPGRADING OF SMALL PROCESSORS COULD SOLVE THE CURRENT MISMATCH BETWEEN DEMAND AND SUPPLY

Based on Burkina contacts, women manage and mostly staff small-scale food processing operations

**Overview of current processor groups and proposed support**

**Current constraints**
- Basic products cater to consumption preference but are of low quality
- Inconsistent supply to supermarkets
- Equipment often inappropriate
- Inability to expand due to financial constraints
- High food safety risk (no aflatoxin testing)
- Support with access to credit to invest in equipment, and building
- Training and capacity building

**How to create value through interventions**
- Basic products cater to consumption preference and are of acceptable quality products
- Bad packaging
- Limited storage space leading to high commodity price fluctuation risk & limited equipment
- Intensified competition in the market is creating a need for new products
- High food security risk (no aflatoxin testing)
- Support with access to credit to invest in marketing, transport, and additional equipment
- Training and capacity building

**Medium Processors**
- Urban
  - Good quality products
  - Do not meet local taste demand due to inappropriate technology
    - e.g. for maize meal, micro and small processors ferment maize prior to milling and that has a significant impact on taste)
  - Currently mostly serving breweries

**Small Processors**
- Urban, some rural
  - Currently mostly serving breweries

**Micro Processors**
- Rural
  - Basic products cater to consumption preference but are of low quality
  - Inconsistent supply to supermarkets
  - Equipment often inappropriate
  - Inability to expand due to financial constraints
  - High food safety risk (no aflatoxin testing)
  - Support with access to credit to invest in equipment, and building
  - Training and capacity building

**Some support already provided by Government**

**Proposed focus of maize intervention 3**

**Based on Burkina contacts, women manage and mostly staff small-scale food processing operations**

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- Intensified competition in the market is creating a need for new products
- High food security risk (no aflatoxin testing)
- Support with access to credit to invest in marketing, transport, and additional equipment
- Training and capacity building

**Medium Processors**
- Urban
  - Good quality products
  - Do not meet local taste demand due to inappropriate technology
    - e.g. for maize meal, micro and small processors ferment maize prior to milling and that has a significant impact on taste)
  - Currently mostly serving breweries

**Small Processors**
- Urban, some rural
  - Currently mostly serving breweries

**Micro Processors**
- Rural
  - Basic products cater to consumption preference but are of low quality
  - Inconsistent supply to supermarkets
  - Equipment often inappropriate
  - Inability to expand due to financial constraints
  - High food safety risk (no aflatoxin testing)
  - Support with access to credit to invest in equipment, and building
  - Training and capacity building

**Some support already provided by Government**

**Proposed focus of maize intervention 3**
DANAYA CEREALES WAS ABLE TO EXPAND AND IMPROVE OPERATIONS THROUGH SUPPORT FROM NGOS

Support received from multiple organizations from 2002 to 2014 has allowed Mme Aissata to move from being a small to a large processor – Support received included:

- Access to finance
- Technical support
- Provision of equipment
- Capacity building & business plan development
- Training in marketing, accounting, supply chain, and general business management

Previous facility

<table>
<thead>
<tr>
<th>Employees</th>
<th>Processing Capacity</th>
<th>Lab testing facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (FTE) + 5 (Temp)</td>
<td>1 T/day</td>
<td>No</td>
</tr>
</tbody>
</table>

New facility

<table>
<thead>
<tr>
<th>Employees</th>
<th>Processing Capacity</th>
<th>Lab testing facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 (FTE) + 15 (Temp)</td>
<td>10 T/day</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Danaya still uses its old technique of “wetting” the maize before milling, which is the local taste preference.

Source: Interview with Mme Aissata in Bamako
THE BF GOVERNMENT IS INTENSIFYING SUPPORT TO INCREASE VILLAGE LEVEL MILLING CAPACITY

Government-supported “platforme multi-fonctionnelle” of Saye

The Saye platform mill operates from 1pm to 6pm daily. The women of the village decided on its operation hours. Maize, sorghum, millet, and cowpeas are milled there. The women have requested a millet dehuller to be installed soon.

The women were trained to run the mill, do regular maintenance, and to keep the books.

The mill is operated by four women:
- two machine operators
- two cashiers

- The Burkinabe Government is intensifying support at the rural level to help reduce preparation time for women
- This will likely take care of the micro-level processing constraints
- These platforms are dedicated cereal processing units
- During field interviews, we’ve received positive feedback on this platform from rural women
- For maize, these units will be important for food security
FOR A HOUSEHOLD, COST OF MILLING AT A LOCAL NEIGHBORHOOD MILLER IS SIGNIFICANTLY LOWER THAN THE COST OF BUYING READY MAIZE FLOUR AT THE STORE

Local neighborhood miller in Banfora

“I save a lot of cooking time by going to the mill”
- Woman in Banfora

“A bag of maize flour or couscous costs me >500 CFA at the convenience store. I can make my own for ~300.”
- Woman in Banfora

Comparison of cost of 1kg bag of maize meal to a Burkinabe household

Low-case scenario (harvest)
- Cost of maize/kg
- Packaging
- Cost of milling/kg
- Transport

Includes processor and supermarket margins

Local miller

Store

High-case scenario (dry)

Assumptions:
• Costs of utilities (gas, water, etc.) are excluded (assumed equal for both)
• No transport cost for households as millers are at walking/biking distance
• Transport costs for processors includes 2 trips: 1 to local miller and 1 to deliver products to the store

Source: Prices of maize and packaging and transport costs from interview with processor in Banfora (Association Wassa), local neighborhood miller, and market.
CURRENT MAIZE-BASED PRODUCTS IN THE MARKET DO NOT FOLLOW BEST PRACTICE PACKAGING REQUIREMENTS

Current Situation

- The preferred “wet” or “fermented”* milling of maize requires that the germ is not removed from the grain when milling.
  - Keeping the germ results in a healthier flour however, creates shelf life complications
  - Maize germ contains oil and due to a chemical reaction with oxygen, will cause the flour to turn rancid

Constraints:

- Inability to match consumption preferences with appropriate packaging (improving shelf life without removing germ)
- Short shelf life of ~1-2 month before flour turns rancid according to interviews
- Most processors import packaging mainly from Ghana and Ivory Coast, only 1 local company (Faso Plast) that manufactures it in BF on command
- Some products in the market over-state the shelf life (up to a year), a crucial food safety issue
- Unattractive packaging and poor product marketing

Source: Field interviews, Context expert information

Note: “Fermented” milling refers to the traditional method of preparing maize flour used by rural households and small processors. Steps are the following: Wet maize grain overnight, Mill (either by pounding or by using hammer mills), then dry in the sun before consuming or packing.

Improving packaging is particularly important for INT#3 of increasing maize processing
SNAPSHOT OF MARKET WATERFALL 6-MONTHS POST-HARVEST SHOWS FARMER AND RETAILER CAPTURING MOST OF THE VALUE

Market margins for maize production in Burkina Faso
$USD per farmer per Ha.

