Southern Africa Soy Roadmap – Zambia value chain analysis

November 2010 – February 2011




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Executive summary (1/3)

- **The Zambian soy market is self sufficient and growing rapidly with some exports, with production dominated by commercial farmers and considerable scope for production growth**
  - With **production of 112k MT** and **consumption of 90k MT** in 09/10, Zambia is a **net exporter** of soy, and has been so in the recent past
  - **Production has grown** despite volatility as the **market has grown**; this has been largely achieved by increasing planting area rather than increasing yields
  - **85%** of this production is from **commercial farmers**
  - In theory, there is no cap on production as Zambia has **33m HA available for additional production**
  - The **price** for soy beans has been **volatile in the last 3 years**, peaking at $200 above the SAFEX price in 2008 and tracking SAFEX since then; this is partly due to currency fluctuations
  - The **cake market** (90k in 09/10) has been driven by the **growth of the poultry industry** which drives demand for feed
  - **This is expected to continue**, with the **cake market** rising to **194k MT domestic market by 2020**, driven by a rise in demand from poultry from 65k MT today to 140k MT in 2020
  - The **oil market is large enough to absorb all of the soy oil** produced in the country - it is currently equivalent to **390k MT** of soy beans, although recent imports of palm oil from East Africa which may breach COMESA may threaten the competitiveness of soy oil in the long term
  - Zambia is well placed to **export** soy to **Zimbabwe, South Africa and the DRC**, but high transport costs and inconsistent policy limit traded volumes today to ~20k MT beans and ~10k MT cake

Executive summary (2/3)

- **Despite a strong market and sufficient processing capacity, soy is a marginally attractive crop for commercial farmers due to a high cost base, poor transport infrastructure and an uncertain export policy; it is not an attractive crop for smallholders as they lack inputs, expertise and a market**
  - **Commercial production**:
    - While Inputs are available, they are expensive as they are imported and finance is expensive
    - Commercial farmers use the right inputs and have good agronomic practices giving and average yield of 2.6 MT / ha
    - However, at current cost of production ($398 / MT) and price ($350), soy is not a profitable crop for commercial farmers, with only the best farmers making money
  - **Smallholder production**:
    - Smallholders struggle to obtain inputs as ago dealers do not stock them
    - Smallholders use few inputs and have poor agronomic practices as this is a low priority crop compared with maize - they have yields of 0.9 MT / ha
    - smallholders struggle to find a market as they are not located in the main soy producing regions
    - When total costs are considered for smallholders, soy is only an attractive crop as it increases yields for maize through rotation; however, when considering only cash costs, soy is very attractive
  - **Processing**:
    - Zambia currently has good quality and excess processing capacity, with more coming on line - by the end of January, there will be 40% overcapacity, which would, in theory, allow Zambia to export soy cake (and sell the oil domestically), increasing the value retained in the country
    - Most processors are vertically integrated into feed manufacturers to livestock companies, so their focus is more on making sure they meet their own feed demand
  - **Enabling environment**:
    - Government policy in maize makes soy less attractive to smallholders and trade policy makes producers less inclined to consistently target export markets
    - High transport costs protect the country from imports but also reduce opportunities for exports and restricting the amount of land that is truly accessible for soy markets

Executive summary (3/3)

- **Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:**
  - **Reduce production costs** (particularly input, transport and finance costs)
  - **Improve smallholder agronomic practices**
  - Make **trade policy consistent** and **transparent**
  - Ensure that **palm oil imports adhere to COMESA rules**
  - Work with the **private sector** to **stabilise the market** for soy (particularly for smallholders)

- **There is the potential to improve the lives of 133k smallholders by improving the soy value chain**
  - Improving the yield and market access for smallholders would increase the incomes of the **61k smallholders** currently growing soy by **$128 p.a.**
  - If this attracted 5% of smallholders not currently growing soy, it would **benefit a further 62k smallholders**

Agenda

- **The Zambian soy market is self sufficient and growing rapidly with some exports, with production dominated by commercial farmers and considerable scope for production growth**

- Despite a strong market and sufficient processing capacity, soy is a marginally attractive crop for commercial farmers due to a high cost base, poor transport infrastructure and an uncertain export policy; it is not an attractive crop for smallholders as they lack inputs, expertise and a market

- Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:

- There is the potential to improve the lives of 133k smallholders by improving the soy value chain

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  - Trade
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Zambia is a land-locked, sparsely populated country in the central African plateau

Geography

- Landlocked country in with an area of ~750,000 sq km in the central African plateau
- With the Zambezi, Kafue, and Luangwa rivers, Zambia accounts for over 40% of Southern Africa's water reserves

People

- Zambia's population is ~11.6M (2006) with a growth rate of slowing to 1.9% due to HIV/AIDs
- 38% of Zambians live in urban areas
- More than 70 ethnic groups coexist peacefully

Politics

- Zambia gained independence in 1964 from the United Kingdom
- The Movement for Multiparty Democracy (MMD) party has held power since 1991
- Zambia exhibits strong support for the role of democracy and relatively free press

Economy

- Copper is Zambia's biggest export (70% of export earnings) and contributes ~10% to GDP
- Most Zambians work in agriculture, which accounted for 17.4% of GDP in 2007
- Unemployment is estimated to be 50%
- Kwacha exchange rate is highly correlated to copper prices and as a result, Zambia's managed float exchange rate has led to high currency volatility

Energy, communications, transportation

- Despite abundant hydroelectric resources, Zambia is unable to keep up with power demands
- Transportation infrastructure remains in poor condition and results in high transport costs

Source: Past TechnoServe work; "The Volatility of the Exchange Rate: A Case of the Zambian Kwacha" Economics Association of Zambia" 2010

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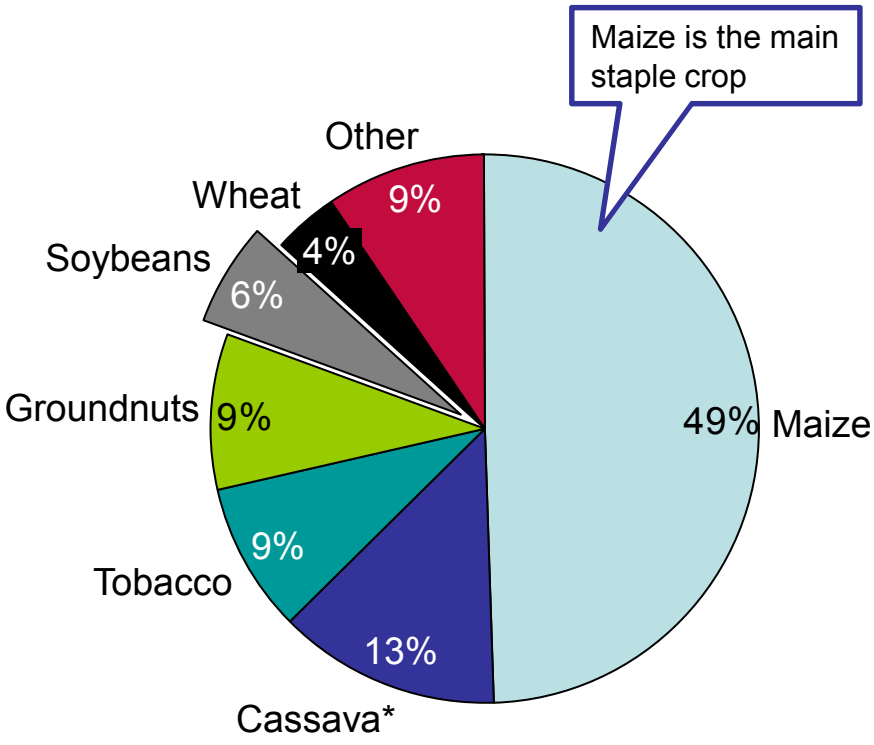
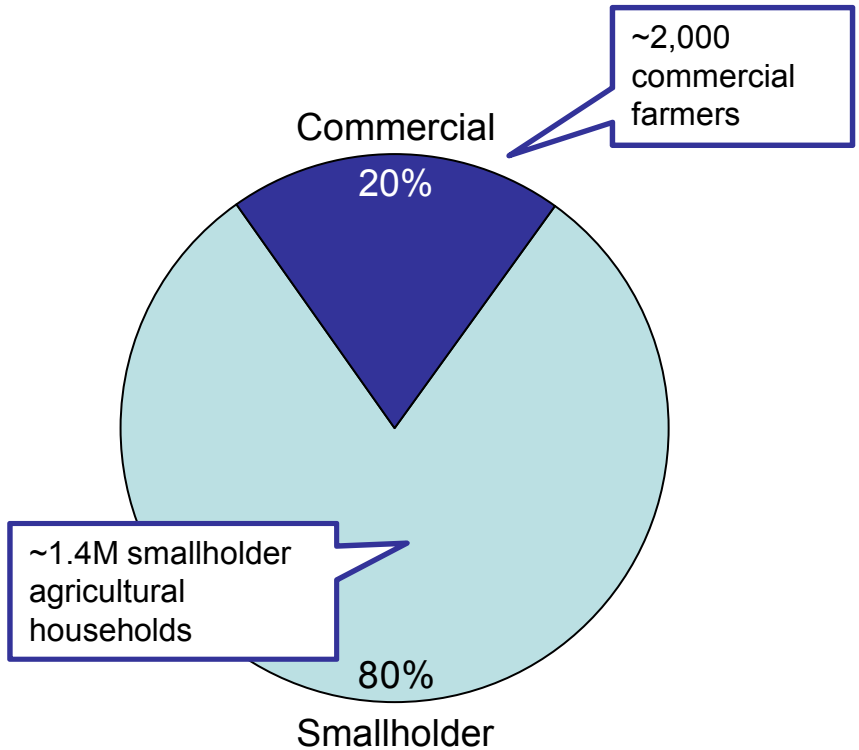
Smallholder maize currently dominates agriculture in Zambia; however, a small group of commercial farmers contribute significantly as well

Breakdown of agricultural output, %, 2009/10
100% = $643m

Breakdown by crop



Commercial vs. smallholder



Source: Ministry of Agriculture and Cooperatives; FAOstat; 2009/10 Crop Forecast Survey; FSRP "Fostering Agricultural Market Development in Zambia"
Note: * Based on 2008/09 production

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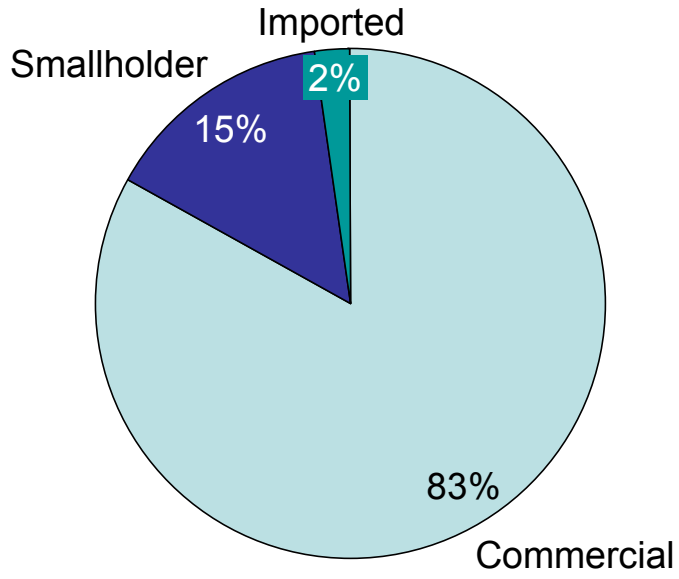
Zambia is a net exporter of soy, with 85% of supply coming from commercial farmers

Zambian soy market, %

Domestic consumption by source, 2009/10

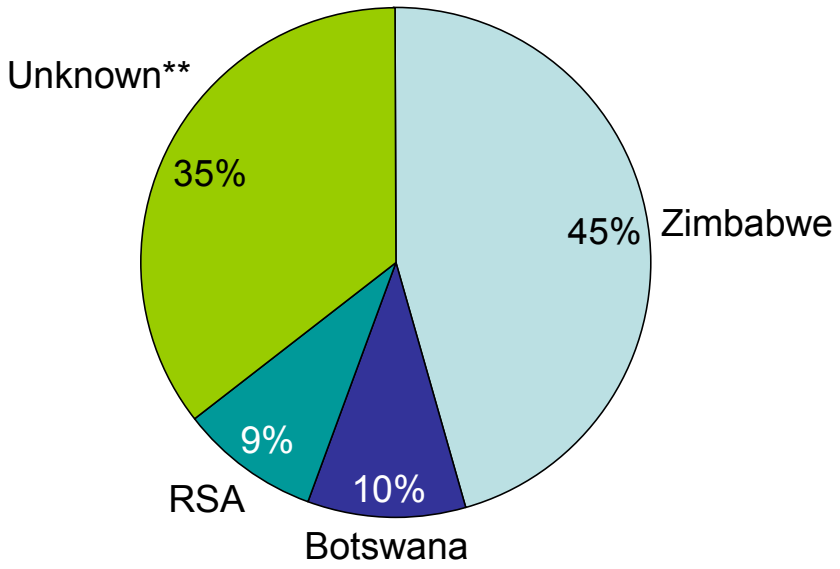
100% = 90k MT



- Imports are all informal
- Anecdotal evidence indicates smallholders have increased market share over the past 5 years

Exports by destination, 2010 YTD

100% = 22k* MT



- ~7k MT of cake was exported to Zimbabwe
- ~5k MT of feed was exported to DRC
- Beans are primarily exported by traders (Afgri, Zdenakie and Quality Commodities) while cake is primarily exported by Zamanita

Source: Central Statistical Office; Interviews

* Central Statistical Office reports YTD exports of 14K MT

** Botswana exports were likely significantly higher based on interviews with traders

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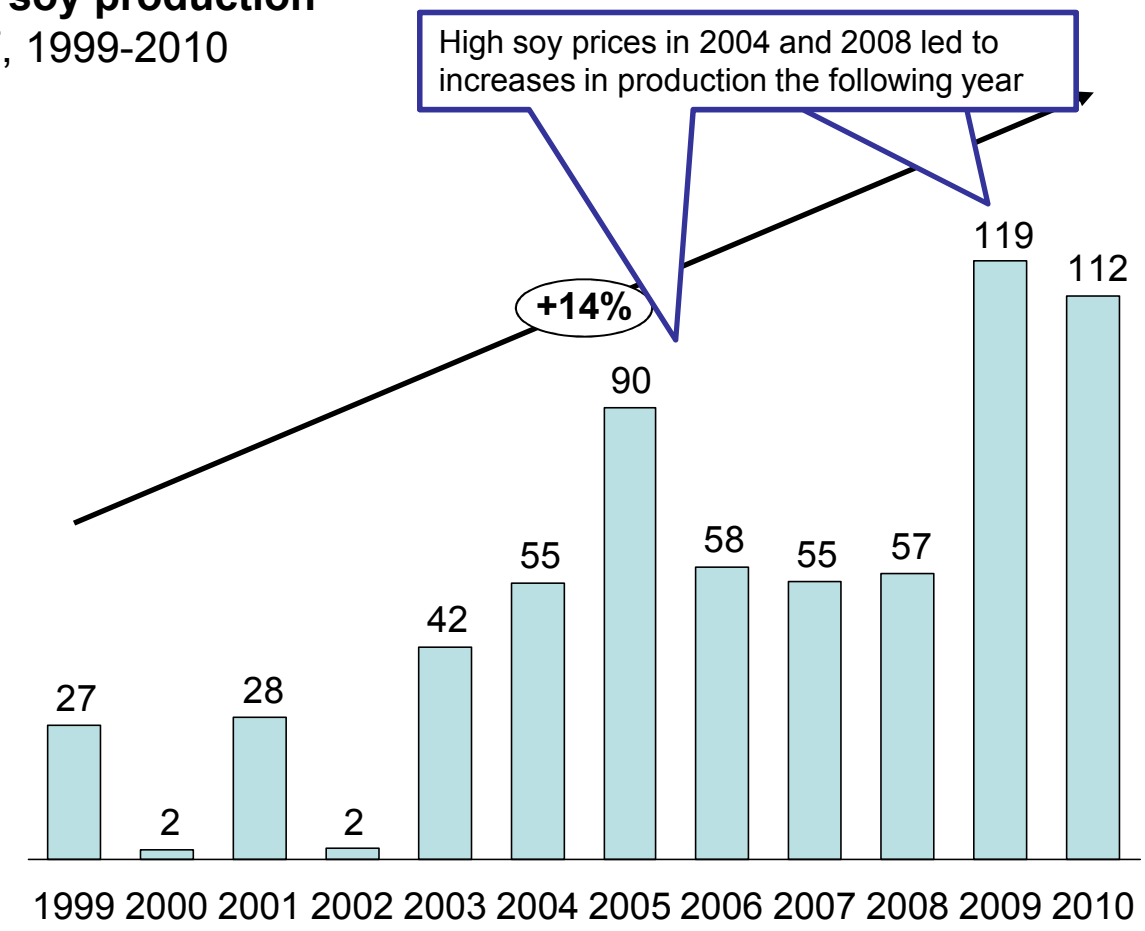
- Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:

- There is the potential to improve the lives of 133k smallholders by improving the soy value chain

Despite volatility cause by price fluctuations, soy production has grown by ~14% p.a. , reaching 112K MT in 2010

Zambia soy production
'000 MT, 1999-2010



- A ~150K MT** soy crop is expected in 2011 because large Food Reserve Agency (FRA) maize carryovers have made maize less attractive

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ha planted (000s)	11.7	2.6	16.8	4.0	17.4	33.2	65.2	44.0	38.9	32.4	64.7	62.3

Source: Ministry of Agriculture and Cooperatives; ZamBeef; Interviews
Note: * Crop Forecast Survey 2009/2010 indicates ~23% of production was from smallholders; however, experts believe it is closer to 15%; ** Estimate according to ZamBeef

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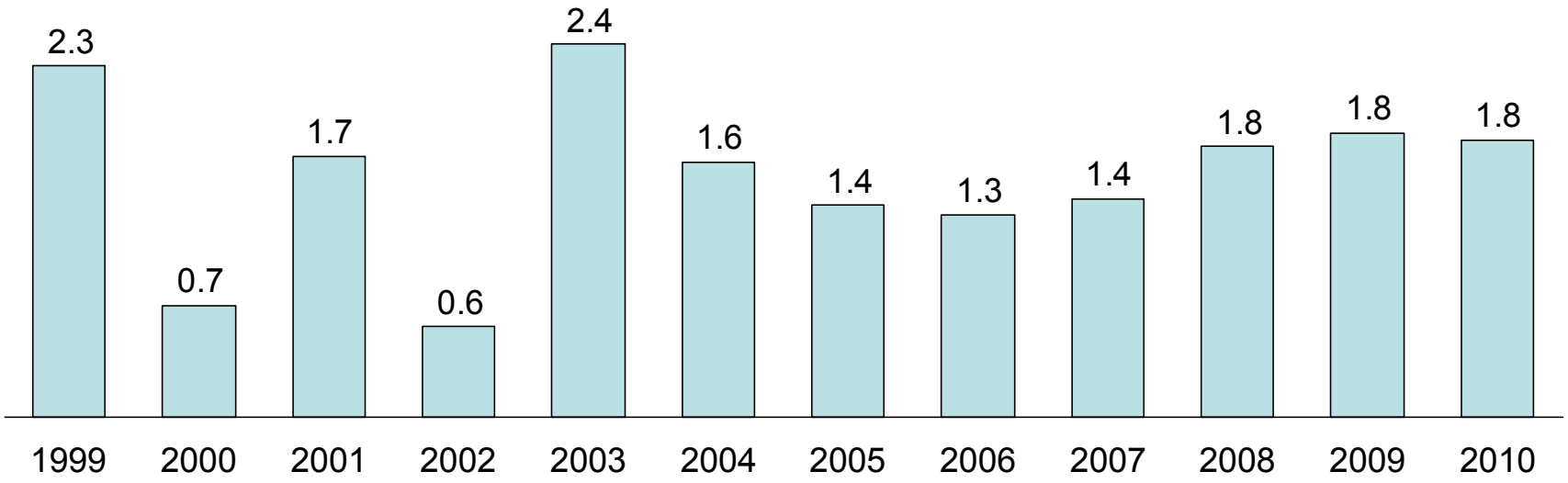
After significant historic volatility, yields have been stable for the last three years

