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Value Chain Analysis of the Groundnuts Sector in the Eastern Province of Zambia

by

Rhoda Mofya-Mukuka and Arthur M. Shipekesa

Working Paper No. 78

September 2013

The Indaba Agricultural Policy Research Institute (IAPRI)

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Mofya-Mukuka is a research fellow and Shipekesa is a research associate at the Indaba Agricultural Policy Research Institute.

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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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EXECUTIVE SUMMARY

Groundnuts play an integral role in the livelihoods of the majority of the Zambian population, particularly the rural households. The crop is produced by nearly half of the estimated 1.4 million rural smallholder households, making it the second largest, after maize, in terms of production volume and hectares cultivated. Approximately 8.8% of total land cultivated in Zambia is planted to groundnuts.

The crop is equally important in Zambian diets. Groundnuts are often eaten in their raw form, or processed as powder and/ or peanut butter. In total, groundnuts constitute approximately 3.3% of the urban household food expenditure in Zambia.

Despite its importance, the groundnuts sector, unlike cotton or maize, has not shown significant growth in production in the last decade. In fact, the area under groundnuts production significantly reduced in the last three years. Similarly, the total quantity produced by smallholders significantly reduced from about 160,000 metric tonnes (MT) of shelled groundnuts in 2009/10 to 113,000 MT in the 2011/12 agricultural season. Given that in 2008, urban consumption demand for groundnuts was estimated at 69,964 MT (about 30% of 2007/08 total production), and taking into account the rural consumption and the export demand, current demand is likely outstripping. Market participation among groundnut producers has also remained low with only about 45% of the producers selling groundnuts. Thus, despite significant national demand, groundnuts remain a poorly commercialized crop for smallholders.

Employing a value chain analysis approach, this study examines the primary stages in the groundnut value chain and the constraints limiting the full functioning of the chain. The study seeks to provide new insights on investment opportunities along the groundnuts value chain in Zambia for farmers, private and public actors. Given the clear benefits of groundnuts as a source of income and nutrition, this study focuses on Eastern Province, which is the largest producer of groundnuts in the country and yet has one of the highest rates of poverty and malnutrition.

The study is primarily based on a qualitative survey conducted among key actors in the groundnuts value chain in Eastern Province. To support the qualitative analysis, the study utilizes survey data from the nationally representative Crop Forecast Surveys (CFS), an annual survey conducted by the Central Statistical Office (CSO) covering 13,200 households. The study also utilizes recent data from Rural Agricultural Livelihoods Survey (RALS) conducted in 2012 and covering the 2010/11 agricultural season. RALS covered 8,839 smallholder households nationwide.

The key findings of the study are:

- Persistently *low yields* of groundnuts in the country significantly contributing to low production levels despite over 8% of total cultivated land dedicated to groundnuts and nearly half of the smallholder farmers growing the crop. A critical factor partly explaining the low yields is the low use of hybrid seed and extensive recycling of Open Pollinated Varieties (OPV). This further discourages private investment in new seed production as the demand for such seed remains low.
- Approximately 80% of the groundnuts are grown for *home consumption* leaving very little for the market. Relative to maize, groundnuts are more labour intensive, particularly during weeding, harvesting and shelling, such that most households tend to produce only enough for home consumption;

- *Low and unpredictable prices.* The prices can vary from K1,800/kilograms (kg) to K6,000/kg in one season, depending on when the selling is done, whether it is a cash or credit transaction and the distance to the markets and;
- *High levels of aflatoxin contamination* caused by poor drying and storage methods of groundnuts. Currently, Aflatoxin levels in Zambia exceed acceptable international requirement levels for export. Zambia is among the lowest exporters of groundnuts in the region despite having favourable agro-ecological conditions for growing the crop.

These issues and several others discussed in this paper, explain the challenges affecting the full functioning of the value chain and interactions of the key players. As such, the paper highlights some critical pathways for increasing the private and public sector participation at different stages of the groundnuts value chain in order to improve production, assembling, and storage, processing and marketing. Private Public Partnership (PPP) and donor involvement in groundnuts research and seed supply, can potentially improve yields, while investment in Aflatoxin mitigation, can lead to increased export markets. More broadly, coordination of the public and private investment in groundnuts is essential for raising productivity and profitability. This comes down to public research and extension, coupled with complimentary private investment in seed development, storage, testing, credit and output markets.

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ABBREVIATIONS AND ACRONYMS

ADP	Animal Draught Power
CAADP	Comprehensive African Agricultural Development Program
CAZ	Cotton Association of Zambia
CFS	Crop Forecast Survey
COMACO	Community Markets for Conservation
CSO	Central Statistical Office
DACO	District Agricultural Coordinator
DHS	Zambia Demographic and Health Survey
EPCMU	Eastern Province Cooperative Marketing Union
EPFC	Eastern Province Farmer's Cooperative
ETG	Export Trading Group of Zambia
EU	European Union
E-voucher	electronic voucher
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Statistical database
FEWSNET	Famine Early Warning Systems Network
FGDs	focus group discussions
FISP	Farmer Input Support Program
FRA	Food Reserve Agency
FSRP	Food Security Research Project
GIAZ	Groundnuts Industry Association of Zambia
ha	Hectare
HCC	Hepato-Cellular Carcinoma
IAPRI	Indaba Agricultural Policy Research Institute
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	Institute of Tropical Agriculture
K	Un-rebased Zambian kwacha (i.e., in rebased currency, K1,000 equals KR 1)
kg	kilogram
LCMS	Living Conditions Monitoring Survey
MAL	Ministry of Agriculture and Livestock
MT	Metric Tonnes
NASFAM	National Smallholder Farmers' Association of Malawi
NGO	Non-Governmental Organization
PPP	Private Public Partnership
RALS	Rural Agricultural Livelihoods Survey
SADC	Southern African Development Community
USAID	United States Agency for International Development
ZARI	Zambia Agricultural Research Institute
ZMK	Zambia Kwacha
ZRA	Zambia Revenue Authority

1. INTRODUCTION

1.1. Background

Groundnuts have long been an important crop in Zambia and continue to be widely grown by smallholders. As of 2011/12, groundnuts were the second most important crop after maize in terms of volumes of production and hectares planted. More than 90% of the groundnuts producers in Zambia are small-scale farmers, who cultivate less than 2 hectares of land (CSO/MAL 2011). Households within this category of smallholder farmers, tend to have limited productive assets (Lubungu, Chapoto, and Tembo 2012), are frequently classified as poor (Chapoto et al. 2011) and are net-buyers of maize - *the staple food* (Mason and Myers 2011). These farmers also experience low crop productivity (Chapoto and Jayne 2011) and only 45% of the producers participate in agricultural output markets (Sitko et al. 2011).