Prices were recorded during field visits in April 2014

Comments

- Value-added estimates based on simultaneous recording of farm-gate and retail prices can provide a misleading impression.
- Traders buy much of their stock during the post-harvest low-price period, store until prices rise, and then take their profit.
- By April, the farmers who have held on to their grain are making good margins when they sell, and so are retailers, with scarce grain to re-sell.

1. Assuming yield of 35 bags of maize produced per hectare per farmer
2. Interview notes from one of 4 large traders in Ouagadougou (Denis Zangrana) with regional buying centers in villages, equals to $234 per MT. Validated by interviews with farmers
3. Based on interview notes with traders having large collection centers in villages
4. Based on interviews with traders
5. Based on field research at regional markets for cereal prices to households
Note: Assumes an average of 1 Ha of maize planted per farmer; analysis is agnostic of groundnut production consumed on farm; farmer household labor costs excluded
Sources: Context Network stakeholder and farmer interviews
3 Interventions & Impact
Maize area has expanded 8x within the past 20 years, to become a major cereal crop in Burkina, encroaching on sorghum and millet in western BF higher rainfall areas
• A minority of SHFs already use input-intensive production systems:
  – ~40% use improved varieties, but <10% apply recommended fertilizer rates
• Production and consumption have accelerated by ~11%/yr. since the grain price rise of 2008
• Maize 7% cheaper than sorghum, and consumed increasingly on-farm in West and in cities

Maize was developed as a food security crop first, then as cash crop by cotton companies in Burkina. A greater share (~50%) is still marketed in high producing regions than is the case with sorghum & millet
• Hybrid maize takes <5% of the seed market now, but high-yielding products are on offer
• Processing absorbs 20% of maize sales
• Poultry feed makes up almost half processing share and is expanding at ~9%/yr.

Most promising interventions focus on reinforcing trend to intensification and high input use by expanding SHF numbers empowered to participate
• INT #1 Risk Mitigation of Adoption of Inputs
• INT #2 Local Aggregation Facilities
• INT #3 Upgrading of Processing Industry
• $463/annum average benefit projected for 190,000 SHFs (28% of total) at Year 10 (base)

The intensification of maize production requires a network of cooperating stakeholders who straddle the technical, financial, risk-mitigation and market access areas
• Farmer associations (UGCPA; COPSA-C; UPPA Hauts Bassins, FNZ,
• NGO’s (SNV, IFDC, Oxfam etc.)
• Processing (Afrique Verte, GRE, ATCB)
• Micro-finance groups (Caisse Populaire; Graine; Microfinance Plus)
• Banks (Ecobank; Orabank; Coris Bank)
• Crop insurance (PlaNet Guarantee)
### Interventions & Impact

**Assuming Interventions Impact 190,000 SHFs at Full Adoption in a Decade, the Annual Benefit is Projected to Reach $87MM/Annun**

<table>
<thead>
<tr>
<th>Number of target SHFs for interventions:</th>
<th>190,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net financial benefit per farmer</strong></td>
<td></td>
</tr>
<tr>
<td>Benefit per farmer from Int. #1:</td>
<td>$325</td>
</tr>
<tr>
<td>Benefit per farmer from Int. #2:</td>
<td>$90</td>
</tr>
<tr>
<td>Benefit per farmer from Int. #3:</td>
<td>$49</td>
</tr>
<tr>
<td><strong>Net benefit per farmer</strong></td>
<td>$463</td>
</tr>
<tr>
<td><em>Per annum</em></td>
<td></td>
</tr>
<tr>
<td><strong>Aggregate SHF benefit</strong></td>
<td>$87 MM</td>
</tr>
<tr>
<td><em>Per annum – 190,000 SHFs</em></td>
<td></td>
</tr>
</tbody>
</table>

**Assumptions of Context Network Analysis:**
- 1.8 ha of maize grown per farmer
- $200 farm gate sale price
- 3.0 MT tons yield per Ha, less 10% storage loss
- 1.2 million hectares of maize in Burkina Faso
- At full adoption in year 10, 336,000 ha. are impacted (at 1.8 ha. per farmer, ~190,000 farmers are involved

Details shown in following spreadsheet
**INTerventions & Impact**

**At Full Adoption, Maize Interventions Could Eventually Increase Farmgate Crop Value by ~$86 Million Annually**

<table>
<thead>
<tr>
<th>Base Yield¹</th>
<th>Yield Gain²</th>
<th>Yield Gain</th>
<th>Gross Yield</th>
<th>Storage Loss</th>
<th>Storage Loss</th>
<th>Net Sold</th>
<th>Price</th>
<th>Gross Rev.</th>
<th>Cash Outlays (Credit, Inputs, Fees)</th>
<th>Net Income/Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT/ha</td>
<td>%</td>
<td>MT/ha</td>
<td>MT/ha</td>
<td>%</td>
<td>MT</td>
<td>MT</td>
<td>$/MT</td>
<td>$/ha</td>
<td>$/ha</td>
<td>$/ha</td>
</tr>
<tr>
<td>Adoption of optimal production system, w/ input package incl. improved OPs/hybrids &amp; fertilizer, due to enablers crop insurance and credit</td>
<td>1.5</td>
<td>200%</td>
<td>1.5</td>
<td>3</td>
<td>10%</td>
<td>0.3</td>
<td>2.7</td>
<td>$200</td>
<td>$540</td>
<td>$170</td>
</tr>
<tr>
<td>Traditional production system</td>
<td>1.5</td>
<td>1.5</td>
<td>15%</td>
<td>0.225</td>
<td>1.275</td>
<td>$200</td>
<td>$255.00</td>
<td>$255</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Yield Gain Impact (basic benefit)**

$115

**Credit, crop insurance & warehouse receipt system to enable SHFs to postpone sale three months post-harvest to receive 20% price premium³,⁴**

<table>
<thead>
<tr>
<th>MT/ha</th>
<th>%</th>
<th>MT/ha</th>
<th>MT/ha</th>
<th>%</th>
<th>MT</th>
<th>MT</th>
<th>$/MT</th>
<th>$/ha</th>
<th>$/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7</td>
<td></td>
<td>$240</td>
<td>$648</td>
<td>$43</td>
<td>$606</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional sales timing post-harvest</td>
<td>2.7</td>
<td>$200</td>
<td>$540</td>
<td>$540</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Credit/Insurance Impact (additional benefit)**

$66

**Farmers' marketing association cleans, grades, stores and arranges bulk grain sale, assuming 15% price premium & 5% fee deducted on sales**

<table>
<thead>
<tr>
<th>MT/ha</th>
<th>%</th>
<th>MT/ha</th>
<th>MT/ha</th>
<th>%</th>
<th>MT</th>
<th>MT</th>
<th>$/MT</th>
<th>$/ha</th>
<th>$/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7</td>
<td></td>
<td>$230</td>
<td>$621</td>
<td>$31</td>
<td>$590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional price-taking sales</td>
<td>2.7</td>
<td>$200</td>
<td>$540</td>
<td>$540</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Aggregation, Quality Improvement & Storage Impact (additional benefit)**

