

The Soybean Agri-Processing Opportunity in Africa



African Center *for* Economic Transformation

Contents

1. Executive Summary	4
Overview of the Soybean Value Chain and Africa’s Positioning	4
Opportunities and Challenges for Developing the African Soybean Sector	4
Implications and Next Steps for Policy-Makers	5
2. Overview of the Soybean Value Chain.....	6
The Value Chain – From Soybean to the Final Consumer Product	6
The Structure of the Soybean Industry.....	8
A Review of Selected Key Players	9
3. The International Soybean Market.....	12
Soybean Production	12
Soybean Processing	14
Prices	15
Outlook for the Soybean Market.....	16
4. The African Market	18
The Structure of the African Market	18
Nigeria: Africa’s Leading Soybean Producer.....	21
Zambia: a ‘Mid-Sized’ Soybean Producer and Processor.....	23
Senegal: An Example Cake Consumption Market.....	24
5. The Value Capture Opportunity	25
Challenges and Barriers	25
Key Opportunities for Value Capture for African Countries	28
6. Brazil: a Case Study of the Key Success Factors for Value Capture in the Soybean Industry	32
Background: Converting Soybean into Poultry Exports.....	32
Implications: Key Success Factors for Value Capture	33
7. Positioning of African Countries for Successful Value Capture	35
8. Considerations and Steps Required to Develop Policy	37
A – Identify and Prioritize Opportunities for Value Capture	37
B - Identify Current Policy Bottlenecks	38
C – Develop Key enabling interventions	39
D – Address Potential Policy Trade-offs.....	40

Table of Figures

Figure 1: Overview of Products that can be Generated from Soybeans	6
Figure 2: Breakdown of Value-Capture by Stage of Soybean Processing.....	7
Figure 3: Soybean's share in Poultry Production – Mozambique Example	8
Figure 4: Soybean Share of Global OilSeeds Activity	12
Figure 5: Global Soybean Production [US\$ or Tons???]	13
Figure 6: Soybean Production and Exports by Major Country	13
Figure 7: Soybean Processing by Country (mT Crushed in 2010/11).....	14
Figure 8: Processed Soybean Production and Trade	15
Figure 9: Pricing of Soybean versus Processed Products.....	16
Figure 10: Soybean Trade Outlook	16
Figure 11: Recent Soybean Production and Processing Growth in Sub-Saharan Africa	18
Figure 12: Soybean, Cake Oil and Cake Production and Imports for Countries in the African Transformation Report	19
Figure 13: Overview of African Countries by Nature of Value Capture Opportunity	20
Figure 14: Distribution of Soybean Production in Nigeria, 2008	21
Figure 15: Nigerian Soybean and Poultry Production, and Soybean processing volumes (1990-2009)	22
Figure 16: Overview of Challenges Faced by Sub-Saharan African Countries Across the Soybean and Poultry Production Value Chain in Africa	25
Figure 17: Importance of Argentina in African Imports, and Relative Cost of Argentine Beans versus Local Production	26
Figure 18: Soybean and Processed Soybean Product Import Tariffs in Sub-Saharan Africa.....	26
Figure 19: Relative Import Prices of Substitutes for Soybean Products Into Sub-Saharan Africa, 2008	28
Figure 20: Key Value-Capture Opportunities in Soybean	29
Figure 21: Size of the Soy Import Substitution Opportunity, by Country.....	29
Figure 22: Size of the Broader Edible Oils and Oilcake Import Substitution Opportunity	30
Figure 23: Key Sub-Saharan Africa Poultry Production and Consumption markets	31

Figure 24: Overview of Nigeria's POsitioning Against Key Success Factors for Greater Value Capture in the Soybean Value Chain..... 35

1. Executive Summary

Soybean is the world's most important and most traded oilseed. It is valued in its processed form as a source of high quality, high protein animal feed in the poultry and pig meat industry, and also as a source of edible oil. There is also a growing market for human consumption of processed soy in forms such as corn-soy blend that offer a low-cost source of protein.

Africa is both a net importer of soybean and processed soy products, and also has the capability to produce substantial volumes of soybean. Although major soybean producing and processing countries are able to achieve low unit costs of production, emerging information on the sector suggests that local production is not necessarily at a significant price disadvantage versus imports. As a result, soybean represents a very tangible opportunity to capture an already present import substitution opportunity, as well as address generally highly price elastic markets in Sub-Saharan Africa for meat or protein in general.

OVERVIEW OF THE SOYBEAN VALUE CHAIN AND AFRICA'S POSITIONING

In terms of value-addition, the soybean value-chain is best regarded as a human protein value chain that involves the production of soybean, processed soy protein and oil as a co-product, and finally either animal meat or soy products for human consumption. While there is a vast array of additional co-products such as soy gums, lecithin and mill feeds, these are relatively niche products; for the purposes of this report, we focus on the protein and soybean oil pathway:

Soybean production: Production of soybean is largely concentrated in the US, Brazil and Argentina, which accounted for 81% of volumes and 88% of trade in 2011. Africa is a marginal producer, accounting for less than 1% share of production.

Soybean Processing: At the processing level, China is the largest player by volume, followed by the key soybean producer countries. Key import markets for soybean include China as a consumer of raw soybeans and EU as a consumer of soybean cake. At the global scale, Sub-Saharan Africa is a small producer, with less than 0.7% share of total production. However, Sub-Saharan Africa imports substantial volumes of processed soybean in the form of oil and cake for animal feed, valued at \$1.2bn in 2008.

OPPORTUNITIES AND CHALLENGES FOR DEVELOPING THE AFRICAN SOYBEAN SECTOR

As a net importer, Africa is exposed to rising global prices for soybean, oil and cake. Its low scale of production and lack of integration with the production systems of global processors and traders such as Archers Daniels Midland (ADM), Cargill and Bunge largely exclude prospective processors from accessing key import markets.

The value-capture opportunity for prospective African processors is therefore in maximizing the potential of the domestic market. There are three main strategies available:

- **Substitute soy imports:** Africa imports constitute a \$1.2bn substitution opportunity for African producers and processors that can match the price and quality of imports. In many countries the relatively low cost of soybean when compared to the cost of major producers, provides a platform for local processors to compete.
- **Displace other oils and meals in the African market:** Low quality, locally produced feeds, like cottonseed cake, are used extensively in poultry production. Prospective soybean processors that are able to achieve lower costs than imports can potentially access the entire poultry-feed sector in Africa. On the other

hand, displacing palm oil, the major edible oil in Africa, is a greater challenge, as its low relative cost is very attractive to price sensitive consumers.

- **Target growth markets for soybean cake:** Human consumption of soybean is marginal in most African countries, with Malawi and Nigeria as notable exceptions. A large untapped market of low-income consumers with latent demand for low-cost dietary protein could be addressed by soybean processors.

Several challenges hold back the development of the sector, and provide points of entry for policy interventions. Soybean processing can be a challenging business, with difficult economics due to the seasonal variability of input costs and prices for oil and cake. As a result there are very few standalone processors, and most are vertically integrated into animal feed manufacturing or further into livestock production. Additionally, soybean processing requires sales of both cake and oil to be economically viable and currently, indigenous demand is heavily skewed toward oil. As a result, markets for cake need to be found in order to fully capture opportunities. Policy-makers have a role to play in stimulating general demand, especially for human consumption of soybean. They can also support producers and processors of soybean with access to inputs and finance.

IMPLICATIONS AND NEXT STEPS FOR POLICY-MAKERS

From the policy-makers' perspective, development of the soybean processing sector should be understood primarily as a means for, 1) reducing expensive imports and 2) as a strategy for increasing dietary protein of citizens (either by being consumed directly, or as poultry). Soybean processing is not a significant source of value-addition or spillovers to the broader economy.

To develop a robust soybean processing agenda that addresses the above objectives, policy-makers need to undertake a detailed understanding of local production and consumption potential for the full range of key soybean and soybean-related products, and develop an approach that can foster the development of an infant industry that may, despite indications of emerging price competitiveness of African production, face some price competition in its development phase before reaching minimum efficient scale. Given the positive spillovers in terms of benefits to the livestock sector and overall nutrition, a case can be made for supporting the industry, but this must be balanced with a clear roadmap to eliminating support in order to avoid open ended commitments and manage the challenge of development of special interests.

A decision also needs to be made regarding the extent to which policy-makers intend to work with major multinational oilseed traders and processors, versus developing local processing capability. While in many sectors the development of local capabilities has significant broader benefits in terms of employment, skills development and income generation, the relatively low value-added from soybean processing, combined with significant positive spillovers, suggests a detailed analysis of country-specific impacts is required in order to determine the appropriate policy balance at the country-level.

In this report, we aim to analyze the structure of the whole soybean value chain. We build on extensive existing literature, but pay particular attention to the distribution of value across the different stages of production, the trends influencing the market and the role that African policy-makers can play in capturing the soybean processing opportunity.

2. Overview of the Soybean Value Chain

THE VALUE CHAIN – FROM SOYBEAN TO THE FINAL CONSUMER PRODUCT

Soybean is a legume that can be used as a base for a broad array of agricultural products. It is a key source of protein that is either consumed directly or indirectly as animal feed, with a small amount of oil generated as a side product that can be used for cooking.

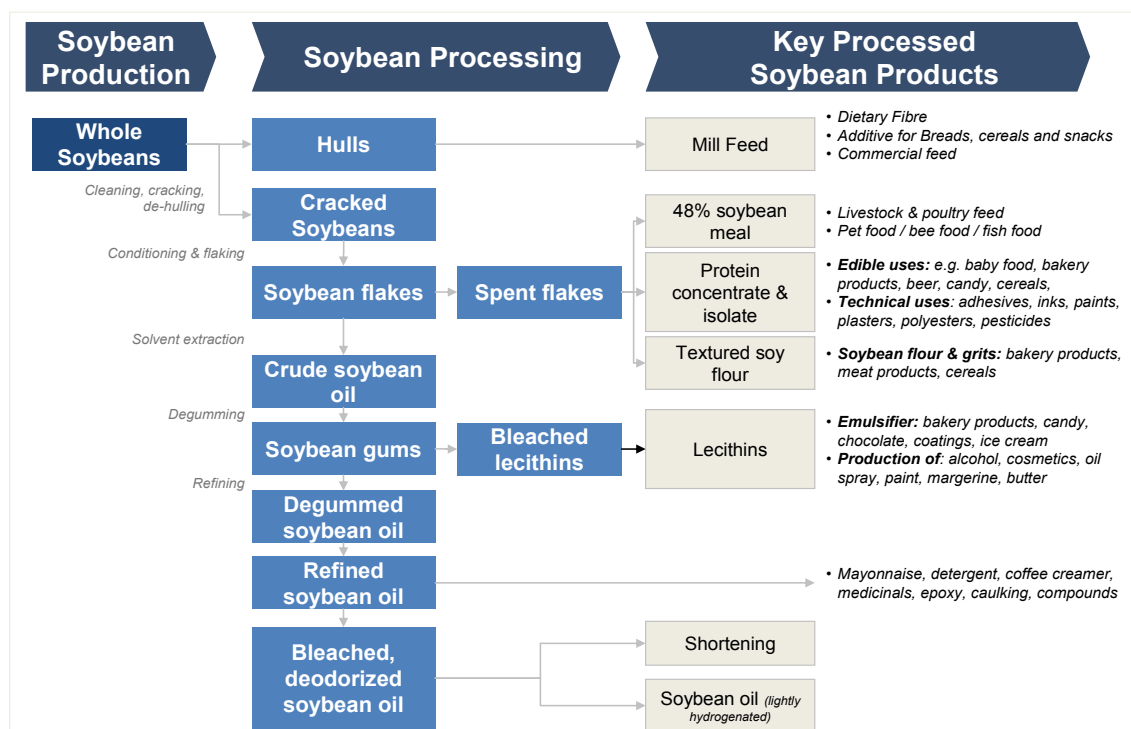
The major processed soybean product globally is soybean meal, which is used for animal feed (especially for poultry and pigs). Meal is derived from soybean flakes that are separated from the oil when beans are processed either mechanically or by using a solvent. Soybean meal is considered a very high quality feedstock, mostly due to its high protein content in comparison with alternatives.

Approximately 15-18% of soybean mass converts to oil. There is a small but growing proportion of soybean oil that is used as a feedstock for biofuel production, but soybean is rarely cultivated with this as the core objective.

Depending on regional tastes, soybean is also used to produce food products for human consumption. This is particularly common in East Asia, and examples in Africa include Malawi where soy pieces are considered an attractive and low cost substitute for meat.

In developed markets such as the US, a market also exists for other derivatives from soybean, but these are largely absent in emerging market soybean industries.

FIGURE 1: OVERVIEW OF PRODUCTS THAT CAN BE GENERATED FROM SOYBEANS

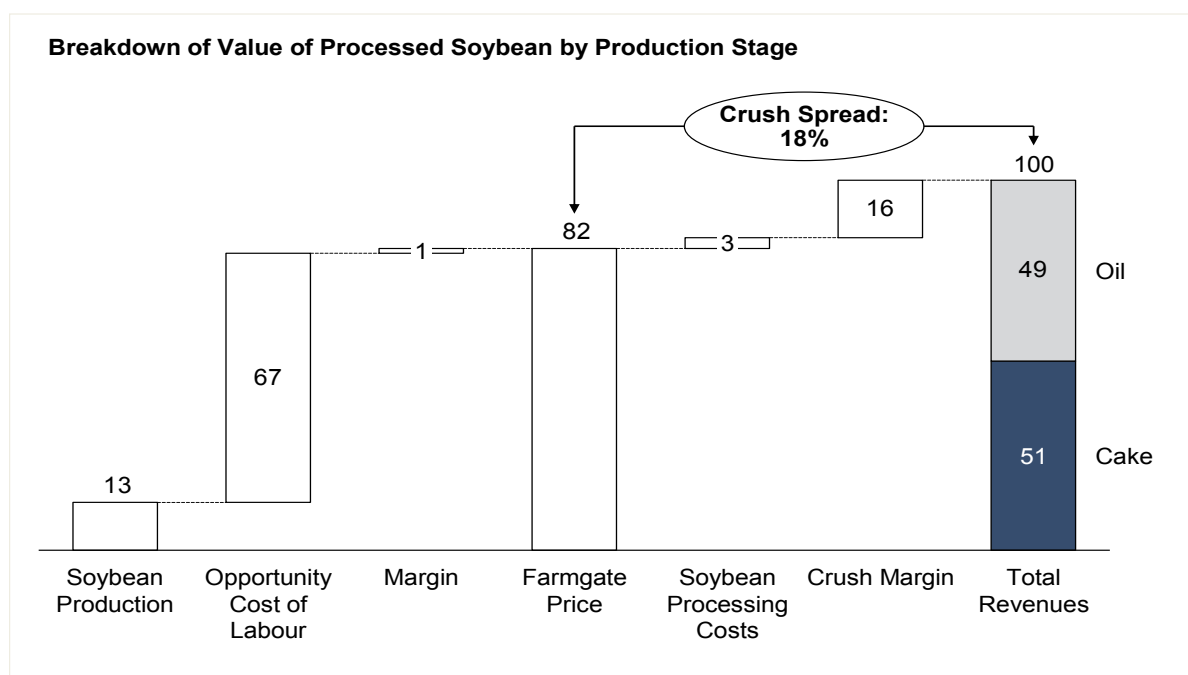


Source: Adapted from Wish H

The key indicator of the margin from processing soybean and other oilseeds is the ‘crush spread’, which is defined as the difference between the combined sales value of processed soybean (i.e. the weighted average price per ton for soybean oil and cake, with weights determined by the typical mix of oil, cake and wastage produced per ton of soybean input) versus the input cost of raw soybeans. This is also known as the ‘gross processing margin’ (“GPM”). Figure 2 provides an example of a soybean processor with a crush margin or GPM of 18%. However, margins for soybean processors can vary across the harvesting cycle and across regions.

A broad set of seasonal, cyclical and fundamental factors impact the GPM that processors are able to realise, including variations in the demand for high protein feed over the course of a year and the depletion of stocks over the course of the year in the intra-harvest period. The cost of raw soybean can account for over 80% of operating costs and is the biggest determinant of processing economics. As a result, regional variations in soybean farming techniques, such as the level of importance of commercial farms versus smallholders, and the use of genetically modified strains with higher yields all very directly impact the viability of a processing industry. Processors’ ability to capture value is also determined by the availability of direct substitutes (i.e. imported soybean products) or close substitutes derived from other oilseeds.