Zambia soy yield
MT/ha, 1999-2010



- Weather variance has caused yields to vary widely from year to year, especially in the early 2000s when irrigation was less widely used by commercial farmers
- Weather impacts aside, smallholder yields and practices have remained fairly constant over time

Source: Ministry of Agriculture and Cooperatives, Crop Forecast Survey 2009/10, Interviews
Note: * Crop Forecast Survey 2009/2010 indicates ~23% of production was from smallholders; however, experts believe it is closer to 15%

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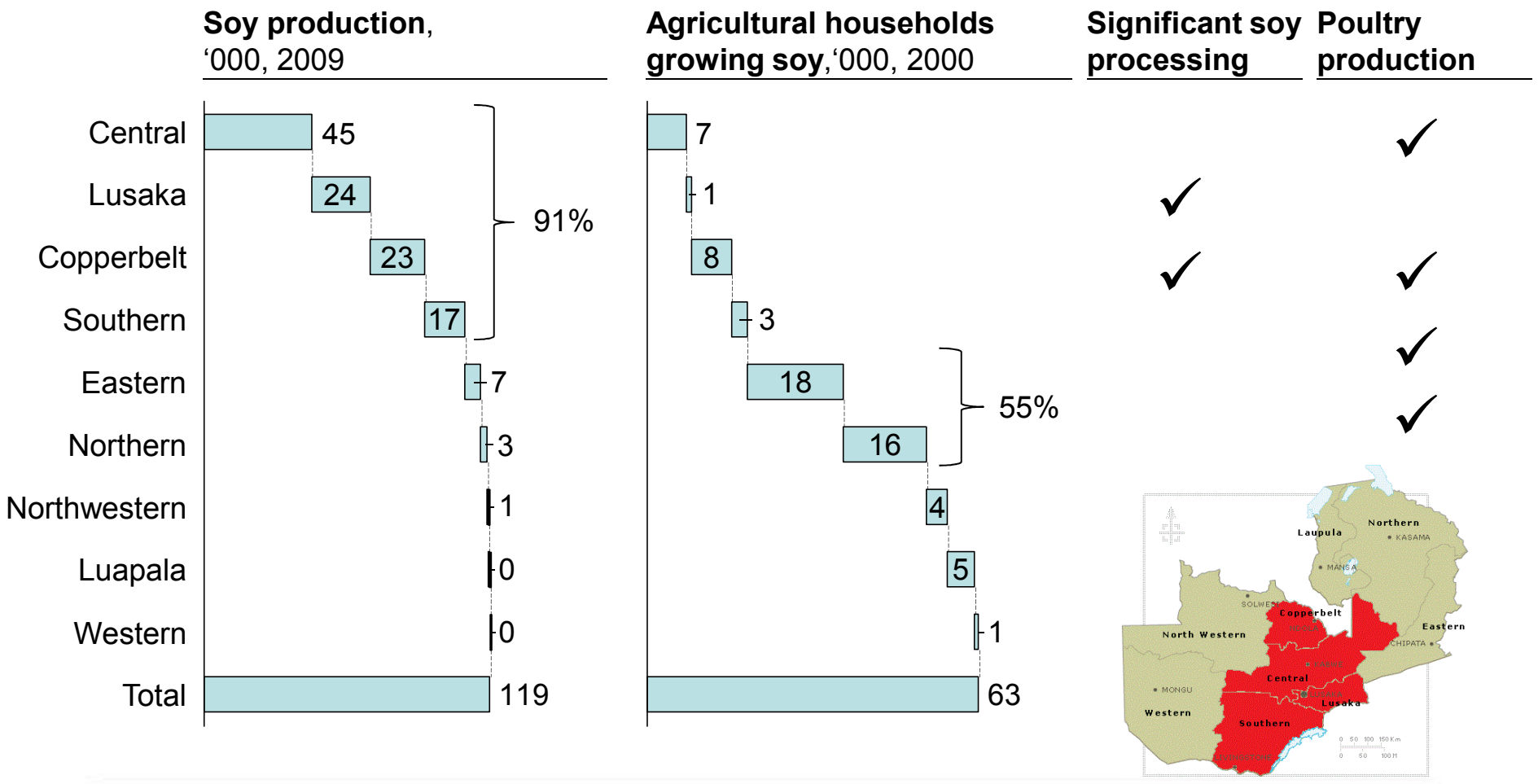
While most production is near processing in Central, Lusaka, Copperbelt and Southern, most smallholders are in Northern and Eastern



Source: Ministry of Agriculture and Cooperatives; Interview with Poultry Association of Zambia, CSO, 2000 Census of Population and Housing; Interviews

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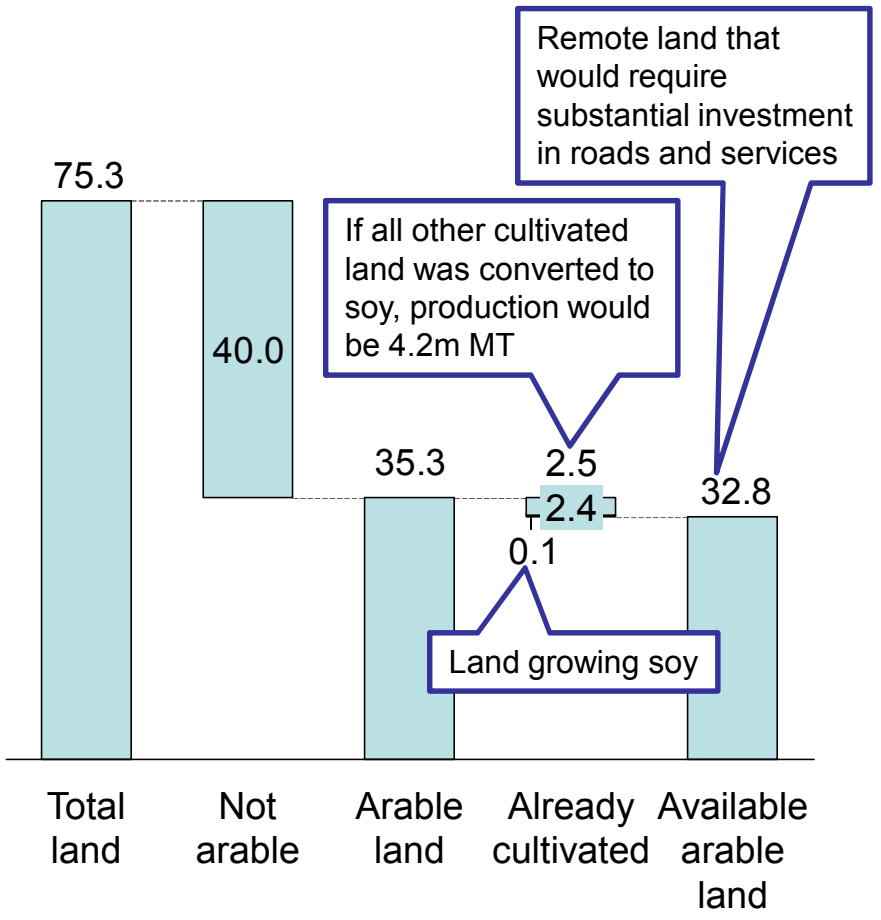
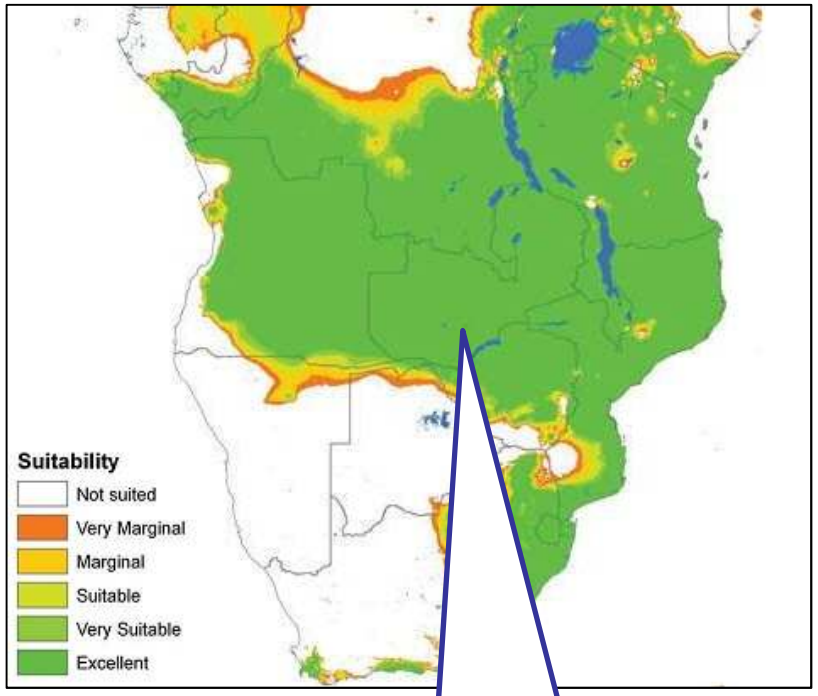
Land for soy cultivation is not a constraint on production

Arable land use, m ha, 2010



Soybean agro-climatic suitability map



Compared to other countries in the region, Zambia has ideal soybean growing conditions

Source: Ministry of Agriculture and Cooperatives; Interview with Poultry Association of Zambia, CSO, 2000 Census of Population and Housing; Interviews

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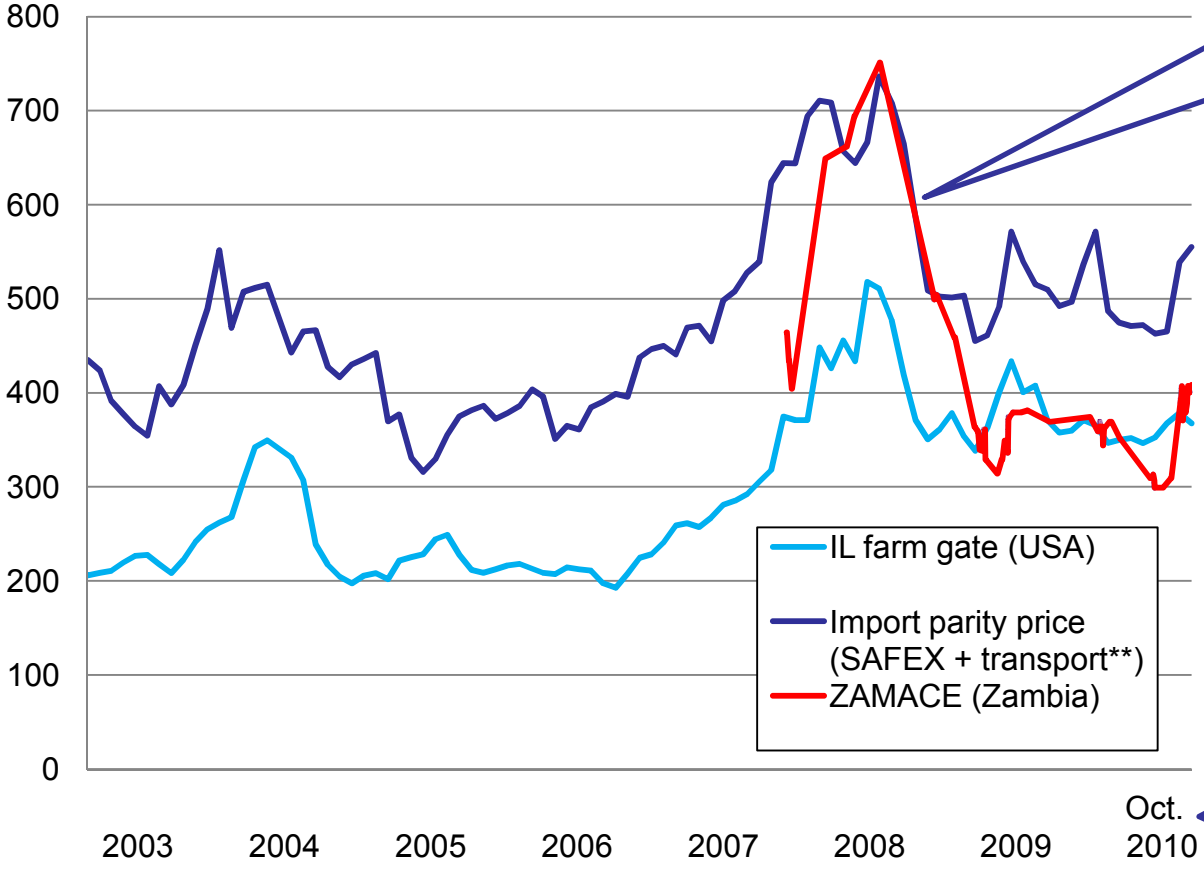
Soy prices have been volatile due to currency fluctuations over the last three years but are now in line with SAFEX

Soybean prices: ZAMACE, Zambia import parity, USA $/MT, 2003-2010



ZAMACE fall in price was exacerbated by a weakening Kwacha; KWA/$ exchange rates was ~3,200 in 06/2008 but rose to ~5,800 by 04/2009

- ZAMACE is the Zambian commodity exchange, which launched in 11/2007
- ZAMACE prices represent the trade price on the exchange, which may differ from farm gate price paid to commercial farmers and is likely to differ significantly from the farm gate price smallholders get

January 2011 prices are significantly higher on all 3 indices (e.g., ZAMACE is >$500/MT

Source: Zamace; SAFEX; University of Illinois; Oanda

* Prices also reflect changes in exchange rates between currencies

** Transport cost of $130/MT added

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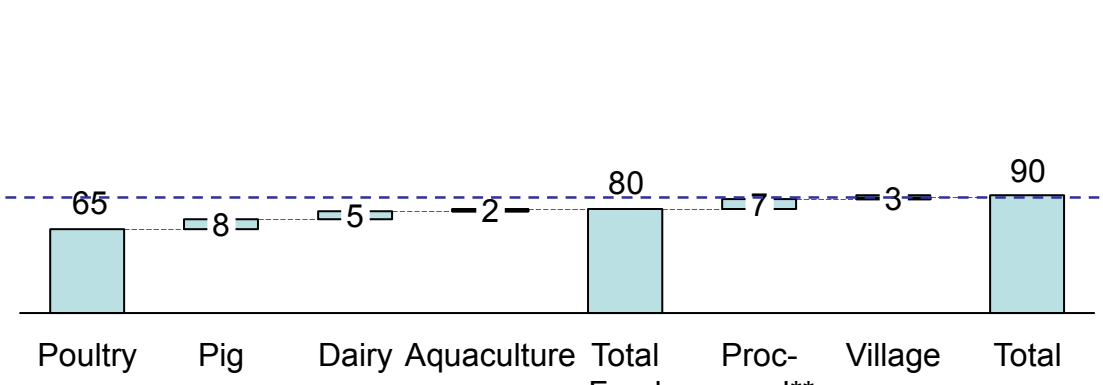
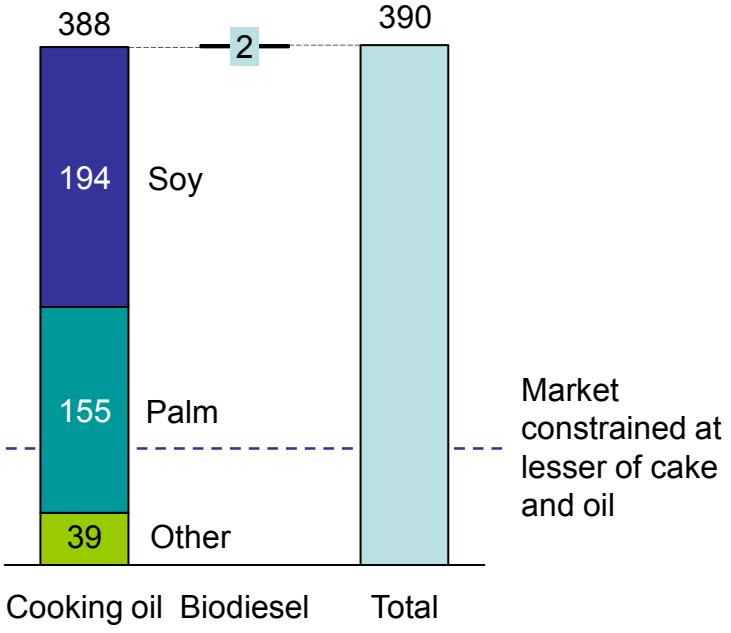
At present, total demand for beans is constrained at 90k MT by the cake market which is driven by demand for poultry

Demand for soybeans for cake*, ‘000 MT, 2009/10



Hypothetical demand for soybeans for oil*, ‘000 MT, 2009/10



At present, ~75% of cooking oil is imported; however, if all oil was soy oil and produced domestically using solvent extraction, demand for beans would be ~390K MT

Source: Interviews

* Calculated by taking total demand for cooking oil (soy, palm, sunflower) and dividing by solvent oil extraction rate of 18%

** Soy chunks, HEPS, Yummy Soy, etc

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Demand for soybeans has increased significantly over the past few years despite a significant fall in the poultry market in 2009

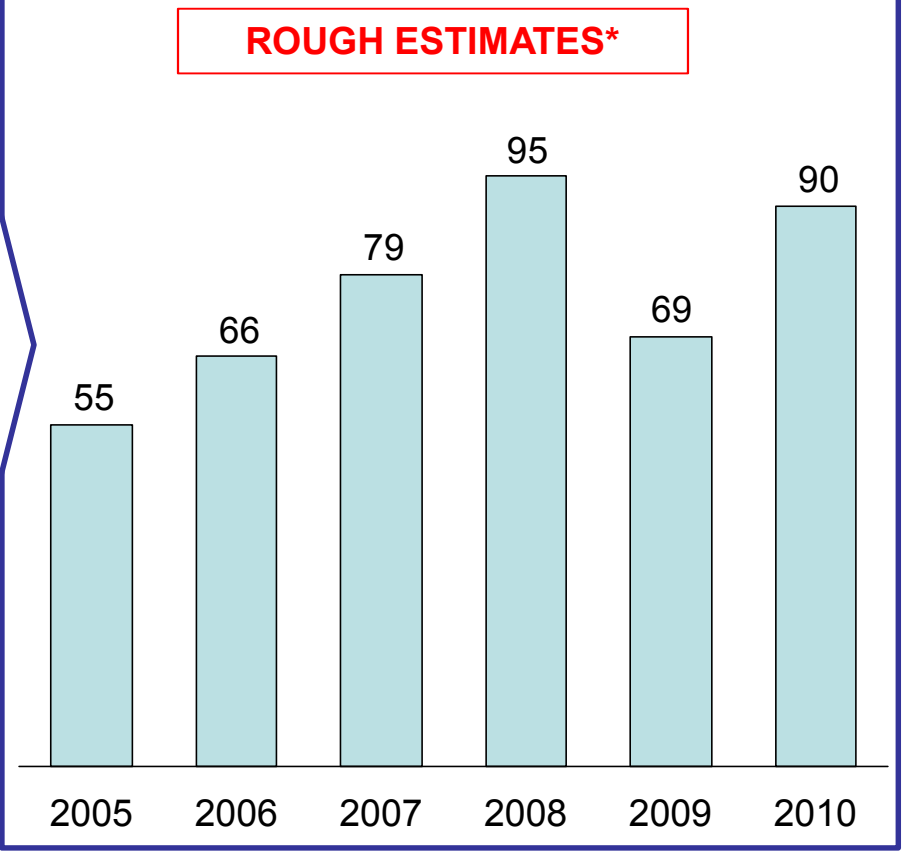
Recent trends in feed stock demand

- Historically, the market for soy has been driven by the feed industry, particularly the poultry industry
- The poultry industry, and in turn, the market for soy, grew at an estimated ~20% CAGR leading up to 2009
- However, growth had been volatile - 2H08 and 1H09 saw the poultry industry, and likely the entire feed industry, shrink by ~40% due to the rapid rise in soy prices
- The feed market has since recovered and demand is near historic highs and industry participants are bullish on the future as long as soy prices remain stable