Over the last three years, the groundnuts sector has recorded negative trends, both in terms of production and area cultivated, while crops like maize and cotton have experienced a boom in production. In fact, the area under groundnuts production reduced from 267,578 hectares to 222,981 hectares between the 2009/10 and 2010/11 agricultural season. Despite being the second most widely grown crop in Zambia, currently only 8.8% of Zambia's land cultivated by smallholders is planted to groundnuts (CSO/MAL 2011). Similarly, quantity produced significantly reduced from about 160,000 MT of shelled groundnuts in 2009/10 to 113,000 MT in the 2011/12 agricultural season. Given that in 2008, urban consumption demand for groundnuts was estimated at 69,964 MT (about 30% of 2007/08 total production) (Sitko et al. 2011), and taking into account the rural consumption and export demand, current demand for groundnuts is outstripping supplies.

Furthermore, groundnuts trade volumes have remained low with an average of less than 2,000 MT of shelled nuts per year in the last decade (FAO 2012). Exports were around 582 MT in 2011, with a value of US\$ 154,000. These figures are very low given that exports of other countries in the region, such as Malawi, were around 8,900 MT in 2010. Groundnuts prices for Zambia have also experienced acute year-to-year price variability. Price variability makes it difficult for producers to plan their production as well as for the domestic traders, processors, and exporters to forecast their profits and eventually their income levels.

Despite the poor production and trade performance of groundnuts in the country, their potential for improving income, reducing poverty and improving nutritional status is well documented in literature. First, groundnuts are rich in proteins, a critical nutrient for reducing impaired growth especially in children (Michaelsen et al. 2009). Second, given the significant local and regional demand, groundnuts can provide an important source of income for the rural households (Diop, Beghin, and Sewadeh 2004). Third, groundnuts also serve as an important raw material in the manufacturing of, among other products, peanut butter, oil, sweets, and animal feed. Fourth, the fact that the crop is generally considered a woman's crop, being more widely produced by women farmers compared to other crops (CSO/MAL 2011), implies that efforts to improve the sector would potentially impact the economic empowerment of the women farmers, who by and large, constitute up to 60% of the smallholder households. Lastly, as a legume, groundnuts provide nitrogen fixation in the soil, which enhances soil fertility in a more environmental friendly manner, and can boost yields of cereal crops when grown in rotation (Setimela, Monyo, and Bänziger 2004).

Despite its potential, there is a dearth of literature to guiding government, donor, and the private sector in making investment decisions on how the groundnuts sector functions, and

how it can be improved. This paper seeks to fill in this gap through a detailed value chain analysis of the sector.

1.2. Objectives of the Study

The aim of this study is to identify the main stages in the groundnut value chain and the constraints limiting its full functioning, in order to establish policy recommendations for increased and sustainable groundnut production, efficient markets with full farmer participation, and product utilization.

The study has five specific objectives:

- Identify key market channels and stages in the groundnut value chain. This involves developing a market channel diagram with percentage *estimates of* volumes traded through each channel and the various actors in the system;
- Describe the structural and organizational features of the groundnut value chain and their impact on the overall performance of the system;
- Examine the behaviour and operating procedures of the actors at each stage of the groundnut value chain, and consider how this behaviour influences the risks and costs borne by the various actors;
- Examine the major constraints impeding the potential of the groundnut value chain to promote broad based income growth, nutritional status, and other important government rural development and agricultural policy objectives in Zambia; and
- Propose interventions to address these constraints. This involves identifying specific policy and programmatic interventions and how they are likely to affect private sector investment in the groundnut value chain.

This analysis also seeks to contribute to guide investments toward the attainment of the Comprehensive African Agricultural Development Program (CAADP)'s overall goal of an average annual growth of 6% in agriculture, which will eliminate hunger, reduce poverty and food insecurity as well as expand and diversify exports.

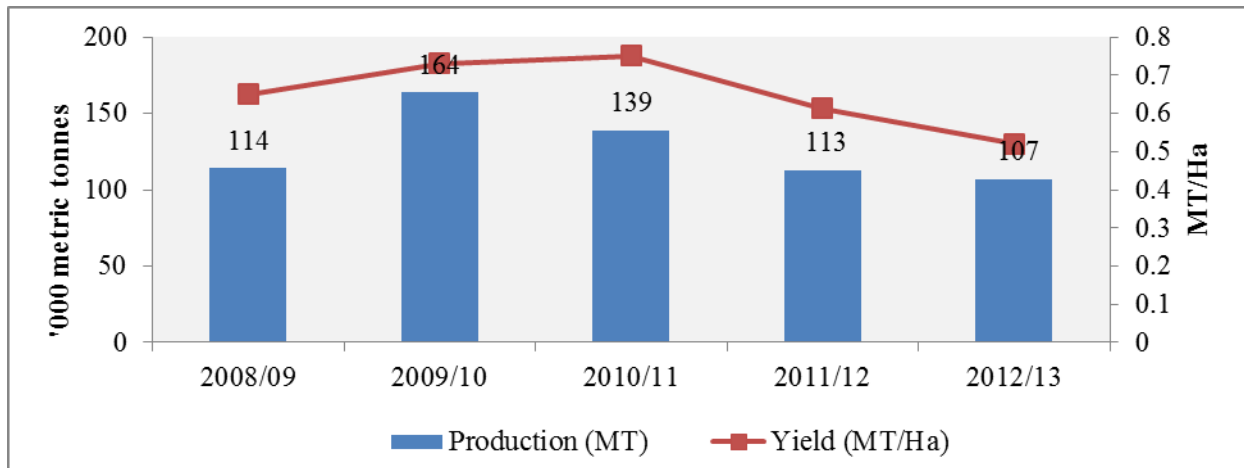
1.3. Status of Groundnuts Production in Zambia

In this section, we will explore broad trends in groundnut production in Zambia. This enables us to situate the regional location of our study, Eastern Province, within the broader context of the smallholder groundnut production system.