FIGURE 2: BREAKDOWN OF VALUE-CAPTURE BY STAGE OF SOYBEAN PROCESSING¹



SOURCE(S): example soybean processing facility model; Technoserve; FAO; Dalberg analysis

As the data above illustrates, simply processing soybean into oil and cake does not offer very large returns. On a per ton basis, cake tends to be priced lower than raw soybean, with soybean oil priced substantially higher²; the combined sales value tends to generate a positive GPM, but given the factors outlined above, margins are volatile

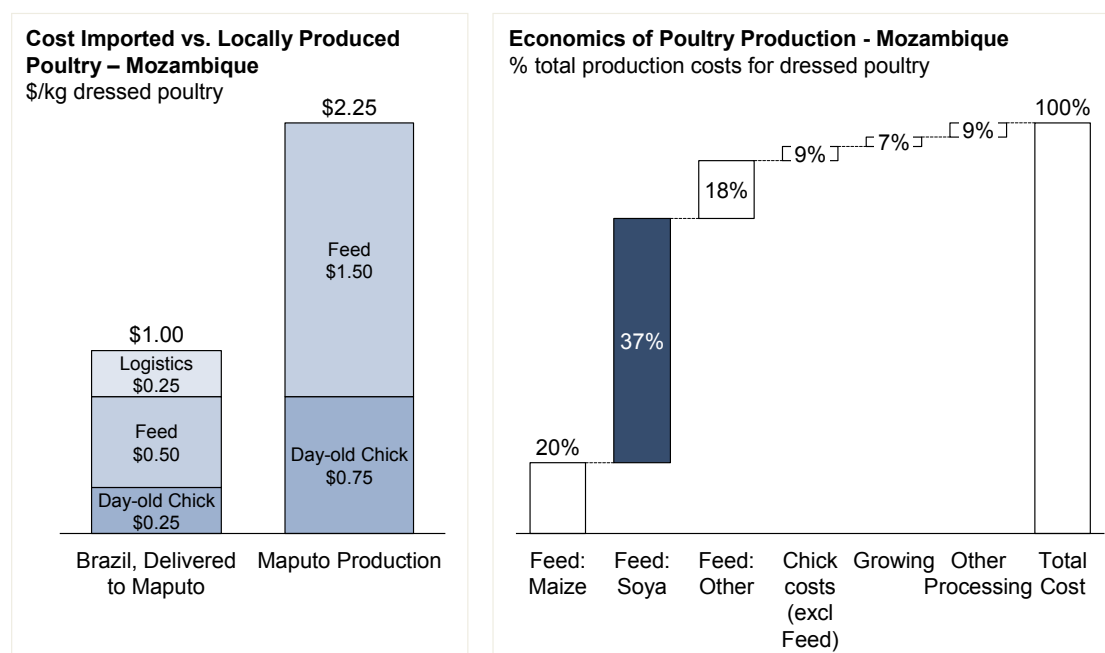
¹ Numbers do not sum due to rounding

² As an example, based on a small c.36,000 ton crushing facility in Rwanda, soybean meal prices were 0.9x the cost of raw soybeans, while soybean oil was sold at 4.3x the price of raw soybean

and do not set the stage for much meaningful increased value capture or significant broader positive spillovers, especially in regards to fostering a broader industrial base.

However, conversion of soybean protein to poultry meat is a key opportunity for value addition. Although soybean is only one component of what is necessary to produce poultry, it can be the single largest production cost. In the case of Mozambique, an investment of \$1.50 of soybean cake is required to produce a kilo of poultry meat, which can be sold at a minimum breakeven price of \$2.25. Demand for poultry in many Sub-Saharan African markets is highly price elastic. Therefore, reducing soybean input costs through efficient local production can support reduction in poultry prices, and thereby foster both the expansion of the sector and improved nutrition.

FIGURE 3: SOYBEAN'S SHARE IN POULTRY PRODUCTION – MOZAMBIQUE EXAMPLE



SOURCE(S): Technoserve; Dalberg analysis

THE STRUCTURE OF THE SOYBEAN INDUSTRY

There are few major standalone soybean processors given the relatively low margins involved in soybean processing as well as the low investment cost required to use soybean processing facilities for other oilseeds. Globally, there are generally two main types of industry participants:

- **Global corporations** that tend to have **vertically integrated commodities trading and processing operations**, and process soybean as part of a broader oilseed portfolio: e.g. ADM, Cargill, and Louis Dreyfuss. These players will often be involved in raw soybean production in many key markets, with ADM and Cargill in particular involved in the cultivation of a substantial share of the US and Brazilian crop.
- **National players** that tend to be either **poultry/ feed producers** that process soybean in order to secure supplies of soybean cake, or **local co-operatives** that may be composed of local (smallholder) farmers, and tend to process soybean on a small scale

Global corporations account for a substantial share of global soybean production and processing (see “A Review of Selected Key Players” for indicative market shares of major players such as ADM, Cargill and Louis Dreyfuss across key geographies). These corporations are able to leverage substantial economies of scope and scale in production,

processing, logistics and trading. For prospective African entrants, these factors can create substantial barriers to entry, which may justify the temporary use of levers to protect a nascent soybean processing industry during its ‘infant’ stage.

A REVIEW OF SELECTED KEY PLAYERS

While it is difficult to precisely determine their market shares, several key international corporations have a major role in the soybean industry. These corporations have vertically integrated soybean production, processing and trading activities, and typically have operations in all major global markets.

To date, these corporations have not materially invested in the Sub-Saharan Africa region to cater to either domestic demand or to service other international markets, leaving the market opportunities available for local and regional processors. Given their established access to low cost soybeans and access to key consumption markets, corporations may also be potential partners for policy-makers that aim to aggressively develop their production in order to serve export markets such as the EU.

ARCHER DANIELS MIDLAND (ADM)

ADM is a conglomerate headquartered in the US with interests across a broad portfolio of agriculture and agro-processing sectors, and activities including producing, procuring, transporting, storing, processing, and merchandising agricultural commodities and products. It operates more than 270 plants in 60 countries across its portfolio of agricultural commodities world-wide and generated \$61.7bn in revenues in 2010.

In the US, ADM is responsible for 31% of total soybean processing volumes. It has 23 crushing facilities and 13 oilseed refineries in the country. In 2006 ADM’s plants accounted for 30% of US soybean oil production capacity. In Brazil, ADM is the 3rd largest producer of soybeans accounting for 7% of the total produce. Currently ADM’s Africa activities focus on cocoa processing in Cameroon, Côte d’Ivoire and Ghana and the company lacks any significant soybean production or processing assets in the region.

Across the value chain, ADM activities include production, processing and trading of soybean and its products, through its “Oilseeds Processing” and “Agricultural Services” divisions.

- **Oilseeds Processing:** Includes activities related to the production, crushing and further processing of soybeans. The processed products are then produced and marketed as ingredients for the food, feed and energy industry. It has made substantial investments in technology, and ADM currently claims to operate the most modern soy processing system in the US, capable of leaving only 1% oil in the soy meal with the rest being extracted and available for further refining
- **Agricultural Services:** The company has an extensive grain elevator and transportation network, used for buying, storing and transporting soybean and other agricultural commodities and their resale as food and feed ingredients and raw materials for the agricultural processing industry. ADM operates 330 silos in the US, South Africa, Canada, Brazil and other major agricultural regions.

Beyond core soybean products, ADM operates one of the world’s largest ‘soy isoflavone’ facilities under the brand name of Novasoy. Isoflavones are a unique group of compounds found in soybeans, which share some of the physiological properties of the hormone estrogen, and are used as a dietary supplement.

Key recent investments include a 50% share in Edible Oils Limited of the UK to procure, package, and sell edible oils in the UK. It also has a 50% share in Stratas Foods in Memphis, US to procure, package and sell edible oils in North

America. It has an 80% interest in Toepfer in Germany, which is a global merchandiser of agricultural commodities and processed products.

CARGILL

Cargill is a multinational corporation based in Minnesota in the USA, and is an international producer and marketer of food, agricultural, financial and industrial products and services. Cargill's overall business operations include purchasing, processing and distributing grain and agricultural commodities, the manufacture and sale of livestock feed and ingredients for processed foods and pharmaceuticals. Founded in 1865 it has operations in 65 countries today and recorded revenue of \$107.9 billion in 2010. It is responsible for 25% of all US grain exports.

Cargill is a global purchaser, producer and trader of soybean. The company has evolved from trading soybeans, to processing them into meal and oil, to producing high-value natural vitamin E from a soybean byproduct. Cargill has a substantial footprint in the key soybean production markets of the US, Brazil and Argentina. In the US Cargill processes 21% of the available soybean on the market, and accounted for 22% and 13% of soybean oil production in the US and Argentina respectively in 2006, and accounted for 7% of the total soybean crush in Argentina. In Brazil, Cargill has 11% share of total soybean production. Cargill also has substantial presence in some smaller production markets: for example, Cargill has approximately 40% share of total soybean production in Paraguay.

Although Cargill has a substantial presence in Africa that covers 12 countries including Ghana, Kenya, South Africa, Tanzania and Zambia, these activities do not currently include soybean production or processing.

It has partnered with the Bill & Melinda Gates Foundation for the South African Soy Value Chain Program being conducted in Zambia and Mozambique. This program will target smallholder farmers and facilitate their access to agricultural inputs and new technologies, facilitate market access, and assist in infrastructure development. This will introduce soya production to 37,000 farmers across the two countries.

Key recent investments include a \$20 million port terminal in Santarem in Brazil's northern state of Para in 2003, with the capacity to store 60,000 metric tons of soybeans, and expected throughput of 800,000 metric tons per year. In 2006, Cargill made a significant entry into the Chinese processing sector through a \$60 million investment in a soybean crushing plant with a 5,000 ton per day capacity. More recently, in 2010 Cargill invested \$112 million in an 18MW co-generation plant and a soybean biodiesel production plant with a processing capacity of 240,000 tons per year in Argentina.

BUNGE

Founded in 1818 in the Netherlands, Bunge is a leading multinational agribusiness and food company with operations in 30 countries, and net sales of \$41.9bn in 2009. It is a leading grain producer and is also involved in processing and grain trading. Bunge is the world's largest oilseed producer, with operations across the entire value chain from oilseed cultivation to distribution to retailers and farmers.

It has three business segments involved at different points across the value chain:

- **Grain and Oilseed origination:** Sources soybeans, stores and blends them and sells the final product to commodity customers. Bunge trades the resulting aggregated soybeans to over 80 countries.
- **Oilseed processing:** Produces soybean meal, soybean crude oil, soybean hulls and hull pellets, and is capable of producing GM-free soy products to cater to markets like the EU. It operates over 50 processing facilities across North America, South America, Europe and Asia. Bunge is a major supplier to the Caribbean, Asia, North Africa and the Middle East.

- **International marketing:** Focused on the sale of soybean and its processed products to worldwide customers, management of logistics and price risk.

Bunge has soybean production and processing activities in all the major producer markets: in the US it accounts for 14% of soybean processing, and 15% of production, in Argentina, for 7% of processing and 9% of production, and is the leading producer of soybean in Brazil, with 18% share of volumes.

In 2009, Bunge built a new \$76m soy processing plant in Brazil with crushing capacity of 1.3 million tons a year. Bunge has also made significant investments in Vietnam, including \$100m toward an integrated soybean processing plant with 3000 tons per day capacity, scheduled to start production in 2011. Bunge also has a 50% stake in a Vietnamese port operator of Phu My Port.

To date, Bunge does not have a significant presence in the Sub-Saharan Africa oilseeds sector, but in April 2011 it announced a joint venture with Senwes, a South African agribusiness company, to develop grains and oilseed operations in the country as a base for trading in the Sub-Saharan Africa region.

LOUIS DREYFUSS

The Louis Dreyfus Group is a diversified French private company that is involved in agriculture and energy commodities, as well as real estate and telecommunications. Louis Dreyfus has 72 offices in 53 different countries, has 35,000 employees and has annual gross sales of over \$120 billion. Louis Dreyfus' overall business activities in commodities include processing, trading and merchandising.

The Louis Dreyfus Corporation (LDC) – Grain Division is headquartered in Wilton, CT, USA. It is responsible for all grains and oilseeds activity in the US, Canada, Australia and Mexico and is responsible for the overall trading group's daily positions. It has a substantial presence in the key soybean markets of US, Brazil and Argentina. It owns and operates four exports terminals in the US, one in Canada, and one in Argentina. These facilities are primarily used for sales to Asia. Louis Dreyfus also has origination offices located in Argentina and Brazil. SACEIF Louis Dreyfus is one of the largest exporters of soybeans, soybean products and grains in Argentina. In Brazil, Louis Dreyfus operates through a wholly owned subsidiary called Coimbra, which owns and operates five soybean crushing plants. The company's primary destination offices are Louis Dreyfus Negoce in Paris, France and Louis Dreyfus Asia located in Singapore. The office in the US handles monitoring of positions, buys its products from major origination offices and supervises all sales of soybeans and soybean products and processing operations in Europe, the Mediterranean, the Middle East and South and East Africa³. In 2006, Louis Dreyfus built the largest integrated soybean-based production facility in the world in Clayton, Indiana, the Louis Dreyfus Processing and Biofuel Plant, a large step towards America's biodiesel future. The plant can crush 50 million bushels of soybean, and produce over 1 million tons of soybean meal.

Although Louis Dreyfus activities in Africa aren't as substantial as other regions, it is a significant though not leading player in the African soybean market. LDC's main activities in Africa are the trading and merchandising of grain commodities, of which soybean is an important member. Louis Dreyfus Commodities and its affiliates have 17 offices across Sub-Saharan Africa: in Angola, Burundi, Kenya, Madagascar, Mali, Senegal, South Africa, Tanzania, and Uganda. Earlier this year, LD Commodities acquired the company SCPA-Sivex International, the leading fertilizer, crop protection and chemical products distributor in West and Central Africa, to help increase its presence in the region. The combined entity, LDC-SSI will be one of the key agri-business players in Africa with solid potential for future growth and diversification.

³ HighQuest and Soyatech. How the Global Oilseed and Grain Trade Works. 59

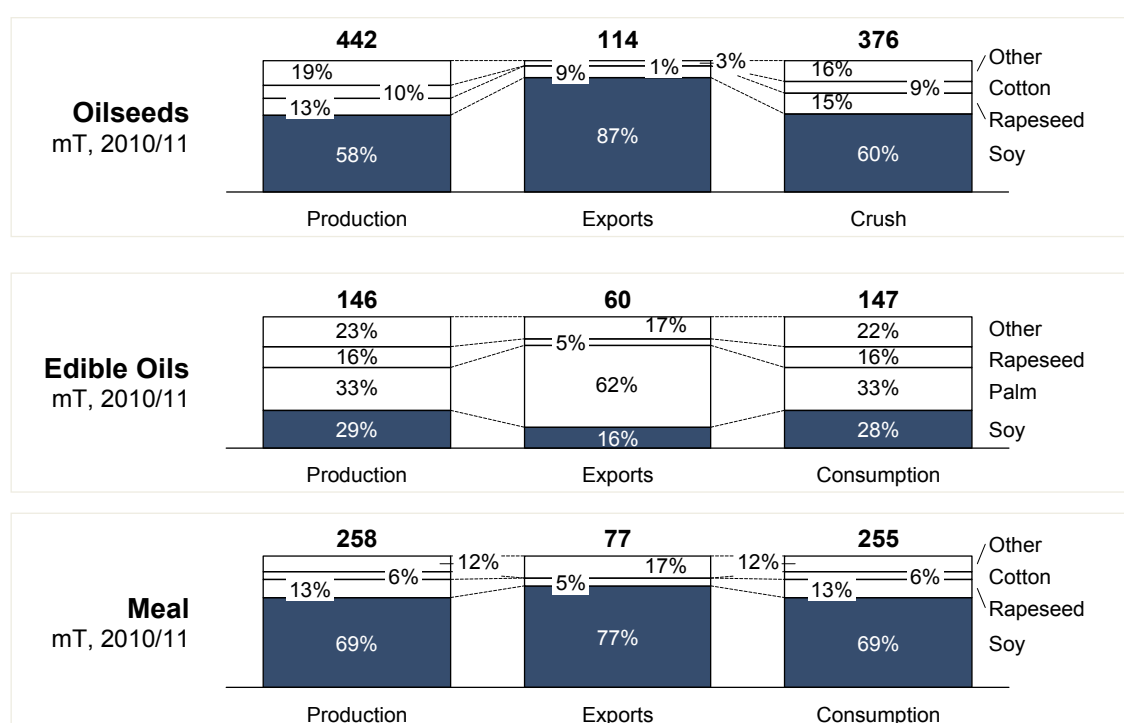
3. The International Soybean Market

SOYBEAN PRODUCTION

PRODUCTION

Soybean is the world's most traded oilseed, accounting for 87% of volumes, as it is easy to store and transport and is a key input for livestock production. When compared to other processed oilseeds, soy dominates the meal market – with 77% share of traded volumes – but has a significantly smaller share of the edible oils market. This is mostly explained by the physical constraints of soybean's oil content, as soybean converts to a relatively low share of oil by weight. In addition, soybean oil is considered a 'mid-quality' oil. Palm oil is generally cheaper and more popular in price-sensitive emerging markets while sunflower oil and others with low saturated and trans-fat content are preferred in more health-conscious developed markets.