Recent trends in human demand

- No data is available on historical human consumption; however, interviewees noted dramatic increases over the past 2-3 years, especially in demand for soya chunks

Demand for soybeans*,'000 MT, 2005-10

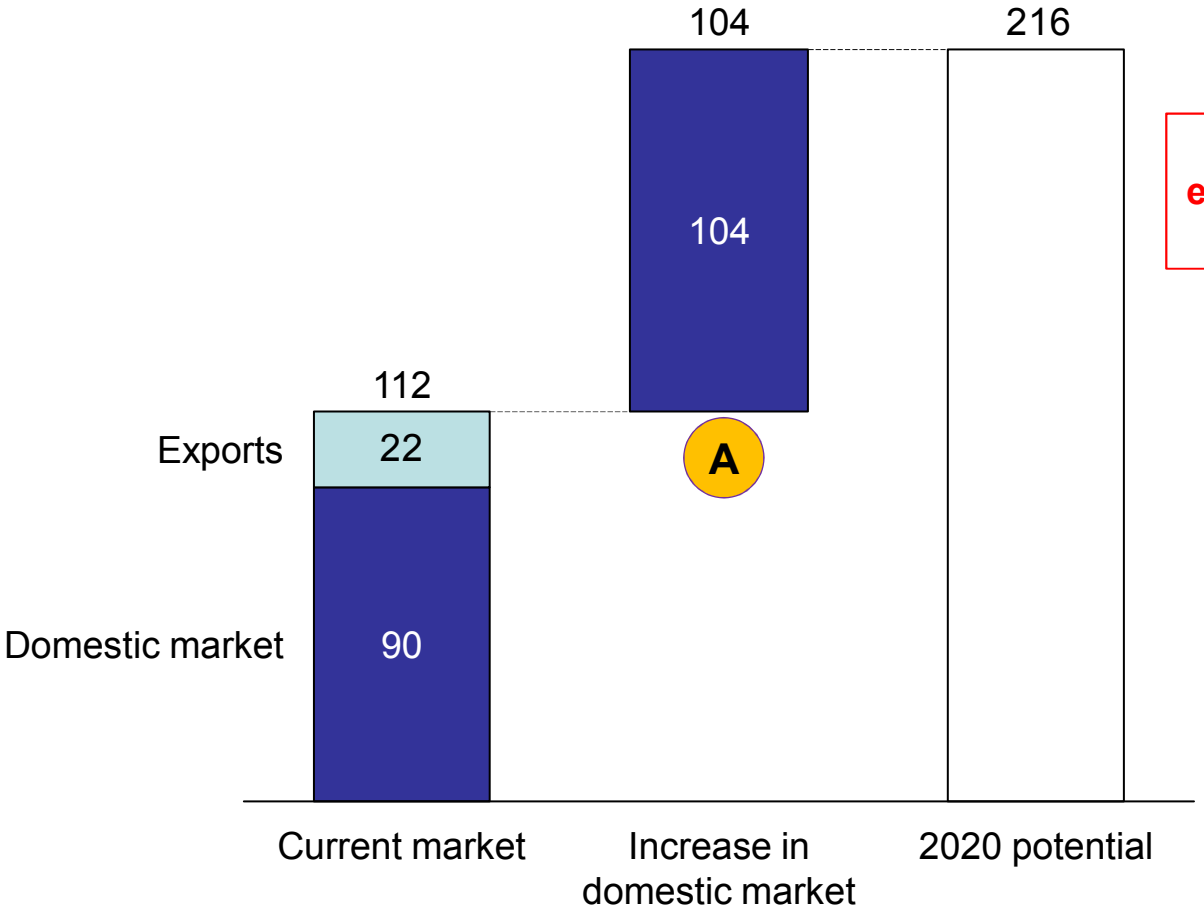


Source: ZNFU, PAZ Interviews; TechnoServe analysis

* Historical demand is extrapolated based on interview comments regarding the poultry and feed industries, which has been the primary driver of demand

Market growth is expected to continue, creating a 216K MT market by 2020

Projected demand for soybeans,
'000 MT, 2020

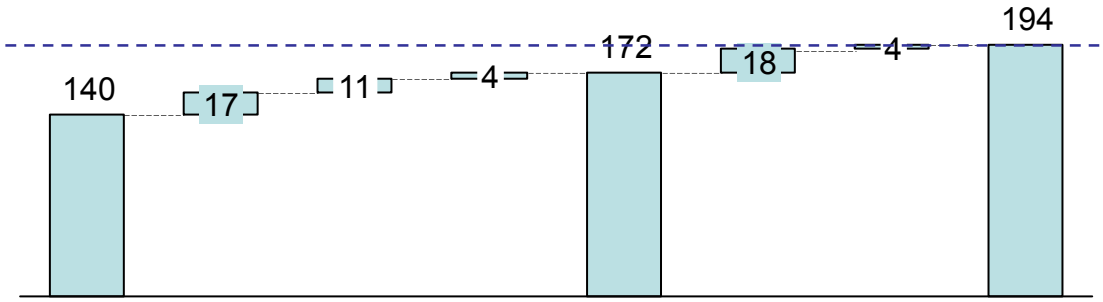


International market excluded; potential upside could be even greater

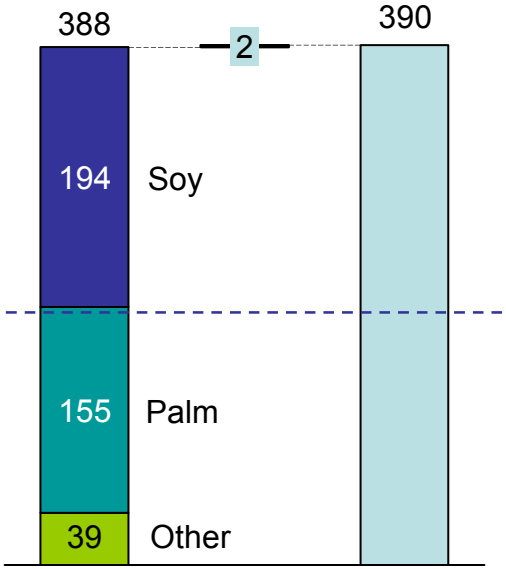
Source: TechnoServe analysis

A Domestic growth will be driven by the poultry industry, leading to a demand for 194K MT of soybeans in 2020, an increase of 104K MT

Potential demand for soybeans for cake*, '000 MT, 2020



Hypothetical demand for soybeans for oil*, '000 MT, 2009/10



Market constrained at lesser of cake and oil

Assumes no increase in oil demand as oil market is already large enough to absorb increase

Source: Interviews

* Calculated by taking total demand for cooking oil (soy, palm, sunflower) and dividing by solvent oil extraction rate of 18%

** Soy chunks, HEPS, Yummy Soy, etc

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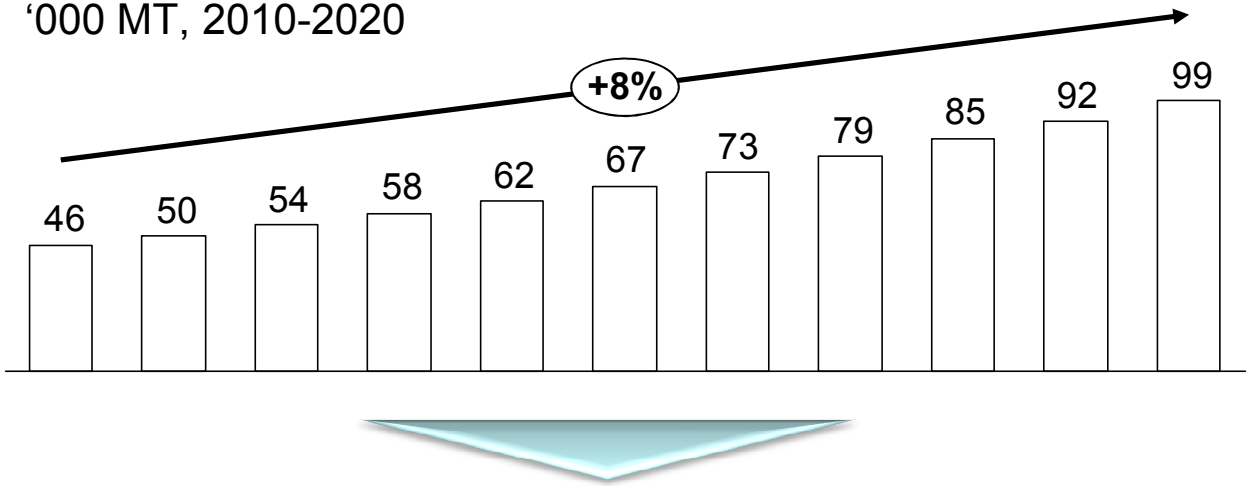
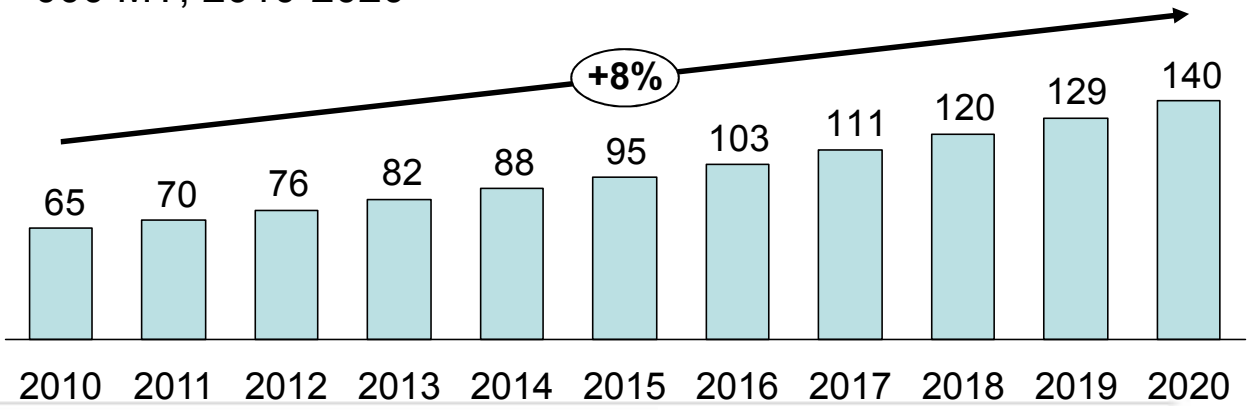
A The Zambian poultry industry will grow rapidly as consumption rises with income leading to a 2020 demand for 140K MT of soybeans

- The industry will primarily be driven by higher disposable incomes with per capita GDP expected to rise by 6.0% p.a.
- Demand will also be driven by population growth of 2.1% p.a.
- Poultry exports could result in even higher growth
- At present, phyto-sanitary restrictions protect the industry from imports; however, a change in policy could adversely affect the industry
- Despite shrinking by ~40% in 2H08 into 1H09, the industry has recovered and this growth is expected to continue
- Soybean to poultry ratio is ~1.41:1

Poultry consumption, '000 MT, 2010-2020



Demand for soybeans* by poultry industry, '000 MT, 2010-2020



Source: Interviews; FAO Stat; IMF; Poultry Association of Zambia; TechnoServe analysis

* Demand includes demand for both broilers and layers

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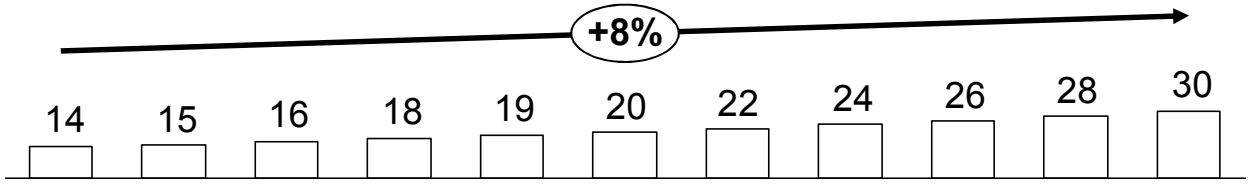
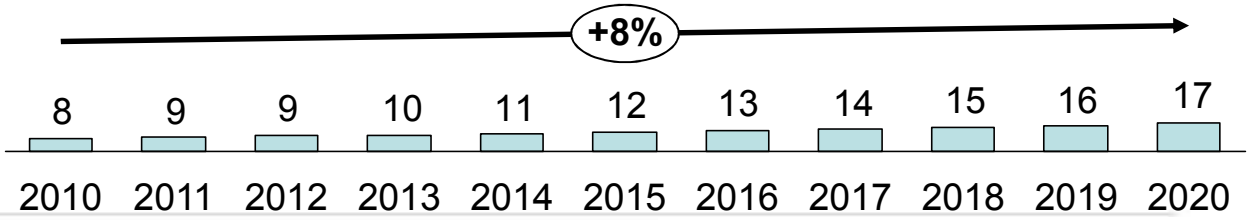
A The Zambian pig industry is also expected to grow rapidly at 8.0% p.a.

- The pig industry will primarily be driven by higher disposable incomes and by population increases
- It is assumed the pig industry will grow at the same rate as the poultry industry as disposable income rises

Pig consumption,
'000 MT, 2010-2020



Demand for soybeans by pig industry,
'000 MT, 2010-2020

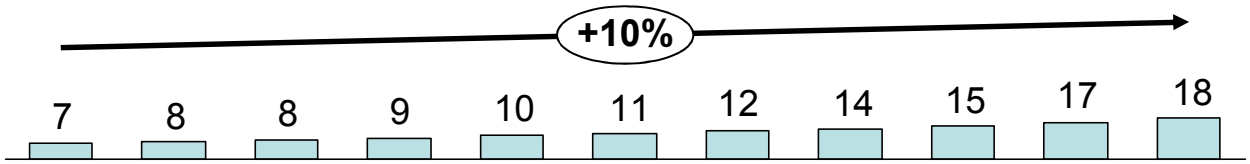


Source: Interviews; TechnoServe analysis
Note: Projections were extrapolated from analysis on poultry consumption growth

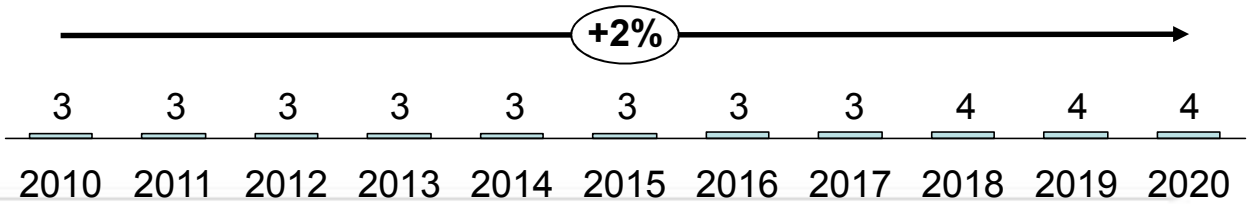
A Human consumption of processed soybeans is expected to grow at 10% p.a., while village-level consumption is expected to grow with population

- Human consumption of processed soy is expected to continue to grow as consumers become more aware of soy products and distribution becomes more widespread
- Growth is expected to be driven primarily by demand for soy chunks
- Village level human consumption is forecasted to grow with population at 2.1% p.a.

Demand for soybeans by humans (processed), '000 MT, 2010-2020



Demand for soybeans by humans (village level), '000 MT, 2010-2020



Source: Interviews; TechnoServe analysis

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- Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:

- There is the potential to improve the lives of 133k smallholders by improving the soy value chain

Although export opportunities exist to Zimbabwe, DRC, and RSA transport and inconsistent export policy are hurdles to competitiveness

Opportunities for trade

- Zambia is a net exporter of soybeans with no significant imports of beans, feed, or cake for ~5 years
- Zambia central location means it is well placed to export to South Africa (soybeans and soy cake), Zimbabwe (soybeans) and DRC (soybeans, cake and feed)
- This would build on recent exports to South Africa, Zimbabwe, DRC and Botswana
- Zambia has a competitive advantage to countries such as Zimbabwe and Botswana because there is a strong preference for non-GMO soy
- This strong position is strengthened by the fact that there are no duty-taxes on imports/exports to COMESA or SADC countries (TBC)

Challenges to trade

- High transport costs limit Zambia's regional competitiveness
  - Nearly all soy transport into and out of Zambia is by road
  - Rail capacity exists to Harare, Johannesburg, and Dar es Salaam; however, it is very poorly run, less secure, and unreliable
- Import/export permits are issued by the Ministry of Agriculture and Cooperatives, but this is done inconsistently and with little transparency
  - Private sector participants are wary of exporting and lack competitiveness due to inconsistent issuance of permits and export bans
  - Some trade is conducted informally, without permits

Source: Interviews

Major export markets for Zambia are Zimbabwe, South Africa, Botswana, and DRC

	Interview findings	Estimated 2010 trade	Transport costs
Zimbabwe	• Historically imported soy cake from Zimbabwe • Trade has reversed in recent years due to the decline of agriculture and processing in Zimbabwe • Eventually expected to return to self-sufficiency; however, there is believed to be a 5-10 year window of opportunity	• Export: ~10K MT of beans and ~7 MT of cake	• $50/MT by road (Harare)
South Africa	• Historically, South Africa has been a big export market for cake but recently Zambia has been less competitive • Future potential believed to be significant	• Export: ~2K MT of beans and 1.7MT of cake	• ~$130/MT by road (Jo'burg)
Botswana	• Botswana is small but still significant partner for exports	• Export: 2-10K MT beans*	• Unknown
DRC	• Recently DRC has imported small amounts of feed & cake • There is believed to be future potential for feed	• Export: <5K ~MT • Mostly in feed	• $~100/MT by road (Lubumbashi)
Namibia	• Namibia is not typically an export destination	• Export: ~2.5 MT of cake	• Unknown
Malawi	• Nearly all trade is informal and minimal • Very little demand in Malawi	• Net import: 1-3K MT beans	• ~$80/MT by road (Lilongwe)
Tanzania	• Current transport costs prohibit Zambia from being competitive	• Minimal	• Road: $180/MT • Rail: $120/MT (Dar es Salaam)
Mozambique	• Small market demand, cheap port access, and high road transport costs to Maputo make export unattractive	• Minimal	• High

Source: Interviews
Note: * CSO reports 2K MT of bean exports; however, traders believe it was higher