$50

**Expansion of efficient medium-scale flour mills to provide better market access for SHFs due to reduced transaction costs, assuming 5% price premium⁶**

<table>
<thead>
<tr>
<th>MT/ha</th>
<th>%</th>
<th>MT/ha</th>
<th>MT/ha</th>
<th>%</th>
<th>MT</th>
<th>MT</th>
<th>$/MT</th>
<th>$/ha</th>
<th>$/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7</td>
<td></td>
<td>$210</td>
<td>$567</td>
<td>$567</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional price remote from processing operations</td>
<td>2.7</td>
<td>$200</td>
<td>$540</td>
<td>$540</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Improved Processor Market Impact on SHF (additional benefit)**

$27

**Total Potential Farmgate Crop Value Impact Per Hectare on SHF Net Income**

$257

Number of maize hectares (millions) in Burkina Faso² = 1.20

Assuming intervention measures eventually reach given % of maize hectares | 28% | 336,414 ha

**Potential Farmgate Crop Value Impact of Maize Interventions at Full Adoption ($M)**

$86.61M/year

---

Numbers may not match exactly due to rounding

¹ Base yield is average of 7 anchor countries as reported in FAOSTAT, 2010-12

² Yield gain of 40% considered conservative; anchor countries yield still well below benchmark countries of Brazil, South Africa and Zambia

³ A price rise of 20% 3 months after harvest is conservative. Most monthly prices series seen show 30% plus gains. Insurance is considered as a necessary net cost, not valued as a cash benefit

⁴ All seed is assumed stored through the post-harvest period, with grain stored off-farm against a warehouse receipt that acts as collateral for cash loans as needed

⁵ Six months credit is charged at 25% of the cost of cash inputs purchased; assumed sufficient to cover crop insurance

⁶ Development of medium-scale rural/small-town mills has broader regional economic benefits, but this analysis is focused on SHF benefits only
POTENTIAL IMPACT OF MAIZE INTERVENTIONS ON FARMER MARGINS AT FULL ADOPTION REPRESENT AN ~85% INCREASE

Maize production net margin per hectare
$USD/ha

Current Farmer Margins

Crop Yield Improvements

Credit/Insurance Impact

Group Storage/Marketing

Upgraded Processing Facility

Future Farmer Margins

Intervention #1

Intervention #2

Intervention #3

At full adoption the interventions would increase farmer margins by ~85%

- Warehouse receipt systems will assume a 20% price premium on better timed farmer sales
- Bulk storage and group marketing will yield increased quality and a price premium of 15%
- Expansion of medium-scale mills will yield reduced transaction costs and better market access resulting in a price premium of 5%

Intervention

Crop Yield Improvements

Credit/Insurance Impact

Group Storage/Marketing

Upgraded Processing Facility

296

115

66

50

27

554

Increases availability and quantity of crop inputs driving maximized crop yields per hectare

At full adoption the interventions would increase farmer margins by ~85%
MAIZE INTERVENTIONS WILL IMPACT SHF FAMILIES THAT STRADDLE THE $2/DAY POVERTY LINE

Poverty distribution by region

2012 Population by region (in millions) and Average annual growth from 1997-2012

Poverty distribution classes affected by interventions

% of population living under 2$/day

- 90-95
- >95
- 80-90
- 70-80
- 70-80
- 50-60
- 40-50

Focus regions for maize interventions

Source: 1- Institut National de Development de Statistiques 2- International Food Policy Research Institute
MAIZE IMPACT MODEL ASSUMES THAT MAIZE HA. WILL CONTINUE TO INCREASE THROUGH THE NEXT DECADE, LEVELING OFF AT 1.2M

**Maize hectares projections**

- **At Year 10, the model projects that the project will have impacted 190,000 SHFs**
  - The maize area increases by ~40%
  - The maize area per SHF increases from 1.1 to 1.8 ha. This increases benefit per farmer, but reduces number impacted
- **The BMGF project will be responsible for a substantial increase in the intensively farmed maize area**
  - to 35% of the total maize crop by Yr. 10 - up from 7% now
- **The increased maize production resulting from the project is 1.2M MT**
  - This adds 75% to Burkina’s 1.6M MT maize production in 2013 (Maize consumption rose by 85% in the decade to 2012, so this increase can be absorbed, of which ~40% will be driven by population increase)
INTERVENTION #1: RISK MITIGATION FOR ADOPTION OF INPUTS IS SEEN AS AN EVEN HIGHER PRIORITY INTERVENTION THAN ORIGINALLY ENVISAGED

### 1. Risk Mitigation for Adoption of Inputs

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
<th>Recommended Approach</th>
</tr>
</thead>
</table>
| **Access to appropriate inputs**  
  - Low availability of cash or credit  
  - Late input distribution  
  - Long distance to points of sale | **Provide**  
  - Crop insurance  
  - Credit support  
  - Capacity building | **Lack of understanding of technical details of the indexing system & compensation rationale leads to low adoption rates of crop insurance**  
| **Environmental challenges**  
  - Variable rainfall regimes (drought, floods) in maize growing areas | | **Fertilizer pricing at the farm level is influenced by the complex interaction between cotton and government input subsidy systems**  
| **Farmers are already well aware of maize productive potential with input intensification**  
  - They need input credit and risk mitigation support to enable them to exploit that potential | | **Banks reluctant to lend to individuals; insist on group sharing of responsibility for repayment**  

1) **Insurance:**
   - **Option 1:** Bundle crop insurance and credit support to ease bank concern over making individual loans
   - **Option 2:** Offer them as separate products, so that SHFs are not pressured into taking out insurance
   - Develop “cash-back” scheme for crop insurance to increase adoption and encourage saving

2) **Input credit funds:**
   - Develop products to reinforce financial systems interest in input credit support

3) **Capacity Building**
   - Reinforce capacity of farmers’ organizations to manage credit and provide technical training – UGCPA is one example of this in Burkina

*Detailed on next slide*
INTERVENTION #1: RISK MITIGATION FOR INPUT ADOPTION RELIES ON PROVISION OF PARALLEL OR INTEGRATED CROP FINANCE AND INSURANCE PLUS CAPACITY BUILDING TO ENSURE YIELD BENEFITS

1. Risk Mitigation for Adoption of Inputs

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
<th>Recommended Approach</th>
</tr>
</thead>
</table>
| Access to inputs through credit support | - Establish loan guarantee funds to support lines of credit for farmer organizations for input supply (seeds, fertilizer, agricultural equipment)  
- Establish loan guarantee fund for infrastructure (storage facilities and equipment (husking, dehullers, winnowers, dryers, sorters) investments  
- Develop capacity building program for micro-finance and other financial institutions in order to support rural & farm-based credit and loan product  
- Develop capacity building program for farmers’ organizations to analyze and understand different financial products and to negotiate with micro finance and/or banks |  |  |