FIGURE 4: SOYBEAN SHARE OF GLOBAL OILSEEDS ACTIVITY⁴

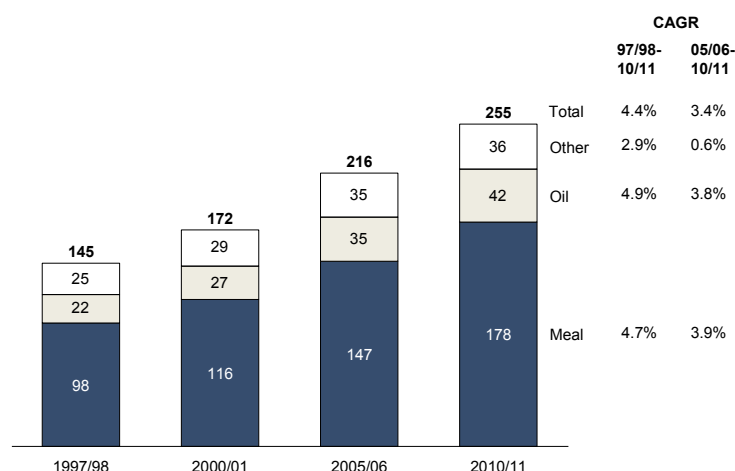


SOURCE(S): USDA "Oilseeds: World Market and Trade", Feb 2011; FAO; Dalberg analysis

Soybean is largely consumed in the form of meal: in the 2010/11 season, the total soybean consumption of 255m tons was dominated by meal, which stood at 178m tons. Growth of meal production is supported by global growth in demand for meat.

⁴ "Other" oilseeds include Copra, Cottonseed, Palm Kernel, Peanut and Sunflower seed. "Other" Edible Oils include Coconut, Cottonseed, Olive, Peanut and Sunflower. "Other" Meals include Copra, Peanut, Linseed, Maize & Palm.

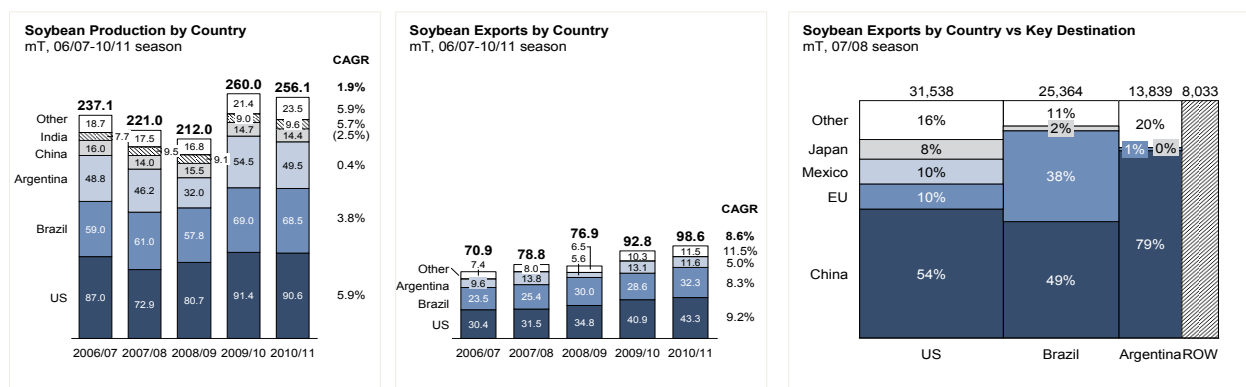
FIGURE 5: GLOBAL SOYBEAN PRODUCTION (MILLION TONS)



SOURCE(S): USDA "Oilseeds: World Market and Trade", Feb 2011; FAO; Dalberg analysis

The US, Brazil and Argentina dominate global production and export of soybean products accounting for 81% of global production and 88% of global exports in the 2010/11 season. India and several other smaller countries (e.g. Paraguay) are quickly expanding production but are moving from a small base, and have little role in shaping the global soybean market. As a result, overall global growth in soybean production is largely driven by the activities of the three major producing countries, and this is likely to continue over the medium term, as they continue to invest in production technology and (in the case of Brazil) expand the cultivation area.

FIGURE 6: SOYBEAN PRODUCTION AND EXPORTS BY MAJOR COUNTRY



SOURCE(S): USDA "Oilseeds: World Market and Trade", Feb 2011; FAO; Dalberg analysis

DEMAND

Trade in raw soybeans can be largely captured by only a small number of inter-country flows: the majority of global trade in soybeans can be considered a flow from the US, Brazil and Argentina to China and the EU, where they are processed. China is the biggest importer for all three major producers, accounting for approximately half of the US and Brazil's exports and almost 80% of Argentina's exports in the 2007/08 season; Brazil remains the key supplier to the EU. As a result, global trade flows are highly consolidated, and offer few points of entry for prospective new soybean producers.

Overall export volumes are growing faster than production, as the market is undergoing a transition: a gradual global disaggregation of soybean production from soybean processing is taking place. Leading producers such as

Brazil, Argentina and the US, are shipping larger quantities of raw soybeans to China and, to a lesser extent, the EU and smaller markets in Asia and the CIS where processing then takes place.

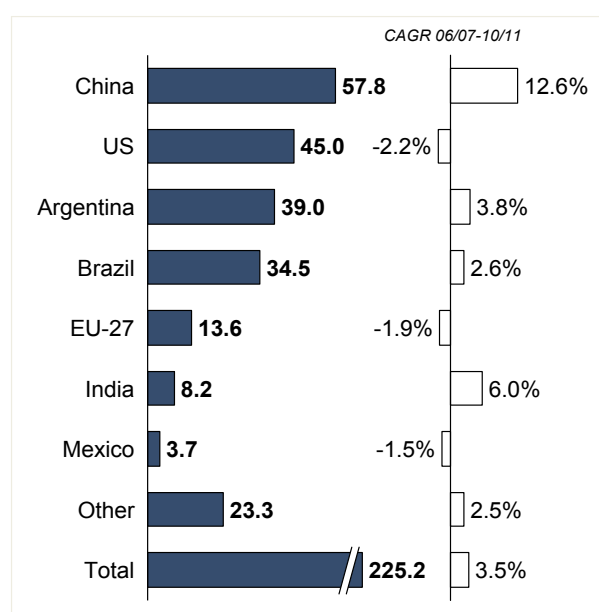
SOYBEAN PROCESSING

Although not a major producer of raw soybean, China emerges as a major processor in the value chain, and has been growing faster than any other major soybean crushing market. This partly reflects moves by major global processors such as Cargill and regional Chinese players to shift global crushing capacity from the US and EU to China. China has therefore disaggregated soybean production from soybean processing, and focused on the development of domestic processing capacity, which complicates any efforts to build processing capacity targeting China as an export market.

More generally, countries can be understood in three groups when considering global processing capacity and demand:

- **Process-to-consume:** This tactic is epitomized by China, and appears to be the strategy that India is following. These countries have developed their processing capacity with a strong domestic orientation, and therefore undertake very low volume of trade in soy meal and oil versus their overall soybean processing.
- **Process-to-export:** The US, Brazil and Argentina are key countries that have vertically integrated soybean production and processing capability and that, given the scale of their raw production, and resulting economies of scale, have strong comparative advantage in terms of price competitiveness.
- **Import:** The EU is the key destination market for the process-to-exporters; based on a lack of available agricultural land with the appropriate climate. Given the relatively low margins that would accrue, the EU does not play a significant role in soybean processing (which has actually declined in volume terms by approximately 2% per year between the 2006/7 and 2010/11 seasons)

FIGURE 7: SOYBEAN PROCESSING BY COUNTRY (MT CRUSHED IN 2010/11)



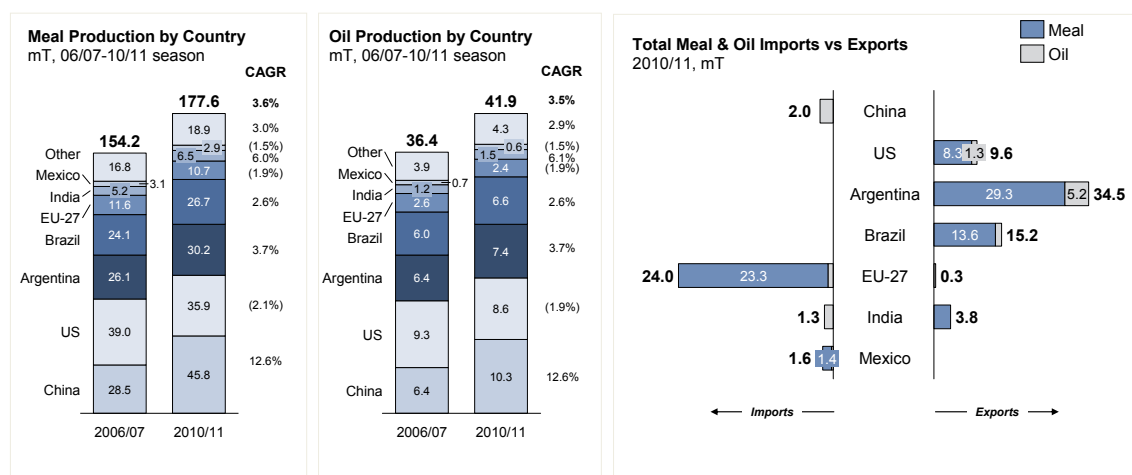
SOURCE(S): USDA "Oilseeds: World Market and Trade", Feb 2011; FAO; Dalberg analysis

Over the last five years, China has rapidly over-taken the US to become the leading global processor, while the EU has become the leading market for the import of processed soybean, in the form of meal. However, the EU market is challenging to access. The volume of trade of soybean and meal into the EU is heavily concentrated amongst the four major processors ADM, Cargill, Louis Dreyfuss and Bunge, which manage vertically integrated supply chains of soybean production and processing.

Growth in EU meal imports is largely a result of the shift of major processors' activities globally to optimise processing costs. These companies own crushing facilities in production markets such as Brazil, Argentina and the US, as well as in the EU. As a result, they are able to shift processing across their locations, and have responded to rising relative costs of crushing in the EU by shifting crushing to production markets and importing meal. The EU soybean meal trade is therefore consolidated amongst major players.

Since 2008, the EU has accepted the import of meal made from genetically modified (GM) soybeans, as the growth in demand from the livestock industry could not be satisfied by the supply of non-GM meal. For African processors, niche opportunities such as the remaining demand for non-GM meal may be addressable; however, the domestic African market is likely to be easier to access than the EU.

FIGURE 8: PROCESSED SOYBEAN PRODUCTION AND TRADE



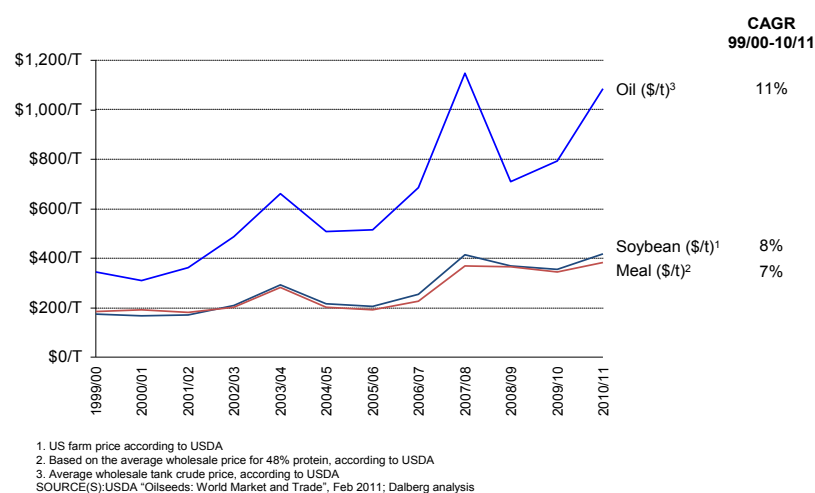
SOURCE(S): USDA "Oilseeds: World Market and Trade", Feb 2011; FAO; Dalberg analysis

PRICES

Raw soybean and soybean meal trade at broadly similar prices, while soybean oil trades at a substantially higher level. The relatively high prices for oil are reflective of relative prices across most oilseeds, and are not unique to soybean. At the global level, prices for soybean and processed products have been increasing, with oil rising at an average of 11% per year between 1999 and 2010, and meal increasing at 7%.

Growing demand for meal from the livestock industry, and growth in demand for oil – both for human consumption and as a feedstock for biofuel production – have driven this trend and are expected to continue to support price increases. While this clearly raises costs for net importing regions such as Sub-Saharan Africa, this also provides an opportunity for prospective processors aiming at import substitution.

FIGURE 9: PRICING OF SOYBEAN VERSUS PROCESSED PRODUCTS



OUTLOOK FOR THE SOYBEAN MARKET

Growth in global soybean production and processing is expected to continue, with the trends that are currently shaping the market continuing to play out. China, India and other Asian countries will be key drivers of demand for vegetable oil and protein meal in general, while the use of soybean oil as a biodiesel feedstock, especially in Brazil and the EU, will support demand and continued price growth.

China is expected to continue its shift from importing processed soybean meal, to importing raw soybean for local processing in its highly competitive large scale facilities. The EU will reduce soybean crushing and continue the approximately 2% per annum decline in soybean imports, while shifting to increased meal and oil imports.

From the perspective of potential African processors, the key competitors for the domestic African market will continue to be imports from Brazil, Argentina and the US, while export markets will continue to be difficult to access beyond niche opportunities such as non-GM beans and meal.