1.3.1. Production Trends

Amongst Zambian smallholder farmers, groundnuts have stood as an important crop over the years. Within the top three widely grown crops, groundnuts have come out second from maize in terms of area under cultivation, except in 2011/12 agricultural season, which saw cotton take second place. The status of groundnuts in Zambia is not only seen in production and area cultivated but equally as a food crop and source of income for the smallholder households. Also, nearly half of the smallholder households in Zambia cultivate the crop. In terms of regional distribution, Eastern Province comprises the largest share of area planted to crop.

Figure 1. Groundnuts Production and Yields in Zambia, 2008-2011



Source: CSO/MAL 2008/09-2011/12.

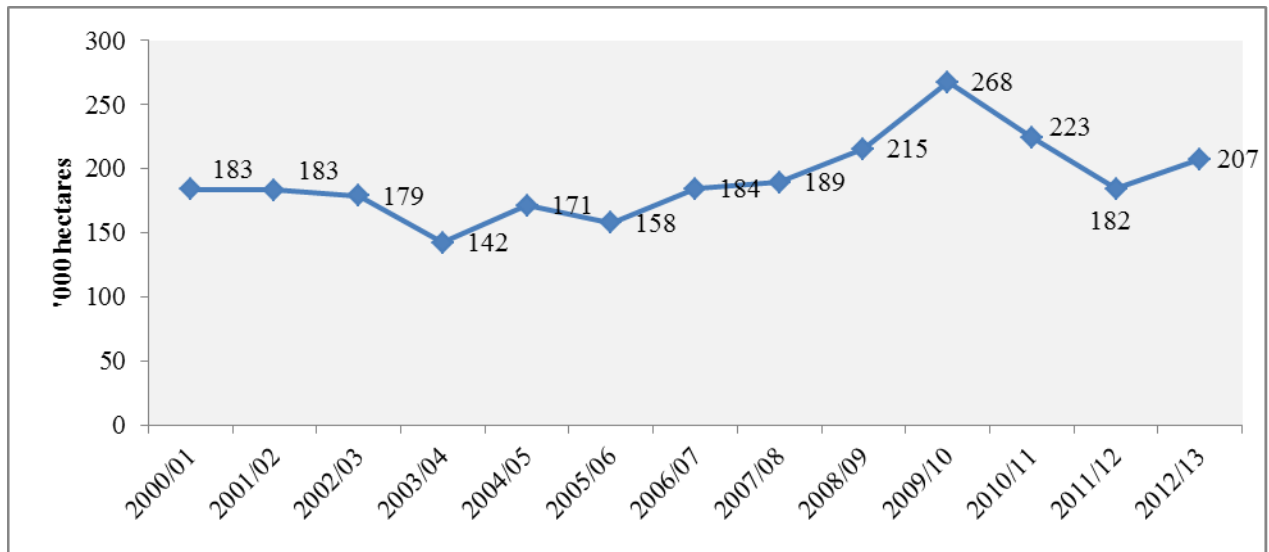
Groundnuts production levels in Zambia have ranged between 100,000 MT and 160,000 MT in the last five years with the highest production of about 160,000 MT achieved in 2009/10. Recently, production has significantly trended downwards. In 2012/13, less than 120,000 MT of groundnuts were harvested nationwide (CSO/MAL various years).

Based on our analysis we attribute the decline in groundnut production to three interrelated factors. First, low and declining yield resulting from seed recycling. Second, perceptions of market unpredictability during this period relative to maize and cotton. Finally, declining area dedicated to groundnuts, likely resulting from the point 2 and substitution of some groundnuts field with cotton or maize. As shown in Figure 1, despite favourable weather conditions, groundnuts yields have dropped continuously over the last three years. This closely mirrors a similar trend in production. Groundnuts yields have remained low, ranging between 0.5 and 0.7 metric tonnes/hectare (MT/ha), compared to the global averages of around 1.7 MT/Ha (FAOSTAT 2011).

1.3.2. Area under Groundnuts Cultivation

Overall, as shown in Figure 2, the area cultivated with groundnuts fairly increased in the last decade. However, considering the population growth of 1.36% for rural Zambia (CSO 2012), the relative expansion in area cultivation per household is likely to be smaller to mitigate the production shortfall. Furthermore, between 2009/10 and 2011/12, there was significant drop of 32% in area under groundnuts cultivation from 267,578 to 181,556 hectares. Also, during this agricultural season, production declined by 15% signifying a high correlation between area contraction and production falloffs. However, there was marginal improvement in the 2012/13 season with the area under groundnuts cultivation increasing to 207,249 hectares (Figure 2).