Support the expansion of crop insurance

- Provide financial support for crop insurance companies to encourage scale-up of crop insurance programs specifically directed at support for maize farmers (Current scheme covers input credit for maize land where inputs are received on credit from a farmers group)  
- Support the development of a better indexing system to account for highly variable rainfall regimes  
- Share in design of diversified products (e.g. insurance for grain stored under warehouse receipt systems or other bulk storage arrangements; agro-dealer packages)  
- Promote better information campaigns and customer service |
ON BEST PRACTICE FARMS, FERTILIZER EXPENSES REPRESENT 30% OF TOTAL PRODUCTION COSTS

Benchmark maize farmer economics
$USD per farmer, per hectare

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost ($USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Preparation</td>
<td>$8</td>
</tr>
<tr>
<td>Ploughing</td>
<td>$45</td>
</tr>
<tr>
<td>Seed Purchases</td>
<td>$18</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>$154</td>
</tr>
<tr>
<td>Financing 3</td>
<td>$8</td>
</tr>
<tr>
<td>Herbicide Application</td>
<td>$27</td>
</tr>
<tr>
<td>Weeding</td>
<td>$51</td>
</tr>
<tr>
<td>Harvesting</td>
<td>$393</td>
</tr>
<tr>
<td>Post Harvest</td>
<td>$46</td>
</tr>
<tr>
<td>Warehouse Storage Credit</td>
<td>$24</td>
</tr>
<tr>
<td>Bagging 4</td>
<td>$42</td>
</tr>
<tr>
<td>Transport 5</td>
<td>$19</td>
</tr>
<tr>
<td>Total cost production</td>
<td>$523</td>
</tr>
<tr>
<td>Revenues (April-14)</td>
<td>$819</td>
</tr>
</tbody>
</table>

Manual weeding practices now increasingly supplemented by herbicides use

Currently only ~10% of farmers utilize the recommended rate 250kg/ha. of fertilizer

1. Based on mainly animal traction (Oxen and cows)
2. Source: CORAF survey 38% of seed is purchased
3. Based on the assumption of 15% interest charges on Fertilizer, Seed & Herbicide
4. Assumed bagging costs of 550CFA ($1.17) per 100kg bag with an average yield of 35 bags per hectare
5. Average farmer responses stated costs of 250CFA ($0.53) per bag and the yield of 35 bags per hectare

Recommended rate of application for fertilizer is 3 bags of NPK and 2 bags of Urea

Note: Assumes an exchange rate of 470CFA per USD

Sources: Context Network stakeholder and field farmer interviews, AGROSTAT Market Analysis (2012)
<table>
<thead>
<tr>
<th>Key Intervention Elements</th>
<th>Potential Programs Formats</th>
<th>Size, Scalability &amp; Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cropping Season Credit</strong> is required to enable SHFs to purchase maize seed, fertilizer and herbicides</td>
<td>Regional micro-finance groups partnered with farmer associations and banks</td>
<td>Maize crop input financing to reach 190,000 maize farmers within 10 years (28% of the total)</td>
</tr>
<tr>
<td><strong>Post-harvest Credit Extension:</strong> Should extend post-harvest, so that SHFs can time their sales to secure attractive market prices</td>
<td>Crop insurance, voluntarily linked with farmer associations and/or microfinance groups.</td>
<td>Crop insurance for 50,000 maize farmers in Burkina within 10 years – (14% of the total)</td>
</tr>
<tr>
<td><strong>Crop Insurance:</strong> This is intended to overcome SHF reluctance to risk cash outlays for intensification</td>
<td>Collaboration with Agrodia and its agro-dealer members to ensure input supplies physically available and that financing/insurance arrangements are facilitated</td>
<td>Intensive maize production to extend over 35% of the Burkina maize crop area (up from 7% in 2013-14)</td>
</tr>
<tr>
<td><strong>Input Supply &amp; Use:</strong> Facilitate input availability and extension training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Key Dependencies & Risks

- Risk of loan default, if strong farmers associations or village level groups fail to cover individual farmers’ inability to repay loans
- A run of poor harvests could lead to erosion of crop insurance company equity, associated premium increase or reduction of payouts
- Government actions could disrupt the input supply market, so that Agrodia dealers become reluctant to support free-market-based initiatives

### Gain to SHF (est.)

- Higher yields: Maize is a very responsive crop if intensification strategies are used – $115/ha gain
- Higher sales price: Pooled sales deferred to several months post-harvest are more profitable (this gain also involves Intervention 2, where the combined financial and storage benefits are shown)

### Leading Stakeholders

- **Caisse Popular:** Largest micro-finance company focused on agric. in Burkina
- **Orabank:** Prominent in agricultural loans and encouraging development of warehouse receipt systems
- **PlaNet Guarantee:** Has managed a crop insurance pilot project in Burkina since 2012, and is planning to scale-up
- **INERA:** Govt. agency responsible for basic seed production and seed certification
- **AGRODIA:** Agro-dealer association supported by AGRA. Manages seed subsidy program.
**INTERVENTION #2: LOCAL AGGREGATION, STORAGE AND GROUP MARKETING**

2. Local aggregation, storage and group marketing

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
<th>Recommended Approach</th>
</tr>
</thead>
</table>
| Farmer technical capacity (knowledge of crop production and post-harvest handling and conditioning techniques; lack of skills in farm management and literacy) limit farmer’s ability to take advantage of aggregation and group marketing | - Capacity building for members of farmers’ organizations at all levels (technical, family farm management, literacy)  
- Facilitate the construction of aggregation and storage facilities  
- Facilitate the provision of cleaning, husking, dehulling services to village clusters.  
- Promote warehouse receipt system at village and commune level to provide cash after harvest for income generating activities,  
- Promote large scale aggregated storage and marketing by provincial and regional farmer organizations | - The prohibitive cost of storage infrastructure at all levels  
- Weak management capacity and analytical skills to negotiate favorable financial terms and timing of sales  
- High cost and sustainability of capacity building interventions at farmer level | - Capacity-building for farmer organizations at various levels;  
- Develop or adapt warehouse receipt systems that balance flexible access and authorization for sale  
- Provide loan support for storage facility construction and conditioning equipment  
- Establish a farmer organization grant fund to support member training and special projects  
- Assist farmer organizations to develop strategies to enhance group solidarity and to increase membership |
| Smallholder grain varies in quality and includes foreign matter, broken and disease/pest damaged grain. |                                                                                  |                                                                                         |                                                                                      |
| Poor quality of on-farm storage leads to excessive post-harvest loss as well as quality deterioration |                                                                                  |                                                                                         |                                                                                      |
| Farmers sell at low post harvest prices in small lots, leaving the accumulation and storage price gains to merchants |                                                                                  |                                                                                         |                                                                                      |
### INTERVENTION #2: KEY ASPECTS OF LOCAL AGGREGATION, STORAGE 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>• Cohesive farmer organizations at village and communal levels are needed to effectively benefit from aggregated storage and group marketing</td>
<td>• Farmers’ Organizations have loan options including third party warehouse receipt system; farmer organization managed warrantage system; line of credit for advance payment of members’ production stored for future marketing</td>
<td>• Maize post-harvest credit to reach 85,000 maize farmers within 10 years (14% of the total)</td>
</tr>
<tr>
<td>• Network of secure storage facilities of various capacities (100 T to 500 T) required – scaled according to village-level need</td>
<td>• Farmer organization establishes service center (mobile or stationary) to assist members in cleaning and conditioning grain</td>
<td>• This intervention will develop in parallel with Intervention 1</td>
</tr>
<tr>
<td>• Warehouse receipt system to facilitate income generation of off-season productive activities</td>
<td>• NGOs reinforce the capacity of farmer organizations and assist them to increase membership</td>
<td>• Scalability will depend on active membership in farmer organizations and the ability of provincial and regional unions to attract new members</td>
</tr>
</tbody>
</table>