FIGURE 10: SOYBEAN TRADE OUTLOOK

	Volume (Million Metric Tons)				CAGR (%)	
	2008/09	2010/11	2015/16	2019/20	08/09-10/11	10/11-19/20
Soybeans						
Imports	75.9	83.1	94.8	103.9	4.6%	2.5%
China	41.1	43.1	53.3	61.0	2.4%	3.9%
EU ⁵	13.0	12.5	11.2	10.4	-1.9%	-2.0%
Other	21.8	27.4	30.3	32.5	12.1%	1.9%
Exports	76.8	83.1	94.8	103.9	4.0%	2.5%
United States	34.9	35.4	38.6	39.6	0.6%	1.3%
Brazil	30.0	26.2	31.5	37.2	-6.5%	4.0%
Argentina	5.7	12.4	13.5	14.0	47.1%	1.3%
Other	6.2	9.0	11.2	13.0	20.8%	4.2%
Soybean Meal						
Imports	51.8	56.5	65.2	72.4	4.4%	2.8%
EU	21.8	23.6	27.4	30.4	4.0%	2.9%
S E Asia	9.1	10.1	11.7	13.1	5.4%	3.0%
Latin America	7.3	7.9	9.3	10.3	3.8%	3.1%

⁵ EU-27, excludes intra-EU trade

MENA ⁶	4.4	4.9	5.7	6.3	4.8%	2.9%
Other	47.4	51.6	59.6	66.0	4.4%	2.8%
Exports	52.5	56.5	65.2	72.4	3.8%	2.8%
Argentina	24.4	28.0	36.2	42.6	7.3%	4.8%
Brazil	13.0	12.2	13.2	14.1	-3.1%	1.6%
US	7.7	8.5	8.9	8.9	5.2%	0.5%
Other	7.4	7.7	6.9	6.8	2.2%	-1.4%
Soybean Oil						
Imports	9.2	9.6	11.4	12.9	1.9%	3.4%
China	2.5	2.5	2.8	3.1	-0.9%	2.5%
Latin America	1.4	1.7	2.0	2.2	10.5%	3.0%
MENA	1.5	1.8	2.0	2.2	9.2%	2.5%
India	1.1	0.9	1.2	1.4	-6.3%	4.9%
EU	0.8	0.2	0.6	1.0	-48.8%	18.6%
Other	1.9	2.5	2.7	2.9	12.7%	2.1%
Exports	9.0	9.6	11.4	12.9	2.8%	3.4%
Argentina	4.7	5.5	6.9	8.0	8.4%	4.2%
Brazil	1.9	1.5	1.9	2.3	-10.8%	4.5%
United States	1.0	1.2	1.2	1.3	10.5%	0.4%
Other	1.4	1.3	1.4	1.4	-4.7%	1.0%

Source: USDA Long-Term Projections Report

⁶ Middle East and North Africa

4. The African Market

THE STRUCTURE OF THE AFRICAN MARKET

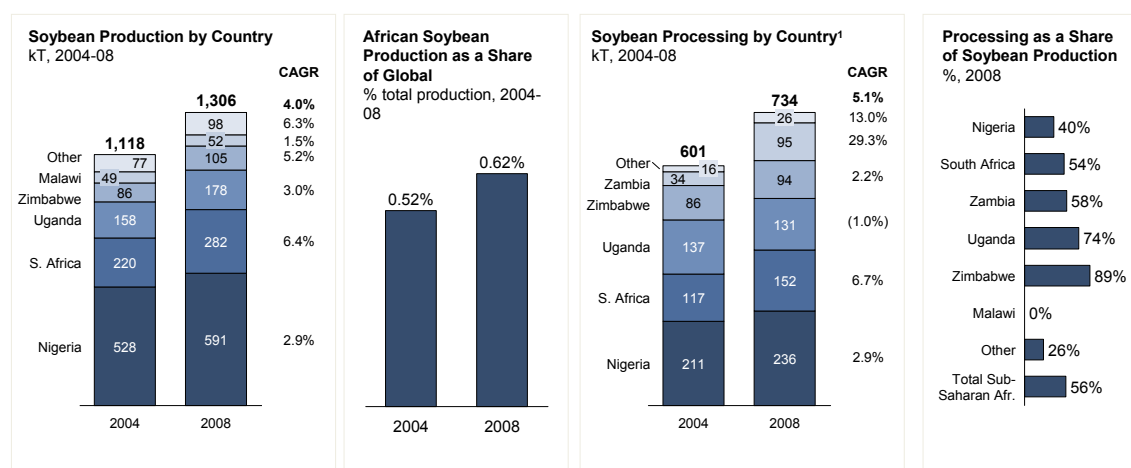
In the context of the global soybean industry, Africa remains a small player, with total Sub-Saharan African production accounting for less than 0.7% of global production in 2008. Soybean is largely a crop for processing, rather than consumption in raw or 'directly' cooked form, and imports from key producers such as Brazil, Argentina and the US are able to serve a number of African markets at a cost that may be below the local cost of production, both of which hinder the uptake of a substantial domestic soybean industry.

Soybean is mostly produced by smallholder farmers in Sub-Saharan Africa: more than 90% of farms that produce soybean are less than 5 hectares. For these farmers soybean is frequently part of multiple crop cultivation. The majority of production is concentrated in South Africa, Nigeria and Uganda, which accounted for 79% of total soybean production volumes in 2008.

Total soybean production in Sub-Saharan Africa has been growing slightly faster than global production, at 4.0% per annum from 2004-08, with South Africa leading growth in percentage terms, and Nigeria contributing the greatest absolute growth. However this remains an absolutely trivial share of the global market accounting for less than 1% of soybean production around the world.

The relatively high level of South African soybean production in the Sub-Saharan African context is reflective of a relatively highly developed agro-processing sector with substantial poultry production, and is also a target export market for regional producers such as Zimbabwe and Zambia. Beyond South Africa, countries such as Nigeria, Uganda and Zambia are also significant producers of soybean, with the poultry sector playing a similar role in driving demand. In these markets, processing is typically performed by animal feed and livestock producers, rather than general oilseed processors.

FIGURE 11: RECENT SOYBEAN PRODUCTION AND PROCESSING GROWTH IN SUB-SAHARAN AFRICA



1. Estimate based on FAOSTAT data on soybean oil production by country and assumption that 18% of total volume of processed soybean is oil
Source: FAO; USDA; Dalberg analysis

Beyond production of soybeans, soybean processing volumes are substantially lower (estimated at 734,000 tons in 2008 versus 1.3 million tons of raw soybean production), with over 50% of processing volumes taking place in

South Africa and Nigeria combined⁷. Of the main African producers of soybean, Nigeria production appears to have the lowest conversion into processed soybean at 40% versus, for example, Uganda at 74% and Zimbabwe at 89%. However, the true scale of processing is hard to determine, as a significant proportion of soybeans may well be processed at a local level in a rudimentary fashion in order to generate meal and edible cake and oils, especially in countries such as Nigeria where there is a domestic market for human soybean consumption.

The demand-side of the soybean sector in Sub-Saharan Africa is more dynamic. Demand for soybean, cake and oil appears to be growing rapidly across the region largely driven by growth in demand from the poultry sector and to a lesser extent human consumption in selected markets such as Nigeria and Malawi. Production has largely been unable to keep pace with the rate of demand growth, resulting in a rapid increase in imports.

The countries of focus in the African Transformation Report accounted for 1.2 million tons of soybean production or 93% of total Sub-Saharan African soybean production. As a group, they are representative of the overall trend for growth in imports, with the value of imports of soybean, oil and cake growing 14%, 33% and 39% per annum respectively over the period 2004-08, as shown below.

FIGURE 12: SOYBEAN, CAKE OIL AND CAKE PRODUCTION AND IMPORTS FOR COUNTRIES IN THE AFRICAN TRANSFORMATION REPORT

	Production ('000 mT)						Import Volumes ('000 mT)						Import Value (\$m)					
	'05	'06	'07	'08	'09	CAGR	'05	'06	'07	'08	CAGR	'05	'06	'07	'08	CAGR		
Soybean	1,132	1,317	1,125	1,216	1,487	7%	56	54	131	59	20%	15.4	14.2	38.6	23.0	14%		
Botswana	-	-	-	-	-	-	-	-	1	2	na	-	-	0.4	0.6	na		
Burkina Faso	7	6	6	29	16	25%	0	0	0	0	0%	0.0	0.0	0.0	0.0	0%		
Cameroon	7	8	8	8	8	3%	-	1	0	-	na	-	0.2	0.1	-	-		
Ethiopia	4	6	6	8	7	17%	3	8	0	1	-42%	1.1	1.7	0.1	0.4	-32%		
Ghana	-	-	-	-	-	na	0	0	0	4	165%	0.1	0.0	0.2	2.4	259%		
Kenya	3	2	2	2	2	-10%	5	8	6	8	18%	2.7	2.8	1.8	3.4	7%		
Mauritius	-	-	-	-	-	-	0	0	0	0	16%	0.1	0.1	0.1	0.2	42%		
Mozambique*	-	4	45	6	7	Na	0	1	0	0	-54%	0.2	0.3	0.3	0.1	-31%		
Nigeria	565	605	580	591	574	0%	23	23	0	0	-85%	5.8	5.8	0.0	0.1	-72%		
Rwanda	24	27	40	51	54	23%	0	0	0	0	-44%	0.0	0.0	0.0	0.0	-43%		
Senegal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-		
South Africa	273	424	205	282	516	17%	15	10	118	18	7%	3.1	2.5	34.2	4.7	14%		
Uganda	158	175	176	178	180	3%	1	1	-	0	-88%	0.2	0.1	-	0.0	-83%		
Tanzania	2	3	3	3	4	16%	0	1	4	1	82%	0.0	0.5	1.3	0.3	199%		
Zambia*	90	58	55	57	119	7%	8	1	1	24	45%	2.1	0.2	0.1	10.9	73%		
Soybean Oil	56	82	59	54	62	2%	395	444	470	441	4%	226.6	241.4	384.8	527.1	33%		
Botswana	-	-	-	-	-	-	1	0	0	0	-60%	1.6	0.3	0.3	0.1	-63%		
Burkina Faso	-	-	-	-	-	-	0	0	1	1	82%	0.1	0.2	0.5	0.9	134%		
Cameroon	-	-	-	-	-	-	6	7	1	6	-2%	4.5	5.5	1.0	4.7	1%		
Ethiopia	-	-	-	-	-	-	28	6	8	7	-38%	29.6	4.8	8.2	9.5	-32%		
Ghana	-	-	-	-	-	-	3	6	4	4	5%	2.3	4.0	2.8	3.4	14%		
Kenya	-	-	-	-	-	-	4	7	7	10	42%	1.1	4.6	6.6	14.0	131%		
Mauritius	-	-	-	-	-	-	25	17	21	19	-8%	13.5	9.2	16.6	25.4	24%		
Mozambique	-	-	-	-	-	-	23	30	20	36	16%	13.0	13.8	15.3	29.0	31%		
Nigeria	3	3	3	2	2	-8%	0	0	0	1	67%	0.2	0.3	0.5	1.2	82%		
Rwanda	-	-	-	-	-	-	0	1	0	0	482%	0.0	0.4	0.0	0.3	595%		
Senegal	-	-	-	-	-	-	66	96	102	84	8%	36.7	58.4	93.2	112.5	45%		
South Africa	31	55	34	27	33	2%	219	261	273	248	4%	109.7	130.1	209.2	289.3	38%		
Uganda	22	23	21	24	25	4%	5	0	0	-	-100%	2.9	0.0	0.1	-	-100%		
Tanzania	-	-	-	-	-	-	1	1	17	12	113%	0.9	0.8	15.9	15.8	159%		
Zambia	1	1	1	1	1	0%	14	12	17	13	-1%	10.4	9.0	14.6	21.0	26%		
Soybean Cake**	250	364	261	241	274	2%	662	896	1,040	1,063	17%	140.2	188.3	244.3	380.1	39%		
Botswana	-	-	-	-	-	-	1	1	4	6	114%	0.3	0.3	0.8	1.2	64%		
Burkina Faso	-	-	-	-	-	-	na	na	na	na	na	na	na	na	na	na		
Cameroon	-	-	-	-	-	-	12	16	16	16	12%	4.6	6.5	7.6	9.7	28%		
Ethiopia	-	-	-	-	-	-	0	-	0	-	-100%	0.1	-	0.0	-	-100%		
Ghana	-	-	-	-	-	-	2	6	1	10	77%	1.1	3.4	0.9	5.9	73%		
Kenya	-	-	-	-	-	-	4	4	4	8	26%	1.5	1.2	1.6	4.5	42%		
Mauritius	-	-	-	-	-	-	37	32	30	34	-2%	9.4	8.5	9.6	16.2	20%		
Mozambique	-	-	-	-	-	-	1	7	8	8	107%	0.4	1.7	2.7	2.6	91%		
Nigeria	11	11	11	8	8	-8%	17	40	31	28	17%	3.0	7.6	10.3	8.3	40%		
Rwanda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Senegal	-	-	-	-	-	-	1	0	3	17	203%	0.2	0.0	1.5	8.4	260%		
South Africa	136	243	150	122	146	2%	587	790	942	928	16%	119.2	158.9	209.4	317.3	39%		
Uganda	96	104	95	105	113	4%	-	-	0	-	-	-	-	-	-	-		
Tanzania	-	-	-	-	-	-	-	-	-	0	-	0.0	-	-	0.0	196%		

⁷ Processing volumes are estimated from FAO data by using soybean oil production data, and assuming that 18% of the total volume of crushed soybean is oil.

Zambia	6	6	5	6	6	0%	1	0	0	9	122%	0.4	0.2	0.1	5.9	148%
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* - Soybean production figures are based on estimates from Technoserve; all other production figures are from FAOstat

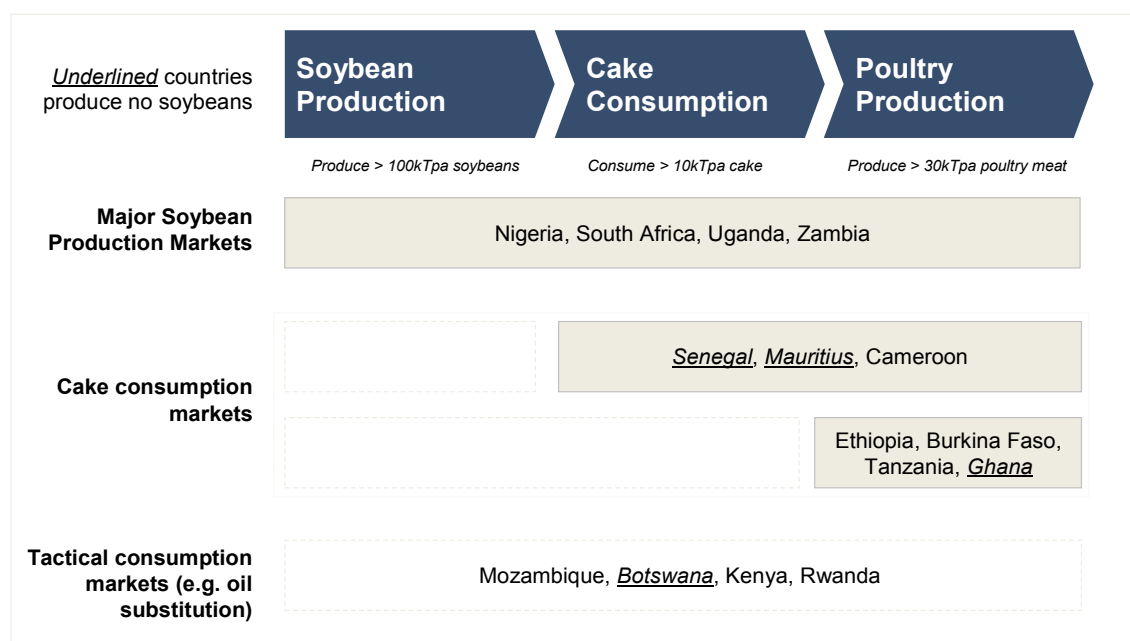
** - Cake production is estimated using FAOstat figures for oil production, based on assumption that processors produce 18% soybean oil and 80% soybean cake

Source: FAOstat

Countries in Sub-Saharan Africa⁸ can be segmented into three general types, with respect to the soybean market:

- **Major Soybean Production Markets:** Nigeria is the most important country in Africa in terms of soybean production at 591,000 tons in 2008. Growth is largely driven by demand for feed for the domestic poultry industry and domestic vegetable oil producers, both sectors that are protected by import trade bans. Zambia and Uganda are also key soybean producers with outputs of 119,000 and 178,000 tons respectively in 2009. These countries also process much of their production to generate oil and cake, with cake demand largely for the poultry sector and a small but fast growing market for human consumption.
- **Cake consumption markets:** These are countries with a significant poultry industry that is therefore a key addressable market for soybean processors. Countries like Zambia already have a domestic soybean production and processing industry, but imports of soy cake dominate, whereas in countries such as Ethiopia, soy cake is not yet a major component of poultry feed, and poses opportunities for potential processors that can source domestic or international supplies of soybean at sufficiently low costs to be able to service the sector.
- **Tactical consumption markets:** Markets such as Kenya, Mozambique and Botswana lack a scale domestic poultry production industry on par with countries like Nigeria, but may provide opportunities for processors to tactically service, especially as a means for realizing value from soybean oil through regional exports from a key processing area.

