Analysis of the Soya Bean Value Chain in Zambia's Eastern Province

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Working Paper 74
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The Indaba Agricultural Policy Research Institute is a non-profit company limited by guarantee and collaboratively works with public and private stakeholders. IAPRI exists to carry out agricultural policy research and outreach, serving the agricultural sector in Zambia so as to contribute to sustainable pro-poor agricultural development.

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Any views expressed or remaining errors are solely the responsibility of the authors.

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EXECUTIVE SUMMARY

The Feed the Future (FtF) program being implemented in Zambia's Eastern Province by United States Agency for International Development's (USAID) has its goal of lifting more than a quarter of a million rural people (mostly farmers) out of poverty by 2015 (USAID 2011). The attainment of this objective will be achieved, in part, through sustained investments in several key value chains in the agricultural sector, including soya bean value chain. Despite the clear benefits of soya production for smallholders, soya production remains low. In part, this may be linked to the pervasive belief among farmers that soya markets are unreliable. However, interviews with downstream market actors suggest that there is in fact significant unmet demand for soya in Zambia. The purpose of this value chain analysis is to identify the factors limiting smallholder linkages to the growing markets for soya in Zambia, and to provide concrete strategies to overcome them.

The primary data used in this study stem from qualitative research conducted in Eastern Province of Zambia. The data were collected through guided interviews with key actors at each node of the soya bean value chain. In addition to qualitative research, data from different national representative surveys were used to inform our discussion.

The study highlights the following challenges:

First, there is limited availability of high yielding soya seed and limited incentive for private investment in smallholder soya seed multiplication. This is partly because smallholder farmers prefer open pollinated varieties (OPVs), which can be recycled for up to five years with minimal yield loss. However, supplying recyclable seed is less profitable, so corporate suppliers tend not to promote them heavily. Another challenge concerns lack of inoculum as Zambia Agriculture Research Institute (ZARI) is the sole producer within Zambia.

Second, yield improving input usage in soya bean production is low. Smallholder farmers rarely use inoculum in soya bean production due to a lack of knowledge about the benefits of using inoculums, coupled with problems associated with acquisition. In Zambia, ZARI is the sole producer of inoculum. Low production is also related to poor agronomic practices, such as late planting and poor disease management

Third, due to low production, farmers tend to have small quantities to sell and the earliest opportunity farmers have to turn their crop into cash is when the prices are the lowest of the marketing season during harvest time. Limited quantities of production do not justify transporting soya to potentially more remunerative markets in the district capital where buyers are willing to pay a premium on bulk purchases. Lastly, there is a large amount of trade distrust between farmers and traders, and it flows in both directions. Farmers complain of rigged scales whereas traders complain that sacks are frequently loaded with sand or stones to increase their weights.

Based on the highlighted challenges, we suggest the following intervention strategies to overcome them:

i. The project should work with seed suppliers and agro-dealers on forecasting demand based on project interventions. In addition, there is need for more public investment in the smallholder soya seed production and multiplication.
ii. Awareness campaign on the benefits of using inoculum and how to apply it in soya bean production as well as improve accessibility.
iii. Improve the extension service with regard to crop management practices.

iv. Work with farmers on local bulking for onward sale. Need to focus efforts on improving farmers' capacity to engage with the already existing market.
v. Strategies for improving farmers' capacity include market training on negotiation, market identification, and capacity to store.

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE **PAGE**

LIST OF TABLES

TABLE **PAGE**

ACRONYMS

CFS	Crop Forecast Surveys
CRS	Catholic Relief Service
COMACO	Community Markets for Conservation
CSO	Central Statistical Office
FSRP	Food Security Research Project
FtF	Feed the Future
IAPRI	Indaba Agricultural Policy Research Institute
KR	Kwacha Rebased (new currency)
Km	Kilometer
MAL	Ministry of Agriculture and Livestock
NGO	Non-Governmental Organizations
OPV	Open Pollinated Varieties
PHS	Post-Harvest Surveys
RALS	Rural Agricultural Livelihoods Survey
SS	Supplemental Surveys
USAID	United States Agency for International Development
WFP	World Food Programme
ZARI	Zambia Agriculture and Research Institute
ZMK	Zambian Kwacha (old currency)

1. INTRODUCTION

The United States Agency for International Development's (USAID) implementation of the Feed the Future (FtF) program in Zambia's Eastern Province has the stated goal of lifting more than a quarter of a million rural people (mostly farmers) out of poverty by 2015 (USAID 2011). A major part of this effort is dedicated to upgrading several key value chains in the agricultural sector. The soy bean (locally *soya* bean) value chain has been identified as a priority value chain, based on a number of agronomic and nutritional attributes, as well as its income generating potential for poorer farmers, especially women. The goal of this report is to explore the soya bean value chain from the input supply to retail level in an effort to identify the key constraints and opportunities to enhanced smallholder commercialization and production in Eastern Province of Zambia.

Soya beans offer a variety of potential benefits to the production systems, diets, and incomes of smallholder producers. In addition to being a potentially profitable cash crop, the high protein content (about 40%) in soya means it could also contribute to improved nutritional status of rural households (Dixit et al. 2011). Though soya beans are not usually boiled and eaten like other legumes such as beans, cowpeas, or groundnuts, the soya flour is often mixed with other ingredients to form a nutritious rich protein blend that can be prepared into breakfast porridge. Given high levels of under nutrition in Eastern Province (USAID 2011), it is believed that soya porridge can improve the health of the malnourished children[1].

Soya production also has potential agronomic benefit of rejuvenating soils. Soya bean canopies protect the soil from recurrent erosion, fix atmospheric nitrogen into the soil and decaying root residues improve soil fertility. Soil improvement leads to higher levels of sustainable agriculture with minimal input requirement.

In Zambia, the soya bean is mostly used as an industrial crop. It is used in oil production and in products such as soya chunks and soya meal. The by-product (cake) is fed directly to animals or processed with other ingredients into animal feed stock. As an animal feed, soya by-products provide relatively low cost, high quality protein to feed rations. With a livestock revolution underway in developing countries, including Zambia, industrial demand for soya is likely to increase[2]. The growing demand of soya offers significant opportunity for smallholder farmers to improve their cash base.

Despite the clear benefits of soya production for smallholders, soya production remains limited. In part, this may be linked to the pervasive belief among farmers that soya markets are unreliable. However, interviews with downstream market actors suggest that there is, in fact, significant unmet demand for soya in Zambia. The seeming disconnect between farmers' perceptions of unreliable markets despite significant market demand is the underlying paradox of the smallholder soya value chain. This value chain analysis will seek to identify the factors limiting smallholder linkages to the growing markets for soya in Zambia, and to provide concrete recommendations on overcome them.

The insights in this study stem primarily from qualitative research that was conducted in the Eastern Province of Zambia between March and April 2012. To augment our qualitative research, data from different surveys were used to inform our discussion. The survey data

[1] About 14% of Zambia's underweight children under five years of age are in Eastern Province (USAID 2011).

[2] Livestock revolution refers to increased consumption of animal products as a result of high population growth rates coupled with increased incomes and urbanization (Delgado et al. 1999)

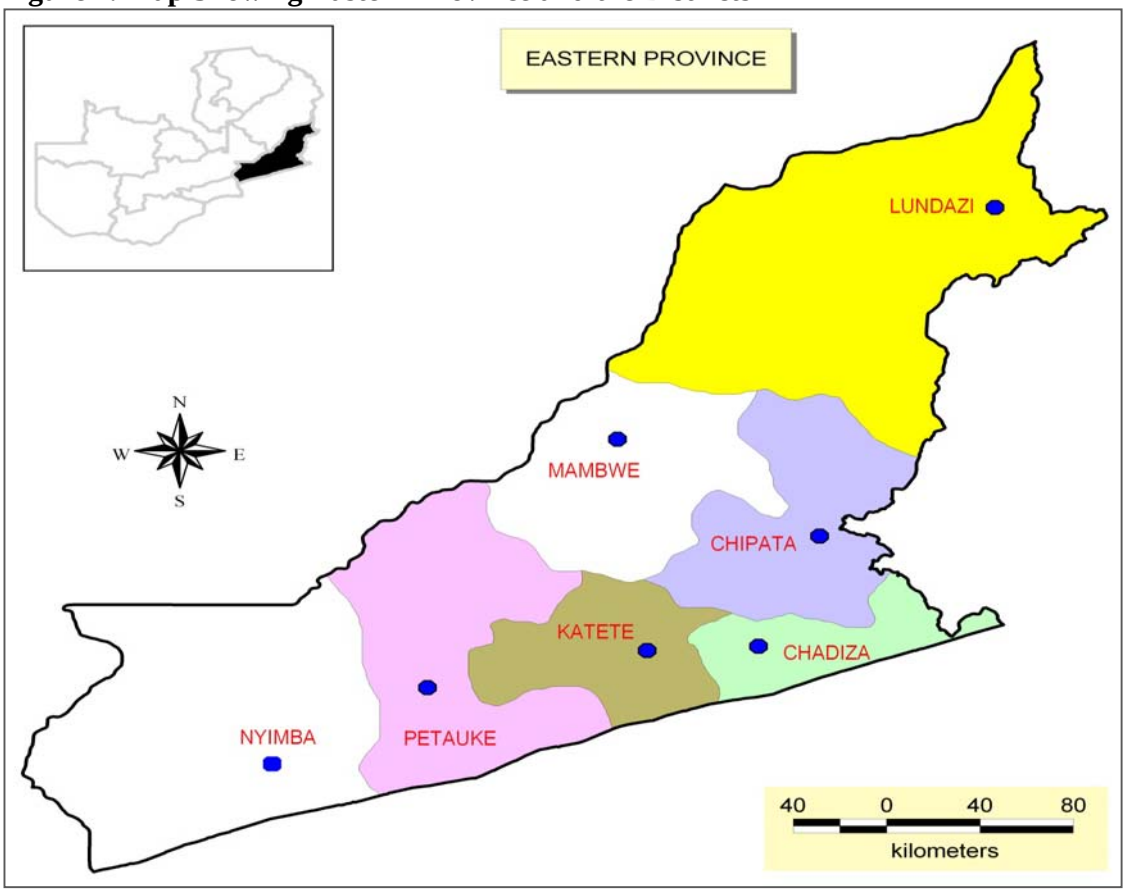
included Crop Forecast Surveys (CFS), Post-Harvest Surveys (PHS), Supplemental Surveys (SS), and Rural Agricultural Livelihoods Survey (RALS), all of which have been carried out by or with the assistance of Zambia's Central Statistical Office (CSO).