### Key Dependencies & Risks
- Financial institutions need to partner with groups that can responsibly underwrite individual loans. Capacity building is essential to achieve this
- Conditions for the warrantage system need to be flexible so that farmer organizations can participate in bulk deliveries to large-scale purchasers when prices are favorable
- Farmers need the analytical skills to be able to determine if and when to participate in a warrantage system

### Gain to SHF (est.)
- The typical price gain over three to six months post-harvest is 20-30%, which would should cover administrative and storage costs in system managed by farmer organizations.
- Bulk delivery to institutional buyers by passing the assembler trader system, can add another 10-20% price gain

### Leading Stakeholders
- **Farmer Organizations**
  - UGCPA – Boucle de Mouhon region
  - COPSA-C – Sud Ouest region
  - UPPA – Hauts Bassins region
  - UPPA – Hauts Bassins region
  - UPPA – Hauts Bassins region
  - FNZ – Centre – Ouest region
- **Institution-building**
  - Oxfam - international NGO that is Belgian and Spanish in Burkina Faso
  - IFDC – US based development NGO
  - INERA - government seed research organization
  - SNV - Dutch International NGO
### INTERVENTION #3: PROMOTE UPGRADING OF PROCESSING INDUSTRY

#### 3. Promote Upgrading of Processing Industry

<table>
<thead>
<tr>
<th>Constraints Addressed</th>
<th>Potential Solutions</th>
<th>Issues + Considerations</th>
<th>Recommended Approach</th>
</tr>
</thead>
</table>
| • Inability of industrial processors to compete with micro and small mills due to effect of different processing systems on product taste  
  • Artisan mills per-soak their grain, which adds a distinctive, attractive flavor that cannot be duplicated in a large-scale mill  
• Lack of compliance with hygienic requirements for processing and finished products in small mills  
• Lack of business know-how and poor or no marketing done for finished products  
• Lack of access to equipment / most often inadequate | - Facilitating the development of financial products aimed at company investments (machinery & equipment, etc..)  
- Training small processors on norms and hygiene needed  
- Capacity building on all business related topics  
- Promoting quality labels to create demand for good quality finished products | - Identifying efficient technologies that could cater for the taste requirement while still meeting scaled-up production efficiency needs  
- Scaling up while maintaining quality and hygiene requirements  
- Availability of quality raw materials with the required characteristics to ensure regular supply of processed products | - Provide Business Development Services  
- Establish linkages between processors and farmers, and processors and markets  
- Increase urban demand for processed products |
### INTERVENTION #3: KEY ASPECTS OF UPGRADING OF PROCESSING INDUSTRY

#### Key Intervention Elements
- Identification of serious and determined women’s processing groups
- Leverage existing processor networks in Burkina like ATCB
- Management training in both financial and marketing skills is essential for effective operations.
- Brand development and product diversification is key

#### Potential Programs Formats
- Partners to develop selection criteria for beneficiary women’s group
- Development of processor needs and requirements on all levels
- Close revisit of the preferred processing technique and impact on taste
- Focus on market and product development to diversify market
- Leverage existing networks

#### Size, Scalability & Timing
- 1-3 year support based on group needs
- Scheduled one-on-one capacity building and technical support to be paired up with loan (will increase program success and loan repayment rates)
- Scalability will be limited to processors that are willing to invest and grow current operations

#### Key Dependencies & Risks
- Maintaining current processing techniques while expanding is crucial for the success of the intervention
- Assumes good quality input and raw materials
- Assumes maize prices will remain the lowest cereal prices

#### Gain to SHF (est.)
- The direct impact is in reducing transaction costs, by ~5%
- This is due to a combination of lower transportation costs and a more even-sided bargaining environment with a local buyer available

#### Potential Partners
- **GRET** – French NGO with good experience in technical and business support across Africa
- **Afrique Verte** – Good grain marketing and processing experience focused on the West African Sahel. Wider span across interventions
- **ATCB** – Association des Transformateurs de Céréales au Burkina – Good network of processors
- **RTCF** – Réseaux des Transformateurs de Céréales au Faso – Good marketing network for finished products
4 Stakeholder Profiles
PHASE 2 BURKINA MAIZE EXECUTIVE SUMMARY

Maize area has expanded 8x within the past 20 years, to become a major cereal crop in Burkina, encroaching on sorghum and millet in western BF higher rainfall areas
• A minority of SHFs already use input-intensive production systems:
  – ~40% use improved varieties, but <10% apply recommended fertilizer rates
• Production and consumption have accelerated by ~11%/yr. since the grain price rise of 2008
• Maize 7% cheaper than sorghum, and consumed increasingly on-farm in West and in cities

Maize was developed as a food security crop first, then as cash crop by cotton companies in Burkina. A greater share (~50%) is still marketed in high producing regions than is the case with sorghum & millet
• Hybrid maize takes <5% of the seed market now, but high-yielding products are on offer
• Processing absorbs 20% of maize sales
• Poultry feed makes up almost half processing share and is expanding at ~9%/yr.