FIGURE 13: OVERVIEW OF AFRICAN COUNTRIES BY NATURE OF VALUE CAPTURE OPPORTUNITY



Source: FAO; Dalberg analysis

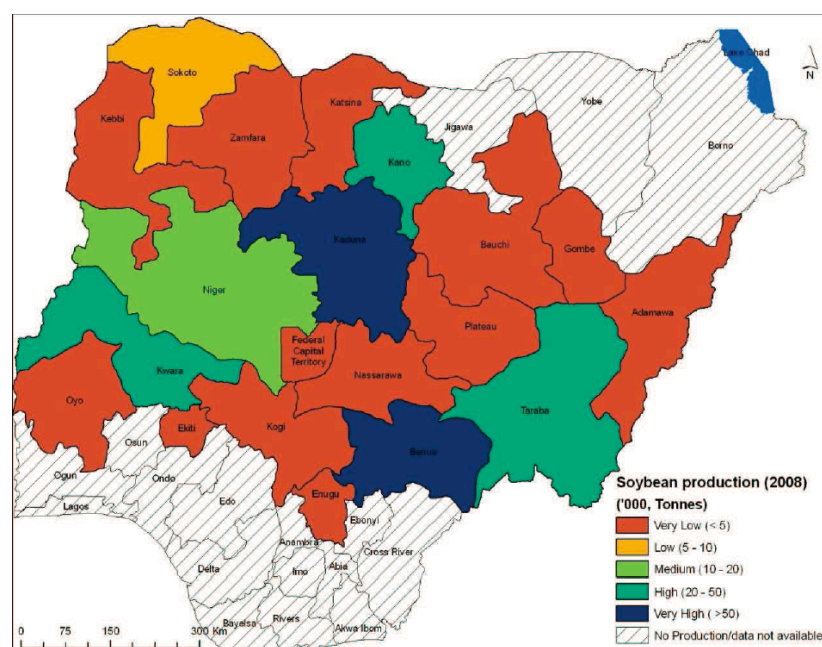
⁸ This list of countries reflects the countries covered in the Africa Transformation Report

Below, we provide a deeper review of 3 countries that are representative of the typical major soybean production and cake consumption markets across Sub-Saharan Africa.

NIGERIA: AFRICA'S LEADING SOYBEAN PRODUCER

Soybean's cultivation as a crop in Nigeria can be attributed to the introduction of the Malayan variety in 1937 by British colonial officers and until recently this was the sole variety grown by farmers. Soybean remained a marginal crop as part of Nigeria's overall agricultural mix, as the Malayan soybean seed quickly lost its ability to germinate after only a short period of storage, which made it difficult for storage for the subsequent planting season, and was not well suited to the Nigerian climatic and soil conditions. Growth in production started to accelerate due to the efforts during the 1970s of the International Institute of Tropical Agriculture (IITA), established in Nigeria in 1967, to develop more suitable strains.

FIGURE 14: DISTRIBUTION OF SOYBEAN PRODUCTION IN NIGERIA, 2008



Source: IITA Geospatial Lab, via UNIDO

Today, soybean is largely cultivated in central, western and southern Nigerian states, largely by smallholder farmers with farms smaller than five hectares. As a result, aggregation of raw soybean volumes is a key challenge. Grain merchants play a key role in the value-chain, aggregating volumes from local markets in soy producing regions and through networks of commission agents and village-level traders, and acting as the main channel of supply of raw soybean for processors. Processors typically sell soybean oil and meal to wholesalers and distributors, which trade oil to the retail sector and cake to the animal feed industry.

Nigeria's soybean industry has grown in response to rapid growth in demand from the domestic poultry sector, which produced 257,000 tons of poultry meat in 2009 and is estimated to be growing at approximately 30% per year⁹. Growth in demand for human consumption, principally in breakfast and baby foods, mixed with traditional

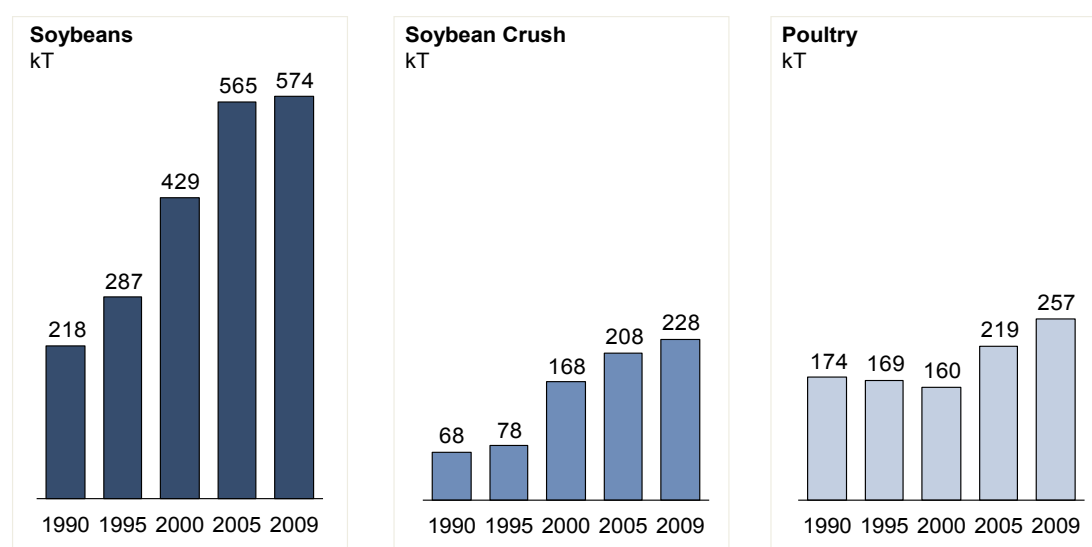
⁹ Year on year growth estimates of the poultry industry are based on USDA Foreign Attaché reports, which indicate a higher annual rate of growth than implied from the FAO data stated in Figure 15

foods such as *gari* to increase protein content, and as a substitute for meat and fish in the form of ‘soy cheese’ or *wara*, is also an important driver of demand.

As a result, Nigerian production of soybean has increased from 429,000 tons in 2000 to 574,000 tons in 2009, an average annual growth rate of 3%, although growth in production has slowed since 2005. Soybean processing has also increased.

A key enabler has been investment in research and development to improve the productivity of the crop by developing high yielding, early maturing varieties with other good agronomic traits, and organized demand promotion through media, local hospitals, clinics and community-based organizations to educate consumers of the benefits of soy consumption and good practices in cultivation. Much of this activity was led or coordinated by the IITA, and has been supported by other Nigerian organizations such as the Institute for Agricultural research (IAR) Zaria and Ibadan.

FIGURE 15: NIGERIAN SOYBEAN AND POULTRY PRODUCTION, AND SOYBEAN PROCESSING VOLUMES (1990-2009)



SOURCE(S): FAO; USDA; Dalberg analysis

Soybean processing (or ‘crush’) has also grown in response, with total output of processed soybean rising from 168,000 tons in 2000 to 228,000 tons in 2009, representing an annual growth rate of 5%. Prior to 2000, the decline of the livestock industry led to the exit of major multinationals in the livestock feed industry and a contraction in output; this trend was reversed in 2000 following the institution of a poultry import ban imposed by the Government of Nigeria which led to rapid expansion of the domestic poultry sector. In 2009, soybean processing in Nigeria was undertaken at 65 crushing facilities, with the largest players including Grand Cereals, ECWA feeds, SALMA oil mills and AFCOT oil seeds processors. Multinational food processors such as Nestlé and Cadbury have also re-entered the sector.

Nigeria’s installed crushing capacity in 2009 was estimated at 580,000 tons, which is almost equivalent to the country’s current production of raw soybeans. However, only 40% of that capacity was utilized. It is likely that the majority of Nigeria’s production was processed for on-farm or local consumption and therefore not captured in the overall industry’s capacity. Nigerian soybean processors also face substantial challenges to economic viability including the lack of reliable, scale volumes of good quality soybeans, outdated technology with a lack of available finance to upgrade production capital, and high energy and transportation costs.

ZAMBIA¹⁰: A 'MID-SIZED' SOYBEAN PRODUCER AND PROCESSOR

Like Nigeria, Zambia is a significant player in soybean production and processing with demand largely driven by a fast-growing poultry sector. Zambia produced 112,000 tons of soybean in 2010, and processed 90,000 tons in the same year.

Zambia is largely self-sufficient in soybean production. 85% of the supply of soybean comes from commercial farmers, characterised by high use of inputs, use of irrigation and relatively high yields of over 2.9 tons per hectare. Only 2% of soybean supply in 2010 came from imports. The processing sector has an installed crushing capacity of approximately 125,000 tons, which is currently more than sufficient for domestic demand, making Zambia a net exporter regionally. The processing sector is largely characterised by two types of players:

- **Integrated feed manufacturers:** These players produce animal feeds and are often vertically integrated into livestock production. Zamanita, the former parastatal organization, is owned by Zambeef and sells cake to Novatek and exports cake to Zimbabwe; this player has the largest capacity in Zambia at approximately 50-60,000 tons per year. Quality Commodities, Agri Options and National Milling Company are also significant players (with 20k, 12k and 12k tons of capacity respectively). These players also manufacture animal feeds.
- **Oil Producers:** These players refine edible oils, are often involved in oilseed crushing, and trade cake to other players. Key players in this sector include Unified Chemical, which solely focuses on refining both domestic and imported oils (principally from Argentina) and Hi-Protein, a smaller player that largely refines palm oil and small quantities of soybean oil. Zamanita is also a key player in the refined soybean oil sector, with 30% market share.

Animal feed accounted for 89% of soybean consumption in 2010, with the majority of this used for the poultry sector, which has recently grown by 20% per year. Human consumption, in forms such as soy chunks and soy products such as 'Yummy Soy', account for the remaining 11%, and is also a fast-growing sector, expected to grow by 8% per year over the medium term to 2020.

In the face of this high level of growth, the soybean sector appears to be positioned for growth in Zambia. Given its location, Zambia can export soybean and processed soybean products to regional markets like Zimbabwe and South Africa, especially given the exclusive use of non-GMO strains; the majority of land with agricultural potential in Zambia is still uncultivated and is well-suited to soybean production; and the construction of a new processing facility in the Lushanya region of 30,000 tons, expected to be operational by the end of 2011, appears to validate the opportunity.

However, the soybean sector faces challenges in delivering viable financial returns. Best-in-class soybean cultivation by commercial farmers appears to be only marginally attractive, with farmgate prices of \$350 per ton, close to the breakeven price of \$349 per ton, while smallholder farmers are unable to achieve attractive returns, and perceive soybean to be a risky crop versus maize that is given a guaranteed price by the government's Food Reserve Agency (FRA). There is tight control over the issuance of import and export permits, and as a result, only a small number of traders that receive permits from government are allowed to legally engage in international trade. This has led traders and processors to take a cautious approach when developing import and export strategies. This often results in less competitive exports as supply cannot be guaranteed. Overcapacity of the

¹⁰ The Zambia case study is adapted from Technoserve's report on the Zambian soybean market, funded by the Bill and Melinda Gates Foundation

soybean sector and the recent bankruptcy of Yielding Tree in 2010 suggest that the economic case for stand-alone soybean processing is likely to be challenging. However, vertically integrated players that produce animal feeds or livestock can justify investments on the basis of security of supply and the overall economic case for using high protein content feeds, which can be realized in the final market for meat.

SENEGAL: AN EXAMPLE CAKE CONSUMPTION MARKET

Senegal is a potential growth opportunity for regional exporters of soybean, given the growth of its poultry sector and its high level of soybean oil consumption.

Soybean cultivation is not undertaken at any scale in Senegal, although there is significant potential for soybean processors to serve the fast growing poultry sector (which has been protected with an import ban since 2006 in response to avian influenza). Poultry production is characterized by two sectors:

- **Traditional poultry sector:** Traditional farmyard poultry keeping or small semi-commercial production. In rural areas most Senegalese households are involved in traditional poultry keeping both as a source of food and as a source of income. This sector accounts for 70-80% of the stock of chickens, of which 30% are consumed per year; as a result, this sector accounts for almost 50% of total poultry meat and egg production. The local market value of poultry meat and eggs in this sector was estimated to be worth \$27m in 2006¹¹. In this sector, chickens typically scavenge for food or are fed household scraps and agricultural residues. Households tend to keep only 50-100 birds, as the lack of access to feed and veterinary services constrain further growth in flock size.
- **Commercial poultry sector:** This sector is substantially smaller than the traditional sector and was estimated to employ only 10,000 people in 2006¹². Players in this sector can have flocks of up to 30,000 birds, and tend to specialize either in broilers (for meat) or layers (for eggs). Feed costs account for 59% of all production costs, and is dominated by maize, which is imported. Soybean, although a relatively expensive input, is increasingly important.

Senegal is not well placed to produce significant quantities of soybean without investing in adapting strains to its local situation – a direct result of its climactic and soil conditions. As a result, it is dependent on imports of cake, 96% of which was sourced from Argentina in 2008.

Given the importance of the traditional sector in the share of total poultry supply, there appears to be substantial scope for growth in poultry production through increased commercialization of the sector, while traditional production could be substantially increased through the provision of lower cost feeds or better education of smallholders of the value of using feeds that include soy cake.

Senegal is also largely dependent on imports of palm oil and soybean oil for domestic oil consumption: in 2008 Senegal imported 80,645 tons of soybean oil and 29,096 tons of palm oil. Over 80% of soybean oil is sourced from Argentina and Brazil, with the US and EU accounting for most of the remaining volumes. The imposition of tougher quality standards on palm oil may lead to higher relative costs for palm versus soybean oil, and promote a shift in the import mix towards greater soybean oil consumption.

¹¹ Ane Rivere-Cinnamond, “Compensation Strategy, Senegal”, May 2006

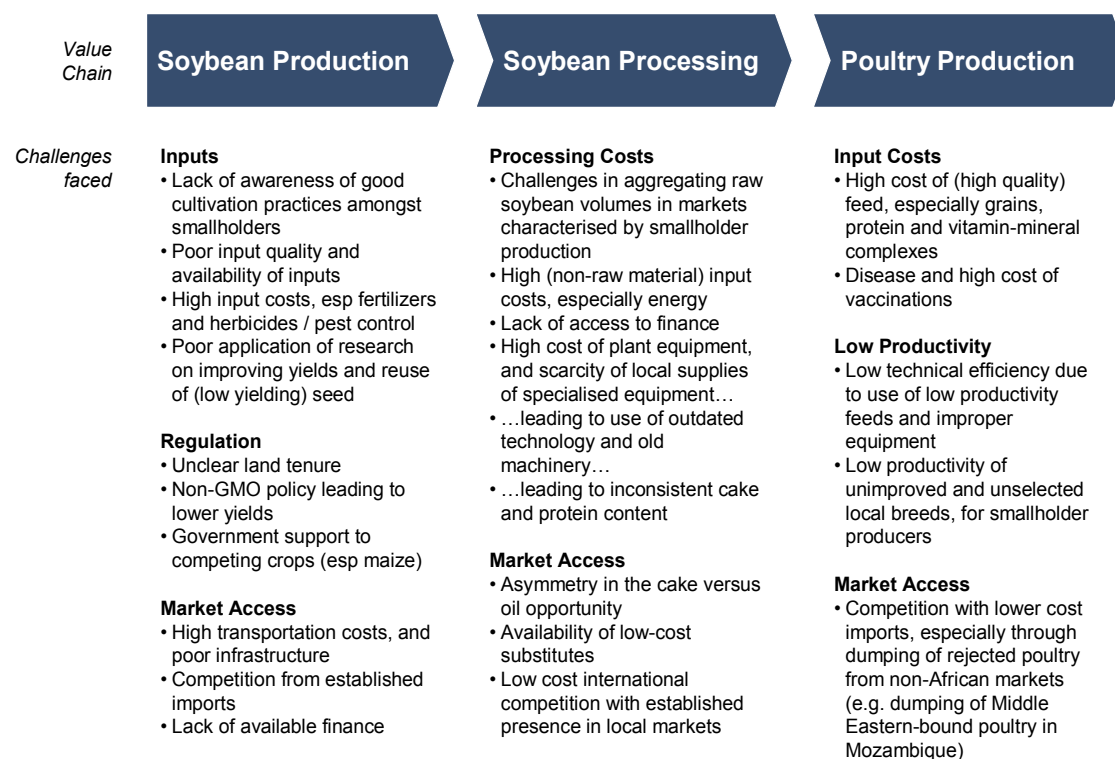
¹² Ibid.

5. The Value Capture Opportunity

CHALLENGES AND BARRIERS

Substantial imports of soybean oil and meal demonstrate the existence of a local market opportunity, but soybean processing can be a challenging market to enter. An overview of the broad range of challenges facing the sector is outlined below.