Figure 2. Area Planted to Groundnuts 2000/01 to 2012/13



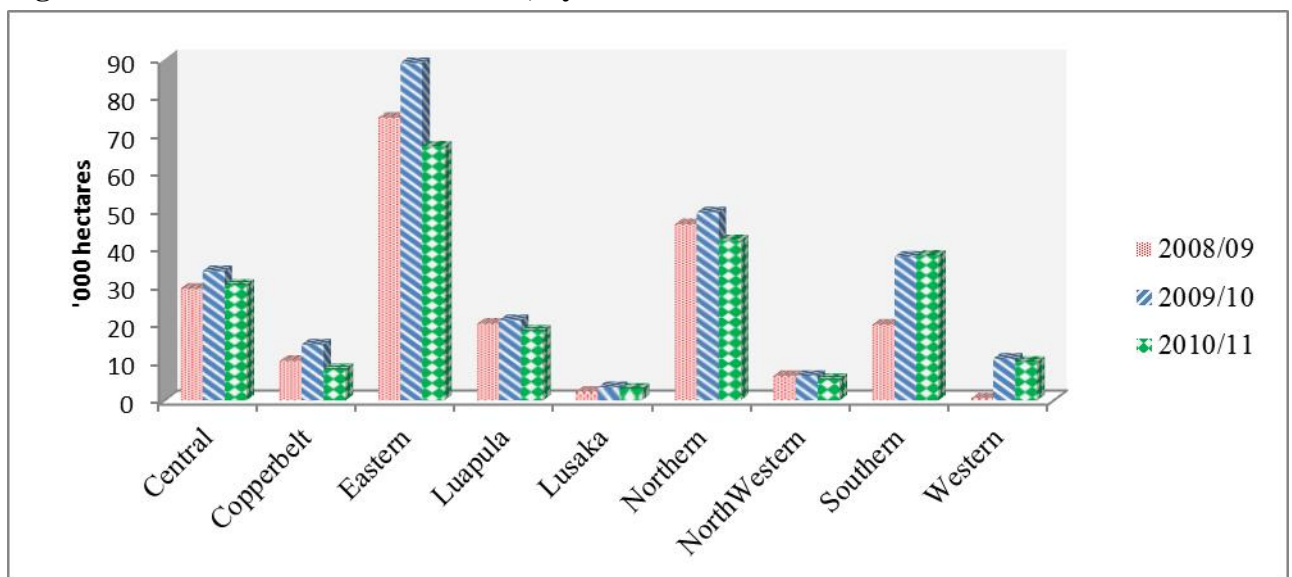
Source: CSO/MAL various years.

Examining the trends in area planted to groundnuts in all the provinces in Zambia, the CFS data shows that the largest decline in area planted to groundnuts between 2009/2010 and 2010/11 was in the Eastern Province (Figure 3). In part, this could be explained by the increase in cotton production in the province, compared to the rest of the provinces.

1.3.3. Households Growing Groundnuts

Unlike other countries such as South Africa, groundnuts in Zambia are mostly grown by smallholder households who cultivate less than 2 hectares of land (this area is shared among all the crops that the household grows). Out of the estimated 1.4 million smallholder households in 2010/11, 672,227 (47%) cultivated groundnuts. Approximately, 95.2% of those

Figure 3. Area Planted to Groundnuts, by Province



Source: CSO/MAL 2008/09 – 2010/11.

who grew groundnuts cultivated less than one hectare of groundnuts. The figure was even higher in Eastern Province, where 96.3% of these households cultivated less than one hectare of groundnuts (IAPRI/CSO/MAL 2012).

1.3.4. Groundnuts Share of Arable Land

Zambia's agricultural system has increasingly been dominated by maize production in the last decade. While maize constitutes more than 60% of the share of total arable land in Zambia, the share of groundnuts is a paltry 8.8% (CSO/MAL 2011) (Table 1). Despite all this, groundnuts have remained the second after maize, in terms of hectarage, over the last three years. It is evident that despite government's huge emphasis on maize in terms of public expenditure, groundnuts continue to occupy an important but clearly less appreciated role in the smallholder crop production systems.

Table 1. Percentage of Hectares Planted to Crop in Zambia, 2008-2012

Crop	% share of crop within agricultural season			
	2008/09	2009/10	2010/11	2011/12
Maize	60.6	61.1	66.5	61.0
Groundnuts	11.5	13.8	11.3	8.8
Cotton	5.8	4.4	6.7	15.4
Mixed Beans	4.2	4.3	3.5	4.7
Sweet Potatoes	3.5	3.6	2.3	2.0
Finger Millet	3.4	2.9	2.2	1.7
Sunflower	3.9	2.8	2	2.0
Sorghum	2.2	1.7	1.3	1.0
Rice	1.7	1.9	1.7	1.5
Soya beans	1.1	1.5	1	.9
Tobacco	0.8	0.7	0.9	0.4
Other crops	1.3	1.2	0.6	0.8
Total Hectares Planted	1,777,627	1,935,204	1,973,291	2,057,879

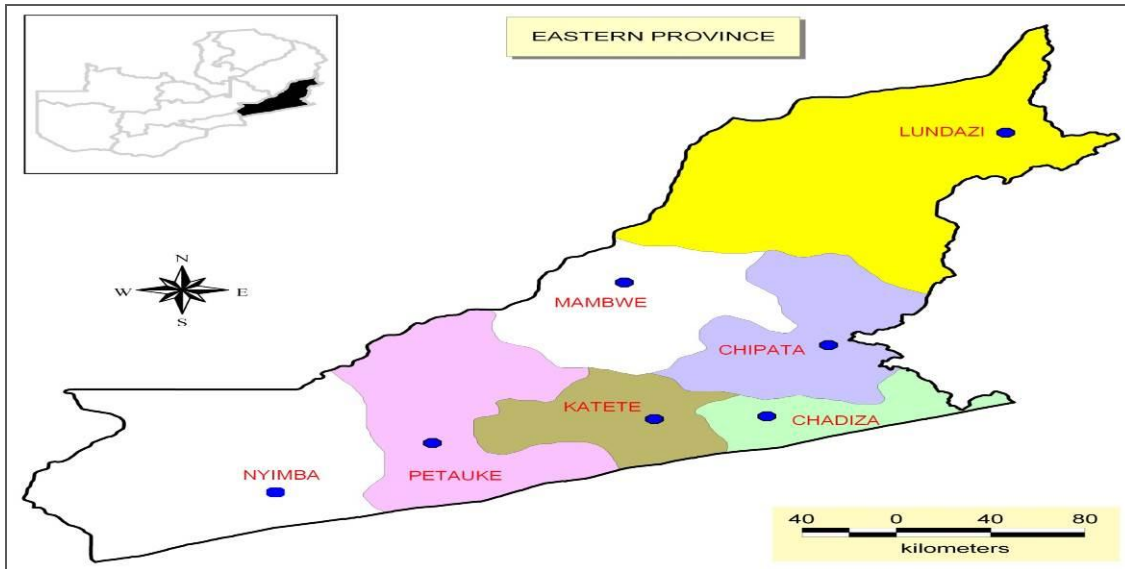
Source: CSO/MAL Crop Forecast Survey various years.