The next section of this report discusses the methods used to collect data. This is followed by a presentation of an overview of the value chain in Eastern Province. The five subsequent sections discuss the input supply, production, marketing, processing, and retail sectors of the value chain respectively. The last section concludes and identifies potential leverage points for policy interventions.

2. DATA AND METHODS

The primary data used in this study stem from qualitative research that was conducted in five districts of Eastern Province of Zambia, namely Lundazi, Chipata, Chadiza, Katete, and Petauke (see Figure 1).

Figure 1. Map Showing Eastern Province and the Districts



Source: Authors 2012.

The data were collected through guided interviews with key actors at each node of the soya bean value chain. The nodes of the value chain include, research, input supply, production, assembling, wholesaling, processing and retailing. The interviews were carried out in March and April, 2012, during two week-long field visits. Each trip involved two primary investigators and two research assistants.

Interviews were conducted at each node of the value chain. These included six focus group discussions with between 30 and 70 farmers in each group, key informant interviews with one and three individual farmers in Katete and Petauke districts respectively, and interviews with six medium/large scale traders. Other key actors interviewed included three processing companies (one in Eastern and two in Lusaka) and two corporate cotton companies that have a stake in soya. Related to input supply, two regional directors of seed companies, four agro-dealers, one Meeker Research Station director, and one staff member from Zambia Agriculture and Research Institute (ZARI) were interviewed. Lastly, the personnel in

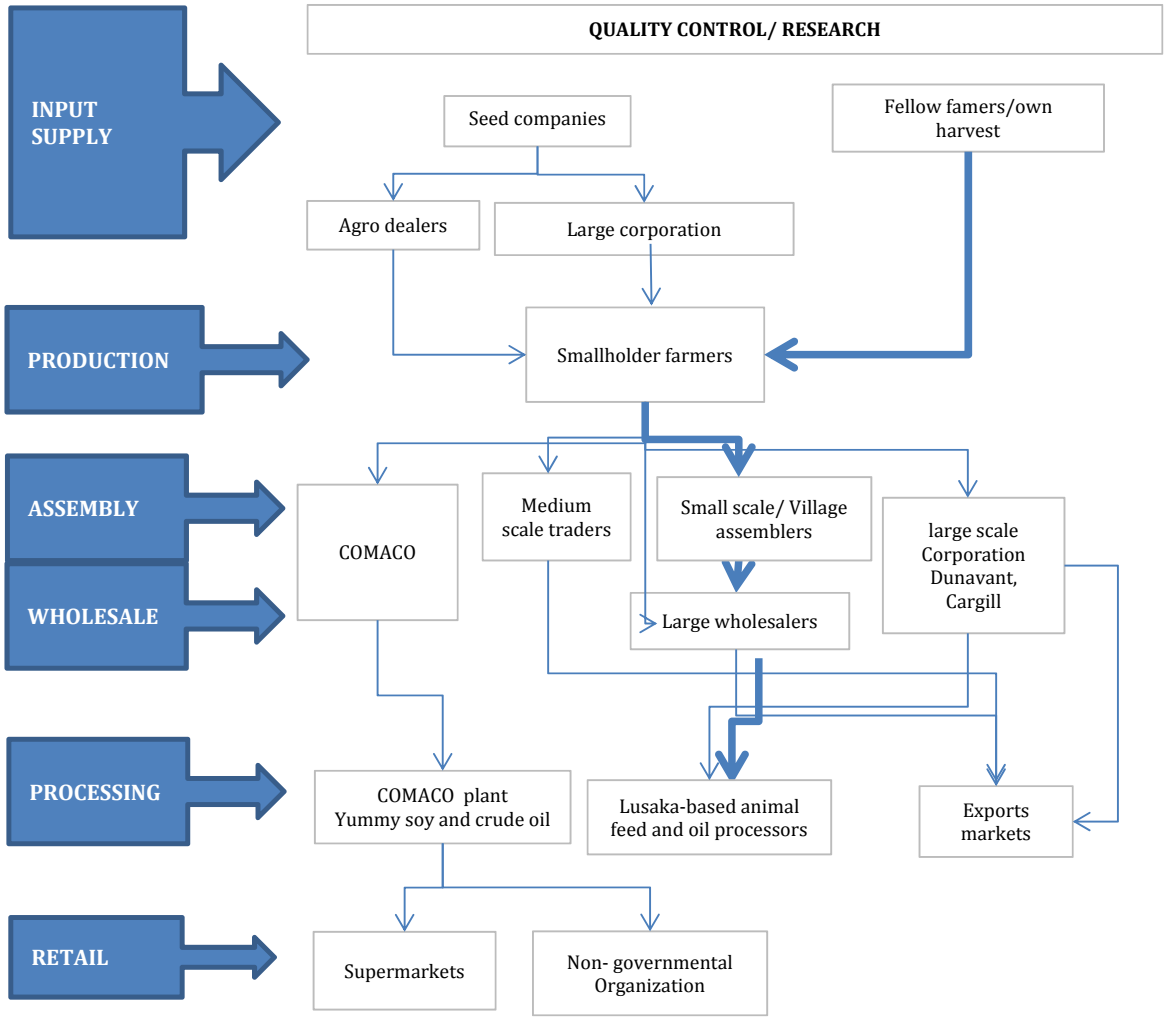
Ministry of Agriculture and Livestock District Agricultural Coordinator Offices in the five districts provided valuable information regarding the soya bean value chain.

To augment our qualitative research, data from different national representative surveys were used to inform our discussion. These include Crop Forecast Surveys (CFS) that are conducted by Central Statistical Office (CSO) and Ministry of Agriculture and Livestock (MAL). The Supplemental Surveys (SS) and Rural Agricultural Livelihoods Survey (RALS) carried out by the Food Security Research Project (FSRP) and Indaba Agricultural Policy Research Institute (IAPRI) in conjunction with CSO and MAL were also utilized.

2.1. Presentation and Description of the Value Chain Map

The value chain map presented in Figure 2 identifies the key players involved in a market from input suppliers to final consumers and illustrates the movement of soya beans in Eastern Province from input supply to retail markets. The visual representation of the value chain through a value chain map helps to identify key inter-relationships and points of coordination as products move from production through to consumption (Rich et al. 2011). The soya bean value chain in Eastern Province is comprised of six key stages: input supply, product assembly, wholesale, processing and retail (Figure 2). At each stage of the value chain, key actors are identified and the thickness of the arrow indicates the major path of soya movement based on relative volume. That said, there are several lesser players at various stages of the value chain that also collectively represent important components of the soya sector in Eastern Province. The details of each stage of the value chain are discussed in subsequent sections

Figure 2. Soya Bean Value Chain for Eastern Province



Source: Authors 2012.

Major flows Minor flows

3. INPUT SUPPLY

In this section we discuss commercial seed production, seed access, and transaction types. We also delve into soya seed and other input demand and lastly we discuss the constraints on the performance of input sector.

3.1. Seed Production

Research and development are important aspects in seed production. Huynh et al. (2008) highlights the importance of R&D in the production of high quality seed that gives the best possible productivity outcomes in a specific condition. Cavallo and Daude (2011) also echo the importance of public investment targeted at increasing productivity as critical. Taken together this suggests that public investment in the process of seed selection and multiplication is critical for driving crop productivity growth (Minot 2008).

In Zambia, the primary public sector institution responsible for multiplying basic seed and distributing new varieties is ZARI. In Eastern Province, such role is undertaken by the Msekera Research Station which is part of ZARI network of public agricultural research centers. Though due to persistent financial constraints within ZARI, seed certification and multiplication responsibilities are contracted out to private growers, in cases where the private sector may have significant financial interests. However, private seed companies tend to shy away from soya beans because they are self-pollinated and famers often retain seed, reducing the amount of repeat business that seed companies depend upon. Therefore, seed companies prefer to work with hybrid seeds such as maize, for which the retained seed's vigor start reducing and have lower yields. As a result, the potential for Zambia's cash constrained public research institute to leverage private capital in order to increase the speed and quantity of soya seed production is limited. This in turn limits the overall availability and diversity of improved soya seed varieties for smallholder production systems.

3.2. Seed Sources and Transaction Types

Farmers can acquire improved seed varieties produced by major corporations through various channels, and commercial seed suppliers are numerous and geographically dispersed. There is a concentration of corporate-owned stores for companies such as SeedCo, ZamSeed, and Pannar in Chipata, but in addition to running agricultural supply shops, there are numerous agro-dealers throughout the districts. In the various district capitals there are at least one such dealer in Lundazi, ten in Chipata, two in Katete, and five in Petauke. Our research also suggests that private sector seed distribution is not confined to the district capitals. Focus group discussions and field visits indicate that there are dozens small-scale agro dealers operating in more remote areas, as well as a host of rural agents who purchase large quantities from bigger dealers and re-sell the seed in rural areas.

Our research suggests that a basic typology of seed retailers/agro-dealers can be described based on whether or not they are officially registered with a commercial seed company. Exploring the differences between registered and unregistered seed retailers/agro-dealers is important for understanding the broader constraints to seed access among smallholders.

Agro-dealers become registered with a seed company as an indication of the quality of their service. After applying for registration, the dealership will be inspected by the seed company

and several unscheduled spot-checks are done to ensure the quality of the seed is not being tampered with (i.e., contaminated with non-seed soya to artificially increase stocks). Spot-checks continue after registration is granted, but with less frequency (1-2 per year). Registered dealers are not exclusively linked to the companies with which they register, and most sell seeds from multiple companies (primarily Zamseed and Pannar). For registered dealers, supplies are provided on consignment and repayments are made as supply is sold. Therefore, the corporate seed producers assume the financial risk of unsold supplies. Under this arrangement, registered dealers make a commission of about 12% of the selling price. On the other hand, unregistered agro-dealers, most of which are new to the industry, buy seed directly from the companies at a discounted rate equivalent to the commission rate for registered traders (12%). Once the unregistered dealer buys the seed, they bear the risk of not clearing the stock by the end of the season. Depending on the company, roughly 75% of soya seed is sold through registered agro-dealers, and 10% is sold through unregistered dealers (though unregistered dealers also buy from registered dealers and re-sell). The remainder is primarily sold from the company's own depots, with marginal additional sales at field days and through rural agents.