FIGURE 16: OVERVIEW OF CHALLENGES FACED BY SUB-SAHARAN AFRICAN COUNTRIES ACROSS THE SOYBEAN AND POULTRY PRODUCTION VALUE CHAIN IN AFRICA



Source: FAO; Technoserve; Industry Interviews; Dalberg analysis

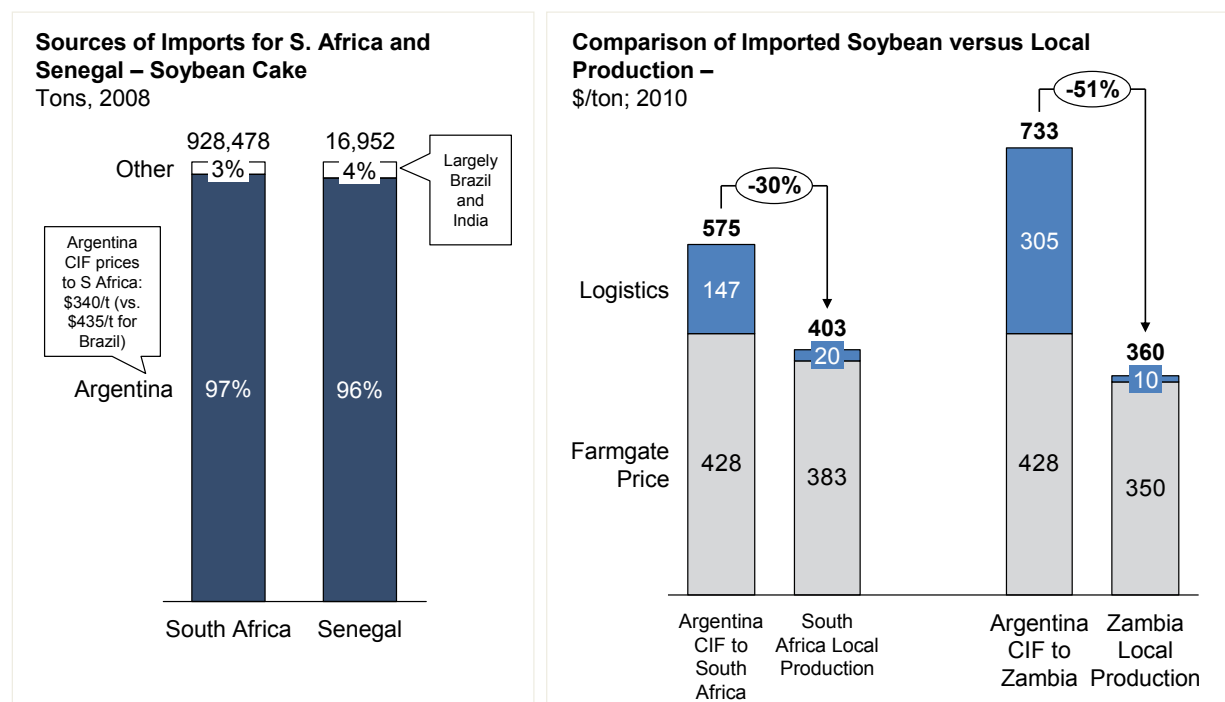
Challenges can be divided into ‘sector-specific’ that are of particular relevance to soybean, and ‘generic processing’ that are not unique to the sector but can have a determining role in the viability of agro-processing for soybean.

SECTOR SPECIFIC CHALLENGES

1. **Competition from established imports:** As shown in Figure 2, raw material costs – in this case raw soybeans – dominate the cost structure of soybean processors. As a result, prices for soybean cake and soybean oil are closely tied to soybean production costs, and processors that are unable to locate competitively priced raw inputs will be challenged to produce processed products at competitive prices.

African production appears to have recently become cost competitive with international imports. In 2008, FAO data suggests that in South Africa, which is the regional benchmark for production cost efficiency, locally produced soybean was 39% more expensive than imported Argentine soybean even including logistics and sea and land transport. More recently, Technoserve analysis suggests that South African production is now 30% cheaper on the same basis.

FIGURE 17: IMPORTANCE OF ARGENTINA IN AFRICAN IMPORTS, AND RELATIVE COST OF ARGENTINE BEANS VERSUS LOCAL PRODUCTION



Source: Technoserve; FAOstat; Dalberg analysis

On this basis, local producers may now be able to produce meal and oil for the local market at a cost advantage to imports. The presence of import tariffs of 8 to 10% on soybean meal is no longer necessary (or a material factor) in determining Sub-Saharan Africa's local competitiveness in the soybean sector.

Several uncertainties still exist. It is not clear whether the emerging cost competitiveness of the domestic sector is likely to be stable over time as Brazil, Argentina and the US continue to invest in production efficiency – especially in terms of the development of better GM strains of soybean. It is also not clear whether the cost advantages remain if production in Sub-Saharan Africa were to increase to a level capable of addressing all regional demand, or whether local capacity constraints and challenges in areas such as domestic logistics would more than offset any production efficiencies. Finally, local cost advantages are partially driven by a lack of fully pricing in labour as a cost input into production which, while prevalent in many areas such as Zambia today, will not be long-run sustainable. As a result, any apparent cost advantages need to be closely scrutinised and tested by policy-makers before building in an assumption of price competitiveness for the local industry.

FIGURE 18: SOYBEAN AND PROCESSED SOYBEAN PRODUCT IMPORT TARIFFS IN SUB-SAHARAN AFRICA

Economic Area	Example Country	Soybean / Meal Tariff	Soybean Oil Tariff
ECOWAS	Nigeria	10%	35%
UEMOA	Senegal, Benin	10%	10-20%
CFA BEAC	Cameroon	10%	30%
SACU	South Africa	8%	10%
EAC	Kenya	10%	0-25%

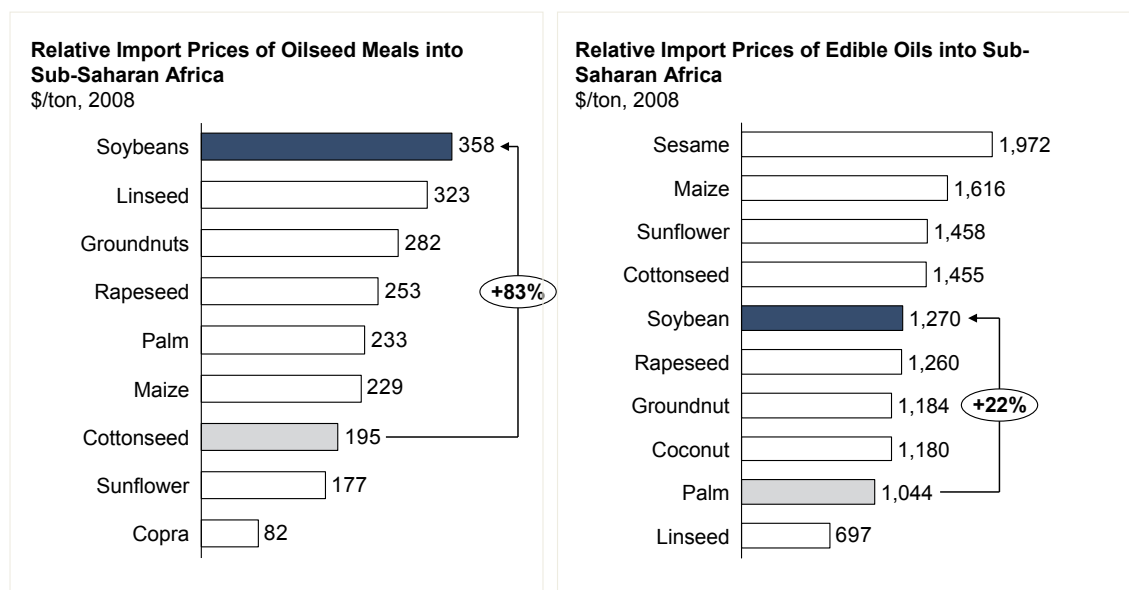
Source: International Trade Centre Market Access Map; Dalberg analysis

2. **Asymmetry in the cake versus oil substitution opportunity:** While substantial opportunity exists for the substitution of edible oil imports, the relative volume of the soybean cake opportunity is significantly lower. It is not possible for processors to produce oil without cake. Alternative products can be produced, such as 'full fat cake', which is a cake that retains all of the oil, and can be used as a finisher feed for livestock, or products that are for human consumption that may use all the oil and cake, but in both cases these are cake-based products. As a result, (as shown in Figure 17) processors need to find a market for both oil and cake in order to be economically viable, and therefore need to find a market for 4.5 to 5.5 tons of cake for every ton of oil¹³. Markets for soybean cake need to be found or created in order to viably address the total substitution opportunity. Alternatively, processors can size their addressable market in terms of the scale of soybean cake imports, which will be a much smaller opportunity but has the benefit of being immediately available, before considering marketing investments to stimulate demand.
3. **Availability of low cost substitutes:** Local substitutes typically exist for both cake and oil. Products such as cottonseed cake and groundnut cake can be used in animal feed, but have lower protein content and can only be used in limited quantities in poultry and pig feed. For subsistence farmers, these may be important substitutes, but in general soybean cake faces weak competition from such alternatives.

Soybean oil faces stronger competition from alternatives. It is a healthier alternative to palm oil, the main imported edible oil in the region, but is typically up to 20% more expensive; given that palm oil consumers tend to be highly price sensitive, soybean oil faces significant challenges to displace large quantities. Sunflower oil is more expensive than soybean, but is preferred by consumers with the purchasing power to make more discretionary food purchases, given its superior health benefits and taste for a relatively small price premium.

¹³ This is based on a typical conversion rate of a ton of processed soybean into 82% cake and 18% oil, implying a ratio of 4.6 tons of soybean cake produced for every ton of soybean oil; assuming wastage of approximately 3% of soybean, the transformation rate could reach 82% cake and 15% oil, implying a ratio of 5.5 tons of soybean cake for every ton of soybean oil

FIGURE 19: RELATIVE IMPORT PRICES OF SUBSTITUTES FOR SOYBEAN PRODUCTS INTO SUB-SAHARAN AFRICA, 2008



GENERIC AGRO-PROCESSING CHALLENGES

1. **High (non-raw material) input costs:** Relatively high energy costs, and instability of supply, can impact processing and storage of raw materials. Processors operating in Sub-Saharan Africa can be exposed to substantial inventory risk, given the requirement to typically hold high levels of raw soybean between crop cycles. As a result, processors are typically required to invest in back-up energy generation.

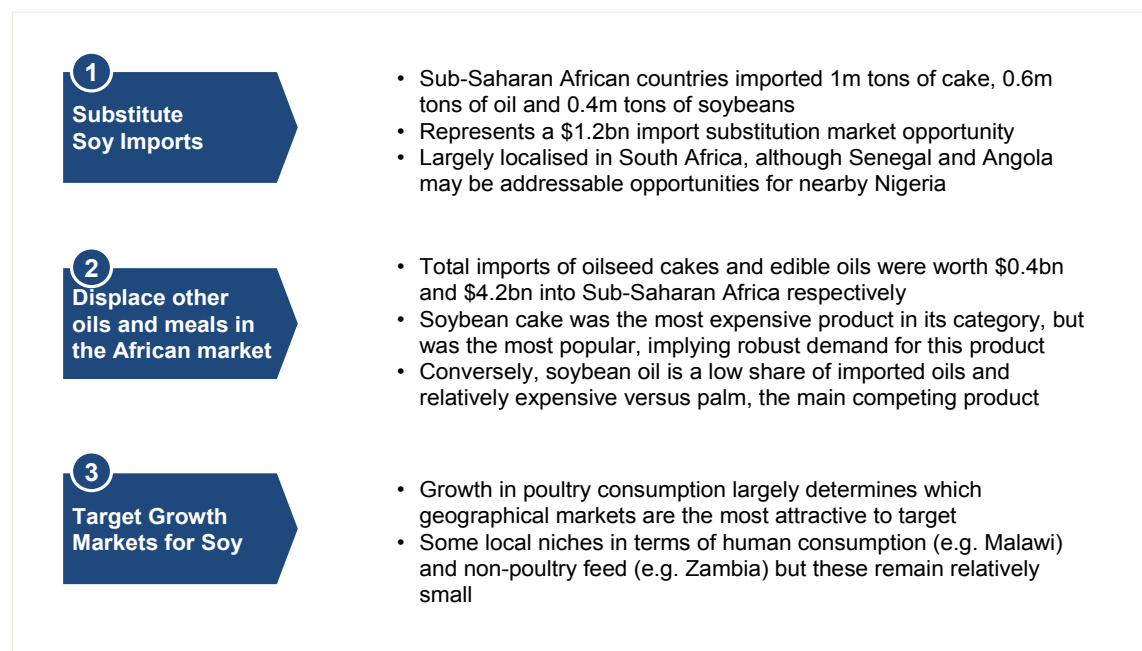
The impact of high transportation costs can be more nuanced for import substitution opportunities: high logistics costs, especially for land-locked countries such as Zambia, can provide partial protection from international imports. However, this can be largely offset by the high cost of transporting raw soybean to processing facilities, and the high cost of imported agricultural inputs for soybean cultivation.

2. **Lack of access to finance:** Prospective investors in processing facilities are often faced with high financing costs for start-up. Once the facility is in production, fixed assets such as land, buildings and machinery can provide a source of collateral in order to finance ongoing working capital and subsequent expansions. However processors suggest that financing costs remain a challenge, especially given the requirements to hold high levels of intra-season stocks of soybean.
3. **High Costs for Plant Equipment:** While soybean crushing – either using screw-press or solvent extraction methods – is a relatively simple process, specialised equipment is required and typically needs to be imported. Customs duties raise costs, while long lead times and delays in transit of equipment require plant operators to ensure additional redundancy and carry high stocks of spare parts.

KEY OPPORTUNITIES FOR VALUE CAPTURE FOR AFRICAN COUNTRIES

Given the low level of overall production of soybean and soybean processing in Sub-Saharan Africa in the global soybean market, and the presence of substantial imports of soybean products into the region from key producer countries, opportunities for capturing value need to be focussed on local opportunities for displacing imports and catering to domestic growth sectors. As shown in Figure 20, these opportunities can be categorised into three groups.

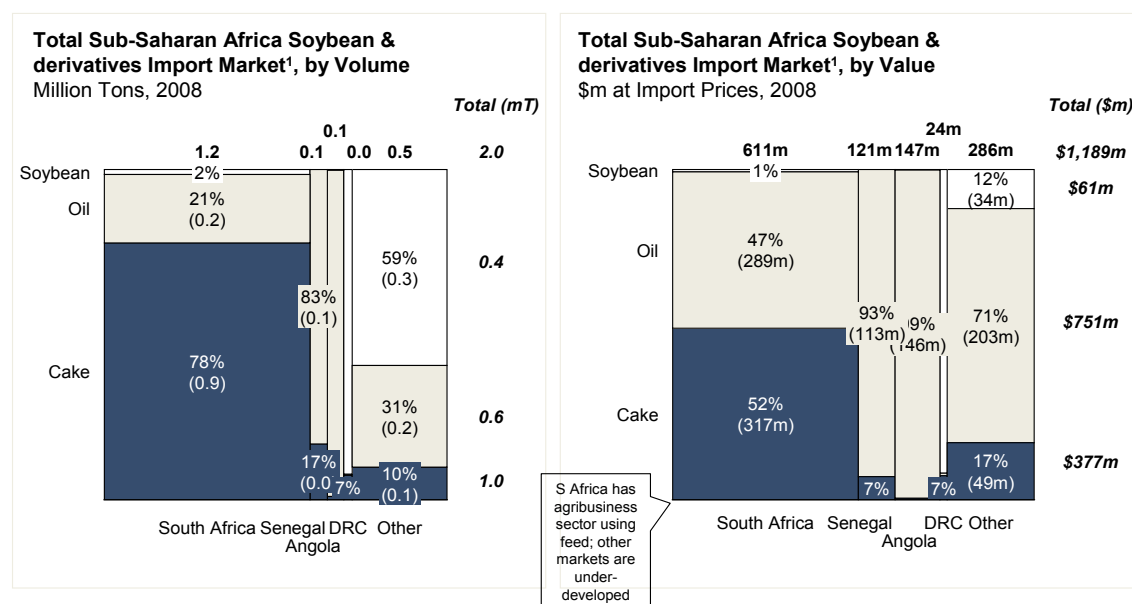
FIGURE 20: KEY VALUE-CAPTURE OPPORTUNITIES IN SOYBEAN



SUBSTITUTE SOY IMPORTS

Sub-Saharan African countries imported \$1.2bn of soybean and processed soy products, with soybean oil the largest import sector at \$751m, followed by \$377m of imported cake in 2008. South Africa is the largest import market, at \$611m, representing a potentially addressable opportunity for players in Eastern and Southern Africa such as Zambia and Uganda, while Senegal and Angola may represent opportunities for processors in Nigeria.