1.4. Location of the Study

This study was conducted in Eastern Province (Figure 4), which covers the most parts of northeastern Zambia where the country shares a boarder with Malawi. In the agricultural season 2010/11, 265,418 households in the province were engaged in agricultural activities (IAPRI/CSO/MAL 2012).

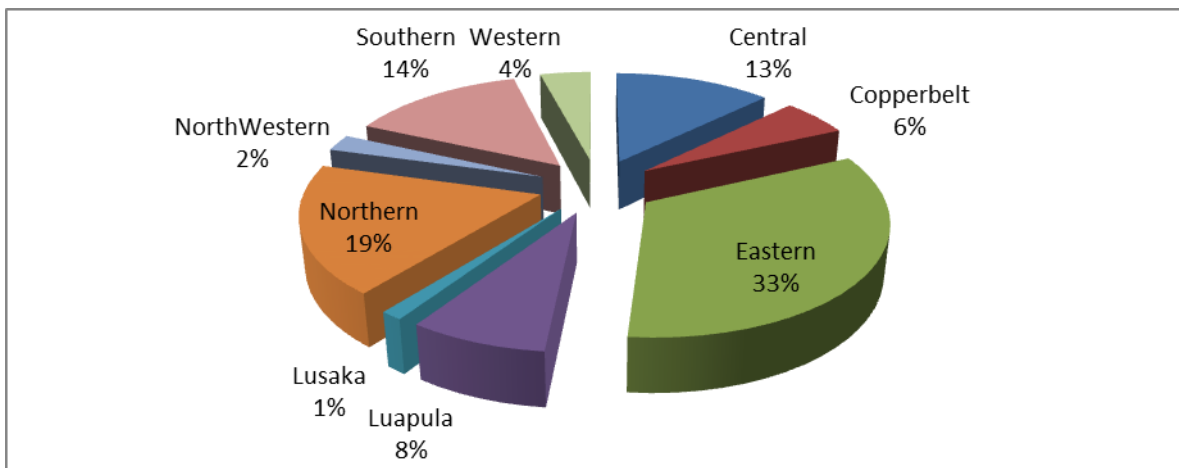
Eastern Province was selected because it is the main producer of groundnuts in Zambia (Figures 5 and 6). In the 2010/11 agricultural season, the province had the largest total area under groundnuts in Zambia with over 62,000 ha translating into a third of total area under groundnuts production in Zambia. Eastern Province alone comprised 159,957 (33%) groundnuts producing households in 2010/11, followed by Northern (19%). Traditionally, the two provinces are the main groundnuts producing areas in the country, falling in agro-ecological zones IIb and III that are well suited for groundnuts cultivation due to high rainfall as well as coarse textured and sandy loam soils.

Figure 4. Map Showing Eastern Province and the Districts



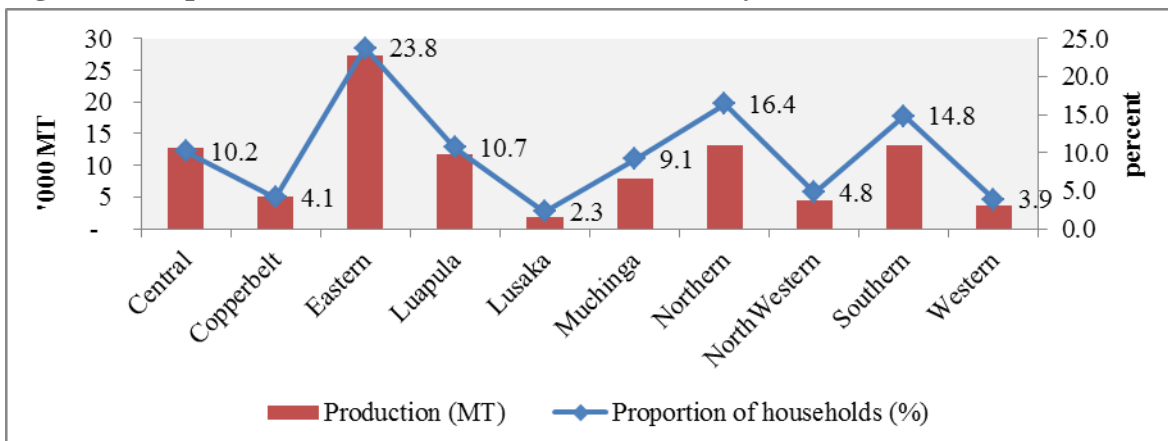
Source: Authors 2012.

Figure 5. Proportion of Area Planted by Province



Source: CSO/MAL 2011 Crop Forecast Survey 2010-2011.

Figure 6. Proportion of Households and Production, by Province



Source: IAPRI/CSO/MAL 2012.

Despite these relatively high levels of groundnuts production, Eastern Province remains one of the poorest in the country with poverty incidence of 79%. The province also records one of the highest levels of child malnutrition of about 56% against the national average of 45% (CSO 2010; CSO 2007) (Table 2). Given the high importance of groundnuts in agricultural systems in the province, there is scope for addressing rural poverty and malnutrition through improvements in the productivity, profitability, and utilization of groundnuts.