Agenda

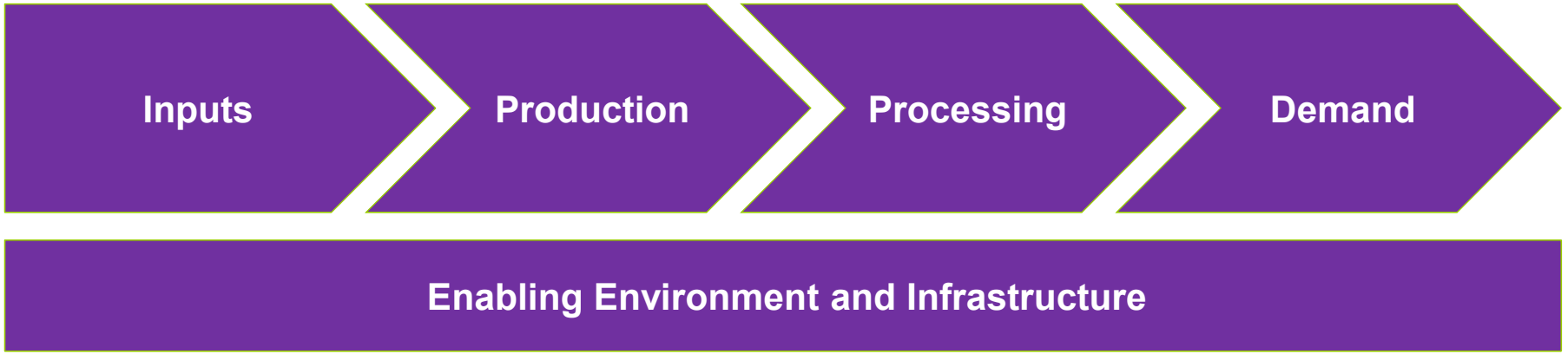
- The Zambian soy market is self sufficient and growing rapidly with some exports, with production dominated by commercial farmers and considerable scope for production growth

- **Despite a strong market and sufficient processing capacity, soy is a marginally attractive crop for commercial farmers due to a high cost base, poor transport infrastructure and an uncertain export policy; it is not an attractive crop for smallholders as they lack inputs, expertise and a market**

- Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:

- There is the potential to improve the lives of 133k smallholders by improving the soy value chain

We have analyzed the soy industry by looking at the whole value chain



Usage of inputs is low among smallholders; commercial farmers input use is sufficient, but irrigation could increase

	Current Situation	Underlying cause
Commercial farmers	• Use and availability of basic inputs such as lime, fertilizer, herbicide, inoculant and seed are sufficient • An estimated 60-70% of commercial farmers grow irrigated soy; 30-40% grow dry land • Farmer face high input and fixed costs compared to neighboring countries such as RSA	• Lack of attractive financing is cited as the primary constraint to increasing irrigation • Most inputs are imported leading to higher prices due to high transport costs, duties and exchange rate fluctuations

Smallholders	• Usage of all inputs is very low among smallholders due to high costs, lack of availability and insufficient awareness of benefits
	  • Many farmers only purchase uncertified seed and no other inputs
	  • Almost no smallholder farmers have irrigation and <5% use mechanized tools
		• Lack of input accessibility is a problem as many inputs are only sold in major markets
		  • This is particularly true for certified seed, lime, soil testing, and inoculant
		• Many smallholders want to buy inputs at harvest time rather than at planting time because that is when they have cash

Source: Interviews

Input availability is sufficient ; however, they are often costly and only available in the large markets

	Current Situation	Current Capacity	Key Players
Seed	• **Commercial**: ~70% use recycled or uncertified seed • **Smallholder**: 80% use recycled or uncertified seed • Seed companies typically err on side of under-production • It is easy for seed companies to increase production from year to year	• Not uncommon for seed companies to run out (e.g., MRI & Pannar this year) • However, neither farmers nor experts say seed availability is a problem • High costs and local availability are hurdles for smallholders	• Seed Co (~60% share) • MRI (~30% share) • ZamSeed • Pannar • Kamono
Fertilizer	• **Commercial**: lack of fertilizer use is not an issue • **Smallholders**: usage is very low	• Availability is non-issue, but it is very expensive (imported from RSA)	• Greenbelt • Omnia • Nitrogen Chemical Zambia • Nyiombo
Inoculant	• **Commercial:** current usage of ~60% is adequate • **Smallholders:** only 10-20% use inoculant	• **Commercial:** Inoculant is widely available • **Smallholders:** have to go to major market (e.g., Lusaka)	• Soya Grow (imported from RSA) • ZARI produces

Source: Interviews

Commercial farms lack complete irrigation; smallholders have very low levels of mechanization and irrigation

	Current Situation	Current Capacity	Key Players
Lime	• **Commercial:** farmers test soil and adjust where necessary • **Smallholders:** Very little soil testing or lime usage	• Significant domestic reserves of lime • Agro-dealers don't distribute widely • Soil testing locations are very limited in the country	• Ndola Lime • Uniturtle Zambia
Herbicide / Chemicals	• **Commercial:** farmers use herbicides and chemicals fully • **Smallholders**: ~10% use herbicide; hand weeding is predominant method	• Herbicide is widely available to both commercial farmers and smallholders	• AgraChem • Crop Serve • Farmer's Barn
Mechanization	• **Commercial:** fully mechanized • **Smallholders:** Very little mechanization (some tractor plowing)	• Biggest hurdles are financing and cost • High costs as most equipment is imported	• Farmer's Barn • SARO
Irrigation	• **Commercial:** 60-70% of commercial soy is irrigated • **Smallholders:** Virtually no irrigation	• Biggest hurdle are financing and cost	

Source: "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews

Production practices vary significantly between commercial and smallholder farmers, leading to very different yields

	Soy yield MT/ha, 2010	**Competing crops**	**Importance to farmer**	**Production practices**
Commercial farmers	2.6	• Maize, wheat, sugar, sorghum and field beans • Maize, sorghum and field beans compete for land	• Important commercial crop with rotational benefits • Depending on the year 20-60% of soy is grown on forward contracts	• Generally good agronomic practices • The best farmers achieve 3.1 MT/ha with irrigation • 60-70% of soy is grown in rotation with winter wheat
Smallholders	0.9	• Maize, cassava and cotton • Cotton is the main competing cash crop	• Lower priority crop then maize as maize is a strong cultural and political crop, • Convincing smallholders to diversify is a challenge	• Generally have very poor agronomic practices • Insufficient instruction and attention from extension services • Often planted late and weeded insufficiently • A sizeable share of planted soy not harvested as weeds or disease take over due to neglect

Source: Ministry of Agriculture and Cooperatives, Crop Forecast Survey 2009/10, Interviews
Note: * Crop Forecast Survey 2009/2010 indicates ~23% of production was from smallholders; however, experts believe it is closer to 15%

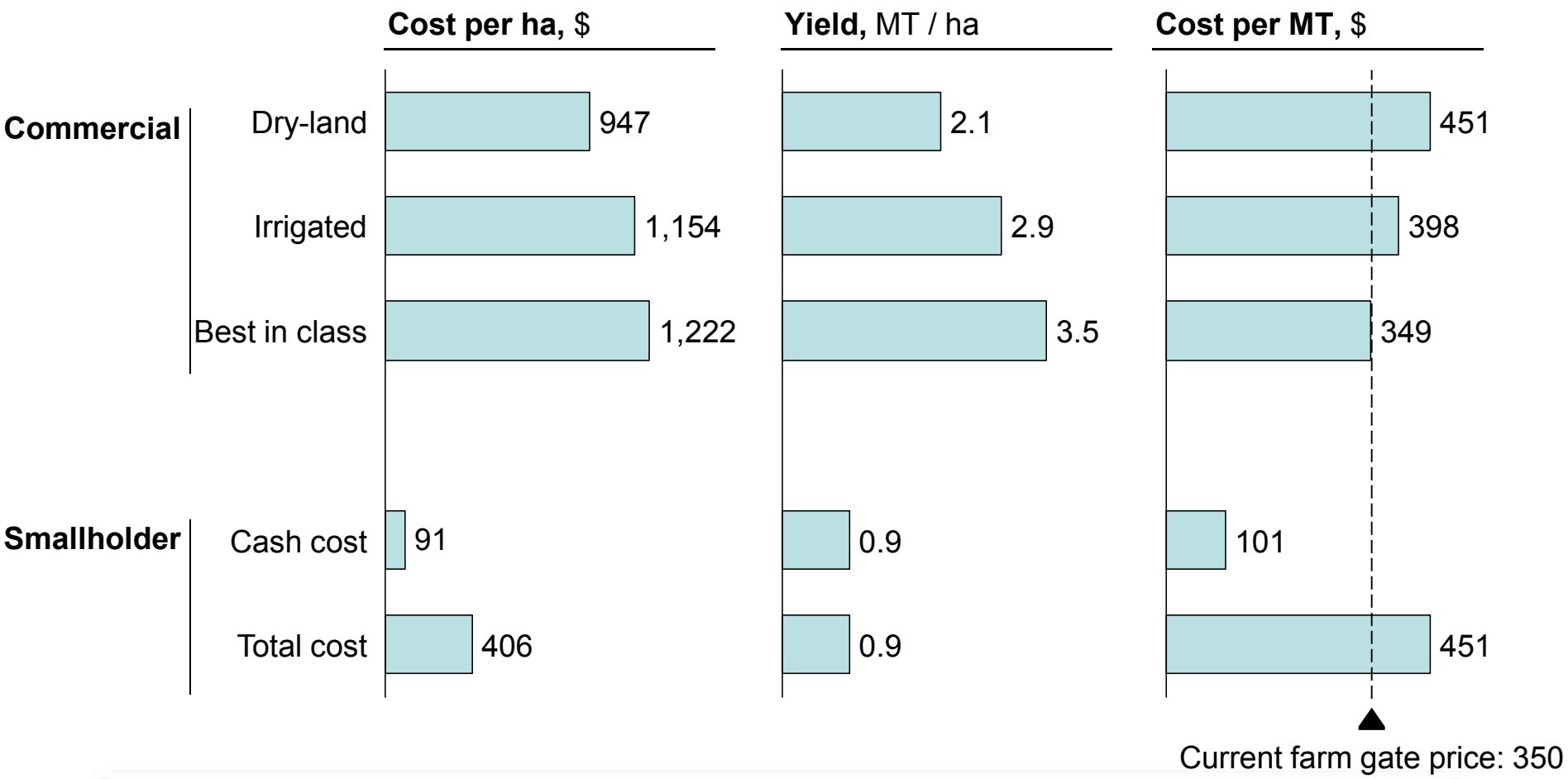
Zambia has potential to significantly expand soy production as only 14% of arable land is cultivated

	Current Situation	Current Capacity	Key Players
Land	• Only 14% of arable land is currently cultivated • **Smallholders** account for ~93% of cultivated land	• Agro-climatically, vast expanses of land suitable • Poor infrastructure limits competitive land	• N/A
Agronomic Practices	• **Commercial**: Strong agronomics • **Smallholder:** Very weak agronomics (i.e., late planting, insufficient weeding & disease control) • **Smallholder:** Soy is viewed as a risky crop and as a result it is lower priority to learn about and tend to	• Current extension services ratio is ~800:1; ideal ratio would be ~300:1 depending on the region • Sparse population density results in expensive and time consuming travel between farms, often by bicycle • Each extension officer is responsible for all crops and livestock, limiting expertise	• Government extension services • Private sector (e.g., Dunavant Cotton, Cargill) • NGOs (e.g., CFU, COMACO)
Competing Crops	• **Smallholder:** Maize, and cotton are main competing crops • **Smallholder:** 85% of agricultural households grow maize • **Commercial:** Sorghum, field beans, and maize compete; soy is often rotated with winter wheat	• Maize is strongly supported by government at smallholder level • Threat of export bans limit soybean production and market	• Government

Source: Interviews, 2000 Census: Agriculture Analytical Report

At current price levels, only the best commercial farmers are able to make a profit on soy production

Comparison of production costs and yields, 2010



Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews

Note: * Assumed average yield of 2.9 MT/ha for irrigated soy; ** Only accounts for explicit transport costs. Transport costs also increases prices of other inputs

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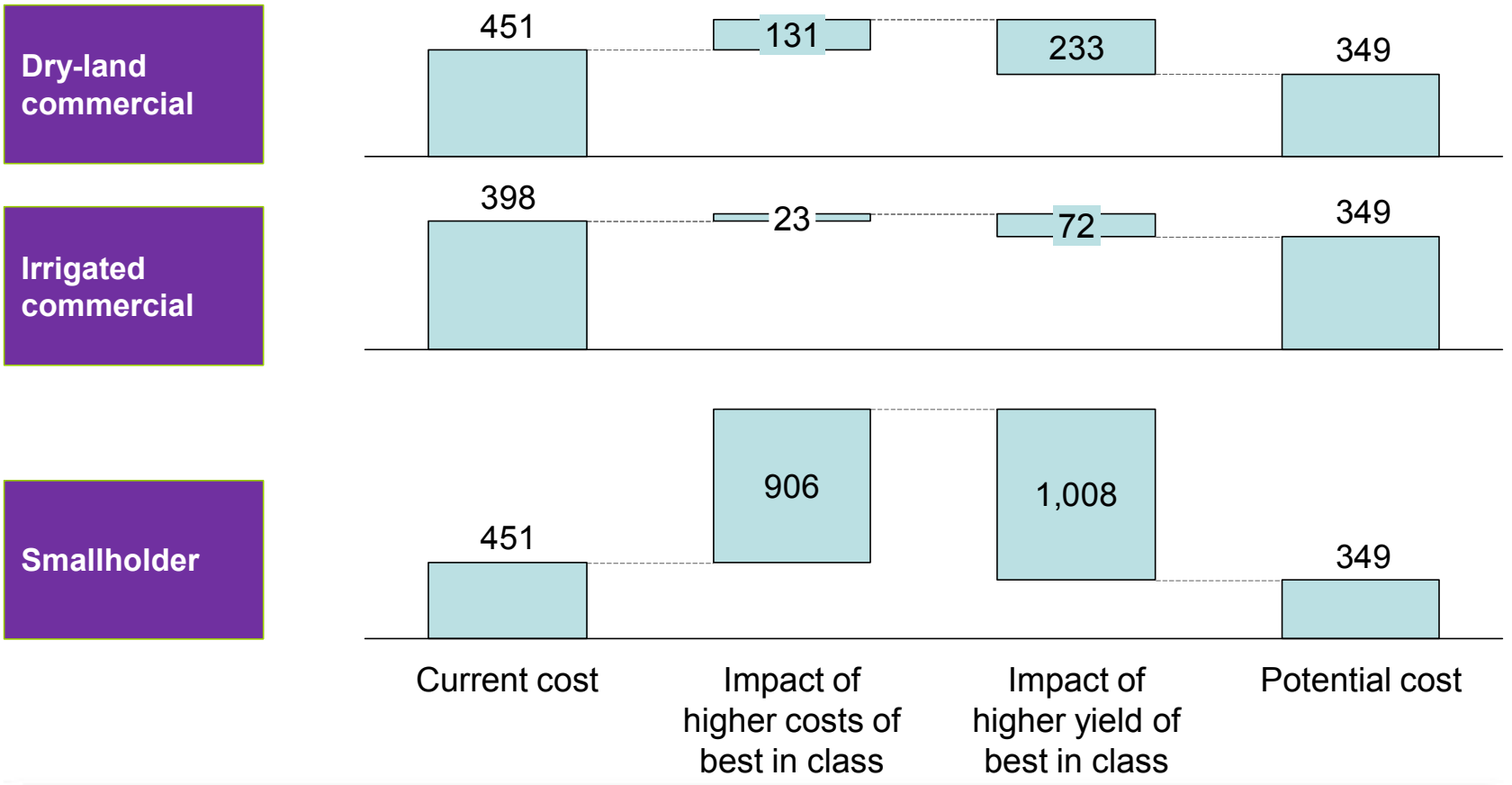
As yields havde a greater impact on cost per MT han the cost per ha farmers should focus on yield improvement

Impact of moving to best in class production methods,
Cost per MT, $, 2010



Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews
Note: * Assumed average yield of 2.9 MT/ha for irrigated soy; ** Only accounts for explicit transport costs. Transport costs also increases prices of other inputs

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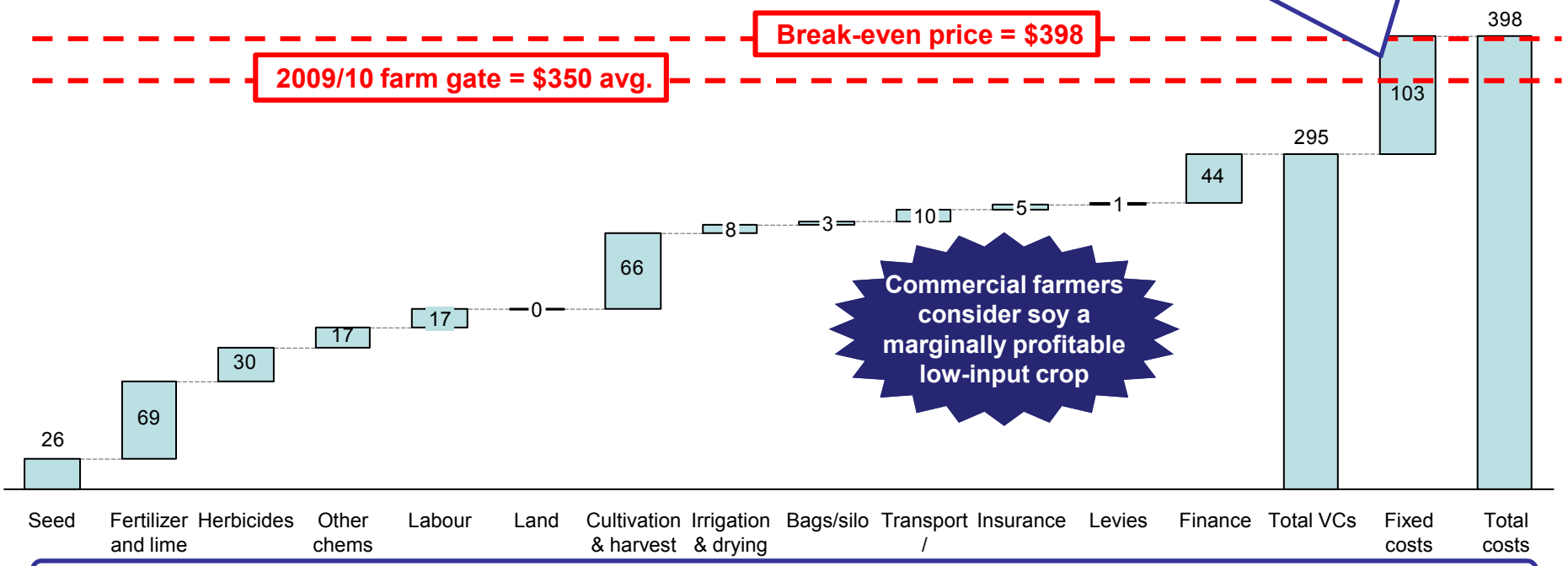
Under average yield conditions, soy is at best a marginally profitable for commercial farmers

Average cost of irrigated production for commercial soybean farmers
$/MT, 2010

IRRIGATED COMMERCIAL

- Fixed costs estimates range from 20% ($59/MT) to 50% ($148/MT) of variable costs depending on rotation and farmer
- Includes an element of farmer basic income



This excludes a $30 per ha reduction in input costs for winter wheat if the farmer uses a soy / winter wheat rotation

Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews
Note: * Assumed average yield of 2.9 MT/ha for irrigated soy; ** Only accounts for explicit transport costs. Transport costs also increases prices of other inputs