FIGURE 21: SIZE OF THE SOY IMPORT SUBSTITUTION OPPORTUNITY, BY COUNTRY



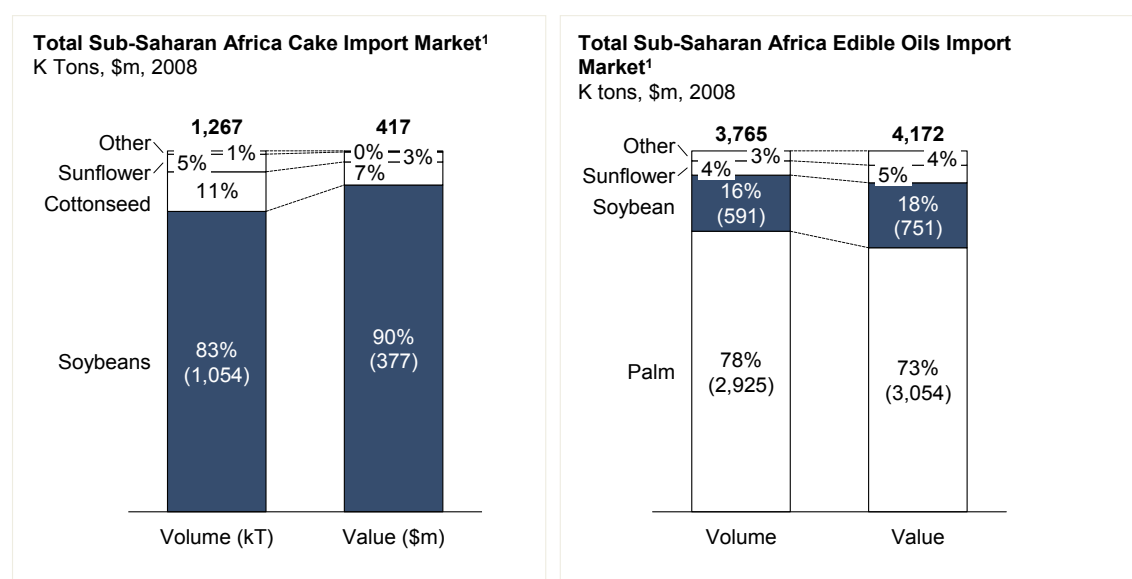
1. Includes trade between Sub-Saharan African countries
Source: FAO; Dalberg analysis

DISPLACE OTHER OILS AND MEALS IN THE AFRICAN MARKET

Within the broader oilseed market, soybean competes with alternative sources of edible oil and oilcake. African imports of oilseed products are broadly reflective of global flows of processed oilseeds: soybean dominates Sub-Saharan African imports of cake, accounting for 90% of the value of total cake imports in 2008, but only 18% of total edible oil imports.

Palm oil dominates African imports of edible oil, representing approximately 3 million tons in 2008. Given the relative health benefits associated with soybean oil including a lower saturated fat content, soybean oil can be considered a higher quality cooking oil than palm, although it typically attracts a higher price: across Sub-Saharan Africa, palm oil import prices averaged \$1,044 per ton versus \$1,271 per ton for soybean oil. In low income consumer segments, this price differential needs to be overcome through a combination of demand generation and cost efficiencies in order to effectively displace palm oil volumes.

FIGURE 22: SIZE OF THE BROADER EDIBLE OILS AND OILCAKE IMPORT SUBSTITUTION OPPORTUNITY

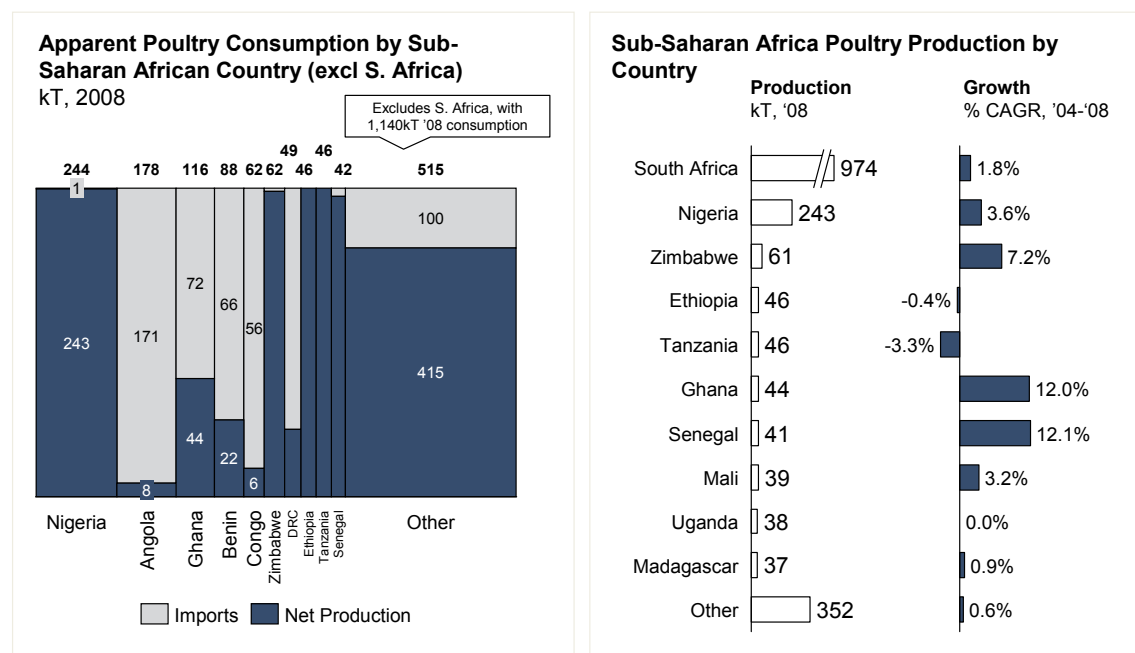


1. Includes trade between Sub-Saharan African countries
Source: FAO; Dalberg analysis

TARGET GROWTH MARKETS FOR SOY CAKE

The relatively large scale of the oil substitution opportunity for soybean processors versus cake creates a challenge for prospective processors: given that the typical output from a crushing facility is 82% cake, the ability to address the oil substitution opportunity is constrained by the ability to locate markets for cake. There appear to be at least 2 growth segments for processors to realise value from cake production:

- **Animal feed sector:** Although animal feed is a key application for soy cake in Sub-Saharan Africa, current livestock cultivation often utilises locally available sources of cake such as groundnut and cottonseed as a feed. These are lower quality, with lower protein content, but as by-products of other production processes can be available at low cost. Beyond displacing lower cost substitutes, fast growing poultry sectors in countries such as Zimbabwe, Senegal, and Ghana constitute important growth opportunities for high soy cake content feeds.

FIGURE 23: KEY SUB-SAHARAN AFRICA POULTRY PRODUCTION AND CONSUMPTION¹⁴ MARKETS

- Human consumption:** Soy products for human consumption, such as Texturised Soy Protein (TSP), soy milk or corn-soy blends can constitute an opportunity to substantially improve nutrition for low income households. Human consumption of soy products is relatively low in Sub-Saharan Africa, with countries such as Malawi and Nigeria key exceptions. In markets without a material human consumption market, deliberate demand generation programs such as those driven by IITA in Nigeria in the late 1980s to early 1990s demonstrate that this sector can be stimulated. Markets such as Zambia with only a nascent human consumption market can expect to see annual growth rates in demand of over 8% per year.

¹⁴ Consumption is measured as “apparent consumption”, which is based on FAO data for production, plus imports, less exports. “Net Production” is defined as production less exports.

6. Brazil: a Case Study of the Key Success Factors for Value Capture in the Soybean Industry

BACKGROUND: CONVERTING SOYBEAN INTO POULTRY EXPORTS

Although a relatively new entrant into the commercial soybean sector, Brazil is today a leading player in the global market in terms of production and processing, and is an important case of the combined application of seed technology and government support to develop the sector. Brazil has also successfully managed to leverage its scale and low cost soybean production into the poultry sector, and is one of the highest volume and lowest priced exporters of poultry meat globally.

Commercial cultivation of soybean started in Brazil in the mid 1950's as a side-effect of a government program of incentives for the production of wheat to achieve self-sufficiency: soybean was typically grown as a summer crop on rotation with wheat. However, production was still small scale, at only 1 million tons by the end of the 1960s and restricted to the South of Brazil. Production accelerated in the 1970s, reaching 12.5 million tons by 1977, as farmers responded to high prices for soybeans from the agricultural feed sector by shifting cultivated land towards soybean.

By the end of the 1970's, high land prices in the South led to a shift in farmers to the Cerrado, a savanna with low fertility but good rainfall. Government-led research through the Brazilian Agency for Research on Agriculture and Animal Husbandry (EMBRAPA) developed varieties that were able to be grown in the mild, wet climate of the region, allowing a massive expansion in land dedicated to soybean cultivation. The Cerrado's abundance of flat land with predictable rainfall allowed farmers to exploit massive economies of scale, and constitutes the beginning of substantial soybean cultivation. Between the early 1960's to 2009, approximately 70% of the growth in Brazilian soybean output could be attributed to an expansion of the area under soybean cultivation. The remaining growth has been driven by increases in yields, due to improved production techniques, and the use of high-yielding seeds, including genetically modified (GM) varieties.

GM soybeans were not permitted in Brazil until 2001, although GM seed had been smuggled in from neighboring countries and planted illegally, and now account for 84.5% of the crop in the 2010/11 season. A persistent proportion of non-GM soybean continues to be grown in order to serve markets such as the EU and several Sub-Saharan African countries with restrictions or bans on the import of GM soybean.

Soybean processing growth also tracked the development of soybean cultivation: in the 1960's soybean processing began in the South to develop poultry feed. As soybean production began to accelerate in the 1970's, private sector players began to invest in Brazil to exploit its superior economies of scale and proximity to large and growing livestock industries. Brazil's processing sector is fragmented: in 2006, 47 firms operated 96 plants, with a combined annual capacity of 42 million tons per year. The top 20% of plants in terms of output account for 40% of soybean meal production. Therefore, while economies of scale do exist, they do not drive the industry to a highly consolidated model with only a handful of players; potential new industries in Africa do not, therefore, need to leverage massive economies of scale in processing as the key lever to be competitive against international imports.

Poultry in Brazil began on a commercial scale in the 1950's and 1960's with the importation of more productive breeds; poultry farming also began in the South, and has been linked with the availability of corn and soy for feed. Brazilian poultry farming is based on the 'integration' model, in which small and medium-sized farmers are linked to large processors. Poultry farmers typically receive inputs such as chicks and technical assistance from

processors, which provide prices that are linked to efficiency and quality; up to 95% of poultry production takes place under contract in Brazil today.

A combination of strong domestic demand, low input costs through the availability of corn and soy, and public sector support have been key drivers for the growth of the poultry sector. Brazil's domestic consumption of poultry has risen from 2.3 kg of chicken meat per capita in 1973 to 35.7 kg in 2006, with approximately 71% of total production consumed domestically. A stable and low cost supply of soy cake allows Brazilian broilers be extremely price competitive. Government support has been provided through multiple interventions:

- **Tax incentives:** Poultry processors in some states in Central-West Brazil receive tax exemptions and benefit from infrastructure improvements when they establish their plants in these states. Exporters in the South, where the majority of the poultry sector remains today, receive exemption from state value-added-tax
- **Low cost finance:** The federal government provides low interest rate loans for long-term investments in poultry plants; these have been particularly effective in promoting vertical integration from grain co-operatives to extend into poultry production
- **Export promotion:** The Brazilian Agency for Export Promotion provides up to 50% of the cost of export promotion activities such as market studies and participation in trade shows. Poultry exporters also receive finance from banks at rates that are lower than for domestic producers.

IMPLICATIONS: KEY SUCCESS FACTORS FOR VALUE CAPTURE

The Brazilian experience demonstrates many of the most important success factors required for countries to capture value at more advanced stages in the soybean value chain.

- **Low soybean production costs:** Given the dominance of raw soybean costs in soybean processing economics, low soybean production costs are critical to the viability of related processing and meat production sectors.
 - **Seed technology, good technology and practices transfer through EMBRAPA:** The development of strains well-suited to cultivation in the Cerrado allowed the Brazilian industry to take advantage of a latent bank of agricultural land and was a precursor to exploiting massive economies of scale. In terms of seed technology, the decision on whether the use of GM strains is an important success factor is an area of debate. Traits of GM soybeans reduce the level of inputs required and increase farmer convenience, and can thereby deliver increased yields and reduce costs. Several alternative approaches to GM also exist, such as application of lime and using irrigation that can in principle deliver comparable gains. However, the dominance of GM soybean production both in Brazil and in the other major producers appears to be indicative of the importance of GM for internationally competitive levels of costs.
 - **Low input costs:** Efficient soybean cultivation requires appropriate use of inputs such as inoculants to deliver economically viable yields.
 - **Efficient Logistics:** Strong transport infrastructure is required to be able to aggregate in a cost-effective manner as well as bulk and deliver soybean to processing plants.
- **Strong domestic demand, primarily from the poultry sector:** Although Brazilian soybean producers were able to exploit massive economies of scale in production, a substantial addressable market was necessary

to absorb these volumes. The poultry sector was a critical consumer of soybean in Brazil. Its growth was co-dependent on the success of the soybean sector, since low soybean costs contributed to expansion in poultry farming, leading to an expansion in soybean demand and a reduction in soybean costs through greater economies of scale. Long-term reductions in poultry production costs have been critical in stimulating increases in domestic poultry consumption, while also consolidating Brazil's position as a competitive international exporter.

- **Public sector support focused on the development of higher value final consumption good sectors, especially poultry:** Government support at the poultry production stage, rather than for soybean production, has in effect stimulated the development of the entire vertically integrated soybean-to-poultry sector. The provision of low cost finance and export promotion in particular has supported both the efficiency and the expansion of the poultry sector, thereby driving domestic demand for processed soybean.

7. Positioning of African Countries for Successful Value Capture

Countries that are either currently engaged in soybean production or that are experiencing significant growth in soybean imports, have several opportunities to capture more value in the soybean value chain.

However, the feasibility of capturing greater value, especially through driving increases in local processing, is not entirely straightforward. Below we review Nigeria's potential for successful value capture, based on the success factors identified in the previous chapter.

FIGURE 24: OVERVIEW OF NIGERIA'S POSITIONING AGAINST KEY SUCCESS FACTORS FOR GREATER VALUE CAPTURE IN THE SOYBEAN VALUE CHAIN

Success Factor	Positioning of Nigeria	Comments & Observations
Seed technology, good practices and technology transfer	Moderate	<p>The International Institute of Tropical Agriculture (IITA) and Institute for Agricultural Research (IAR) have invested in research and development to improve the productivity of soybean by developing high yielding, early maturing varieties which possess other good agronomic traits, versus the Malayan variety that was originally introduced in the early 20th century.</p> <p>Soybean is now cultivated across central, west and south states in Nigeria, although it remains largely smallholder based and therefore unable to exploit economies of scale</p>
Low input costs	Poor	<p>Challenges in availability of key inputs such as fertiliser, inoculants, herbicides and pesticides, high prices and challenges in controlling counterfeit goods [which goods??] constrain smallholder farmers in achieving high yields and consistently high quality production.</p> <p>Poor electricity supply, a lack of access to finance, and a use of outdated machinery lead to challenging processor economics.</p>
Efficient logistics	Moderate / Poor	Nigeria was ranked 100 out of 155 countries in the World Bank's Connecting to Compete 2010 report, with particular challenges in the timeliness of transportation, ability to track and trace shipments and customs.
Strong demand, primarily from the poultry sector	Strong	<p>Demand from the poultry sector is growing at approximately 30% per year, and benefits from an import ban.</p> <p>Growth in demand for human consumption, principally in breakfast and baby foods, mixed with traditional foods such as gari to increase protein content, and as a substitute for meat and fish in the form of 'soy cheese' or wara, is also an important driver of demand.</p>

Public sector support focused on higher value final consumption goods sectors	Strong/ Moderate	Organised demand promotion to educate consumers of the benefits of soy consumption and on good agricultural practices has supported the growth of the sector. This has successfully cultivated the development of the soy for human consumption sector, evidenced by entry of multinationals such as Nestle and Cadbury.
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As a result, Nigeria appears to have an imbalance of factors on the supply- and demand-side of the soybean sector that create a growing opportunity that it is failing to maximise. Imports of soybean cake and oil are growing rapidly (increasing by 17% and 67% per year respectively from 2005-08 in volume terms) while processing volumes appear to be stagnating (declining by 8% per year from 2005-08 in volume terms).