Table 2. Stunting Levels per Province

Province	1992	1996	2002	2004	2006	2010
Central	38.4	38	45.9	48	56.3	41.3
Copperbelt	33.5	31	39.9	44	53.2	51
Eastern	47.6	48	59.7	59	64.1	51.7
Luapula	55.8	58	57.6	64	56.1	49.2
Lusaka	30.8	30	35.6	40	47.6	39.2
Northern	56.5	57	54.8	55	64.5	52.5
Northwestern	42.3	47	44.8	49	49.1	47.1
Southern	35.4	40	40	40	46.2	39.5
Western	41.1	45	42	45	39.6	45

Source: CSO 2007; CSO 1992-2006; and CSO 2010.

The production of groundnuts in Eastern Province is concentrated in five districts – Chipata, Petauke, Katete, Chadiza, and Lundazi. Chipata the highest producer of groundnuts recorded 10,000 MT in 2010/11 followed by Lundazi with 6,800 MT. Petauke, Katete, and Chadiza had 5,500 MT, 2,300 MT, and 1,900 MT respectively. This study, therefore, focuses on these districts.

1.5. Data and Methodology

The methods and data sources employed in the study were twofold:

First, a qualitative survey that involved two field visits to Eastern Province, where discussions with key actors in the value chains were held. During the first visit, discussions were held with the following key players (the number of players visited is indicated in parentheses):

- Seed companies (3)
- The Zambia Agricultural Research Institute (ZARI)'s Msekera station
- District Agricultural Coordinators (DACOs) (5)
- Marketing Officers from the Ministry of Agriculture and Livestock (MAL) (5)
- COMACO (Community Markets for Conservation)
- The Eastern Province Farmer's Cooperative (EPFC)
- Rabs processing and retailing company
- Localised agro-input and output retailers (6)
- Local assemblers/small traders (10)
- Zambia Revenue Authority (ZRA) Customs Officers at the Zambia-Malawi boarder station.

In the second visit, eight focus group discussions (FGDs) were held, with about 40 to 75 farmers participating in each of the discussions across all the five districts.

Second, the analysis is supported by small householder household level data drawn from two nationally representative surveys: i) the annual Crop Forecast Surveys (CFS) carried out by MAL in conjunction with Central Statistical Office (CSO) in various years and covering 13,200 households, and ii) the Rural Agricultural Livelihood Survey (RALS) conducted by Indaba Agricultural Policy Research Institute (IAPRI) in partnership with MAL and CSO. RALS, which was carried out in 2012 covered 8,839 households in Zambia. Eastern Province was overly sampled with 2,000 households providing a representative sample at district level.

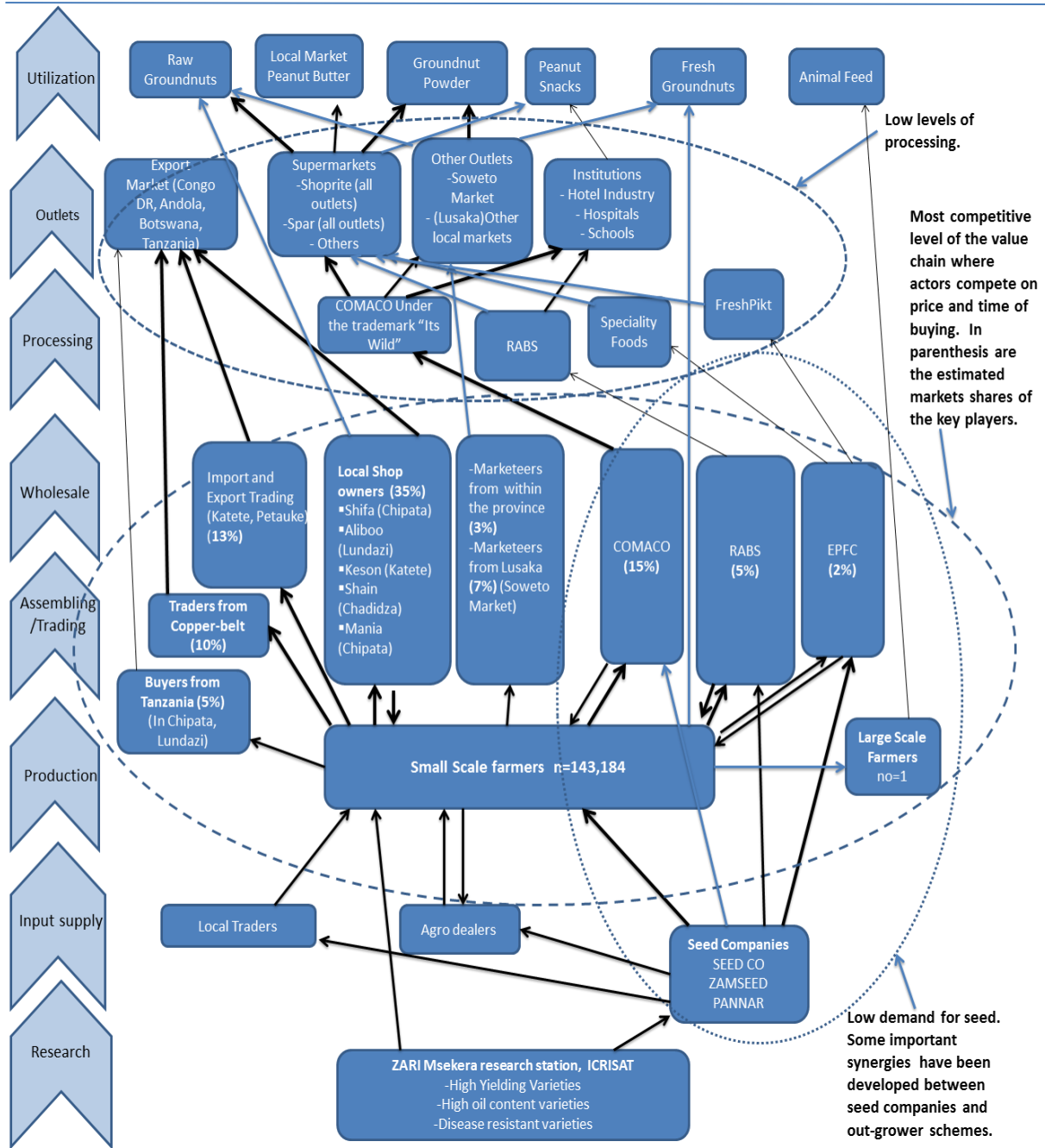
The study applied a value chain approach owing to its advantage of enabling a broader understanding of how value is added at different nodes of the chain, and how the actors inter-relate (Hawkes and Ruel 2011). That way, it is possible to identify specific challenges, successes, and points of leverage at each node of the chain from production to consumption.