Most promising interventions focus on reinforcing trend to intensification and high input use by expanding SHF numbers empowered to participate
• INT #1 Risk Mitigation of Adoption of Inputs
• INT #2 Local Aggregation Facilities
• INT #3 Upgrading of Processing Industry
• $463/annum average benefit projected for 190,000 SHFs (28% of total) at Year 10 (base)

The intensification of maize production requires a network of cooperating stakeholders who straddle the technical, financial, risk-mitigation and market access areas
• Farmer associations (UGCPA; COPSA-C; UPPA Hauts Bassins, FNZ, NGO’s (SNV, IFDC, Oxfam etc.)
• Processing (Afrique Verte, GRET, ATCB)
• Micro-finance groups (Caisse Populaire; Graine; Microfinance Plus)
• Banks (Ecobank; Orabank; Coris Bank)
• Crop insurance (PlaNet Guarantee)
## Stakeholders Span Different Portions of the Interventions

<table>
<thead>
<tr>
<th>Stakeholder Profiles</th>
<th>INT# 1: Risk Mitigation for Adoption of Inputs</th>
<th>INT# 2: Local Aggregation Facilities</th>
<th>INT# 3: Upgrading of Processing Industry</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>UGCPA</td>
<td></td>
<td></td>
<td></td>
<td>B.Mouhon</td>
</tr>
<tr>
<td>COPSA-C</td>
<td></td>
<td></td>
<td></td>
<td>Southwest</td>
</tr>
<tr>
<td>UPPA Houet</td>
<td></td>
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<td>H.Bassin</td>
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<tr>
<td>UPPA Kenedougou</td>
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<td></td>
<td></td>
<td>H.Bassin</td>
</tr>
<tr>
<td>UPPA Tuy</td>
<td></td>
<td></td>
<td></td>
<td>H.Bassin</td>
</tr>
<tr>
<td>FNZ</td>
<td></td>
<td></td>
<td></td>
<td>Centre-West</td>
</tr>
<tr>
<td>All</td>
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<td>All</td>
</tr>
</tbody>
</table>

### Farmer’s Organization

- Farmer’s Organization Capacity Building
- Input Supply
## Stakeholders Span Different Portions of the Interventions

<table>
<thead>
<tr>
<th>Stakeholder Type</th>
<th>INT# 1: Risk Mitigation for Adoption of Inputs</th>
<th>INT# 2: Local Aggregation Facilities</th>
<th>INT# 3: Upgrading of Processing Industry</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Institutions - Banks</td>
<td><img src="image1" alt="Ecobank" /></td>
<td><img src="image2" alt="Orabank" /></td>
<td></td>
<td>All</td>
</tr>
<tr>
<td>Financial Institutions - MFI</td>
<td><img src="image3" alt="Coris Bank International" /></td>
<td></td>
<td></td>
<td>All</td>
</tr>
<tr>
<td>Processors Capacity Building</td>
<td><img src="image4" alt="PlaNet Guarantee" /></td>
<td><img src="image5" alt="Gret" /></td>
<td><img src="image6" alt="ATCB" /></td>
<td>All</td>
</tr>
</tbody>
</table>

**Stakeholder Profiles**

- **INT# 1: Risk Mitigation for Adoption of Inputs**
- **INT# 2: Local Aggregation Facilities**
- **INT# 3: Upgrading of Processing Industry**
### STAKEHOLDERS – FARMER ORGANIZATIONS

Evaluation of characteristics and services offered to farmers

<table>
<thead>
<tr>
<th></th>
<th>Providing Technical Training</th>
<th>Providing Farm Management Training</th>
<th>Facilitation of input credit</th>
<th>Group Market Development</th>
<th>Managerial Capability</th>
<th>Financial Sustainability</th>
<th>Storage Facilities</th>
<th>Region in Burkina Faso affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>UGCPA-BM</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Boucle du Mohoun</td>
</tr>
<tr>
<td>COPSA-C</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Sud-Ouest</td>
</tr>
<tr>
<td>UPPA-Houet</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
<td>Hauts Bassins</td>
</tr>
<tr>
<td>UPPA-Kenedougou</td>
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<td>Hauts Bassins</td>
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<tr>
<td>UPPA-Tuy</td>
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<td>Hauts Bassins</td>
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<td>FNZ</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Centre-Ouest</td>
</tr>
</tbody>
</table>

Organizations are relatively weak in: 1) Farmer training (technical and farm training) 2) Facilitation of input credit 3) Storage facilities

Capacity building would improve these services provided to members

---

1 Field school, IPM, agronomic practices, post-harvest handling and conditioning etc
2 Includes fiduciary responsibility, literacy, family farm management training
**STAKEHOLDERS – FARMERS ORGANIZATION CAPACITY BUILDING**

| **Oxfam** | In Burkina Faso since 1970, Oxfam has worked to increase farmer incomes by improving production, and by helping to restructure farmer organizations to market cereals, rice, fruit and cotton. Also, it works to increase the capacity of communities to address the consequences of climate change on livelihoods.  
**Strengths**: Capacity building of farmers’ co-ops and unions; assistance establishing revolving credit funds |
| **IFDC** | The International Fertilizer Development Center is an international organization, focusing on increasing productivity across the agricultural value chain in developing countries. This is achieved by the creation and transfer of effective and environmentally sound crop nutrient technology and agribusiness expertise.  
**Strengths**: Agribusiness clusters and integrated soil fertility management |
| **INERA** | The Environmental and Agricultural Research Institute of Burkina Faso was created in its current form in 1996. It is responsible for crop research, livestock research, forestry research and research on natural resource management.  
**Strengths**: Technical training, variety development including breeder seed; establishing multi-actor platforms for value chain development |
| **SNV** | SNV is a Dutch international NGO active in Burkina Faso since 1970. Technical advisors work in 8 regions to coach local organizations to strengthen their capacities in agriculture through value chain development.  
**Strengths**: Capacity building of farmers cooperatives and unions; family farm management; and market led development |
STAKEHOLDERS – SEED INPUT SUPPLY

- NAFASO, with sales of $4M/yr., is the largest seed company in Burkina Faso (AGRA-assisted)
- NAFASO contracts for basic seed production with INERA
- They accounted for ~1/4 of the certified maize and sorghum seed sold in 2013

- INERA is the Burkinabe Government agency charged with plant genetics R&D and basic seed production
- Seed companies managers say that financial constraints on pre-basic and basic seed multiplication inhibit the speedy introduction of improved varieties
- Hence, any effort to expand the rate of introduction and dissemination of improved seed must involved reinforcement of INERA's capabilities in these areas
• AGRODIA, established in 2004, is a Burkina Faso-based non-profit organization that aims to promote the interests of wholesalers and retailers of agricultural inputs in order to improve their living and working conditions through the provision of information, training and lobbying
• The association started off with 52 members and now has over 600 members across 13 provinces
• Between 2001 and 2014, Agrodia collaborated with IFDC on the Prodib project, which set out to improve the availability, accessibility and affordability of agro-inputs. In the first 2 years, the project provided inputs to over 272,000 smallholder farmers. While it has made significant achievements (> 3,108mt of certified seeds sold, more than 67mt of fertilizers sold), access remains difficult for the vast majority of smallholder farmers

• The UNPS-BF (National Union for Seed Producers in Burkina Faso) was set up nearly 10 years ago in December 2014
• It has 4,000 members across 13 regions and 43 provinces of Burkina Faso. Its members are the regional and provincial unions of seed producers.
• It has 3 main focus areas: production, marketing and the establishment of demo plots and windows
• It offers to its members free monitoring and certification; bulk seed sales; capacity building of its members in collaboration with DGPV, FAO, INERA and WASA.
• The Union came across as very well-organized and professional
STAKEHOLDERS – FINANCIAL INSTITUTIONS - BANKS

**Ecobank**
- Established in 1985, Ecobank is part of a leading pan-African bank with operations in 35 countries across the continent (incl. both Burkina Faso and Mali).
- Since 2009 acquisition of Caisse Nationale de Credit Agricole, more focus on agricultural loans.
- Largest loans to cotton producers (CFA 7-8bn to Sofitex) + other producers (CFA 40-43bn p.a).
- Official partner of Planet Guarantee for past 2 years.