On the demand-side, growth in the poultry and human consumption sectors are supporting continued rapid year-on-year growth in the size of the processed soybean opportunity. However, poor logistics, high input costs and a lack of access to finance create challenges for domestic processors to scale up production on a cost competitive-basis with imports. At the same time, fragmented, largely smallholder-based farming has resulted in marginal volume growth in soybean production recently (only 0.4% per year from 2005-09).

8. Considerations and Steps Required to Develop Policy

The preceding chapters provide an overview of the key trends in the soybean sector, the primary value capture opportunities for African countries and the key success factors required to capture a greater share of the value available in the soybean value chain. However, at the country level, policy-makers need to consider a range of areas in order to develop a country-specific plan to catalyse and drive transformative growth in the soybean processing sector. Below we outline some of the key areas and considerations to be included in country-specific policy development.

A – IDENTIFY AND PRIORITIZE OPPORTUNITIES FOR VALUE CAPTURE

Africa's low share of global soybean production and processing should be a key parameter in defining the objectives of any intervention in the soybean market. Opportunities for value capture are largely focused on developing a domestically oriented industry that can create independence from imports, and support an increase in protein consumption through either lower cost poultry or as a direct dietary input.

Interventions therefore need to focus on enabling processors to enter the sector on a competitive basis with imports, and promote consumer and smallholder farmer demand. At an individual country level the prioritization of these opportunities will need to take into account several country-specific factors, including:

- **Baselining the current economics of the sector:** The current, vertically integrated economics of the sector need to be understood. This includes the current level of efficiency of soybean production and the scope and feasibility of increasing production, either through increased land allocation, increased yields¹⁵, or both. This needs to take into account the increasing challenges on shifting cultivation patterns and on maintaining yields. An equivalent analysis for the soybean processing and poultry production sectors also need to be undertaken with a review of the current levels of operating capacity and efficiency of the sector, followed by an assessment of the sensitivity of costs to drive increases in production.
- **Forecasting the key variables that have the most impact on the economic viability of the sector:** In this case, this should at least include expectations of international soybean prices and forecast import prices of soybean, cake, oil and poultry meat as key competitors to the domestic sector, in cases where import restrictions do not exist.
- **Sizing the opportunity:** Based on the above economic models and forecasts, scenarios for the potential scale of the overall economic opportunity for increasing production and processing need to be evaluated at each stage of the value chain, This includes the distribution of value capture across the different stakeholders (e.g. farmers versus soybean processors, versus poultry producers).
- **Assessing opportunity costs for market participants in the sector:** The opportunity cost of cultivating soybean especially when compared to alternative crops such as maize, and the relative opportunity cost of supporting soybean versus other crops or other sectors, given limited financial and human resources.

¹⁵ FAOstat data for 2008 indicates yields in Brazil and Argentina of 2.8 tonnes per hectare, versus 1.7 for South Africa, 1.2 for Uganda and 1.0 for Nigeria, largely driven by differences in the strains used (including the use of GM crops in Latin America) and levels of mechanization./

- **Identifying areas of comparative advantage / disadvantage:** Analysis of the relative costs of production, soybean processing and poultry production locally versus in competing markets, and an identification of the key sources of current lack of competitiveness and areas for potential comparative advantage.
- **Outlining what policies would be required to take advantage of opportunities, and paring this back to what is possible:** For example, in the case of driving increased domestic soybean processing, policy-makers need to take a view on the willingness and ability of government to provide sufficient incentives to attract inward investment. If prior analysis suggests that a shift to GM strains of soybean would be required to eliminate competitive disadvantage, the feasibility of such a policy-shift would need to be closely considered.
- **Prioritise opportunities:** From the above, a ranking of opportunities for value capture based on an overall assessment of the net gains, feasibility and risks.

B - IDENTIFY CURRENT POLICY BOTTLENECKS

Having identified priority areas for value capture, relevant policy bottlenecks need to be identified. At a generic level, some policy-created challenges include:

ASYMMETRY IN DEMAND FOR SOYBEAN PRODUCTS VERSUS SOYBEAN OIL

Processors aiming to displace imports of soybean oil need to find sufficient markets to absorb the cake they would produce to be economically viable. The current balance of cake and oil imports suggests that, if all oil imports were substituted by domestic producers, new markets need to be developed for cake, as current levels of cake imports would not account for the total amount they would produce.

Developing such markets for cake may be feasible. There appears to be untapped potential demand for soybean products that, if properly exploited, could increase the scale of the overall soybean processing opportunity for African processors. For example, although soybean offers a low-cost alternative for consumers to increase their dietary protein, and for farmers to increase the quality and volume of their poultry output, awareness is often low, leaving soybean consumption far below potential.

Given that individual processors cannot fully capture the benefits of any marketing activity that aims to generally promote demand and build awareness of soybean products and uses, information and marketing for soybean will only at best be undersupplied by the private sector. IITA's program in Nigeria to increase direct human consumption of soybean constitutes an example of successful behaviour change and could be leveraged more widely.

LOW COST INTERNATIONAL COMPETITION

For countries without a domestic soybean processing or production sector, imports from major global producers present a challenge given their relatively low cost and established presence in the market. Countries that already have a presence in the soybean sector such as South Africa, Uganda, Nigeria and Zambia may in some cases be achieving prices that are competitive with global imports, although for new entrants that have not reached minimum efficient scale, global imports will constitute an important challenge to market access.

Industry protection, in the form of tariffs or import bans have been used in countries such as Nigeria and Senegal to protect selected sectors, such as poultry and edible oils, typically leading to an acceleration of the expansion of the domestic sector.

However, these measures do not address the fundamental economics of soybean production and processing. As the key input for soybean processors, soybean varieties that can have a lower cost of production per ton can have a significant impact on processor economic viability, especially in Sub-Saharan African markets that are characterised by high levels of price sensitivity. The public sector has a potential role to use its convening power to bring together the appropriate skill sets from universities and the agribusiness / agri-technology sectors and capital to promote the development of better performing varieties. Brazil's publicly funded agriculture research organisation EMBRAPA successfully developed strains that could be cultivated in the Cerrado region, enabling Brazil to become a major player in the global market, and provides an example of best practice for adapting crops to the needs of a domestic agro-processing industry.

There are examples of African innovation in strain development: Zimbabwe's Crop Breeding Institute (CBI)¹⁶ developed varieties of the Magoye¹⁷ and Nyala strains of soybean in 1996 to 1997 that were able to increase soil fertility and deliver higher yields in the Southern African environment¹⁸. The CBI, in conjunction with the University of Zimbabwe, provided farmers with knowledge of these new strains and engaged a broad set of key stakeholders from the public and private sector, including farmer's cooperatives, to ensure that the new varieties were used broadly and in the correct way, and were highly successful. Although the agriculture sector has faced substantial challenges following the troubled land reform, this demonstrates that countries such as Zimbabwe have the capability to replicate some of the successes of countries such as Brazil in using research and development to bring down production costs.

REGIONAL TRADE BARRIERS

Most countries in Sub-Saharan Africa currently have relatively low volumes of demand for soybean oil and cake on a per country basis (with the exception of South Africa), although in aggregate the volumes across the region are material. Prospective African processors could export to regional markets: for example, processors in Nigeria can export to Senegal and Angola, while processors in Zambia may be able to serve markets in South Africa and Zimbabwe¹⁹.

However, formal barriers to trade such as tariffs and customs duties, a lack of seed harmonisation across countries, and informal barriers such as long lead times for crossing borders raise costs of cross-border trade for processors. Across Sub-Saharan Africa, imports from Brazil and Argentina dominate imports of oil and cake today: reducing or eliminating formal and informal trade barriers can create larger, more attractive regional markets for domestic processors to address.

C – DEVELOP KEY ENABLING INTERVENTIONS

Based on the opportunities for value-capture and associated policy bottlenecks that have been identified, a policy agenda to support a soybean growth strategy can be developed. This policy-agenda must necessarily be

¹⁶ International Journal of Agricultural Sustainability 'Soyabeans and sustainable agriculture in southern Africa', p. 51 <http://www.tandfonline.com/doi/pdf/10.3763/ijas.2010.0548>

¹⁷ Magoye is a naturally-nodulating or 'promiscuous' variety of soyabean that was originally found in Zambia. See Agricultures 'The successful intensification of smallholder farming in Zimbabwe', <http://www.agriculturesnetwork.org/magazines/global/living-soils/the-successful-intensification-of-smallholder>

¹⁸ Specifically, it is the magoye variety that was demonstrated to increase soil fertility to a greater extent than other non-native varieties, and the nyala variety that was demonstrated to have especially high yields as a cash crop

¹⁹ Technoserve, "Southern Africa Regional Soybean Roadmap – Final Report" February 2011

specifically adapted to the needs and resources of each country, although some general themes may be shared. Beyond general measures that aim to improve the environment for agro-processing in general, such as working to improve the reliability and cost effectiveness of energy, improving road and port infrastructure and providing investment incentives for industry, there are a few measures that may potentially be directed at the soybean industry in multiple countries:

ENSURING AVAILABILITY OF SOYBEAN SUPPLY FOR PROCESSORS

The cost of raw soybean is the single most important for soybean processors. For a soybean processor to be viable, it is critical to be able to locate sufficient quantities of appropriate quality soybean at a reasonable cost. Local crop cycles can create the need to build high intra-season stocks, leading to high demands in terms of working capital and storage facilities, which can amplify the effect of soybean prices on a processor's economic viability.

For countries with soybean cultivation that is largely through commercial farming such as Zambia, processors that need to source soybean must interact with only a small number of commercial farmers. However, for countries with highly fragmented production, processors typically need to source soybean from traders that will consolidate volumes at a mark-up, leading to reduced margins. There may be a role for the public sector in promoting a better organisation of the soybean supply chain to promote efficiency and minimise the number of market intermediaries involved in aggregating soybean. Options for doing this include: market-based interventions such as auctioning licenses or permits for agents to consolidate volumes, with a regulated level of mark-up over and above farm-gate prices or regulated sales prices to processors; and organisation of existing producers into groups or co-operatives that can trade their volumes in bulk directly with processors.

ASSESS REGIONAL OPPORTUNITIES

Although it may be possible to create a viable case for stimulating the soybean processing sector on a domestically focussed basis, there are opportunities for producing countries to assess the total regional opportunities that are available, which may justify a much larger response or higher priority for the sector.

As examples, Zambia's ability to export to regional markets such as South Africa, as well as potentially nascent local markets, constitutes an important and growing opportunity, especially given the expected continuation of rapid growth in the South African poultry sector. Nigeria is well placed to serve West African markets such as Senegal and Angola, both of which are likely to experience rising demand from their local livestock sectors.

From the perspective of non-soybean producing countries or countries with existing processing capabilities in soybean or other oilseed markets, increased regional soybean production could also provide feedstock for a new business line. South African oilseed processors focused on serving local demand for sunflower oil may also be viable partners for regional soybean producers that lack the capability or interest in investing in soybean processing facilities.

D – ADDRESS POTENTIAL POLICY TRADE-OFFS

Policy-makers typically need to take into account the reality that any sector-specific strategy must compete with many other overlapping, and potentially conflicting priorities. However, there are several additional policy trade-offs specific to the soybean sector that need to be addressed when determining an overall approach to defining a soybean strategy for any country, including:

- **Planting of GM versus non-GM soybean:** Although GM soybean is usually assumed to be adapted to deliver higher yields, this is not the case. The traits for GM soybean are primarily focused on increasing

farmer convenience and reducing input costs, and do not directly increase yields, but can contribute to yield increases by reducing pest damage and weeds. This indirect effect has recently been estimated to generate a 12% increase in yields²⁰.

However, there appear to be a broad range of alternative methods focused on application of good agronomic practices and conventional agricultural technologies that can deliver equivalent or higher levels of yield increase. Irrigation can increase yields by 20 to 100%, while use of inoculants and lime can both deliver yield increases of over 10%, respectively²¹.

It should also be noted that, of the major producing countries, only Brazil produces a significant volume of non-GM soybean that is separated from the GM crop. As a result, African countries that import significant volumes of soybean cake and oil from Argentina or the US are permitting products with high GM content to enter the food chain.

- **Prioritising soybean versus alternative crops:** Given limited agricultural resources and constrained public sector management bandwidth and finances, any decision to prioritise or accelerate the development of the soybean sector needs to take into account the net impact on other areas, especially if direct support to the soybean sector involves creation of market-distorting incentives, rather than general business enabling policies that impact the agro-processing sector generally.
- **Protecting infant industries versus protecting consumers:** In the case of tariffs or import bans, or more general support of a domestic sector in preference to supporting imports, governments must make a trade-off between the positive effects on the industry, those directly affected through positive spillovers, and the negative effects on consumers or clients that will typically need to pay higher prices. The need to weigh these considerations in the contexts of the potential dynamic development of the sector over time adds further complexity to the trade-offs in formulating policy to protect an 'infant industry'.

Given that the levels of value addition inherent in soybean processing are low and the positive spillovers to the broader economy, through levers such as increased productivity in the livestock sector and generally improved nutrition through the more widespread and lower cost of dietary protein, there is a potentially strong rationale for support of a soybean sector.

Since negative impacts are broadly spread in comparison to the relative concentration of benefits, industry protection tends to create powerful interest groups, and the resulting market distortions can create opportunities for rent seeking. As a result, commitments for the eventual removal of protection for a domestic industry can become difficult to exercise in practice.

- **Leveraging expertise of key international players versus developing local know-how:** Major international players such as ADM, Cargill and Bunge have extensive know-how in the production, processing, marketing and trading of soybean, and are likely to be poised for expansion into Sub-Saharan Africa over the medium term. Rapid expansion of the soybean sector can be achieved by governments that successfully work in partnership with such players to leverage their know-how, access to capital and

²⁰ Yield gains for HT soybean versus conventional soybean has been estimated to be 12.4% globally. Sexton, S & Zilberman, D. "Beyond Field Trials: The impact of genetically-engineered crops on agricultural production" July 21 2010.

²¹ Technoserve, "Southern Africa Regional Roadmap: Final Report", February 2011

markets. Given their scale across production and processing, and major share of global trade, accessing key import markets such as the EU for cake and China for raw soybean is likely to be highly challenging if pursued independently.

However, reliance on international players can create challenges in achieving effective knowledge-transfer to the domestic sector and often lead to substantial transfers of returns outside the country. Positive spillovers may therefore not be fully maximised, as the natural churn of skilled labour and reinvestment of capital may be reduced for a sector that is driven by foreign players.

There is also a challenge in terms of ensuring sufficient interest from international players in investments in the African market: aside from selective investments in South Africa, major players have not demonstrated interest in an asset-based strategy in the region. Policy-makers will therefore need to understand key value levers which can determine whether and how to design incentives that can most efficiently drive investment.

- **Balancing incentives while ensuring positive spillovers to the local industry and broader economy:** In order to compensate for the relatively high risks borne by early entrants into agro-processing, some incentives may be required such as tax relief in early years. Typically, a case can be made for substantial incentives for first movers or early entrants on the basis of the scale of positive spillovers and demonstration effects that they can create. However, policy-makers need to ensure that an adequate evaluation of the true scale of positive spillovers can be balanced against the scale of incentives that are provided, and that packages for early, or first-mover entrants into sectors do not become the norm for sectors as a whole.