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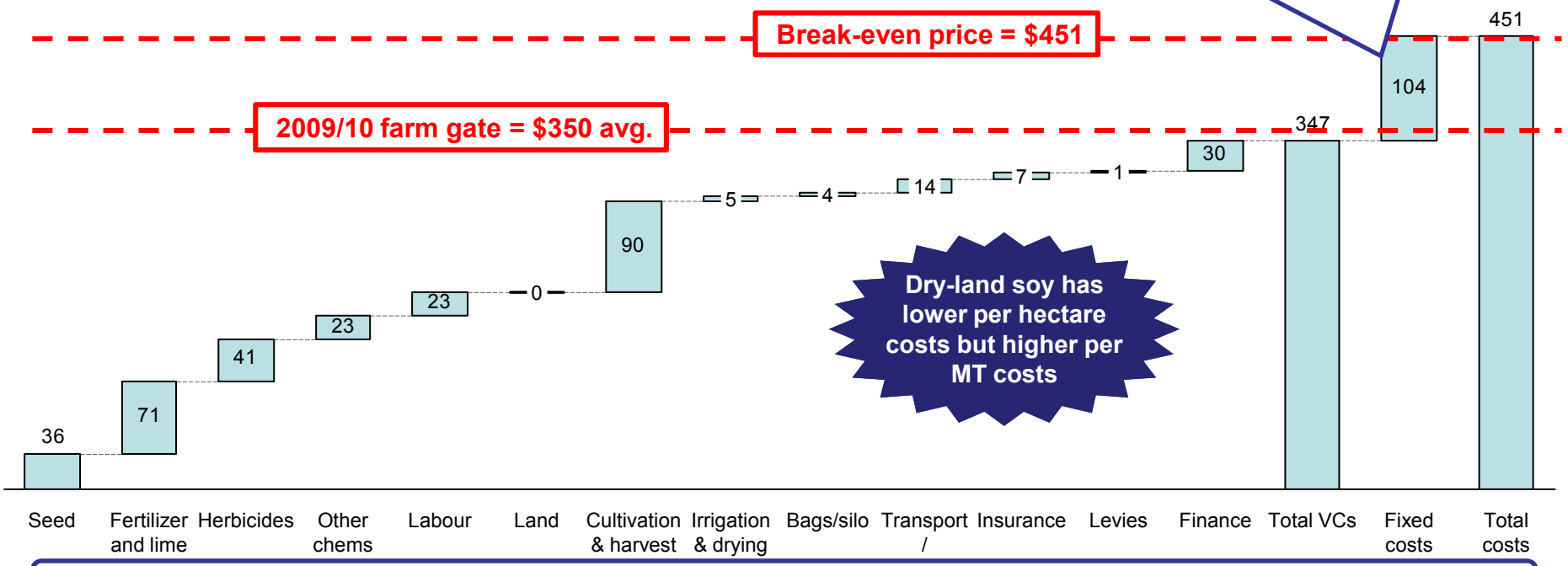
BUSINESS SOLUTIONS TO POVERTY

Under average yield conditions, dry-land soy yield makes it unattractive for commercial farmers when costs are included

DRY-LAND COMMERCIAL

Average cost of dry-land production for commercial soybean farmers
$/MT, 2010

- Fixed costs estimates range from 20% ($59/MT) to 50% ($148/MT) of variable costs depending on rotation and farmer
- Includes an element of farmer basic income



This excludes a $30 per ha reduction in input costs for winter wheat if the farmer uses a soy / winter wheat rotation

Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews
Note: * Assumed average yield of 2.1 MT/ha for dry-land soy; ** Only accounts for explicit transport costs. Transport costs also increases prices of other inputs

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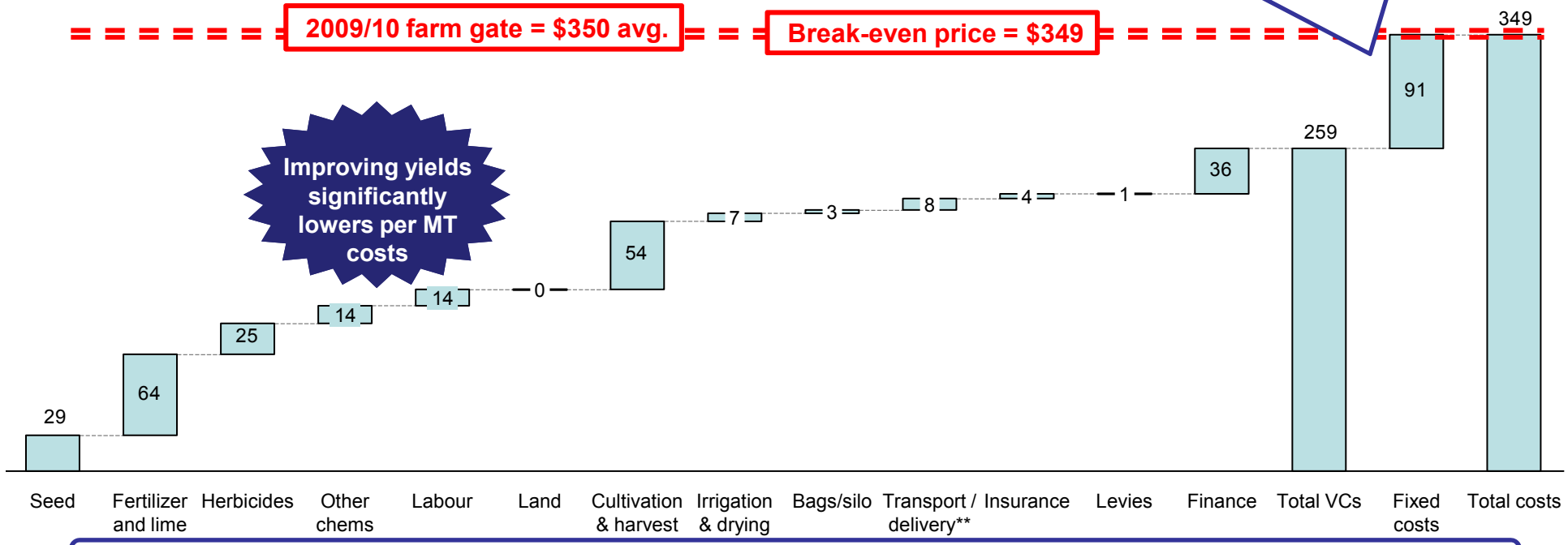
Best practice commercial farmers are able to make soy profitable

Average cost of best practice production for commercial soybean farmers
$/MT, 2010

BEST COMMERCIAL

- Fixed costs estimates range from 20% ($59/MT) to 50% ($148/MT) of variable costs depending on rotation and farmer
- Includes an element of farmer basic income



This excludes a $30 per ha reduction in input costs for winter wheat if the farmer uses a soy / winter wheat rotation

Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews
Note: * Assumed average yield of 3.5 MT/ha for dry-land soy; ** Only accounts for explicit transport costs. Transport costs also increases prices of other inputs

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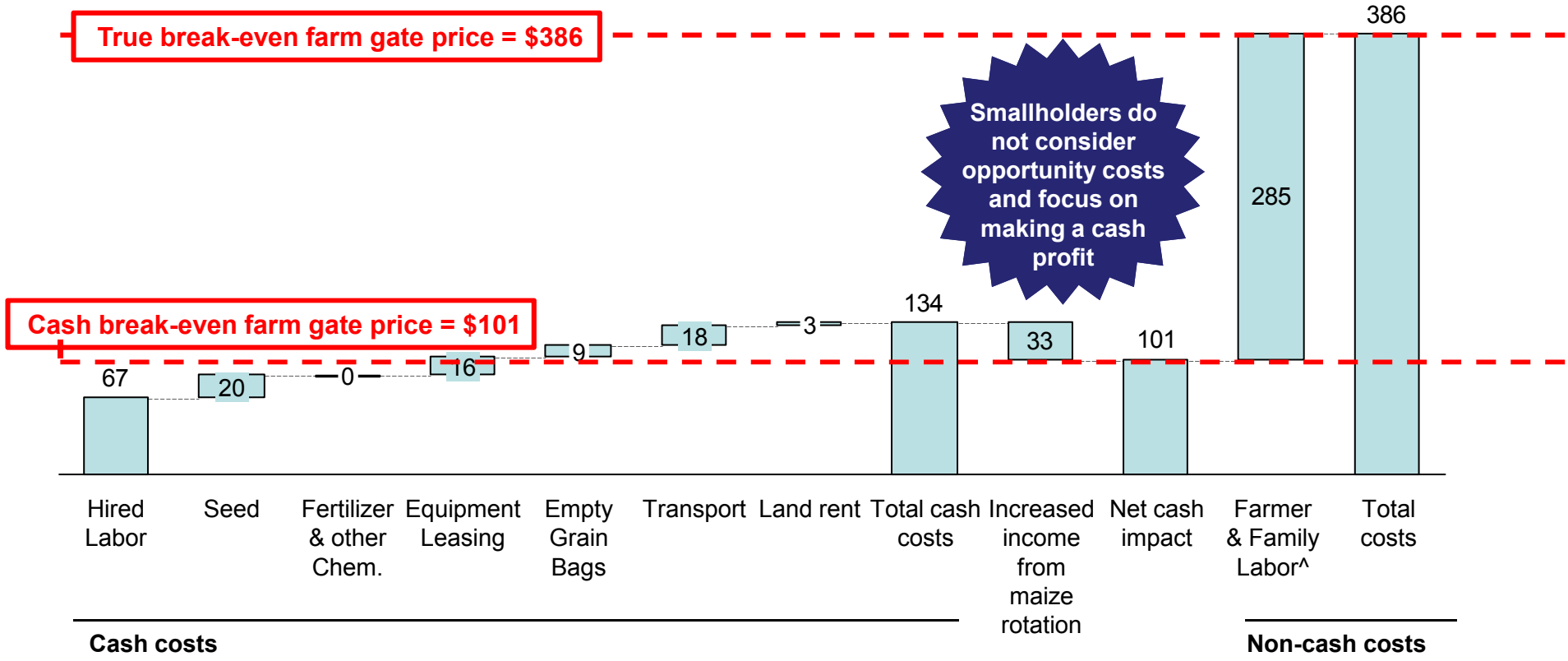
BUSINESS SOLUTIONS TO POVERTY

Although soy is unattractive for smallholders when fully costed, it is attractive on a cash basis

SMALLHOLDER

Average cost of best practice production for smallholder soybean farmers
$/MT, 2010



Source: TechnoServe field survey October 2010 (Dirk K.); "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010 ;Interviews
Note: * Exchange rate of $1 = 4750 Kwa used; ** Assumed yield of 0.9 MT/ha for smallholders; ^ Calculated at same rate as hired labor

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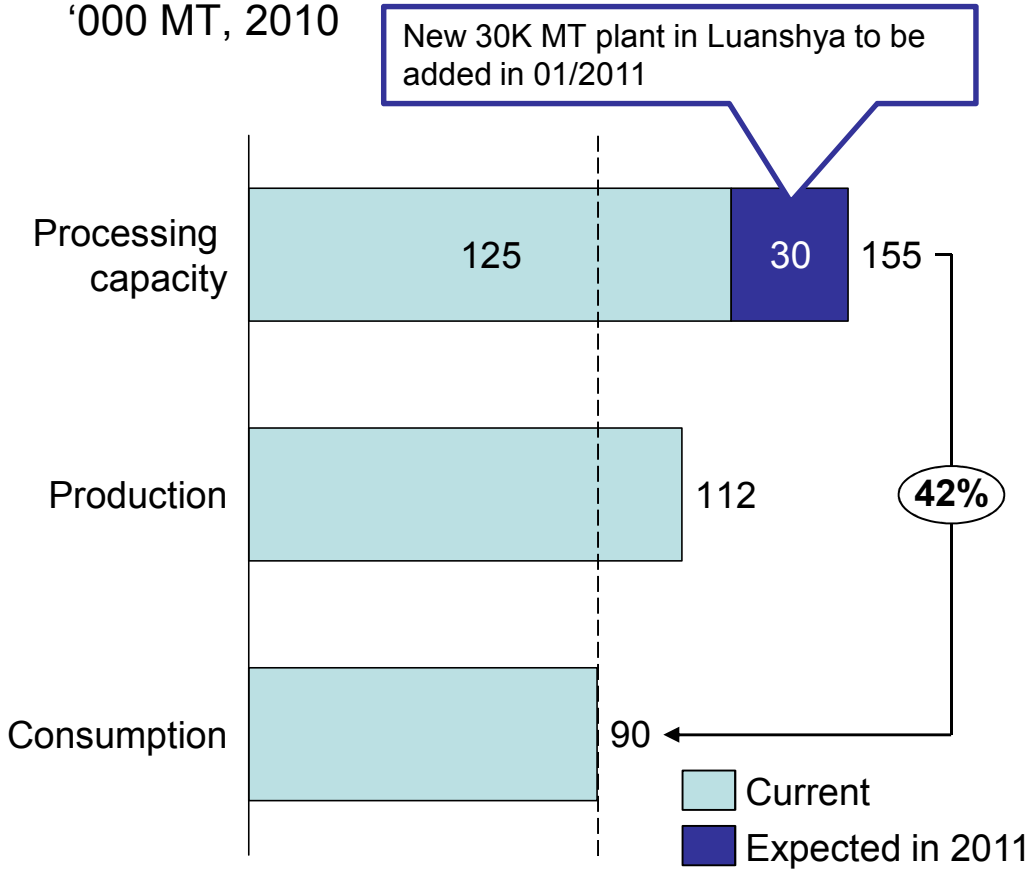
At present, there is ~40% processing over-capacity, but over-capacity is not expected to persist long-term

Soy processing capacity, production and consumption
'000 MT, 2010



- It is unlikely so much over-capacity will remain in the industry
  - Competition is already very high as evidenced by Yielding Tree's bankruptcy in September
  - The feed industry is expected to expand, filling the extra capacity
- If needed, extra mechanical capacity can be added in ~6 months

"Zambia has a growing soya crushing industry, therefore production and sales in the local market is viable"
Russel du Preez, Emvest

Source: Interviews

Processers and feed producers are often the same companies in Zambia and industry competition is high

Industry Players

- Most processors in Zambia are also stock feed producers
  - As a result processing decisions are often driven by a given company's own stock feed input requirements
- 2 new stock feed companies opened in the past 18 months, NutriFeeds and Novatek, have intensified competition
- Zamanita and a new plant in Luanshya are the only solvent extractors
- Imports make up ~75% of the cooking oil market, dominated by Gourock
- Zamanita and Unified Chemicals are the largest domestic oil refiners

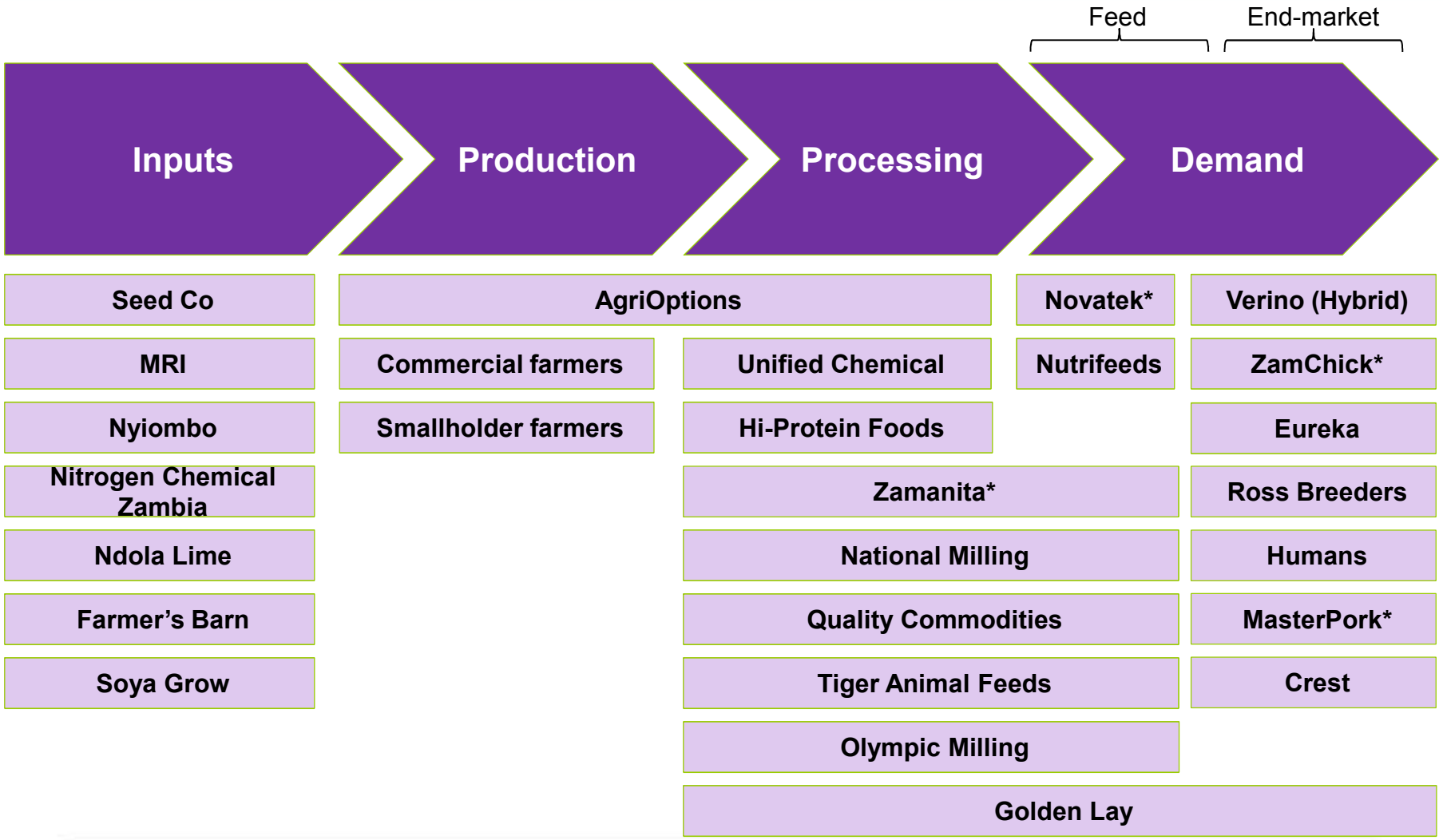
Mechanical vs. solvent extraction

- Due to the age and poor quality of Zamanita's solvent extraction plant. the stock feed industry prefers mechanically extracted cake
  - The mechanically extracted cake has more consistent quality and better nutritional value for finisher feed
  - Mechanically extracted cake costs $20-$30 less per MT
- However, solvent extracted cake is preferred for export for its longer shelf-life
- Long-term it is believed that solvent extraction is a more efficient and superior processing technique, but at present Zamanita's quality is poor and mechanical extraction meets the industries' demand satisfactorily

Source: Interviews

Note: * With perfect equipment and utilization, solvent extracted cake is higher quality; however, the only solvent extraction plan in Zambia is owned by Zamanita and the quality of Zamanita cake is inconsistent

There are various important players among the value chain, and many players participate in multiple segments



Note: * Owned by ZamBeef

There is significant processing capacity in Zambia; however, chemical extraction is dominated by Zamanita

Processor	Current Overview	Capacity	Type	Location
Zamanita (owned by ZamBeef)	• Operating at ~60% utilization • Significant cake exports to Zimbabwe • Inconsistent quality reported • ~20 year old plant purchased from former parastatal • Supplies cake to Novatek (ZamBeef owned) as well as to ZamBeef farms • Large oil refinery also (~30% share)	50K - 60K MT per year	Solvent extraction	Lusaka
New processor in Luanshya	• Currently under construction in Luanshya • New processing company to be established • Opening expected 01/2011 • Owners used to be poultry layers	~30K MT per year	Solvent extraction	Copperbelt
Quality Commodities	• Currently processes 15K-20K • 2nd largest soy buyer in Zambia • Produces cake and crude oil • Sells cake to NutriFeeds • Sells crude oil to Zamanita	~20K MT per year	Mechanical extraction	Lusaka