Whatever the source, commercial seed is mainly sold to farmers in spot market transactions. All transactions at corporate seed stores or depots and the majority of those with agro-dealers are on a cash basis. In the rare case that an agro-dealer will sell on credit, it is expected that payment will be made in a matter of days or weeks, not at the end of the growing season. It is also notable at this point that commercial suppliers of seed (as opposed to farmer-to-farmer sellers) have repeatedly run out of stocks in recent years.

In addition to the agro-dealerships and corporate supply shops, there are three large corporations (in addition to the seed corporations) that sell soya seed to farmers (also on a spot/cash basis). First, Dunavant, a cotton company, promotes soya rotation to enhance the soil fertility of their cotton farmers. The company sells soya seed that it purchases from Pannar. In 2010, Dunavant opened a new trade center (much like an agro-dealership) in Katete. Soya seed and inoculum[3] are sold for cash to farmers and agro-dealers. Dunavant also provides extension services in collaboration with non-governmental organizations. In 2010/2011 agricultural season, Dunavant claimed that they provided training to about 169, 000 cotton farmers. During the cotton trainings, Dunavant also promoted soya rotation. The cotton farmers buying soya seed from Dunavant are encouraged to sell their soya harvest back to the company, but they are not contractually obligated to do so. In 2011 the Dunavant trade center was the last shop in the province to run out of soya seed.

Second, Community Markets for Conservation (COMACO) is a non-profit private company that produces Zambian-made soya products. Lead farmers are identified within communities based on reputation and a history of working with COMACO. Through lead farmers, individuals or groups are supplied with commercial seed (the Soprano variety from SeedCo) on loan basis with an expected one-to-one repayment (essentially a no-interest loan). Lead farmers are given a bicycle and are expected to track farmers' performances in terms of crop diversification, rotation, and yields. As part of its non-profit mandate, COMACO has a responsibility to promote sustainability and environmental protection, and farmers are rewarded for good practices through price incentives. Outside of repaying seed loans, farmers are encouraged, but not obligated to sell their produce to COMACO. COMACO has more

[3] In addition to seed and fertilizer, inoculum is an available input that could enhance soya yields that is discussed in section 3.4.

than 40,000 registered farmers in Eastern Province, but only 10% received seed and are growing soya. Among those buying soya seed from COMACO, roughly half are women.

Third, the Cargill cotton company, like Dunavant, is promoting soya as a rotation crop for their farmers. Currently about 10% of the 62,000 farmers growing cotton for Cargill in Eastern Province are also growing soya, but the long-term goal is to reach 100% (the number of farmers working with Cargill in Eastern Province is expected to increase to 80,000 by 2015). Seed, inoculum, and fertilizer are supplied on loan with an expected one-to-one (cash equivalent) payback at harvest. Extension services are provided to the farmers throughout the soya growing process. Unlike Dunavant, Cargill does obligate these farmers to sell their soya to the company. If Cargill loans are not repaid, payment is taken as a deduction from the farmer's cotton revenue. On average about 90% of the farmers receiving loans pay back in cash and 10% pay from their cotton revenue. Limits on the total value of each loan are established according to farm size, which is meant to prevent over-borrowing and default. For example, farmers growing less than one hectare are not eligible for a loan at all. The six thousand or so farmers buying inputs on loan from Cargill represent the only evidence of linked transactions (borrowing inputs under the condition of selling outputs to the lender) throughout the value chain. Roughly 75% of the farmers supplied with soya inputs are men (this is the same proportion of those growing cotton).

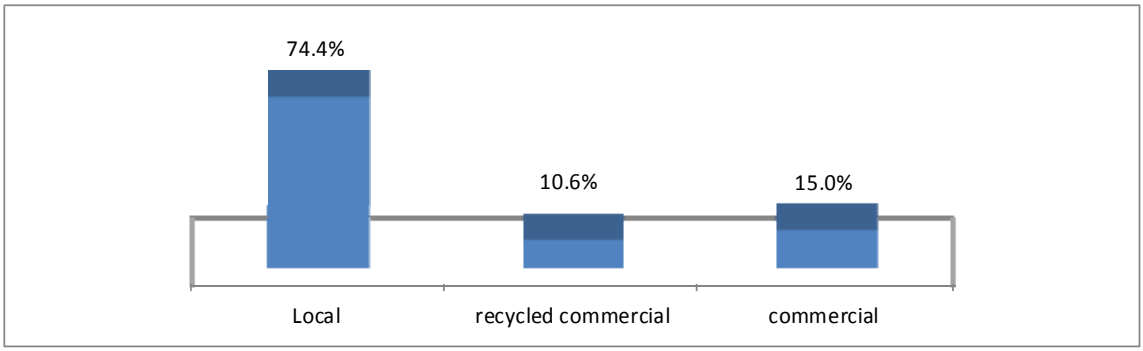
All Corporate seed suppliers occasionally conduct trainings and outreach events in cooperation with Non-Governmental Organizations (NGOs), Ministry of Agriculture and Livestock (MAL) officers and the Conservation Farming Unit (CFU) through field days. These field days are organized in various communities and Farmers Training Centers and showcase demonstration plots of various crops. At least five field days are conducted in each district at block level and about 200 farmers are reached out during the outreach events.

3.3. Demand for Soya Seed and Prices

Farmers in Eastern province predominantly use recycled local soya varieties (Figure 3). Of the commercial varieties used the Magoye OPV from ZamSeed is the most common. There are several reasons for the predominance of local, recycled seed usage. First, local varieties are popular because they are inexpensive, self-pollinating, and farmers say they can be recycled for more than five years with little reduction in seed vigor. Secondly, the availability of commercially produced and open pollinated seeds has been unreliable in recent years. In 2011, for example, the expectation of above-average soya prices significantly increased farmer demand for the more productive commercial seeds. Despite the demand, commercial seed supply systems were unable to respond, leaving considerable unmet demand within the smallholder sector.

Our research with agro-dealers in Eastern Province showed significant prices differences for commercial soya seed. Prices ranged between the Kwacha Rebased (KR) 9 - Zambian Kwacha (ZMK) 9,000 and KR 39 - ZMK 39,000 per kilogram. Variations were as a result of package size, seed type, and geographical location. This was true despite seed company corporate policy that seed prices should not vary according to source, and price lists are supposed to be posted wherever seeds are sold. Price lists can indeed be found at seed company shops and agro-dealers throughout the province. These prices are also announced on local radio programs, however many farmers claim they are often charged more than the posted amounts, suggesting either limited market competition or price collusion among seed retailers in certain areas.

Figure 3. Popular Soya Bean Seed Used in Eastern Province (2011)



Source: IAPRI/CSO/MAL 2012.

3.4. Other Inputs

A critical input in soya production is inoculum, which enhances both production and nitrogen fixation. One of the many benefits of soya (and other legumes) is that it is able to ingest atmospheric nitrogen that other plants need to get from the soil. Soya often ingests more atmospheric nitrogen than it uses to grow, and *fixes* the remainder into the soil (where it will be available for the next crop). The process of nitrogen consumption and fixation is enhanced if nodules have formed on the soya roots, and those nodules only form when the appropriate rhizobium bacteria are present in the soil. Inoculation is the process of coating the seed with the right bacteria to ensure nodulation, which increases bean size, boosts harvests, and better fixes nitrogen (Keyser and Li 1992; Brockwell, Bottomley, and Thies 1995; Albareda et al. 2009).

Unfortunately, very few farmers in Eastern Province are aware of the benefits of inoculation, and those who are aware find it difficult to acquire. Inoculum is usually sold as a liquid that requires cold storage and has a very short shelf life, making it impractical for most rural farmers. Only one farmer in all of the group discussions conducted for this study had ever used inoculum. That said, one of the reasons Magoye is the most popular commercial variety is that it is a promiscuous variety, meaning that the appropriate rhizobium bacteria are the same as those naturally common in Zambian soils. In other words, Magoye does not require inoculum to form nodules abundantly.

Very few farmers use chemical fertilizers during soya production. Because soya is able to consume atmospheric nitrogen, studies have shown that fertilization is not particularly beneficial so long as root nodules have formed (Albareda et al. 2009). It is perhaps for this reason that in 2010, for example, less than 1% of the soya growers in Eastern Province used fertilizer (CSO/MAL 2010).

3.5. Constraints on Performance of the Input Sector

Despite the proliferation of agro-dealers in the districts, availability of commercial seed has become a key constraint to soya production in Eastern Province. Over the past few years, stocks of commercial soya seeds have sold out by December despite consistent farmer

demand[4]. This is for several reasons. First, in response to several years of Government influence in the maize sector, many large-scale commercial farmers throughout Zambia have shifted their crop portfolios away from maize to include more soya production. As a result, most of the seed produced has gone to the commercial farmers, leading to shortages at the smallholder level.

Secondly, while increased government maize purchases have pushed commercial farmers out of the maize market, delays in government payments have disillusioned many small farmers who would now rather grow soya as a more reliable source of cash. Increased demand from both the commercial and smallholder sectors has contributed to seed shortages.

Thirdly, small farmers prefer OPVs, which can be recycled for up to five years with minimal yield loss. Supplying recyclable seed is less profitable, so corporate suppliers tend not to promote them heavily. Indeed, because of the challenges associated with hybridizing soya seeds, some companies do not bother producing commercial soya seed at all.

Fourth, the planning period for how much seed to produce and deliver to the rural areas has up to a 2-year horizon. In other words, the decision process on how much to seed distribute in 2012 began as far back as 2010. Smallholder demand is difficult to predict that far into the future, because it is responsive to fluctuating prices and government spending patterns. The potential losses from over-producing seed are high, because soya seed's shelf life is only one year. This imposes substantial risk, and thus the tendency has been to under-supply rural areas. Companies do not produce and distribute to rural areas the quantities that they expect they *might* be able to sell; rather produce and distribute as much as they *know* they can sell.