The main elements along the groundnut value chain, which are classified according to the activities played by the chain actors, are:

- research,
- input supply,
- production,
- assembling/trading,
- wholesaling,
- processing, and
- retailing/outlets.

Figure 7 presents the value chain map of the groundnut industry in Eastern Province. It provides a summary of the core activities in the industry – starting from research through to utilization of groundnuts. The map highlights opportunity areas for farmer and private sector participation in groundnuts markets. For example, the synergies that have been formed between seed companies and out-grower schemes, mainly because of the unpredictability of demand for improved seed by the farmers, are potential windows for more private sector and Non-Governmental Organization (NGO) participation. Currently only COMACO and the EPFC are working with seed companies in getting improved seed to the farmers. Market channels for groundnuts include traders from within the province and the traders from Lusaka and Copperbelt. On the other hand, there is the informal export market dominated by Democratic Republic of Congo, Tanzania, and Angola. COMACO is the main company processing groundnuts into peanut butter and packaged peanuts and selling to supermarkets and hotels nationwide. Through a series of ‘value addition, Zambian consumers purchase the crop either in its raw form or processed form from the local markets. Most of the exported crop to the neighbouring countries is in raw form.

Figure 7. Value Chain Map of Groundnuts in Eastern Province



Source: Authors, based on discussions with the chain actors.

2. RESEARCH IN GROUNDNUTS

Agricultural research is an essential factor for improving crop productivity and quality. Currently in Zambia, both the public and the private sectors are actively involved in the development of improved seed varieties. Additionally, research into mitigating aflatoxin has gained momentum given mounting evidence on the physiological consequences of aflatoxin consumption, as well as the desire to promote groundnut export market development. This section is divided into two parts. The first part examines research on seed for attributes such as yield and to a lesser extent, oil content, days to maturity and seed size, while the second part focuses on research on aflatoxin.

2.1. Seed Varieties Research

2.1.1. Public Sector Research

ZARI, a national research institute under the Ministry of Agriculture and Livestock, spearheads the public research in groundnuts varieties. The Msekera Agricultural Research Centre, located in Chipata, is ZARI's main center for legume research. Although the goal of ZARI is to release at least one new variety every three years, several challenges that include inadequate funding remain obstacles. Since 1964, ZARI has released 12 different varieties of groundnuts seed, with three varieties (Chishango, Katete, and MGV 5) released in 2007 and 2008 (Table 3).

The development of new varieties is mostly centered on five attributes: *yield, seed size, days to maturity, disease resistance, and oil content*. ZARI recommends the use of different varieties according to the three different ecological zones in Zambia. Chishango and MGV 5, the latest varieties to be released by ZARI (in 2007 and 2008 respectively) have higher yields compared to most previously introduced varieties and shorter days to maturity compared to the widely grown Chalimbana, thereby making it suitable for medium rainfall areas. As presented in Table 3, most varieties have potential to yield above one metric tonne per hectare, yet the average yield for groundnuts in Zambia is around 0.7 MT/ha.

Table 3. Groundnut Varieties, Yields, and Days to Maturity

Variety	Year Released	Days to Maturity	Seed Size	Oil Content (%)	Yield (MT/ha)
Makulu Red	1964	130-145	Medium	48-50	2.0-2.5
Champion	1998	130-140	Large	48-50	1.5-3.0
Chalimbana	1966	150-160	Large	48-50	0.5-1.0
MGV-2	1988	130-140	Medium	45-48	1.0-2.0
MGV-4	1992	120-130	Medium	48-50	1.5-3.0
MGV-5	2008	130-140	Large	45-48	1.5-4.0
Luena	1998	90-100	Small	48-50	1.0-2.0
Chishango	2007	130-140	Medium	48	1.5-4.0
Natal Common	1976	90-100	Small	45-48	0.5-1.0
Chipego	1995	100-110	Small	45-48	1.0-1.5
Comet	1970	90-100	Small	45-48	0.5-1.5
Katete	2008	90-100	Small	43	1.0-2.0

Source: Msekera Research Station.

Note: Data is based on optimal management practices at Msekera research station.

The process of developing and releasing new varieties can take up to 5 to 10 years. This is because, after obtaining the germ-plasma, usually from the Institute of Tropical Agriculture (IITA), other international research institutes, or from local farmers, trials are conducted at Msekera to examine the adaptability to the local climatic conditions. These on-station trials are followed by farm trials by selected farming households. Once the seed has gone through the trials and satisfy the required attributes, certification is done at the Seed Control and Certification Institute (SCCI) in Lusaka. The seed is later distributed to selected farmers for multiplication. Msekera has collaborated with EPFC in the distribution of improved seed varieties to the farmers for multiplication. For example, during the development of MGV5, the EPFC farmers multiplied 400 MT of seed, of which 100 MT was retained by EPFC while 300 MT was distributed to the seed companies and agro-dealers. Intensive extension and training is provided to the selected farmers in order to minimize seed contamination. In 2010/11 agricultural season, EPFC had about 700 farmers in both Chipata and Katete districts.