Source: ZamBeef Annual Report; Interviews

Many of the soy processors are vertically integrated and also produce stock feed

Processor	Current Overview	Capacity	Type	Location
AgriOptions / Farm Feeds	• Processing done by Farm Feeds • Collective of 16 farmers who share silos • Storage run by Afgri • Crude oil is sold to Unified Chemicals	~12K MT per year	Mechanical extraction	Copperbelt
National Milling Company	• Stock feed company is NamFeeds • Exports stock feed to DRC • Processes 8K-10K MT • Oil is refined by a Sunsoft and sold as cooking oil under a National Milling brand	~12K MT per year	Mechanical extraction	Lusaka
Tiger Animal Feeds	• Used to be largest stock feed producer in country, still top 3 but losing share • Currently processes ~7K MT	~10K MT per year	Mechanical extraction	Lusaka
Olympic Milling	• Produces cake and crude oil • Stock feed producer as well • Markets soya chunks	~5K MT per year	Mechanical extraction	Copperbelt

Source: Interviews

In addition to the larger processors, there are several other small players

Processor	Current Overview	Capacity	Type	Location
Golden Lay	• Largest egg layer in country • Market share estimated 33% • Processes for own consumption	~2K MT per year	Mechanical extraction	Kitwe
Various others	• Other smaller processers include Simba, CMR Farms, Seba, and High Protein Foods • Simba produces stock feed • Seba is the largest processor for soya chunks in the country	5K - 10K MT per year combined	Mechanical extraction	Copperbelt & Lusaka
Village-level processing	• Small manually operated yenga presses are cheap and are often distributed by NGOs • Experts do not believe yenga presses can be competitive with larger mechanical or solvent extraction • Most yenga cake and oil is consumed at the village-level	Unknown, but not significant	Yenga	Country-wide

Source: Interviews

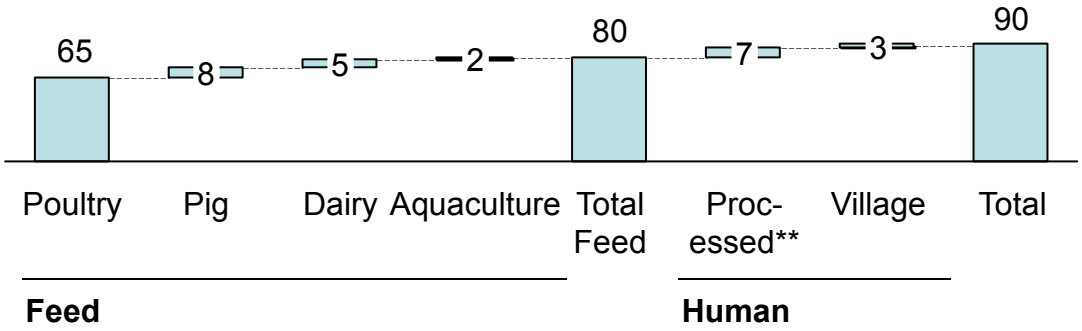
In addition to Zamanita, the largest oil producers are Gourock, Unified Chemicals, and Hi-Pro

Oil Producer	Current Overview	Capacity	Type	Location
Gourock	• Exclusively deals with palm oil • Most oil imported from Tanzania • Very little refining, mostly just importing • Malaysian company has significant ownership stake • Exports oil to DRC	N/A	Imported / Physical	Copperbelt
Unified Chemical	• Unified Chemical is only a refinery • Currently, only soy oil is refined; palm has been done historically • Domestic crude oil purchased from AgriOptions • ~75% of oil is imported (crude soy oil from Argentina) • State of the art refinery	~12K MT per year of crude oil	Chemical	Lusaka
Hi-Protein	• Small refinery with dated equipment • Majority of oil is imported crude palm oil • Current utilization is very low	~8K MT of crude oil per year	Physical	Lusaka

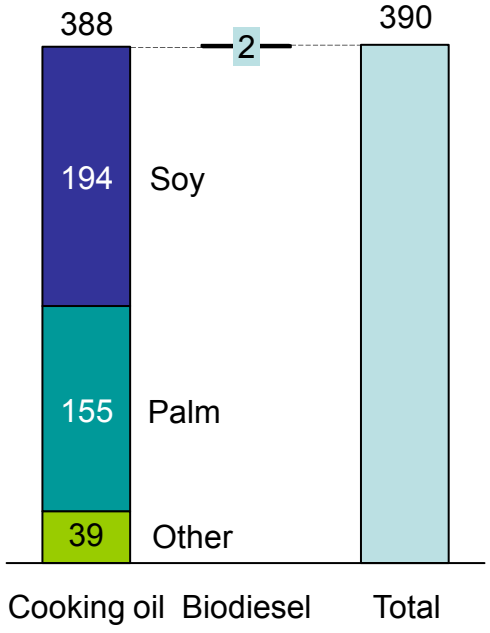
Source: Interviews

Demand for cake is driven by the stock feed industry while demand for oil is driven by the cooking oil industry

Demand for soybeans for cake*, ‘000 MT, 2009/10



Hypothetical demand for soybeans for oil*, ‘000 MT, 2009/10



At present, ~75% of cooking oil is imported; however, if all oil was soy oil and produced domestically using solvent extraction, demand for beans would be ~390K MT

Source: Interviews

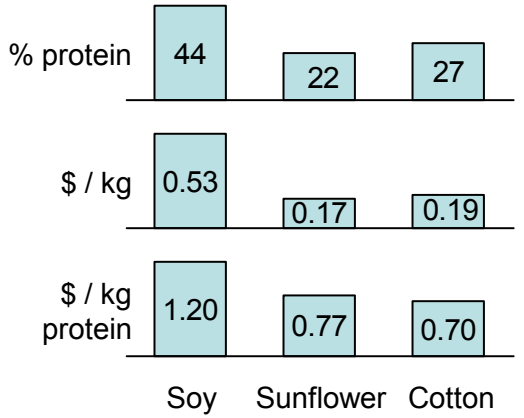
* Calculated by taking total demand for cooking oil (soy, palm, sunflower) and dividing by solvent oil extraction rate of 18%

** Soy chunks, HEPS, Yummy Soy, etc

Soy cake has no direct substitutes; however, soy oil competes directly with palm oil and sunflower oil

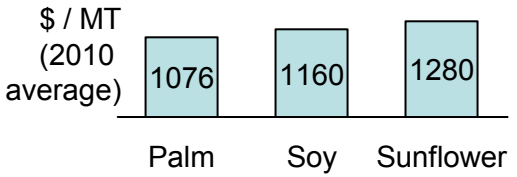
Cake competition

- Potential substitute products for soy cake are sunflower cake and cotton cake
- While both are significantly cheaper per unit of protein, neither are direct substitutes
  - Cotton cake and sunflower cake are primarily used in dairy/beef and with other ruminants such as goats and sheep
  - Sunflower and cotton cake are too fibrous, so very little is used in poultry or pig feed



Oil competition

- Soy oil, palm oil, and sunflower oil are all used for cooking oil
- Despite their differences – such as palm oil being unhealthy – the cooking oil market is very price sensitive so the products act as direct substitutes for the mass market
- At present nearly all palm oil is imported; however, ZamBeef is building a 20k hectare palm plantation in the Northern province
- Recent low cost import of palm oil from East Africa has reduced the competitiveness of domestic soy oil

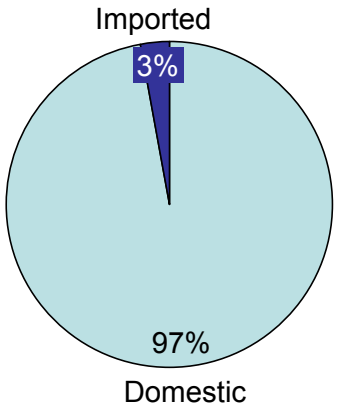


Source: Ministry of Agriculture and Cooperatives; Central Statistical Office; Interviews

The demand for soy cake is driven by the poultry feed industry and is primarily sourced domestically

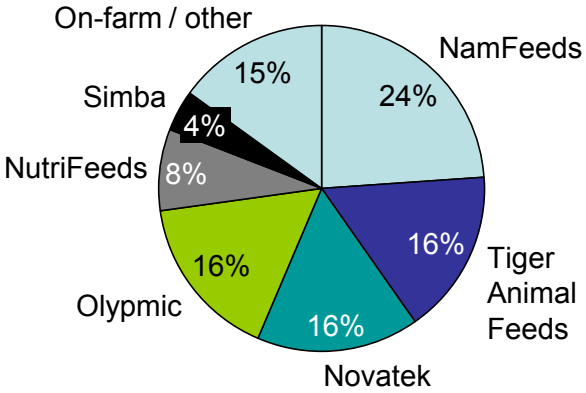
Soy cake market,
%, 2009/10
100% = 90k MT beans

Split by source



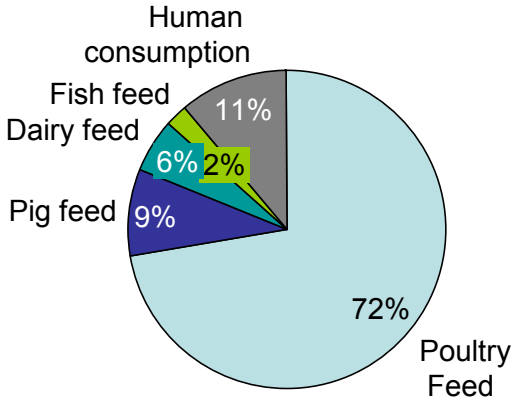
- Estimated 1K-3K MT of beans are informally imported from Malawi annually

Split by company



- Novatek and NutriFeeds are new in the past 18 months
- Verino (Hybrid), Crest, ZamChick, and Eureka are the largest consumers of stock feed

Split by use



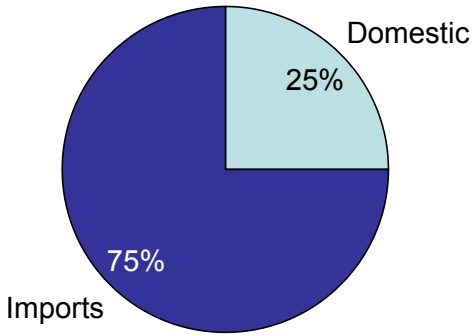
- Most soy cake is used for animal feed
- Human food makes up only ~10% of total cake use

Source: Interviews

Domestic production of soy oil is driven by Zamanita and Unified Chemicals; however, most oil is imported

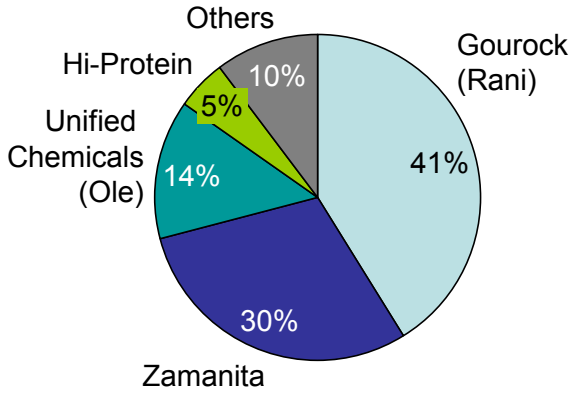
Cooking oil market,
%, 2009/10
100% = 70k MT oil

Split by source



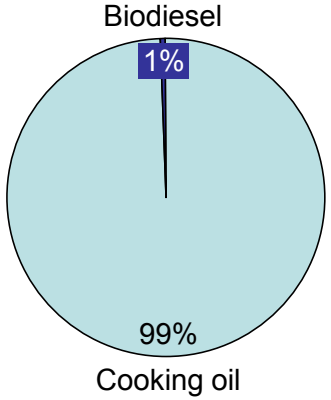
- The majority of imports are palm oil from Malaysia via Kenya and Tanzania
- Most soy oil imports come from Argentina

Split by company



- Current market demand is ~75K MT of oil
- Gourock mainly imports palm oil
- Nearly all soy oil refining is done by Zamanita and Unified; both are also large crude oil importers

Split by use



- Nearly all soy oil is used as cooking oil
- The biodiesel market is small and expected to remain small

Source: Interviews

Government intervention in maize markets makes soy a relatively less attractive crop for smallholders to produce

Key Policy	Rationale	Description	Impact on Soy
Food Reserve Agency (FRA) is major purchaser of smallholder maize	• The FRA is suppose to stabilize supply and prices of designated crops (i.e., maize) • The FRA's mandate also includes management of storage facilities	• Amended FRA act (2005) dramatically changed in the level of FRA involvement in maize markets • FRA has ~680 buying depots to purchase maize from smallholder farmers • FRA sets a fixed pan-territorial price for maize, generally significantly above market prices • FRA also manages the vast majority of storage facilities in Zambia (~2M MT), of which 40% is leased to the private sector	• The FRA indirectly limits planted land for soy because the FRA's purchasing guarantee make maize a preferential crop • The guaranteed FRA maize market, and its reach in rural areas, encourages maize production over other crops
Subsidized maize inputs via Fertilizer Input Support Program (FISP)	• FISP (formerly FSP) was created in order to demonstrate to smallholder farmers the benefits of fertilizer applications and the use of certified seeds, and to reduce food costs	• In 2010, FISP will make up ~35% of the entire Ministry of Agriculture's budget • The FISP has expanded considerably over the past 4 years and now supports 534K smallholders farmers with ~107K tons of fertilizer and ~5K tons of seed • FISP is often viewed as a social welfare program as much as an agricultural program	• Subsidized fertilizer and seed encourage maize production at the expense of soybeans and other crops • Smallholders will always grow maize due to food security, however current government policies discourage diversification

Source: FRA; "Wheat, Soy, and Maize value chain analysis" , ZNFU, 2010; FSRP "Ag Budget Analysis"

The intervention also benefits smallholders at the expense of commercial farmers and consumers

Impact of FRA and FISP on various stakeholders

Positive effect | Negative effect

Non-subsidized smallholders ↑	FISP-subsidized smallholders ↑↑	Commercial farmers ↓	Consumers ↓
			

Impact of policies

Non-subsidized smallholders	FISP-subsidized smallholders	Commercial farmers	Consumers
• Costs unaffected: No affect on production costs • Higher farm gate price: Sells to FRA at prices above private market price	• Lower costs: subsidized maize seed and fertilizer save on production costs • Higher farm gate price: Sells to FRA at prices above private market price	• Costs unaffected: No affect on production costs • Lower farm gate price: not eligible for FRA prices and suffer from the reduced market prices	• Higher retail price: The FRA sells maize back to the market at subsidized rates; however, the policies create inefficiencies and reduce competitiveness which raises costs to the consumer

- Maize production policies drive up supply, thus private market price is lower than it would be without intervention
- FRA sells maize back on the market at subsidized prices thus further reducing private market prices

Source: Interviews

Since the country's independence, there have been three distinct phases in agriculture policies and regulations

1964-1990

- Government **controlled maize prices**, **as well as input prices and trade**, all through a **monopoly awarded to the parastatal** National Agricultural Marketing Board (NAMBOARD)
- NAMBOARD supplied **subsidized inputs** and **guaranteed purchases** of maize at a **fixed pan-territorial price**
- **Nationalized maize mills sold meal at subsidized prices** to consumers, while copper revenues financed these massive subsidies
- With the decline in world copper prices, the **government could no longer afford these substantial subsidies**

1990-2004

- Government began its reform efforts in 1991 by **dismantling** NAMBOARD and **issuing licenses to private maize traders**
- However, the **halving of production** during the 1992 drought led to immediate pressure to resume **heavy government involvement** in both **import and domestic marketing of maize**
- Government established a new **Food Reserve Agency** (FRA) in 1995 to **maintain security stocks**
- Even after liberalization of domestic maize trade, government continued to play an **active role influencing the level of maize imports and exports**

2005-2009

- In 2005, amendment of the Food Reserve Act resulted in **dramatic changes in the level of FRA involvement in maize markets**
- Since then, the FRA has opened up over 600 buying depots through the country to **buy maize from smallholder farmers at pan-territorial prices**, generally **far above wholesale market price**
- During the presidential election year of 2006, the **FRA purchased 390,000 tons of maize from smallholder farmers**. This amounted to **over 90% smallholder marketed volumes**

Source: "Staple food prices in Zambia", FSRP, 2010; "Assessment of alternative maize trade and market policy interventions in Zambia", FSRP, 2008

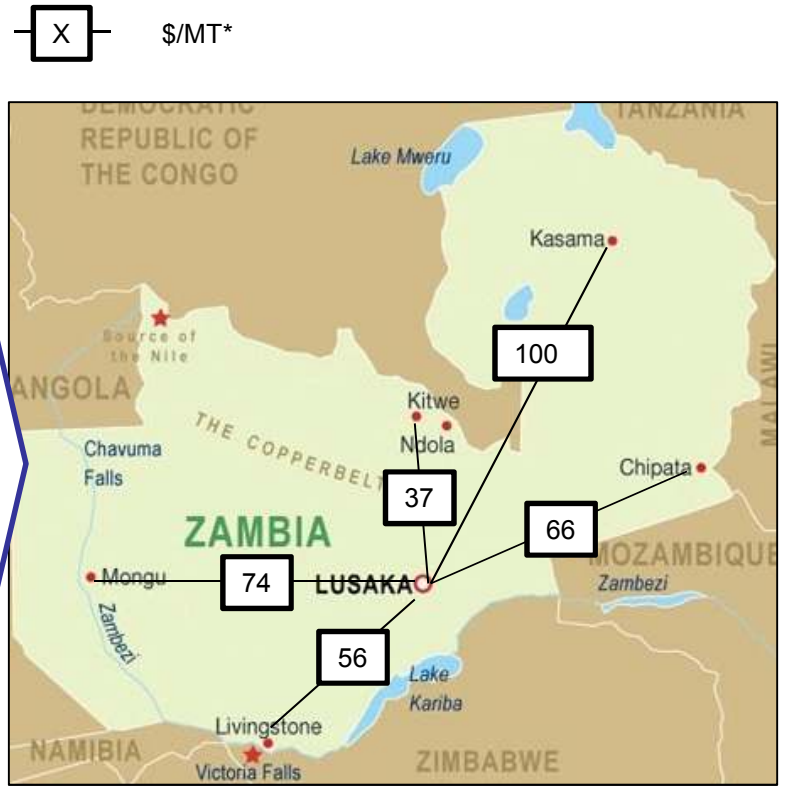
Inconsistent trade policy hinders export potential, while domestic oil prices are depressed by duty-free palm imports

Key Policy	Rationale	Description	Impact on Soy
Trade bans and permit issuance	• Bans allow the government to monitor and control strategic reserves of crop	• Tight controls on private trade, via the selective issuing of import and export licenses • Permit issuance is viewed as inconsistent and unpredictable	• Traders and processors are hesitant to develop strategies based around imports or exports • Zambia exports are less competitive because supply cannot be guaranteed
Tax-free imports of palm oil	• Reducing duty-taxes promotes regional economic integration through trade and investment	• Under COMESA sanction, palm oil is currently imported duty-free from neighboring countries • Technically, value-add of 35% must be contributed to a product to qualify, but this is not monitored or enforced • Zambia Revenue Authority has recognized this and proposed a 5% duty-tax on palm olein; however, this measure is technically illegal under COMESA agreements	• Significant palm oil imports from Tanzania and Kenya, which are believed to ultimately be coming from Malaysia drive down prices of domestic soy oil, hurting processors margins • A 5% duty-tax should help increase the price of domestic soy oil; at current prices this would reduce the price difference from $84/MT to $30/MT

Source: Interviews; ZRA, 2011 Budget overview of Tax changes; Central Statistical Office