Seed contamination is also a major concern in the soya input sector. Seed contamination is the mixing of seed used for agriculture with beans of the same/different crop. Barring a trained eye, the less expensive beans, meant for consumption and less productive if planted, can be mistaken for seed. Contamination may occur at various stages. Though multiplication process in Zambia is regulated and inspected by the Seed Control and Certification Institute, it is still possible for breeders to co-mingle *pure* seed with non-seed beans in order to give the appearance of greater production of seed. The seed retail level is another potential source of contamination, particularly amongst the unregistered agro-dealers, but farmers claim that even registered dealers sell contaminated seed. Some say that dealers go well beyond contamination and actually counterfeit entire bags of seed.

One might think that with so many repeated transactions taking place over time, the dealers who contaminate would develop a reputation, lose customers, and the contamination problem would resolve itself. Indeed, most farmers will give you an opinion of each shop and most agree on which are *bad* dealers. However, the gap between supply and effective demand is such that, eventually, buying from the bad dealers becomes the only option. Farmers do have the right to report seed contamination and counterfeiting, and under the Laws of Zambia Seed Laws Act, the government has the authority to confiscate any commercially sold seed for testing. Very few farmers are aware of this right or how to execute it, however, and almost none actually do.

Finally, the sole producer of inoculum within Zambia is ZARI. ZARI has developed a powder inoculum which overcomes some of the limitations of liquid inoculum (specifically

[4] Depending on the variety, soya can be planted up to mid-January.

the need for cold storage), but introduces the need for training farmers on the re-hydration and application of the input. Perhaps for this reason, ZARI personnel disclosed that inoculum is mainly supplied to commercial farmers and corporate entities such as Dunavant and Cargill. Thus, while the relatively few farmers linked to such entities are more able acquire inoculum, the majority in the province will rarely find it in stock.

4. PRODUCTION OF SOYA BEANS

4.1. Production Levels and Trends

Soya beans are cultivated in nearly all the parts of Zambia, though production levels vary. The Eastern Province leads the country in smallholder soya production in almost every harvest season (Table 1). In fact, from 2001 to 2010, 42% of all soya produced by Zambian smallholders was grown in the Eastern Province. Other provinces with sizable production include Central and Northern Provinces.

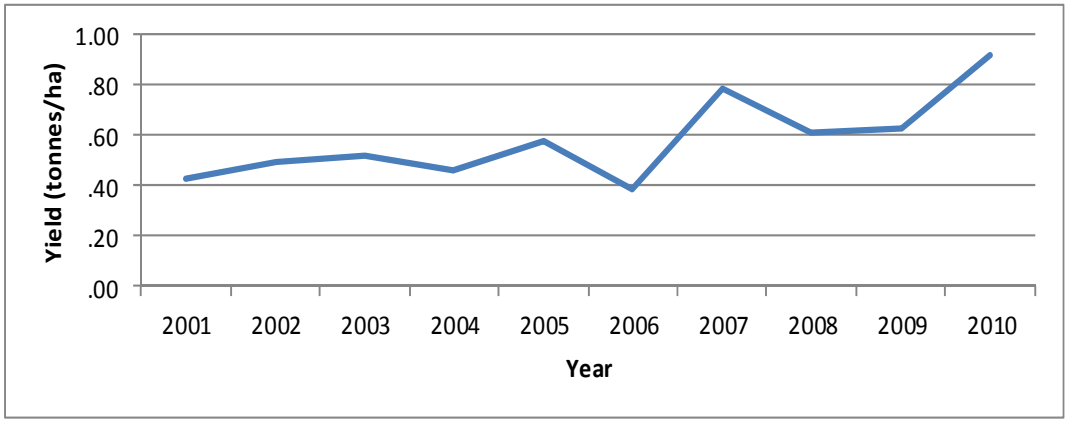
The total soya bean production in Eastern Province ranges from about 2,000 tonnes to about 9,000 tonnes depending on the year, while average yields have remained less than one tonne per hectare (Figures 4 and 5). There have been some fluctuations in the area planted to soya beans during the period 2001 to 2010. While yields have increased moderately over time (Figure 4), changes in total soya production in Eastern Province appear to be driven primarily by changes in the area planted to soya and the number of farmers growing it (Figures 5 and 6). Yield improvements could be partly explained by the favorable weather conditions that the country experienced between 2007 and 2010 (Burke, Jayne, and Chapoto 2010).

Table 1. Smallholder Soya Bean Production over Time by Province

Province	Year									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	Soya production (tonnes)									
Central	942	1,387	2,384	3,557	4,318	4,860	1,431	4,809	10,629	6,929
Copperbelt	61	355	191	441	263	280	174	388	1,195	183
Eastern	**3,542**	**2,258**	**2,281**	**3,316**	**8,877**	**5,496**	**5,138**	**6,695**	**7,847**	**7,260**
Luapula	73	39	72	42	158	201	159	252	166	90
Lusaka	.	38	41	171	461	161	27	149	107	182
Northern	1,092	1,015	2,551	720	4,405	1,769	1,898	2,640	5,095	2,144
N. Western	84	40	106	28	102	313	263	549	613	549
Southern	11	15	95	201	40	35	41	392	474	1,081
Western	13	0	0	1	32	29	17	11	39	92
All Zambia	5,818	5,147	7,721	8,477	18,656	13,144	9,148	15,885	26,165	18,510

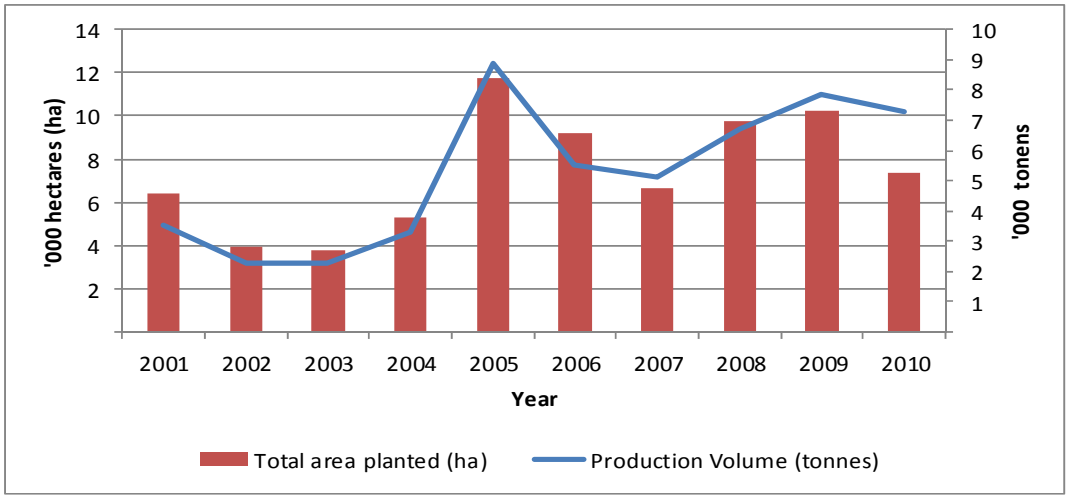
Source: CSO/MAL 2001-2010.

Figure 4. Average Soya Bean Yield over Time, Eastern Province



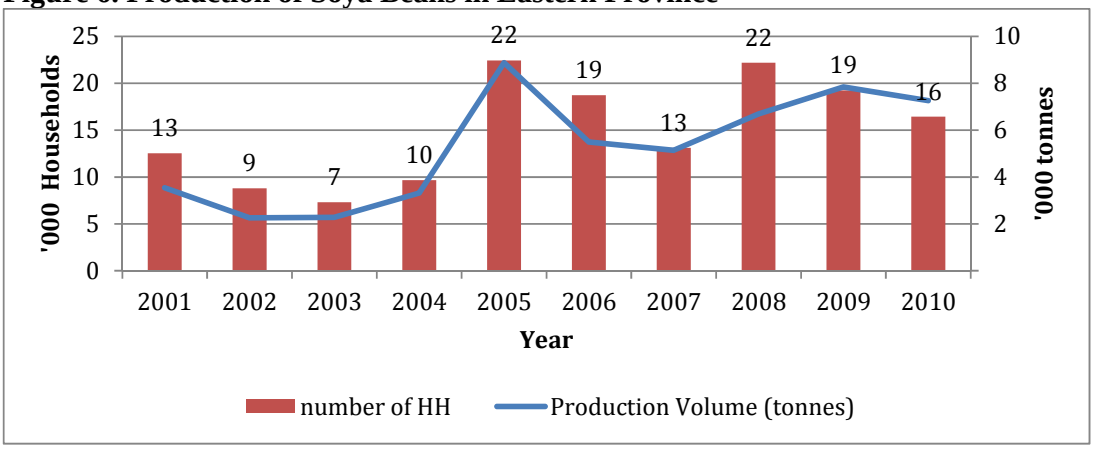
Source: CSO/MAL 2001-2010..

Figure 5. Soya Bean Area Planted and Total Production in Eastern Province



Source: CSO/MAL 2001-2010.

Figure 6. Production of Soya Beans in Eastern Province



Source: CSO/MAL 2001-2010.