**Coris Bank International (CBI)**
- Established in 2008 and is the 2nd largest bank in Burkina Faso. Also known as ‘La Banque Autrement’ or ‘The Other Bank’.
- Besides Burkina Faso, it is also present in Ivory Coast and plans to open branches later this year in both Mali and Togo.
- It doesn’t claim to be an agricultural bank but places significant emphasis on alleviating poverty by accompanying the agricultural sector and financing agricultural production.
- CBI is focused on the SME sector, and within the agricultural sector, it finances individuals but also and in particular organized associations, farmer groups, cooperatives including COPSA-C and ACAP for purchasing inputs and the warehouse receipt system.
STAKEHOLDERS – FINANCIAL INSTITUTIONS - BANKS

• Oikocredit, established in 1968, has grown into a worldwide cooperative and social investor, providing funding to the microfinance sector, fair trade organizations, cooperatives and small to medium enterprises. Its headquarters are in The Netherlands.
• In 2013, Oikocredit focused on serving low-income earners around the world, with loan approvals reaching € 297 million, up 27% from € 234 million in 2012.
• Oikocredit currently has over € 70 million invested in Africa across a range of sectors, with the plan for further expansion. Financing of both agricultural enterprises and microfinance institutions are and will remain a core part of the portfolio.

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STAKEHOLDERS – FINANCIAL INSTITUTIONS – MICRO FINANCE

GRAINE (MFI)

- GRAINE was born out of a former CRS project and became a legal establishment under Burkina law in 2006
- Its activities cover 800 villages across 21 provinces and 9 regions and its customer base is nearly exclusively women farmers (small commerce, processing)
- GRAINE has no prior exposure to food crop lending but is currently experimenting with a sesame project in collaboration with IRD (France)

DCPO

- Part of the Reseau Des Caisses Populaires, largest MFI in Burkina, DCPO is the regional office for the West
- Its focus is on alleviating poverty and improving the livelihood of its members, mostly Women Groups in villages to whom it provides not only financial resources but also training in basic management skills, how to run your own business etc.
- Agricultural loans account for 20% of the total portfolio, with credit for input materials taking up 80% of the former
- According to other banks we met, the RDCP is over-liquid and not especially looking for partners

Microfinance Plus (Banfora)

- Microfinance Plus was established in 2008
- Agricultural loans (mostly for inputs and equipment, livestock), fastest growing segment, account for over 50% of total, and reached CFA122m in 2013 (vs. 8m in 09)
- Active in warehouse receipt system and with crop insurance since PG launch
- Fast growth company, became profitable in 2011, and seek additional capital injection or loans (current banks are Orabank and Bank of Africa)
First encounter with Planet Guarantee (PG) via various VC actors (banks, MFIs, distributors)

In 2011, PG pioneered a pilot scheme for index-based crop insurance, for which it remains the only provider in West Africa to-date. Allianz is the insurer but the entire portfolio is re-insured, of which 80% with SwissRe, the remainder with 2 African re-insurers

Regional focus on Burkina Faso, Mali, Senegal, Ivory Coast, Benin; fastest growth in Mali and BF

List of partners (not exhaustive): AECF, USAID, Allianz, IFC, AFC, Grameen CA, AFD

Crop focus on maize (74% of total ground covered), groundnut (15%) and cotton (11%) but PG is exploring the idea of launching a similar product for sorghum and millet and sesame

In 2013, c. 18,000 persons (vs. 1,540 in 2012 and 800 in 2011) were insured across Burkina, Mali and Senegal for a total insured amount of EUR920,000 (vs. 195,000 in 2012 and EUR90,000 in 2011). The target for 2017 is 250,000 insured
STAKEHOLDERS – PROCESSING

Founded in 1976, GRET is a French development NGO present in 33 countries intervening in 16 subjects. GRET provides expertise in feasibility analysis, monitoring, assessment, organizational and institutional, and sectorial or international policy development.

Afrique Verte has been active in Burkina Faso since 1990. In 2005, the Burkinabe association "APROSSA - Afrique Verte Burkina" was created

- Organizes annual cereal markets each year that bring together representatives of SHF organizations, processors, community cereal banks and others
- Supports small businesses that process cereals and facilitates meetings to improve value chain linkages among processors, small-farmer organizations and private traders, and also women’s processing groups who are associated with the Burkina Network of Processors (RTB)

ATCB
Association de Transformateurs de Céréales au Burkina

Processors Association grouping more than 20 processors in Ouagadougou, Bobo-Dioulasso, Ouahigouya, Dédougou, Fada N’gourma and Banfora. The ATCB is a partner of Afrique Verte and sometimes receives technical and operational support from them. The focus of members of the ATCB is on the Ouagadougou market, and most of the processing units aim to gain access to the urban market.
Appendix
A THEORETICAL BASIS FOR CROP INSURANCE HAS BEEN DESCRIBED IN AGRICULTURAL DEVELOPMENT LITERATURE

UNDERWRITING AREA-BASED YIELD INSURANCE TO CROWD-IN CREDIT SUPPLY AND DEMAND*

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STEPHEN BOUCHER University of California, Davis - boucher@primal.ucdavis.edu

Abstract

Recent theoretical and empirical evidence suggests that risk (especially covariant risk that is correlated across producers) may discourage both the supply of agricultural credit and the willingness of small holders to utilize available credit and enjoy the higher expected incomes credit could make available to them. One possible resolution to this problem is to remove risk from the system by independently insuring it. However, conventional (all hazard) crop insurance has in almost every instance been rendered financially unsustainable by moral hazard and adverse selection problems. This paper instead analyzes two index-based insurance schemes, one based on a weather index, and a second based on measured average yields. While these index insurance products do not protect the farmer from all risks, our econometric analysis (which is based on data from the north coast of Peru) shows that they could have substantial value to the producer and could also crowd-in credit supply from lenders reluctant to carry too much covariant risk in their loan portfolios. We also show that insurance based on measured yields is markedly superior to a weather index (for both borrowers and lenders). We close by arguing that present and past public good failures justify public intervention in this area, and analyze the feasibility of a public scheme to initially underwrite the costs and uncertainties associated with area-based yield insurance.