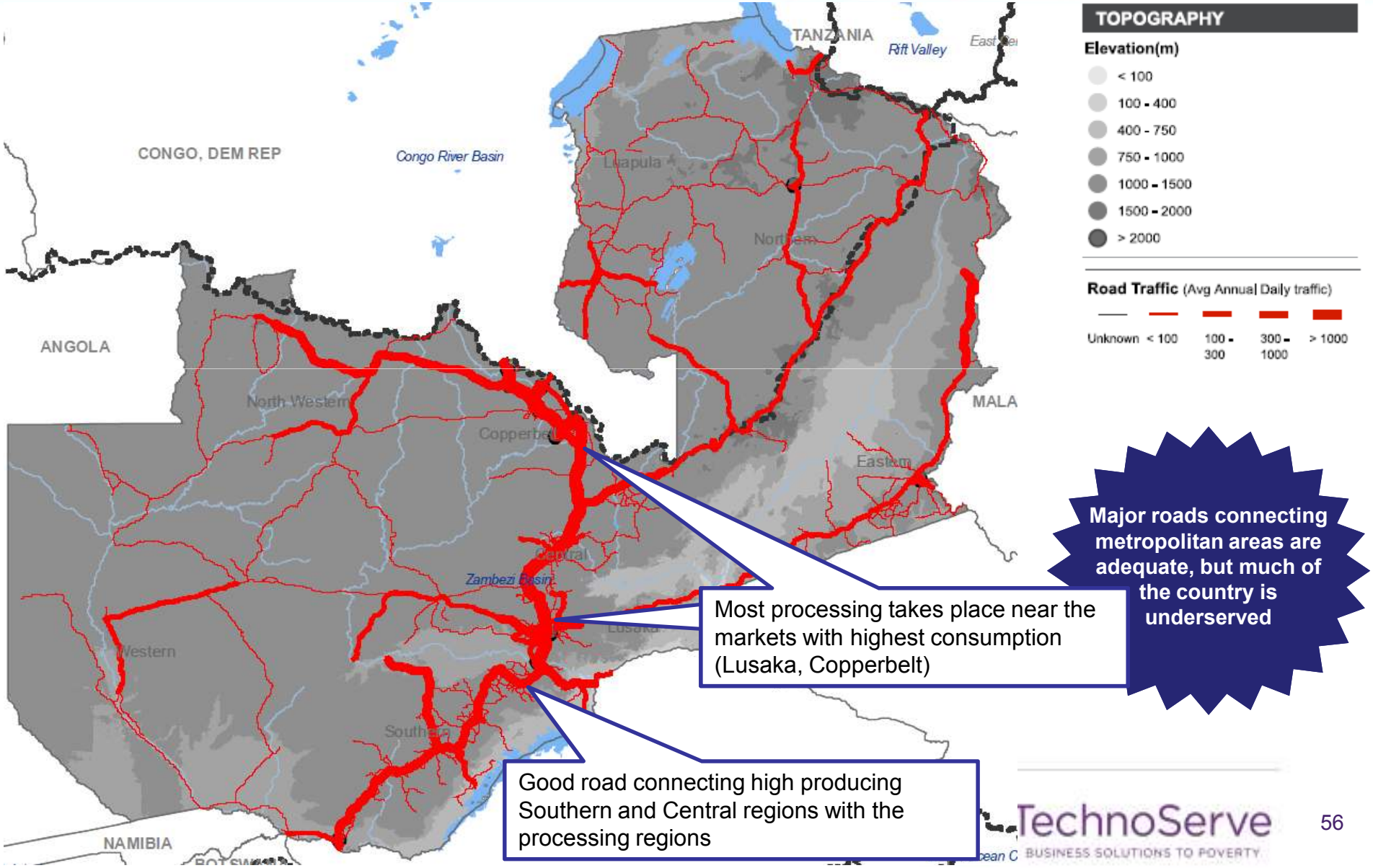
Although high transport costs reduce imports, they also decrease export competitiveness and limits production

- Nearly all soy transport in the country is done by road
  - Domestic transport is typically ~550 kwa/MT/km (~$11.64/MT/100km)
  - Zambia has good major roads connecting the main producer areas with the processing regions, but most feeder roads are in poor condition
- Rail, which was created to serve the mining industry, exists through the country, as well as to Dar es Salaam, Harare, and Johannesburg; however, because it is unreliable, less secure, and slow few traders or processors use it
- Major delays at border crossings also significantly increase regional transport costs
- Because many inputs, especially fertilizer, are often imported, high transport costs affect farms through higher input costs and higher costs after harvest

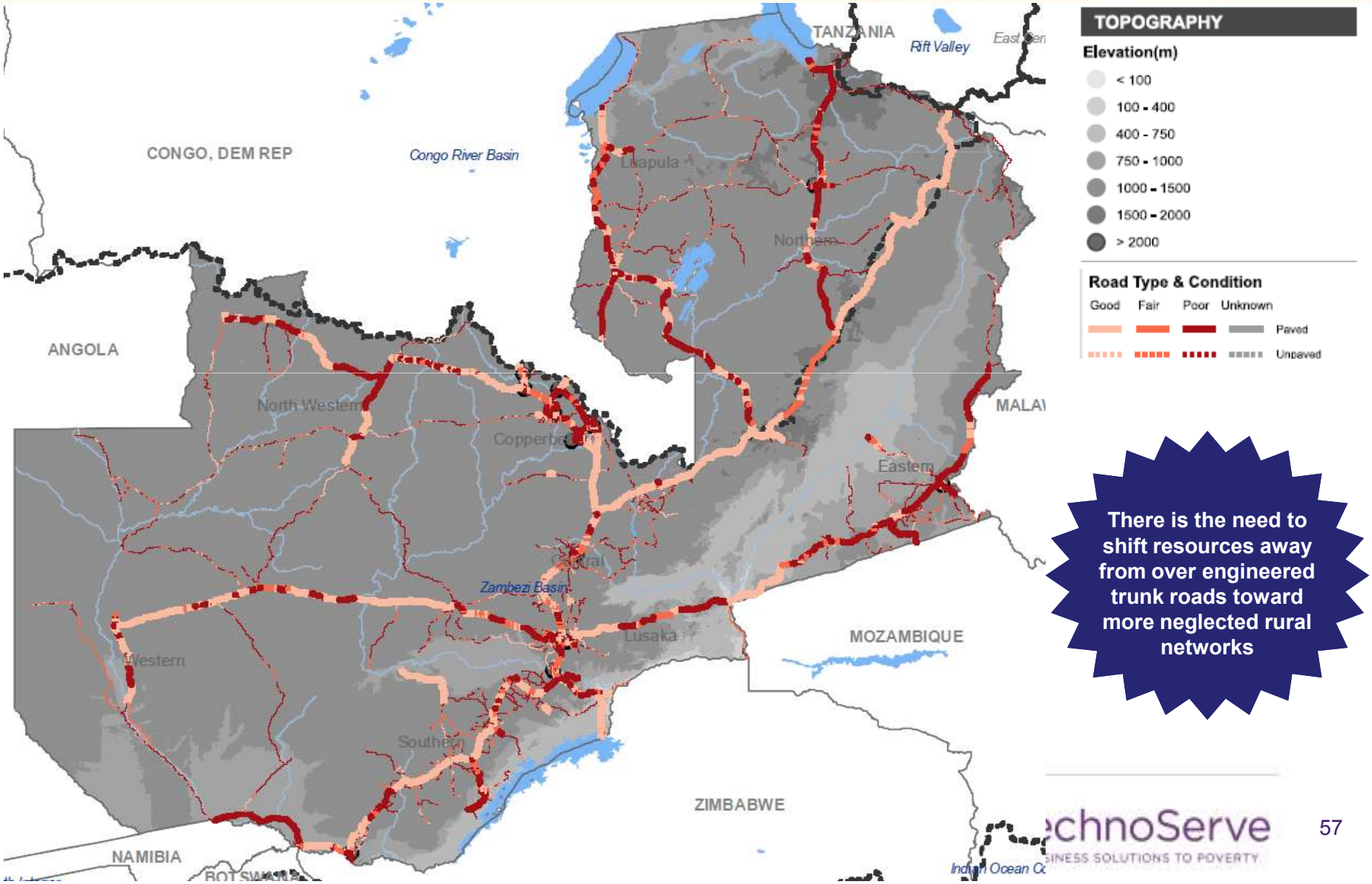


Source: Sable Transport; Interviews
Note: * Domestic transport averages 550 kwa/MT/km, calculations ignore backhaul, remoteness, etc.

The country has good major roads connecting the main producer areas with the processing regions

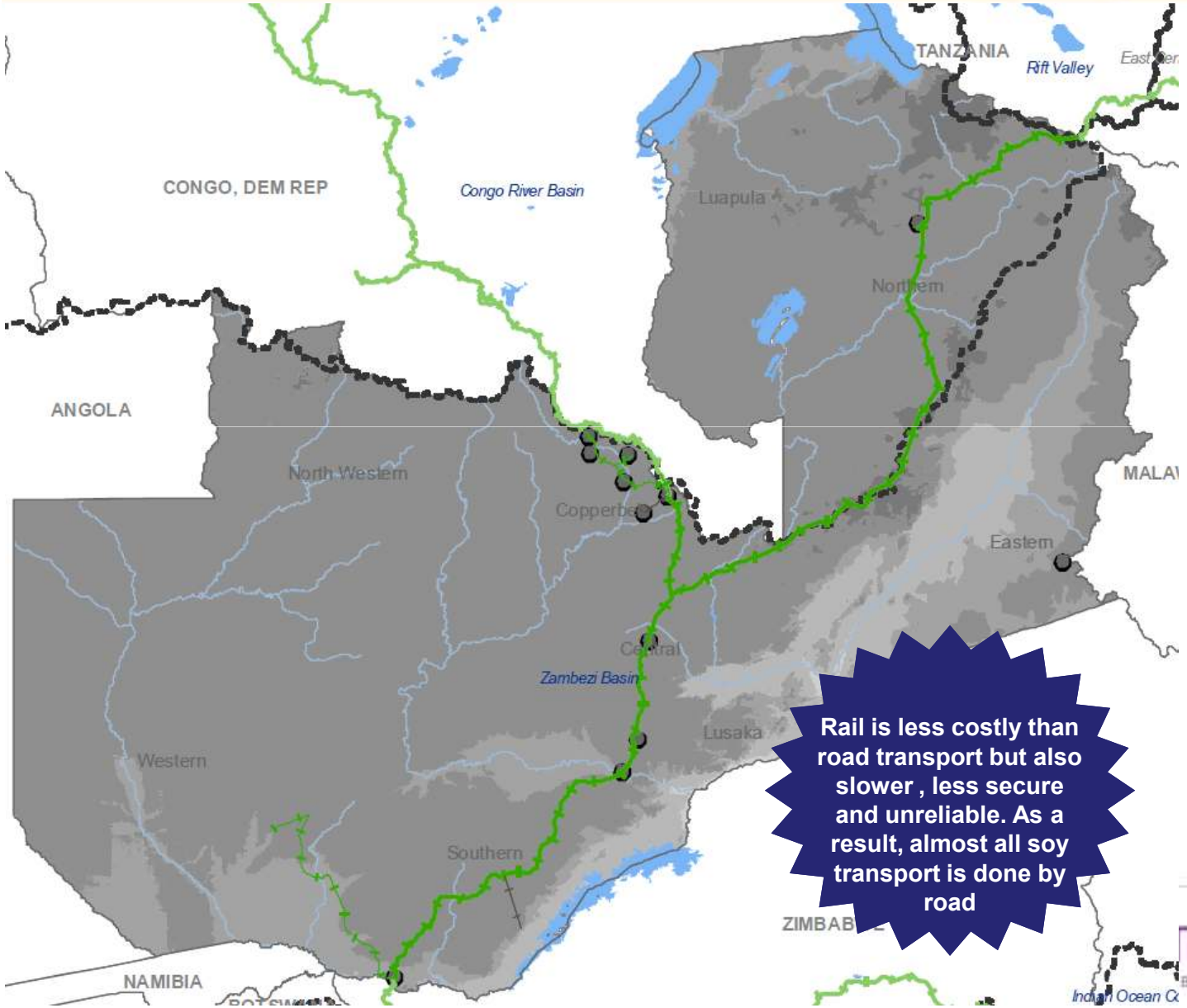


However, smaller feeder roads are either non-existent or in poor condition, often isolating more rural parts of the country



There is the need to shift resources away from over engineered trunk roads toward more neglected rural networks

While there is a rail network connecting Zambia to regional markets, it does not meet industry requirements



TOPOGRAPHY

Elevation(m)

- < 100
- 100 - 400
- 400 - 750
- 750 - 1000
- 1000 - 1500
- 1500 - 2000
- > 2000

Railroad (Million Traffic Unit per Annum)

Not Operating | < 0.5 | 0.5 - 1 | 1 - 2 | > 2

Rail is less costly than road transport but also slower , less secure and unreliable. As a result, almost all soy transport is done by road

- Currently tracks are being laid between Lilongwe and Lusaka
- There are also discussions of building rail to Mozambique
- Rail projects are plagued by insufficient and inconsistent funding

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Agenda

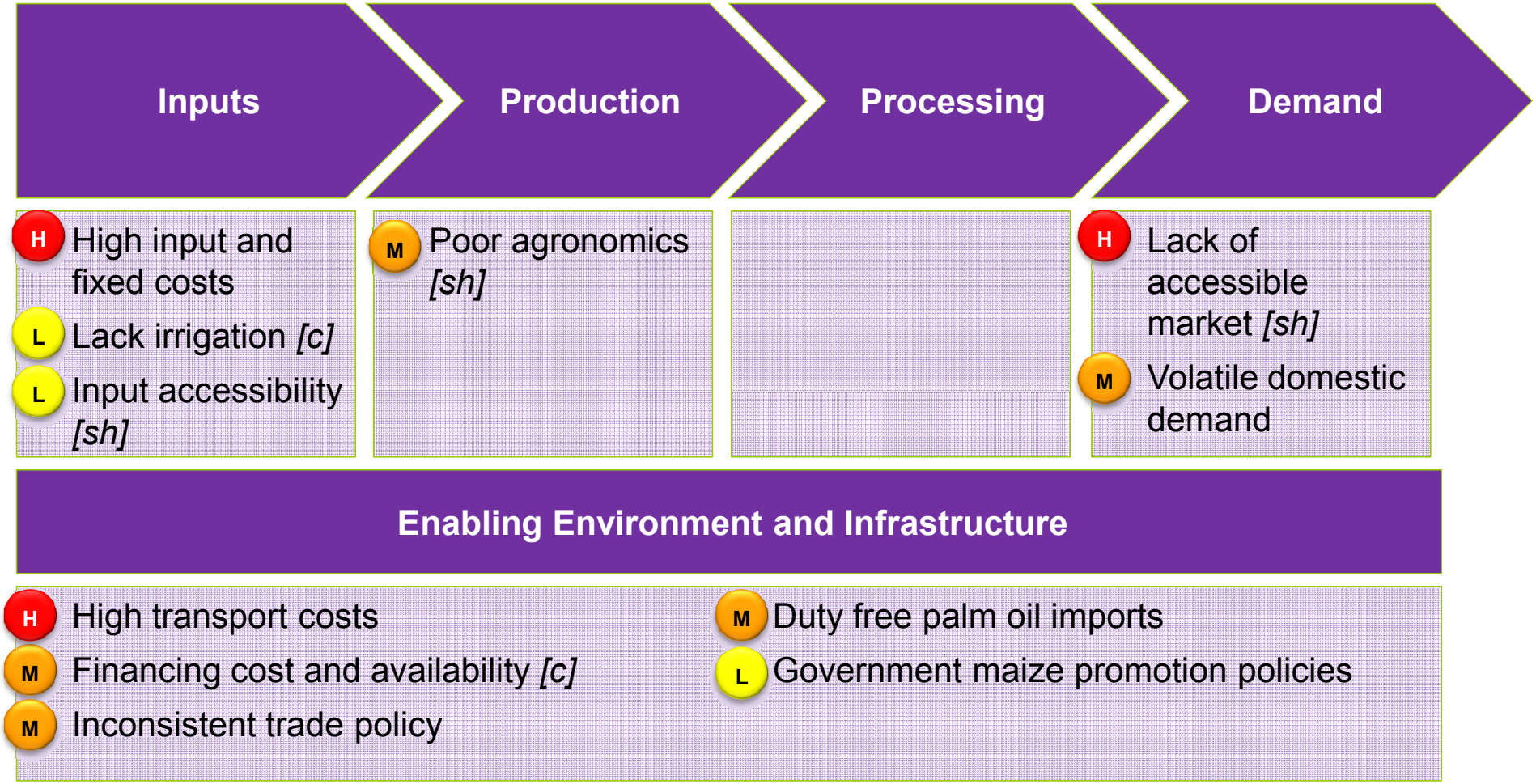
- The Zambian soy market is self sufficient and growing rapidly with some exports, with production dominated by commercial farmers and considerable scope for production growth

- Despite a strong market and sufficient processing capacity, soy is a marginally attractive crop for commercial farmers due to a high cost base, poor transport infrastructure and an uncertain export policy; it is not an attractive crop for smallholders as they lack inputs, expertise and a market

- **Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:**

- There is the potential to improve the lives of 133k smallholders by improving the soy value chain

Zambia faces a number of challenges across the value chain that limit the soybean opportunity



Severity Constraint

L *Low* M *Medium* H *High*

[sh]: Smallholder challenge
[c]: Commercial challenge

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High input and fixed costs drive up cost of production and hurt Zambia's regional competitiveness

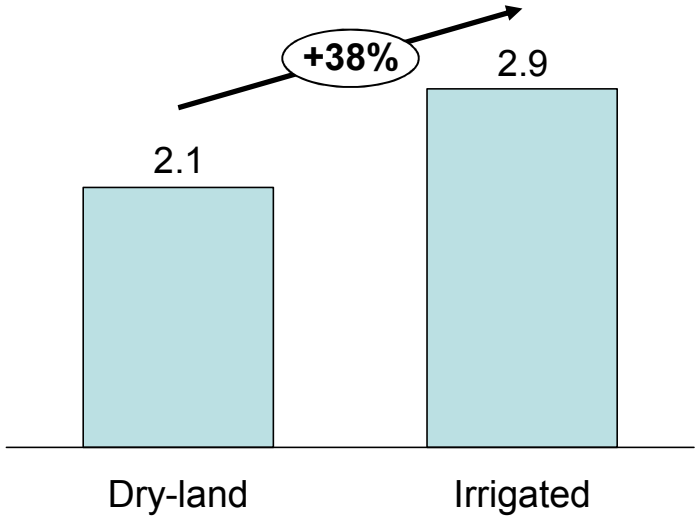
	Challenge	Impact
HIGH **High input and fixed costs**	• Zambian fertilizer, chemical and machinery costs are higher than in neighboring countries due to cost of importation • Fixed costs are estimated to be ~194% higher per MT in Zambia than RSA • Inefficiencies in public and private sector service delivery lead to high "costs of doing business"	• Higher cost structure drives up farmers' cost of production and hurts regional competitiveness • High costs discourage smallholder use of inputs because they: a) lack cash, b) view inputs as a significant investment, or c) both
LOW **Smallholder: lack of input accessibility**	• Smallholder farmers have difficulty accessing inputs, especially certified seed, inoculant, and lime • Agro-dealers report lack of demand, which is in part driven by poor agronomic knowledge and in part driven by high costs • Smallholders also have limited access to soil testing	• Smallholders often have to travel to major markets (e.g., Lusaka) to get the soy inputs they need ○ This can be both time consuming and costly • As a result, input usage is lower than it would otherwise be • Lack of accessible supply increases prices in rural areas

Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; "Commodity Competitiveness Presentation Congress" PROFIT, 2010; Interviews