4.2. Soya Bean Production at District Level

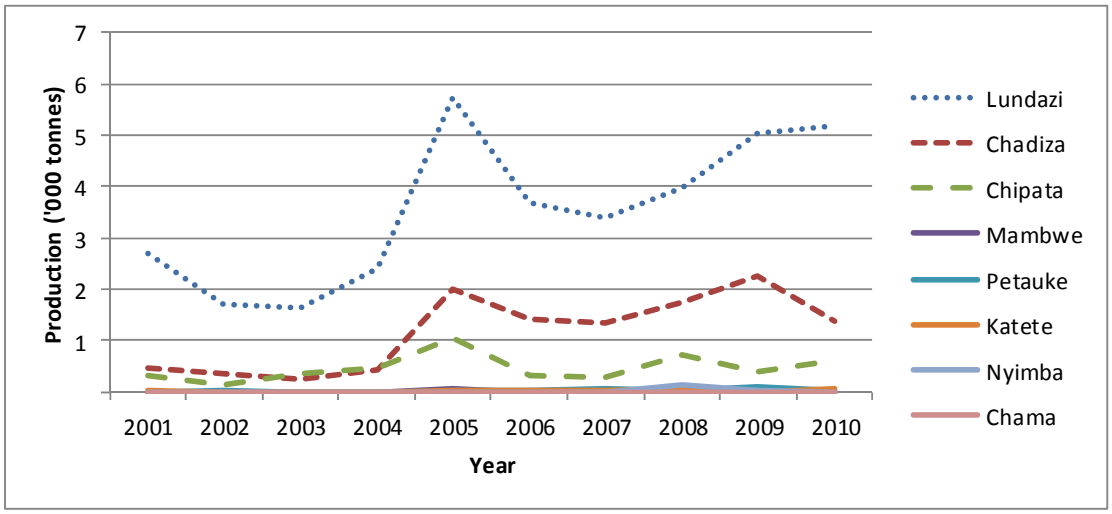
Production is concentrated in Lundazi, Chipata, and Chadiza though erratic participation in soya production is visible in Katete and Nyimba (Figure 7). Over the period 2001 to 2010, production fluctuated in all the districts. Although production fluctuates over the period of 10 years, the three major production districts are consistently Lundazi, Chipata, and Chadiza. Lundazi is leading in soya bean production with the highest peak (about 5.7 tonnes) observed in 2005. The second most important production area is Chadiza. This is followed by Chipata whose production was highest in 2005. Production in Katete is anticipated to increase with the introduction of the Dunavant Trade Centre. The number of households producing soya beans (Table 2) also follows the same trend observed in Figure 6. The number of households growing soya beans is highest in Lundazi followed by Chadiza and Chipata respectively.

Table 2. Number of Households Producing Soya Beans by District over Time

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Lundazi	6,720	6,017	4,392	6,545	11,099	11,906	7,949	13,361	13,876	9,756
Chadiza	2,696	1,668	1,571	1,511	6,113	3,784	2,890	4,215	3,329	3,179
Chipata	1,979	761	1,292	1,429	4,546	2,413	1,778	3,016	1,494	2,654
Katete	819	0	0	74	115	370	257	468	36	611

Source: CSO/MAL 2001-2010.

Figure 7. Total Soya Bean Production Trends by District, Eastern Province



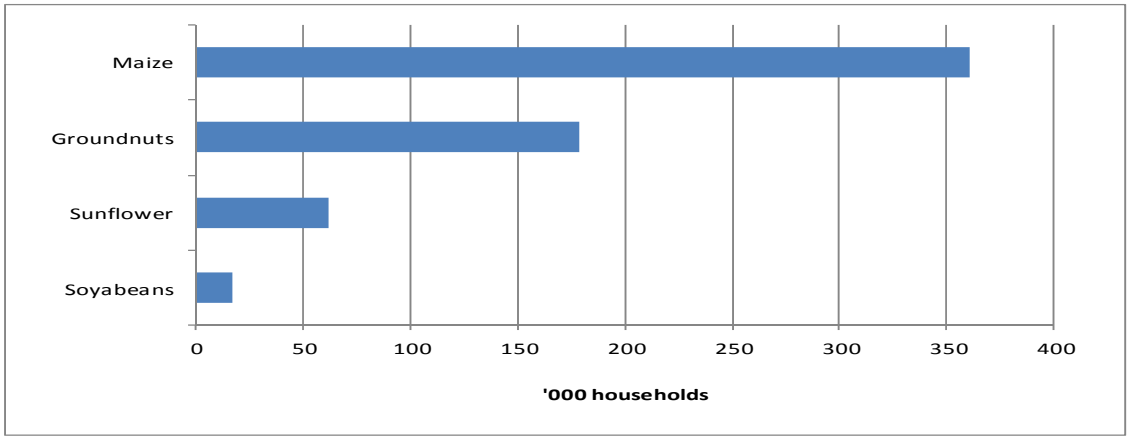
Source: CSO/MAL 2001-2010.

4.3. Importance of Soya Beans in Relation with Other Food Crops

While Eastern Province is relatively important to Zambian soya production, what is soya's relative importance within smallholder production systems in the province? To address this question we rank food crops based on number of households producing them, total production, and area cultivated. Results in Figures 8, 9, and 10 show that soya beans are the fourth most important crop in terms of number of households growing it, tonnage and area planted after maize, groundnuts, and sunflower. Despite it being the fourth most important crop in production terms, it has higher relative value in terms of commercialization with less of soya being retained for home consumption compared to maize, groundnuts, and sunflower. About 70% of soya beans produced in Eastern Province is sold and only 30% is retained at household primarily as seed (Figure 11). These results suggest that soya beans appear to be a viable commercial crop alternative to cotton and tobacco.[5]

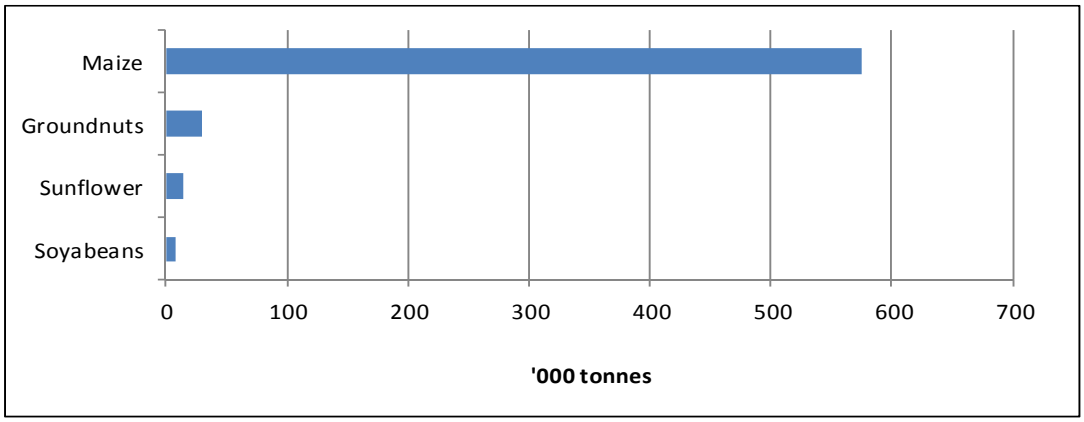
[5] As a caveat, we acknowledge that for simplicity Figures 8 – 11 assume 2010 and 2008 are representative, but this is a demonstrably reasonable assumption.

Figure 8. Number of Households Growing Food Crops, Eastern Province



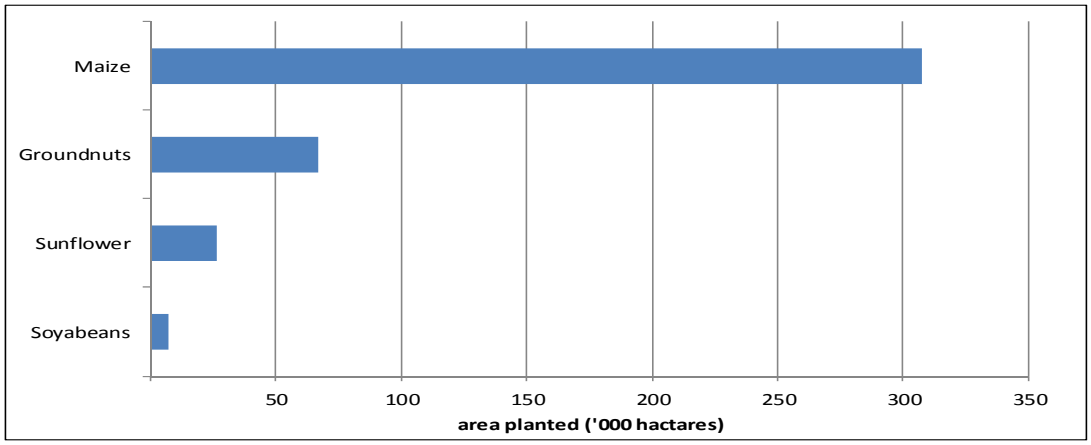
Source: CSO/MAL 2010.

Figure 9. Production of Crops in Eastern Province



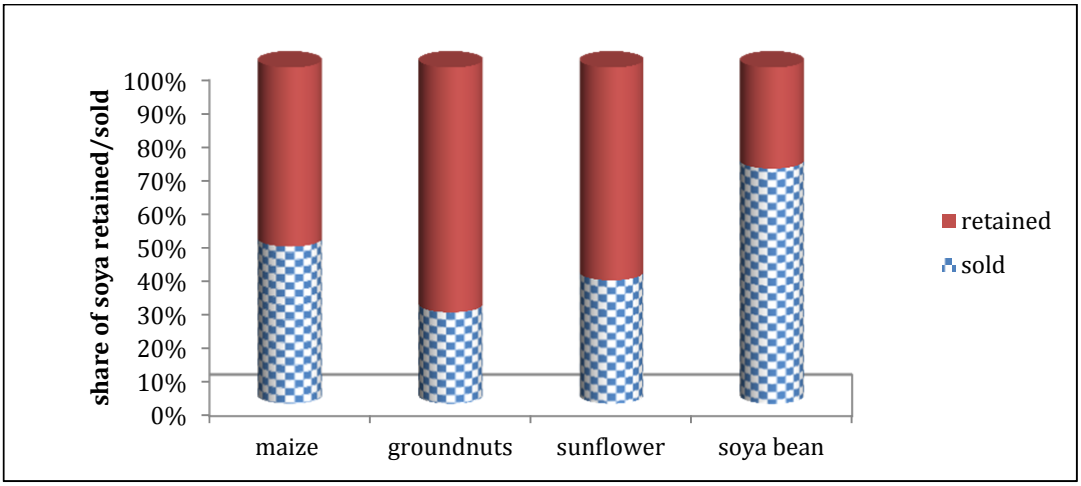
Source: CSO/MAL 2010..

Figure 10. Area Planted to Crops in Eastern Province



Source: CSO/MAL 2010.