ENABLING ENVIRONMENTS

Enabling Environment and Infrastructure

- Province, District and Village-level post-harvest conditioning and storage facilities are required to strengthen farmer bargaining power in the marketplace. Investments in storage at various levels are necessary to facilitate access to credit, warehouse receipt systems, and group marketing.
- Financial infrastructure adapted to rural finance is required to support input credit and post-harvest aggregated storage — microfinance institutions, banks. Few loans are now made for food crop production.

Infrastructure

- Banks in Burkina Faso offer agricultural loans and appear eager to expand their involvement. Moderate interest rates coupled with administrative fees and insistence on collateral make it difficult to get loans and to repay them.
- Farmer organizations typically pledge repayment if individual members default.
- The processing sector is relatively under-developed in Burkina — four flour mills and only one brewery. Competition from Ivory Coast and Ghana in flour production is seen as a constraint.

Business and Finance Environment

- Very generous government seed and fertilizer subsidies are evidence of the commitment to intensify crop production but they are inadequate to support the expansion of maize production.
- Networks of farmer organizations at local, commune, provincial and national levels exist. The range of services offered and effectiveness differs by group, but capacity building and proposed interventions can be based on existing structures.

Industry Bodies and Sector Policies

- INERA is active in maize breeding and has produced many productive maize varieties including two maize hybrids that are well adapted to Burkina maize growing areas.
- Extension services support farmer selection for subsidies and co-sign the paperwork required at each agro-dealer involved in the subsidy program.
- Both INERA and the extension services provide support to farmer field schools, demonstrations and farmer training supported by donor projects.
### Nomenclature des zones socio-rurales

<table>
<thead>
<tr>
<th>Zone</th>
<th>Climat</th>
<th>Région</th>
<th>Agriculture</th>
<th>Elevage</th>
<th>Autres</th>
<th>Nom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pré-guinéenne</td>
<td>Sud-ouest</td>
<td>Céréales (sorgho, maïs) et tubercules (igname, taro)</td>
<td>Zone d'accueil et de sédentarisation</td>
<td>-</td>
<td>Pré-guinéenne, Sud-ouest, céréales (sorgho...) et tubercules (igname...)</td>
</tr>
<tr>
<td>2</td>
<td>Pré-guinéenne à rônières</td>
<td>Ouest</td>
<td>Céréales (maïs, riz), canne à sucre, anacarde, maraîchage</td>
<td>Zone d'accueil et de sédentarisation</td>
<td>Tourisme, forêts</td>
<td>Pré-guinéenne à rônières, Ouest, céréales (maïs, riz), anacarde, légumes et canne à sucre</td>
</tr>
<tr>
<td>3</td>
<td>Sud-soudanien</td>
<td>Ouest</td>
<td>Coton, céréales (maïs, riz), fruits, maraîchage</td>
<td>Zone d'accueil et de transhumance</td>
<td>Petit commerce</td>
<td>Sud-soudanien, Ouest, coton, céréales (maïs, riz), fruits et légumes</td>
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<td>Sud-soudanien</td>
<td>Sud-ouest</td>
<td>Céréales (sorgho, maïs), coton</td>
<td>Zone d'accueil et de transhumance</td>
<td>Pêche</td>
<td>Sud-soudanien, Sud-ouest, céréales (sorgho, maïs), coton</td>
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<td>5</td>
<td>Nord-soudanien</td>
<td>Ouest</td>
<td>Coton, céréales (maïs, sorgho) et sésame</td>
<td>Zone de transhumance, volaille</td>
<td>Noix de carité</td>
<td>Sub-sahélienne, Ouest, coton, céréales (maïs, sorgho) et sésame</td>
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<td>6</td>
<td>Sub-sahélien</td>
<td>Nord-ouest</td>
<td>Céréales (sorgho, fonio, riz), maraîchage, sésame</td>
<td>Elevage sédentaire et transhumance</td>
<td>Pêche, noix de carité, transhumance</td>
<td>Nord-soudanien, Nord-ouest, céréales (sorgho, fonio), maraîchage, sésame</td>
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<td>7</td>
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<td>Centre-ouest</td>
<td>Céréales (maïs, mil), jardinage,</td>
<td>Zone de transhumance, volaille</td>
<td>Noix de carité, commerce</td>
<td>Nord-soudanien, Centre-ouest, céréales (sorgho, mil), jardinage, émigration (envois d'argent)</td>
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<td>Sud</td>
<td>Céréales (sorgho, maïs), tubercules (igname, manioc)</td>
<td>Zone d'accueil et de transhumance</td>
<td>Commerce transfrontalier</td>
<td>Nord-soudanien, Sud, céréales (maïs, sorgho), tubercules (igname, manioc, tourisme)</td>
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<td>Centre-est</td>
<td>Céréales (sorgho, riz), arachide, patate et coton</td>
<td>Zone d'accueil et de transhumance</td>
<td>Pêche, commerce</td>
<td>Nord-soudanien, Centre-est, céréales (sorgho, riz), arachide, patate et coton</td>
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<td>Sud-est</td>
<td>Céréales (sorgho, mil), coton</td>
<td>Zone d'accueil et de transhumance</td>
<td>Petits commerces</td>
<td>Nord-soudanien, Sud-est, céréales (sorgho, mil), coton, tourisme</td>
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<td>Péri-urbain, maraîchage</td>
<td>Agriculture et élevage péri-urbains</td>
<td>Petit commerce</td>
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<td>Centre</td>
<td>Céréales (sorgho, mil), voandzou, maraîchage</td>
<td>Elevage domestique et péri-urbain</td>
<td>Petits commerces</td>
<td>Nord-soudanien, céréales (sorgho, mil), maraîchage, patate, émigration (envois d'argent)</td>
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<td>Sub-sahélien</td>
<td>Centre-nord</td>
<td>Céréales (sorgho, mil), voandzou, maraîchage</td>
<td>Elevage domestique</td>
<td>Commerce, gomme araboqué</td>
<td>Sub-sahélienne, Centre-nord, Céréales (sorgho, mil), voandzou, maraîchage agropastoral à dominante agricole</td>
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<td>14</td>
<td>Sahélien</td>
<td>Nord</td>
<td>Céréales (mil, sorgho), niébé, maraîchage</td>
<td>Elevage semi-nomade extensif</td>
<td>Orpaillage, gomme araboqué</td>
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<td>Nord-est</td>
<td>Elevage semi-nomade, Céréales (mil), niébé</td>
<td>Elevage nomade extensif</td>
<td>Orpaillage</td>
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<td>Céréales (mil, sorgho), voandzou,</td>
<td>Elevage sédentaire et transhumance</td>
<td>Commerce transfrontalier</td>
<td>Sub-sahélien, Est,</td>
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LARGELY DRIVEN BY RAINFALL PATTERN, BURKINA FASO CAN BE SPLIT INTO 4 MAIN AGRO-ECOLOGICAL ZONES

- South Sudan agro-ecological zone receives most rainfall and has more diverse crops grown.
- North Sahel agro-ecological zone receives least rainfall and has less crop diversity.