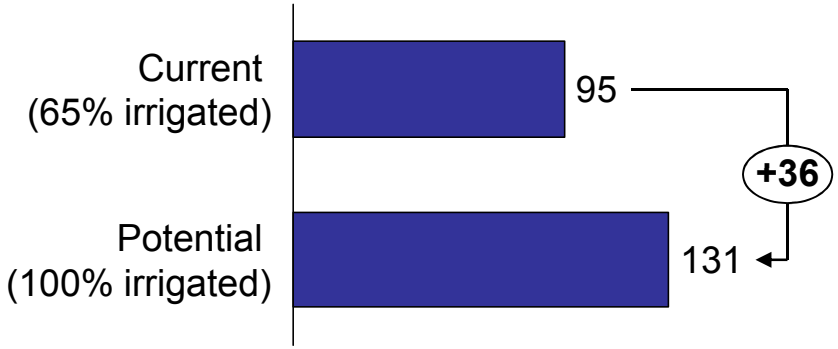
Currently, ~65% of commercial soybeans are grown under irrigation; 100% irrigation would increase production by ~36K MT

LOW **Insufficient commercial irrigation**

Commercial yields, dry-land vs. irrigated
MT/ha, 2010



Potential commercial production
'000 MT



The biggest constraint to increasing irrigation are high fixed costs and poor financing options

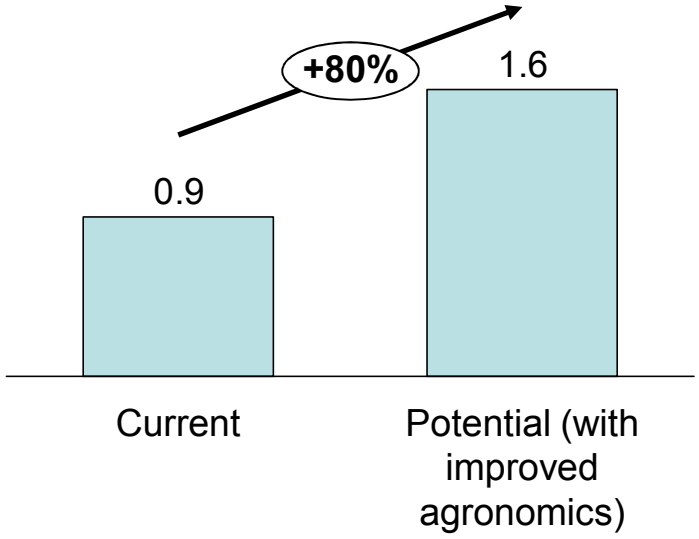
Source: Interviews; TechnoServe analysis

Improved smallholder agronomics could increase yields by 80% resulting in an increase of ~13K MT per year

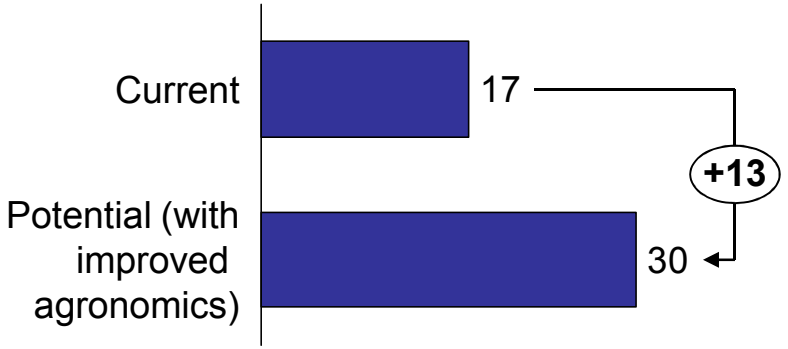
Medium

Poor smallholder agronomics

Smallholder yields, current vs. potential
MT/ha, 2010



Potential smallholder production
'000 MT



- Smallholders too often think of farming as a way of life and lack a business mindset
- Although conservation farming practices are growing; however, adherence is still mixed

Source: Interviews; TechnoServe analysis

The overall market for soy is volatile and smallholders have difficulty connecting to adequate markets

	Challenge	Impact
HIGH **Smallholders: lack of market access**	• Smallholders, especially in rural areas have difficulty finding a market for their soy • Historically farmers have been stuck with their crop or been forced to sell at very unattractive rates to briefcase traders • This is in contrast to maize, which has an assured local market with the FRA, and cotton, which is typically cultivated on private sector out-grower schemes	• Smallholders are hesitant to grow soy • Soy is viewed as a high risk crop and as a result receives less attention even if planted
MEDIUM **Volatile demand**	• It is difficult for farmers to read the soy markets from year to year • Domestic demand from the stock feed industry has been volatile in the past (from the second half of 2008 through the first half of 2009 the domestic broiler industry shrank by nearly 40%)	• Commercial farmers are hesitant to increase production because they fear they won't be able to find an attractive market for their soy

Source: Interviews

Poor transport infrastructure and high cost of finance both drive up the cost of production for Zambian farmers

		Challenge	Impact
HIGH	**Inadequate transport infrastructure**	• Poor feeder roads as well as high fuel and maintenance costs • Lack of main roads between all major destinations means roundabout routes are often necessary • Rail is unserviceable for soy transport due to speed, security issues and reliability	• High transport costs regionally protect Zambia from imports, but it decreases export competitiveness • High domestic transport costs drive up cost of production both for inputs and sales delivery
MEDIUM	**Commercial: availability and cost of financing**	• Large commercial farmers struggle to access reasonable financing, as banks, often justifiably, view the agricultural industry as being at high-risk for defaults • Farmers have difficulty both securing long-term loans, and securing loans at attractive rates	• Lack of adequate financing hinders large-scale investments that take a long time to pay back, such as irrigation • Farmers of often cash constrained and have to make sales decisions based on loan repayments, rather than profit maximization

Source: "Commodity Competitiveness Presentation Congress" PROFIT, 2010; "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; Interviews

Various government policies hinder the development of a regionally competitive soy industry

	Challenge	Impact
MEDIUM **Trade policy**	• Tight and unpredictable controls on soy trade, via the selective issuing of import and export licenses	• Traders and processors are hesitant to develop export strategies • Zambia exports are less competitive because supply cannot be guaranteed
MEDIUM **Palm oil import policy**	• COMESA sanctioned duty-free palm oil is being imported to Zambia via Kenya and Tanzania, most likely originating from Malaysia and Singapore	• Cheap imports drive down prices of soy oil, hurting processors margins and weakening the demand for domestically produced soy oil
LOW **Maize promotion policies**	• Various policies – such as providing subsidized fertilizer and seed, and paying above-market prices – enacted through the Ministry of Agriculture and Cooperatives champion maize	• Maize promotion encourages smallholder maize production at the expense of soybeans and other crops

Source: "Wheat, Soy, and Maize value chain analysis" ZNFU, 2010; Interviews

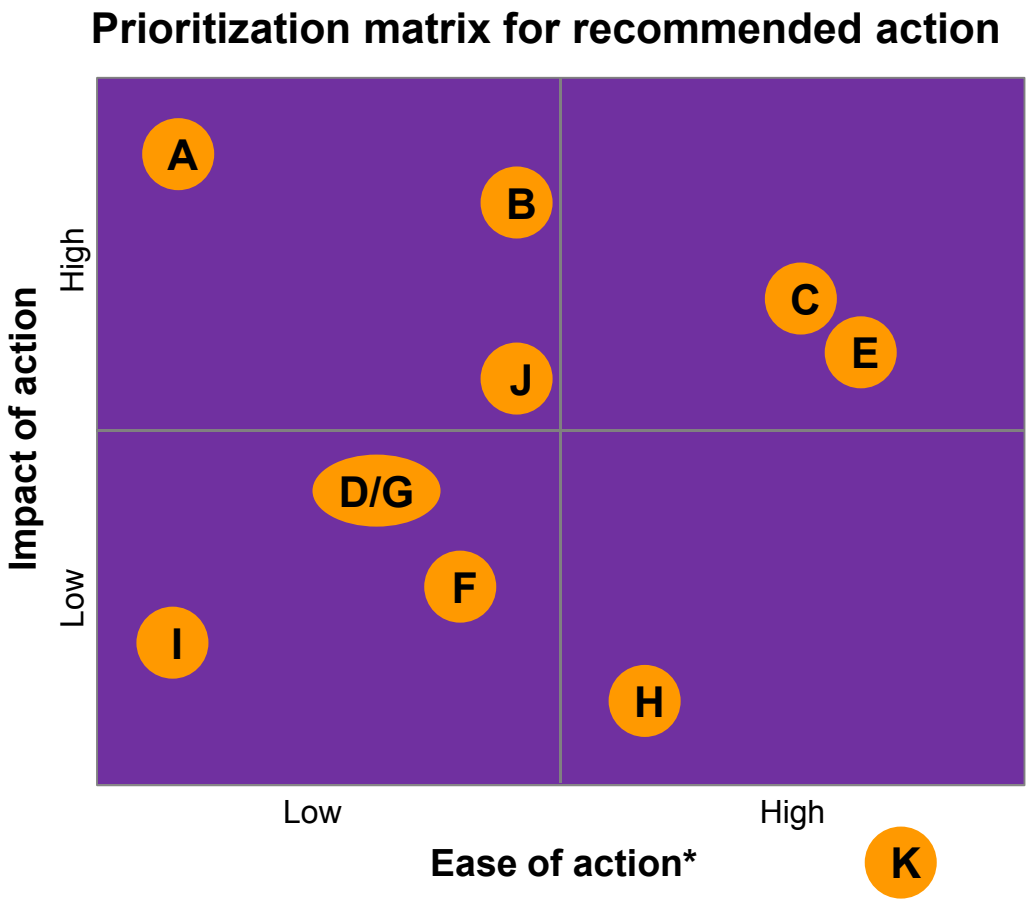
Near-term actions should focus on reducing costs to increase regional competiveness and aiding smallholders

Item	Constraint	Recommended Action(s)	Timing
A	High transport costs	• Encourage public investment in feeder roads and improving existing rail lines • Lobby to reduce fuel taxes	Near-term
B	Lack and cost of financing options for commercial farmers	• Develop program aimed at educating farmers on the importance of to recordkeeping in order for them to become credit worthy • Work with banks to help them understand agricultural lending and encourage banks to expand agricultural credit teams with agronomists	Near-term
C	Lack of market accessibility for smallholders	• Focus on creating market linkages between smallholders private sector (e.g., Cargill, ZamBeef, CHC Commodities) • Strengthen farmer organizations so that smallholders are able to reduce buyers' transaction costs and negotiate collectively	Near-term
D	Poor agronomic practices of smallholders	• Increased extension services and demonstration plots, especially driven by the private sector • Increase funding in private/public research and commercialization of research • Contract farming schemes	Near-term
E	Inconsistent trade policy	• Lobby for less government intervention and consistent, predictable trade policy • Create sub-committee to accurately track domestic supply and demand	Medium-term
F	High market volatility	• Promote use of forward contracts between processors/traders and farmers • Ensure export market by addressing high production costs and inconsistent trade policy (see above), which will in-turn create a reliable export market • Promote health and nutritional aspects of soy • Explore crop insurance	Medium-term

Longer-term actions should focus on improving the policy environment for soy

Item	Constraint	Recommended Action(s)	Time Undertaken
G	Lack of soil testing and lime use among smallholders	• Work with Ministry of Agriculture through programs such as ZARI to conduct district-level soil testing and prescribe input recommendations for smallholders at district-level • Use demonstration plots to demonstrate benefits • Demand for lime should bring down costs; however, if costs remain too high, explore encouraging government subsidies • Encourage private sector to test soil	Medium-term
H	Palm oil import	• Help to continue building business case that palm oil imports from east Africa are originating in Asia and are not contributing 35% value-add	Long-term
I	Government maize promotion policies	• Recognize political weight behind maize policies and that it is not currently a severe constraint • Encourage crop diversification and lobby for policy changes when possible	Long-term
J	Insufficient commercial irrigation	• No direct action needed • The biggest addressable hurdle to irrigation is cheap long-term financing; addressing financing problems should in-turn increase levels of irrigation	N/A
K	Insufficient input availability to smallholders	• No direct action needed • Improving smallholder agronomics, and reducing input costs should in turn stimulate demand • With increased demand, agro-deals should alleviate input accessibility problems	N/A

Actions should be prioritized base on the impact and the ease of the recommended actions



Item	Recommended action(s)
A	Encourage investment in transport
B	Finance education program
C	Market linkages for smallholders
D/G	Agronomic training and soil testing for smallholders; contact farming scheme
E	Lobby for consistent trade policy
F	Encourage use of forward contracts and export transparency
H	Build case on illegal palm oil imports
I	Lobbying government maize promotion policies
J	Reduce financing costs for commercial irrigation
K	No direct action needed

Note: * Relative ease of implementation takes into consideration the stakeholders involved, the level of political difficulty, the cost of fixing it, and the time it would take to do the action

Agenda

- The Zambian soy market is self sufficient and growing rapidly with some exports, with production dominated by commercial farmers and considerable scope for production growth

- Despite a strong market and sufficient processing capacity, soy is a marginally attractive crop for commercial farmers due to a high cost base, poor transport infrastructure and an uncertain export policy; it is not an attractive crop for smallholders as they lack inputs, expertise and a market

- Therefore, Zambia must make a number of improvements along the value chain to take advantage of the growing domestic market and export opportunities:

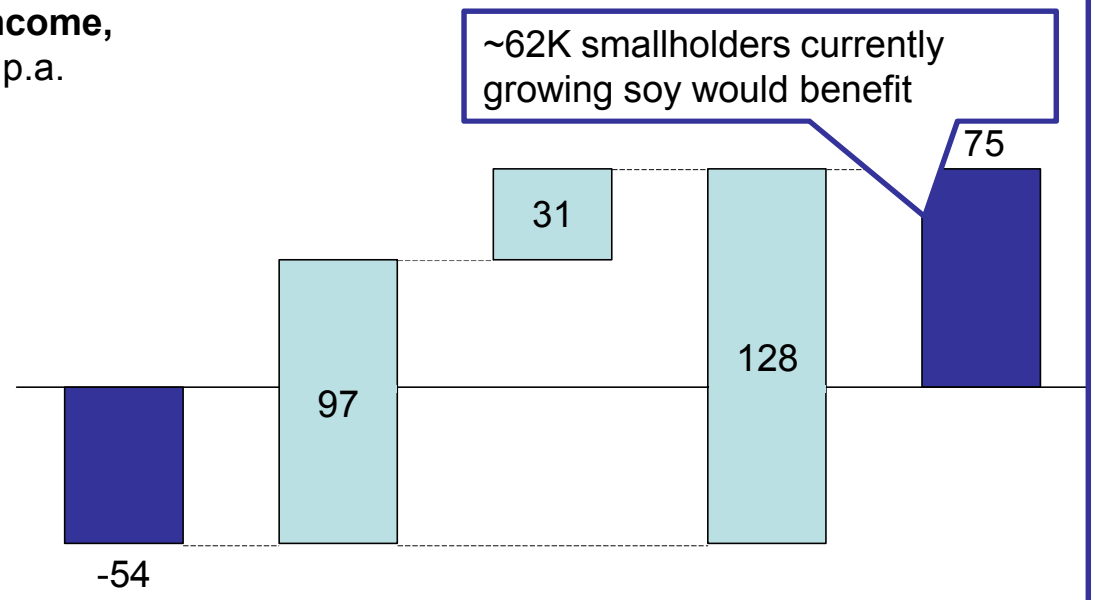
- **There is the potential to improve the lives of 133k smallholders by improving the soy value chain**

Improving agronomics and market linkages for the ~62K existing soy smallholders could increase their incomes by $128 p.a. each

Assumptions

- Smallholders cultivate the same hectares of soy as at present (0.46 ha avg.)
- Yield per ha rises from 0.9 to 1.6 from improved agronomics
- Farmers' costs remain the same; increased input usage could result in even greater benefits
- Traders' margin reduced from 30% to 20% due to improved market linkages (i.e., direct forward contracts between farmers and buyers)
- Wholesale price of soy is $415/MT

Potential improvement to smallholder income,
$ p.a.



Source: Interviews; TechnoServe field survey October 2010 (Dirk K.); "Wheat, Soy, and Maize value chain analysis" , ZNFU, 2010; 2010 Crop Forecast Survey; TechnoServe Analysis

Note: * Accounts for labor opportunity costs

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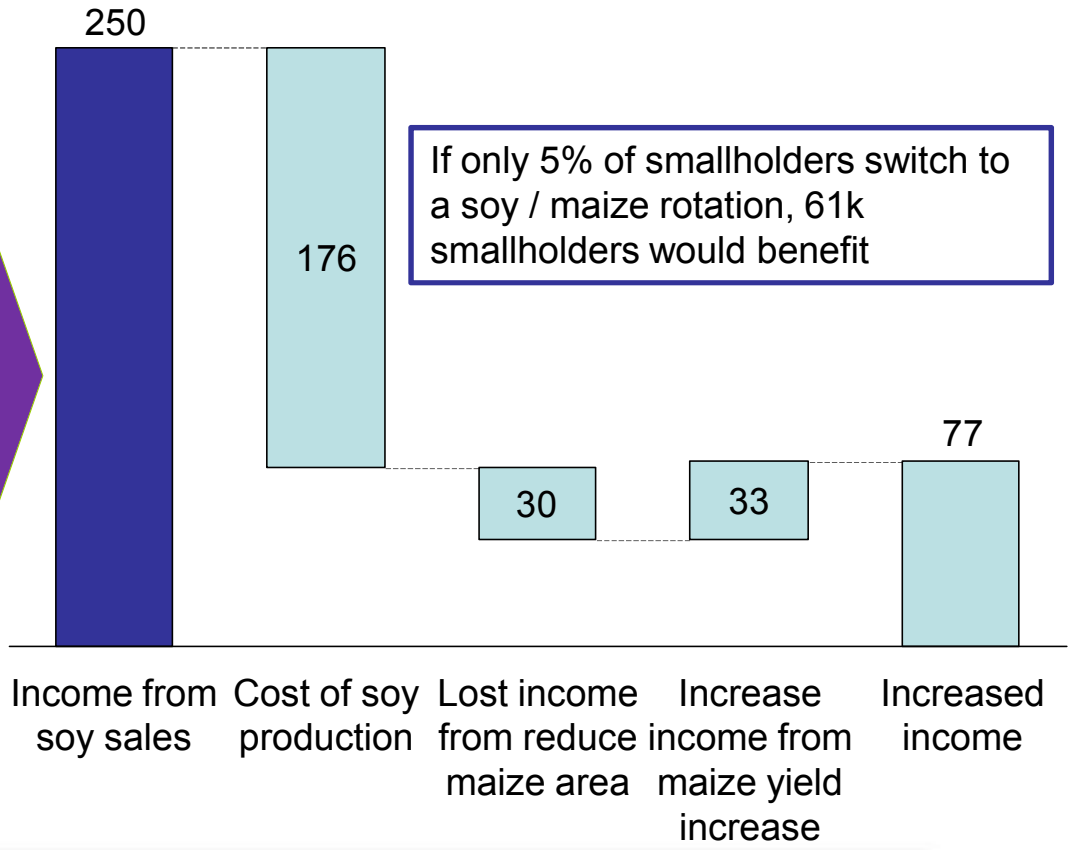
Smallholders moving to a soy / maize rotation could increase their income by $77 p.a.

Net income of smallholder rotating soy and maize,
$ p.a.

Assumptions

- Maize smallholders convert to growing soy on 0.46 hectares each
- Converted soy hectares benefit from improved agronomics and market linkages
- Farm gate maize price is $255/MT
- Average smallholder maize cost is $573/ha
- Average smallholder maize yields are 2.5 MT/ha
- Remaining unconverted maize hectares (0.51 hectares on average) see a 10% yield increase from 2.5 to 2.75 MT/ha due to soy's nitrogen-fixing properties



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