Figure 11. Share of Crops Sold versus Retained for Home Consumption in Eastern Province



Source: CSO/FSRP 2008.

4.4. Production Constraints

Smallholder soya production faces a number of key constraints. First, yield improving input usage in soya bean production is low. Smallholder farmers rarely use inoculum in soya bean production. This is due to a lack of knowledge about the benefits of using inoculums, coupled with problems associated with acquisition and storage.

Second, poor harvests are also related to poor crop management practices, such as late planting and poor disease management. The extent to which harvests may be limited by these constraints is suggested by the fact that close to 40% of smallholder farmer do not harvest the entire area planted due to late planting because yields on those fields are too low to justify the cost of harvesting (IAPRI/CSO/MAL 2012).

Lastly, many farmers believe that the market for soya is less certain than, say, maize, which discourages adoption. In addition, despite the efforts of Cargill and Dunavant, cotton farmers are sometimes reluctant to rotate because they believe cotton is more lucrative than soya beans (at least in the short run).

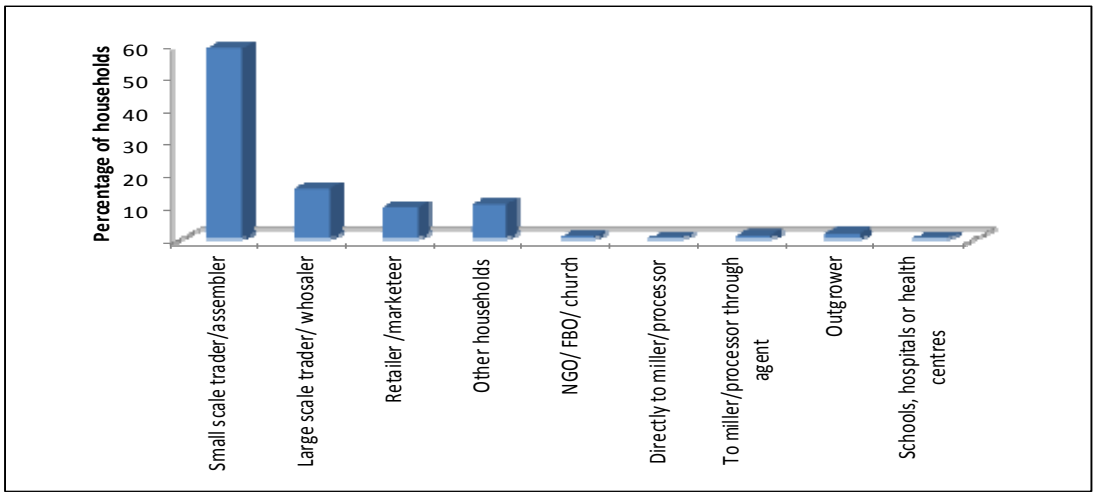
5. BEAN MARKETING

Farmers sell soya beans through various channels. First, they can sell to small scale traders or assemblers who in most cases buy on behalf of large scale wholesalers or processors. They may also opt to sell direct to the large-scale wholesalers (often referred to as Indian traders, but it is worth noting this is based on local jargon and not necessarily ethnicity or nationality). Other buyers include medium scale traders and the previously mentioned corporations: Cargill, Dunavant, and COMACO. Lastly, farmers may sell direct to the Lusaka processing companies or through agents who set up buying points within the villages. Details of each player in grain marketing are discussed in the next sub sections.

5.1. Large Scale Traders

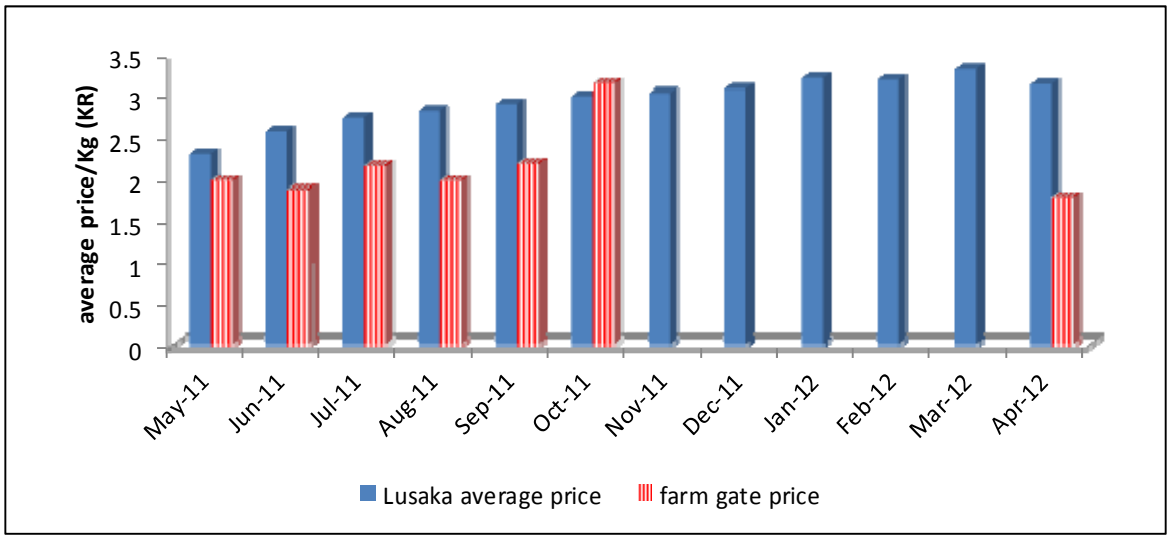
Large scale wholesalers are the primary buyers of soya in Eastern Province. Soya bean transactions are either at the doorstep of large scale traders' shops, usually in a district capital, where prices are posted and non-negotiable or through the assembly traders. Assembly traders, acting as agents for these wholesalers, are sent into rural areas to buy commodities. About 60% of smallholder farmers in Eastern Province sell soya through small scale/assembly traders (Figure 12). Farmers who choose to sell through assembly or small scale traders often will have limited surplus to justify transport cost. On the other hand, farmers assume the cost of transport when they choose to sell direct to the large scale trader. The price discounting level between wholesale and assembly nodes is about 0.106 KR or ZMK100 (IAPRI/CSO/MAL 2012). Occasionally the wholesalers will pay for the commodity even prior to harvest against the promise of delivery. Prices for these transactions are agreed upon at the time of payment, not the price at the time of delivery. The earlier prices tend to be lower. Traders assert that their prices are based on Lusaka's buying price and local competition, which they claim is robust. However, the low concentration of actors at wholesale level, possibly due to the high fixed costs of entry into wholesale trading (e.g., Barrett 1997), creates the potential for oligopolistic pricing behaviors in some district markets. The large scale wholesalers' price tends to be the base price for other buyers (including medium scale and corporate buyers).

Figure 12. Percentage of Households Selling Soya Beans by Type of Buyer, Eastern Province



Source: IAPRI/CSO/MAL 2012.

Figure 13. Soya Bean Average Price Trends



Source: IAPRI/CSO/MAL 2012; Zambia National Farmers Union 2012.

Note: Lusaka average price were collected from Zambia National Farmers Union (ZNFU) market and trade information system (commonly known as ZNFU 4455); farm gate price were collected during the IAPRI/CSO/MAL (2012) surveys; prices are in kwacha rebased. Zambian kwacha was rebased (removing three zeros) in January 2013.

In interviews, large scale traders were reluctant to divulge much information on the structure of their downstream markets, including whom they sell to, in what quantities, and under what contractual arrangements because such information is considered to be trade secrets. Given the structure of seasonal price movements, a likely scenario is that large-scale traders buy grain from small-scale producers, store this grain in local warehouses, and then sell to Lusaka processing markets as prices begin to rise (Figure 13). Thus profits are likely made through seasonal arbitrage, which in turn may help to smooth seasonal price fluctuations in Lusaka. However, most storage facilities at the point of purchase are not large enough to hold more than a few hundred tonnes, but some small farmers hypothesize that the soya (and other commodities) purchased by these traders is shipped to off-site facilities to wait for the inevitable price increases. This hypothesis cannot be confirmed. Contrary to this hypothesis, most traders claim they generally store for one month or less, citing the need to free up room in their warehouses so that they can continue buying. Traders maintain that they prefer spatial arbitrage to temporal, because while the latter would likely provide wider price margins, it also comes with the added risks of theft and other storage losses (and to a lesser extent, price uncertainty).

There are three primary destinations for soya purchased by large-scale wholesalers, but precise figures are elusive, again due to trade secrecy. First, the general assertion is that the majority of the soya is sold to *Lusaka*. Further detail is not forthcoming; however it is noteworthy that there is a substantial domestic market for processed soya pieces, animal feed, soya oil, soya flour, and other soya products from domestic companies such as Seba, Tiger Feeds, and Zamanita plus many more cooking oil processing companies. Second, the large scale wholesalers also process soya beans locally into cooking oil for sale and stock feed for their animals. A third possibility is that the grain is exported informally (no government officials claim to have issued export permits out of any of the three districts where production

is highest). Traders acknowledge that some of the products they purchase from farmers could end up in Malawi, Tanzania, or even Zimbabwe or Botswana.

5.2. Medium-scale Traders

While the large-scale wholesalers dominate in the buying of soya beans in most of the districts in Eastern Province, there are medium scale traders as well. In Lundazi, for example, there are a few that operate continuously, while dozens more set up shop for the weeks around harvest time. They set up scales in front of the store and display buying prices on placards, usually following the large scale traders pricing. Sometimes, they set up buying points within the villages where soya beans are then bulked up for onward sale to processors or export markets. Transactions are most often cash. Fertilizer is sometimes used in barter transactions, but this is rare.

5.3. Interlinked Transactions

Interlinked transactions are beginning to play a more prominent role in soya markets in Eastern Province. These are programs where farmers receive inputs on loan from traders and pay back the loan through sale of the crop at harvest (Jayne, Yamano, and Nyoro 2004). Credit, input supply, and output sale are therefore 'interlinked' in one transaction. It has been established that many farmers do not have access to productivity-enhancing inputs such as inoculum and improved seed. The provision of inputs on credit through interlinked arrangements is intended to overcome some of the constraints on input acquisition owing to small-scale households' limited ability to self-finance such purchases, or in cases where input networks may not be well developed (Jayne, Yamano, and Nyoro 2004). In addition, it helps reduce uncertainty for farmers regarding access to services and output markets. The advantage to the buyer/processors is that it assures access to sufficient raw material of acceptable quality (Minot 1986). However, if contracts are difficult to enforce, interlinked transactions may not be realized.

The existence of this type of transaction in Eastern Province is motivated by corporate responsibility and the desire to maintain cotton productivity in the long run through rotation. The major corporate companies involved are Cargill, Dunuvant, and COMACO.

5.3.1. Cargill

Although Cargill only provides inputs to their registered farmers, they buy soya from anyone willing to sell. They employ the same network of depots that is used to buy cotton. Each depot has two zones and each zone has four marketing centers in the rural areas. There are 77 depots in Chipata (308 marketing centers), 46 depots in Lundazi (184 centers), 34 depots in Katete (136 centers), and 26 depots in Petauke (104 centers). Purchases are exclusively cash-based and 2011's price was KR 2.3/Kg (ZMK2, 300/kg). Most of the soya purchased is sold to Lusaka based processing companies as orders are placed. Cargill purchased 384 tonnes of soya in 2010/2011 marketing season, despite having a purchasing goal of 1,200 tonnes (Note, these figures include purchases in Kabwe and Mumbwa). As with the traders, Cargill says it would have bought more if soya beans were available for purchase.

5.3.2. Dunavant

The year 2012 was the first year Dunavant planned to purchase soya beans. Though trading in beans is profitable, the corporate motivation for encouraging soya production goes further. Dunavant officials note that buying soya (especially from their cotton farmers) provides farmers with an all-round package (input and output market) and help them have a diverse range of products. In 2012, Dunavant planned to buy soya beans from farmers through 25-30 buying points in Petauke, Katete, Lundazi, and Chipata with prices displayed on placards at each buying point. Their pricing strategy takes into account several factors such as transportation costs to Lusaka, which are around 50 to 60 dollars per tonne and the off take agreements with the processing companies. The agreements are based on the quality of soya beans, sorting and grading, as well as re-bagging. The main challenge that Dunavant highlighted was stiff competition with traders who tend to buy earlier even from farmers that could be linked to corporate entities.

5.3.3. COMACO

From 2001 until 2011, COMACO was based in Lundazi, but in late 2011 they shifted their headquarters to Chipata. They have several processing locations throughout Eastern Province, but all will be shifted to Chipata in the next 1-2 years. COMACO received donor grant money as a start-up, but is now primarily self-financed. They buy soya from farmers through the depots established within the villages. In Lundazi, they have 10 such depots. In most cases they prefer organically grown and non-GMO soya. The buying price of soya beans in 2011 marketing season was around KR 2 to KR 2.30 (ZMK 2,000 to ZMK 2,300). In 2011, COMACO purchased 100 tonnes of soya beans, but operations are scaling up. The target for 2012 was 500 tonnes. In the past, they have not been able to meet purchasing targets because financing was not available when the surplus was on the market. Like Dunavant and Cargill, COMACO faces stiff competition from large scale traders on the buying market who tend to buy earlier.

5.4. Grain Marketing Constraints

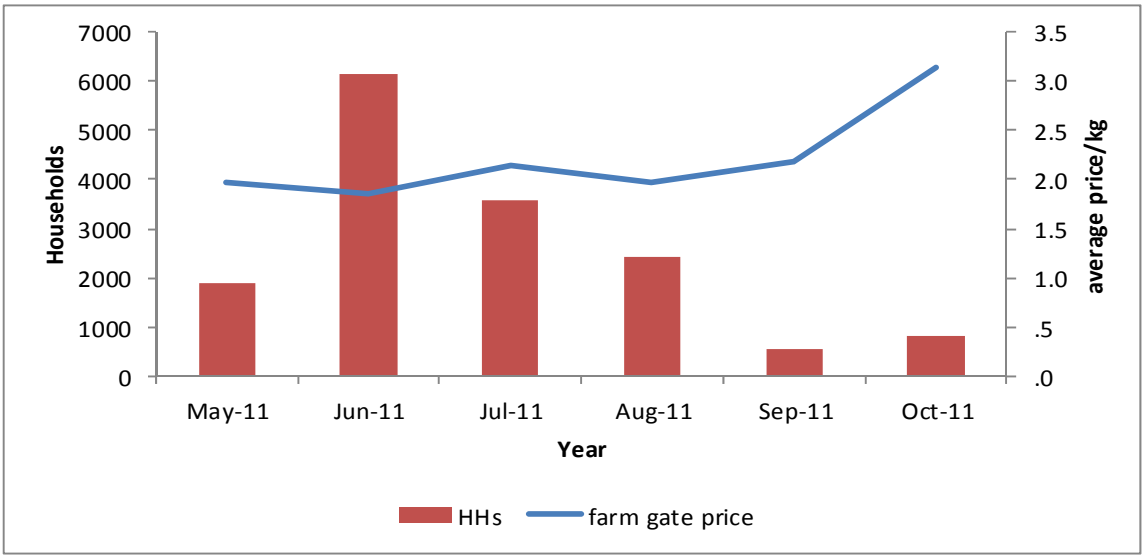
Insofar as the market's role is to move commodities from the farm gate to the processing sector, the soya market in Eastern Province succeeds unequivocally. It is true that farmers frequently complain about there being no market for soya (and other commodities), but they are usually referring to the lack of a subsidized market in which they could sell to the government. In reality, when a farmer puts a soya seed in the ground there is very little risk that there will be no one to buy the beans come harvest time. It is rather more likely that buyers will be clamoring to be the first in line to buy the crop. That said, if the soya market is to be used as a potential pathway to smallholder income generation and poverty alleviation, the constraints are considerable.

Firstly, there is strong anecdotal evidence of positive correlation between poverty and the apparent discount rate for cash; the poorer a household is, the more likely they would rather have a little money now than substantially more money later. Furthermore, the earliest opportunity farmers have to turn their crop into cash is when the prices are the lowest of the marketing season during harvest time (Figure 14). These factors combine to form what can be described as distress sales whereby the poorest farmers sell their products at the earliest possible moment in the marketing season and at the lowest prices (and thus, remain the

poorest). Figure 15 further shows the bulk (about 70%) of the total marketed volume is sold during the first three months after harvest (May-July). By the time the prices start to increase, farmers are left with only 15% of the marketed volume and only wealthier farmers supply soya during this period. This implies that the benefits of higher prices do not accrue to poorer households. This is a recurrent phenomenon for most crops in Zambia.

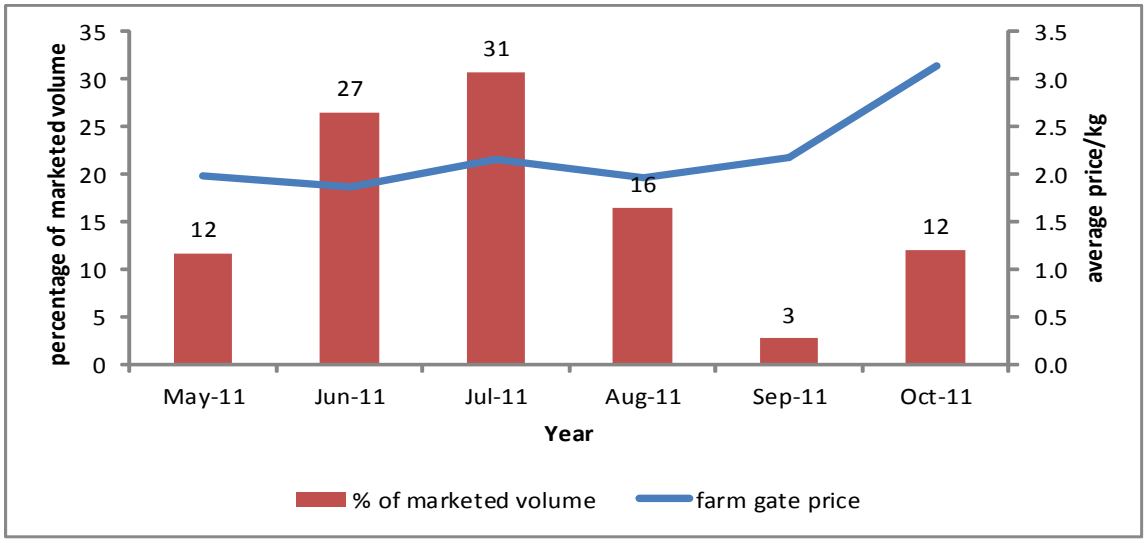
Secondly, poorer farmers tend to have small quantities to sell. Most farmers do not produce a sufficient amount to justify transporting to potentially more remunerative markets in the district capital where buyers are willing to pay a premium on bulk purchases. About 80% of smallholder farmers who grow soya sell less than 500 kilogram (10 by 50 Kg bags) of soya beans (Figure 16). Thus again, only the wealthier farmers (those selling the most) receive the highest prices for their crop.

Figure 14. Number of Households Selling Soya Beans by Price Movement



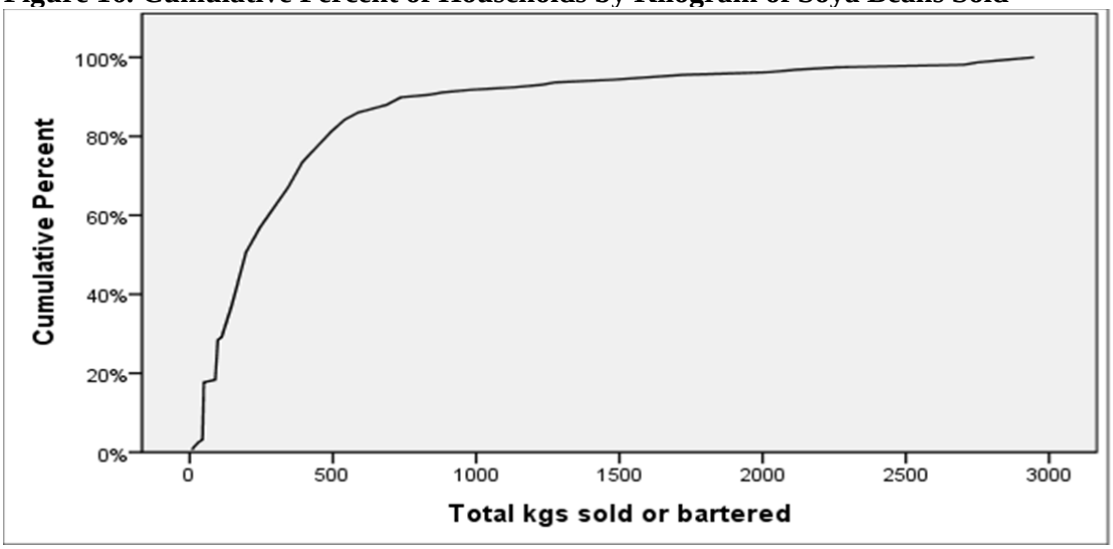
Source: IAPRI/CSO/MAL 2012.
Prices are in kwacha rebased.

Figure 15. Price Movement and Marketed Volume



Source: IAPRI/CSO/MAL 2012.
Prices are in kwacha rebased.

Figure 16. Cumulative Percent of Households by Kilogram of Soya Beans Sold



Source: IAPRI/CSO/MAL 2012.

Finally, there is a large amount of distrust between farmers and traders, and it flows in both directions. More often than not, farmers complain of rigged scales whereas traders claim that scales are checked and certified by the government officials annually. Farmers complain that a scale can measure a 50kg bag for as little as 30kg. While there is certainly a possibility of scale rigging, this could also stem from a lack of understanding about differing grain weights by volume. Specifically, a 50kg bag is meant to hold 50 kg of maize, while the same volume of soya very likely does have a different weight. Traders, on the other hand, claim that scales are rigged to favor the farmer, if anything, to promote loyalty. This could be a tactic to attract sellers without violating any collusive price agreements that may exist or, if prices are competitively set, initiating a price war.

Traders, on the other hand, complain that sacks are frequently loaded with sand or stones to increase their weights. Other than buyer's discretion, there is no enforced grading system in place to dis-incentivize such farmer behavior. These institutional inadequacies impose transfer costs and rents that are disproportionately captured by dishonest market actors. The honest farmer will get the same price for a pure kilogram of their soya as a dishonest farmer will get for a kilogram diluted with sand and stones. Furthermore, this price is lower than what they would get for a certifiably pure kg of soya, because the trader must hedge their risks that some of the other farmers are dishonest. Therefore, the dishonest farmer gets a price slightly higher than the actual value of what they are selling, at the expense of the honest farmer who gets a slightly lower price than their product is worth.

Buyer's discretion is not sufficient to solve this issue, because traders prefer to act quickly and buy as much as they can in a given day. In other words, because buyers can factor their risk into the price paid to farmers, they largely accept that some sacks will be diluted and focus on purchasing the largest quantity possible.

6. PROCESSING

Soya beans are processed into various products. These include products for human consumption such as soya oil, chunks, meal, and milk. The high protein cake which remains after oil processing is used in the manufacturing of livestock feed. There are basically two levels at which soya beans are processed; the small and large scale processing. Within Eastern Province, COMACO is the main processor of soya beans at the large scale, while other major players in the oil extraction and feed production located outside the province include Zamanita, Mount Meru, National Milling, Tiger Animal Feeds, Yielding Feeds, Olympic Stock Feeds, Novetek Animal feeds, and more small companies. In the subsequent sections, we discuss the small scale processing and large scale processing. We focus on three large scale processors (COMACO, Tiger Animal Feeds, and Mount Meru).

6.1. Small Scale Processing

Processing soya into oil and animal feed on a small scale is simply done with an electrical motorized mill. Within the districts, small scale millers are present where there is electricity, but most focus on processing sunflower, because soya is denser and wears down the mill components much faster. Apart from small-scale milling, a portion of the soya bought by large-scale wholesalers is processed locally. One of the large wholesalers interviewed for this report processed soya into cooking oil and sold it within the province, keeping the by-product (cake) to use as livestock feed.

6.2. Large Scale Processing within Eastern Province

COMACO processes the entire amount of soya they purchase into Yummy Soy as well as by-products such as cake and crude oil. Yummy Soy is a powder and used to make a cool drink, cold cereal, or a hot porridge. They produce an unflavored product as well as a strawberry flavor. For each kilogram of soya beans purchased, 65% ends up in Yummy Soy, 18% becomes oil, and 17% becomes feed cake. The oil and cake are sold to other companies for further processing and sale. Roughly, 70% of the Yummy Soy is sold to supermarkets (ShopRite, Spar, Pick-n-Pay, and Melissa) and 30% is sold to NGOs and government health programs such as World Food Program (WFP), Catholic Relief Service (CRS), and Hospices. COMACO's selling price for Yummy Soy is KR 8.20/kg (ZMK 8,200/kg) and the Soya content is 25%. Interestingly, the wholesale price of Yummy Soy is the same whether it has to be delivered 1kilometer (km) to the Spar in Chipata or 590 km to the Spar at Arcades (or any other location).

6.3. Large Scale Processing outside Eastern Province

6.3.1. Mount Meru

Mount Meru is a newly opened company located along the Great North Road in Chibombo district (a few kilometers north of Lusaka). It started its operation in September, 2012. The company's primary focus is oil extraction and processing from soya beans. It has the processing capacity of up to 70 thousand tonnes of soya beans, but is currently operating at less than 17 thousand tonnes.

Mount Meru buys soya from various sources. However, commercial farmers and large traders are the major suppliers, while smallholder farmers' account for less than 6% of the total soya beans supplied. The procurement process depends on the type of supplier. The buying process from smallholder farmers is on cash basis, with payment made upon delivery. These transactions require a minimum of 30 tonnes of soya beans. The majority of smallholder farmers, however, produce few bags of soya on their own, thus, in the absence of aggregation among a group of smallholders it is unlikely that smallholders will sell directly to this new processor. Thus, only farmers in cooperatives or associations tend to sell to Mount Meru.

6.3.2. Tiger Animal Feeds

Tiger Animal Feeds is located along Mwembeshi Road in the light industrial area of Lusaka. The company produces feed for poultry (broilers, layers, and rabbit) livestock (pigs, dairy, beef, and horse) and feed for game birds, and dogs as well as fish. The demand for soya is not met locally. To cushion unmet demand, the company imports already processed cake from South Africa and as far as India.

Like Mount Meru, Tiger Animal Feeds buys soya mainly from commercial farmers and wholesalers and less than 20% comes from small scales farmers. There are no contractual arrangements with smallholder farmers. Regardless of the source, the company screens soya beans before payments are made. The screening procedure follows the international soya bean standards which include moisture, oil, and protein content, foreign matter, and total defective grain (split green beans and immature grain). Based on these standards, for example, grade A has 12% moisture content, 1% extraneous matter, 9% total defective grain, 18% oil content, and 36% protein content whilst grade C has 12% moisture content, 3% extraneous matter, 14% total defective grain, 14% oil content, and 30% protein content. Soya bean pricing also depends on the grade.

6.4. Constraints to Processing

COMACO faces two major challenges in soya bean processing. First, they are not able to procure enough soya beans to operate at full capacity. This is partly due to lack of supply and lack of financing when the supply is available. Second, payments from supermarkets are frequently delayed. At the time our field work was carried out, COMACO officials claim they were owed nearly 2 Million KR ($400,000). Similarly, the other large processing companies do not operate at full capacity due to the limited of supply of soya beans.

7. RETAIL

Retail of whole grain is limited. Most of the soya grain in markets is for seed. However, for oil extracted by the traders, the sales are confined within the province while the retail of COMACO's product Yummy Soy mainly occurs outside Eastern Province. COMACO supplies the chain stores such as Shoprite, Melisa, Spar, and Pick n Pay. Each supermarket has its own retail price. For example, the retail price for Shoprite Manda Hill is KR 9.98 while Melisa Kabulonga sales Yummy Soya at KR11.50. This also results in varying profit margins.

8. CONCLUSIONS AND RECOMMENDATIONS

The soya bean has been identified as one of the potential crops for income generation among smallholder farmers in Eastern Province under the FtF program. Motivated by an influx of donor investment in the area, this report describes the soya bean value chain from the input supply to retail level, identifies the major constraints faced by smallholder farmers, and potential leverage points for the implementation of FtF. Our findings suggest that Zambia has substantial unmet demand for locally produced soya beans, which are currently being met through imports. The FtF and other public investment programs can help to contribute to meeting this demand through investments aimed at addressing the challenges associated with input supply, production, and grain marketing.

8.1. Input Supply

The challenges highlighted in this study are limited availability of high yielding soya seed, a lack of information to properly incentivize private investment in soya seed multiplication to meet smallholder demand, seed counterfeiting, and lack of inoculum. Based on these challenges, the following are suggestions for improving the input supply:

- Work with seed suppliers and agro-dealers on forecasting demand for both soya seed and inoculum to mitigate the risks of supplying to smallholders; and
- Promote awareness of smallholder rights under the Laws of Zambia Seed Act and ensure the government's ability to enforce rules on sellers that are in violation.

8.2. Production

The major problems with production are associated with inoculum acquisition and utilization as well as poor crop management practices. The following will help in mitigating the production challenges:

- Awareness campaign on the benefits of using inoculum and how to apply it in soya bean production; and
- Improve the extension service with regard to agronomic practices.

8.3. Grain Marketing

Smallholders face several challenges concerning soya bean marketing. These include the preference for income when prices are lowest, leading to distress sales, a lack of information regarding the private demand for soya, insufficient volumes of soya to allow them to negotiate for higher prices, and distrust between farmers and traders. To address these challenges, the following options may be considered:

- Work with farmers on local bulking for onward sale. In recent years, there has been increased advocacy for farmers to collectively market as a way to reduce transaction cost, especially in areas where public infrastructure are poorly maintained; and
- Focus efforts on improving farmers' capacity to engage with the already existing market. Strategies could include training on negotiation, market identification, bulking, and storage.

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