Side selling is a challenge during seed multiplication. Although the selected farmers enter into contracts stating how much seed each farmer is required to produce for Msekera, some farmers still sell the seeds elsewhere. So far, there is no law under which such farmers can be prosecuted for side selling because the Seed Variety Act, a statutory instrument that contains such laws, has not yet been enacted.

Seed contamination is another challenge that the research institute faces in the process of developing and multiplying seed. Cross-pollination occurs during the field trials when there are other varieties growing within a radius of 400 metres. It is at this point that seed tend to be contaminated due to cross-pollination. Contamination of seed distorts some attributes of the seed. For example, MGV 5, which has a pure red colour, develops a mixed reddish colour when cross-pollinated, making it look like MGV4. Msekera's efforts to create awareness on the risk of seed contamination often breaks down with poor extension service delivery and field inspection.

2.1.2. Private Sector Research

The private sector supplements government research in seed development and distribution. Seed Co. and ZAMSEED are the main seed companies that have developed improved commercial groundnuts seed over the years. In 2011, ZAMSEED produced about 30 MT of improved commercial seed while Msekera produced less than 5 MT. Seed Co., through the EPFC farmers in Eastern Province, produced 150 MT of Open Pollinated Varieties (OPV) for the nation in 2010 as well as in 2011. Given that 222,981 hectares of land was planted with groundnuts in 2010/11 countrywide, and that on average, a planting rate of 80 kg seed per hectare was used (recommended rate for Chalimabana, MGV4, and MGV5), more than 17,000 MT of certified groundnuts seed would be required in that year to meet total demand. For Eastern Province, the required seed, in that year, would be approximately 5,000 MT (30%). Current private sector seed production levels fall far below that.

However, due to most farmers recycling seed, the actual demand is very low. This remains a critical challenge holding back most seed companies from investing into seed production and multiplication. Consequently, companies like Seed Co. have not produced any new groundnut seed varieties for the market in the last three to five years. In 2008, Seed Co produced 50 MT of a new variety called Orion but faced difficulties selling it due to low demand. Most households have recycled the same seed for more than a decade. Farmers do not seem to

realize the yield losses in the use of recycled seed over time, a major attribute of low yields of 0.7 MT/ha against a global average of 1.7 MT/ha.

2.2. Research in Mitigating Aflatoxin

Contamination of foods with Aflatoxin is caused primarily by the biological (biotic) and environmental (abiotic) factors that lead to moulding and toxin production and can occur in both pre- and post-harvest (Okello et al. 2010). Groundnuts are among crops that are highly prone to aflatoxin contamination, a condition commonly known as *Chuku* in Eastern Province. Consuming aflatoxin-contaminated groundnuts over a long period can lead to a type of liver cancer known as Hepato-Cellular Carcinoma (HCC). Approximately 80% of global HCCs related deaths occur in Southeast Asia, Sub-Saharan Africa, and South America (ICRISAT-ZARI 2013). Yet more worrying still for Zambian consumers is the detrimental effects aflatoxin consumption can have on the physical and mental development of consumers, primarily children. Research on the effects of aflatoxin suggests that consumption of contaminated food by children can lead to growth stunting and cognitive developmental challenges (Okello et al. 2010). Thus, mitigating the levels of aflatoxin contamination in groundnuts could contribute to significant improvements in the physical and mental well-being of consumers of groundnuts in Zambia.

In addition to health risks, aflatoxin contamination has serious economic implications resulting from lost international trade opportunities. Depending on the market, economic losses may reach 100%, when the entire produce/product is rejected by the market because aflatoxin levels are higher than acceptable standards (Okello et al. 2010). Zambia, which was once a net exporter of groundnuts to Europe, now cannot export groundnuts to Europe or even to South Africa because of concerns of high levels of aflatoxin. Between 1960 and 1970, the Eastern Province Cooperative Marketing Union (EPCMU) exported over 8,000 MT of groundnuts to the UK (Sitko et al. 2011). Aflatoxin, therefore, has serious implications for farmer's access to international markets, costing the country significant export loss as well as potential revenue for farmers. Overall, aflatoxin contamination cuts across the value chain, affecting farmers, traders, processors, markets, and finally, consumers (IITA 2011).

To mitigate pre-harvest aflatoxin contamination, ZARI, in partnership with the IITA is conducting research focused on a biological control to be used for groundnuts and maize. Based on a comprehensive survey carried out in Eastern and Central Provinces, isolates of aflatoxin-producing and closely related fungi from maize and groundnuts and from soil cropped to these crops have been created by ZARI. The isolates will be used to develop a bio-control product called *Aflasafe* made up of locally isolated atoxigenic strains (ICRISAT-ZARI 2013).

Previous tests for Aflatoxin that were carried out by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Eastern Province in 2006 revealed high contamination levels in groundnuts. However, findings from selected districts in Eastern Province show that more than half of the farmers produced groundnuts with aflatoxin contamination in the range of 4 to 100 parts per billion (ppb). The Maximum is 4,980 ppb, which was recorded in Nyimba (ICRISAT/ZARI 2013). Current legislation in the European Union (EU) sets maximum aflatoxin levels for groundnuts sold within the EU at 10 ppb for groundnuts destined for processing and 4 ppb for those destined for direct human consumption (Otsuki, Wilson, and Sewadah 2001). Similarly, South Africa demands that no groundnuts entering the country should have aflatoxin levels exceeding five parts per billion (5 ppb). While the human health justification for these extremely low levels of aflatoxin are

questionable (Otsuki, Wilson, and Sewadah 2001), the fact remains that under current production and storage conditions, few groundnuts produced in Eastern Provinces would meet EU or South African requirements resulting in less groundnuts being exported to these markets.

The biggest challenge Zambia is facing in detecting aflatoxin contamination is the lack of testing equipment. So far, ICRISAT in Malawi has devised a fast and simple test kit for detecting aflatoxin that cuts the cost of testing from \$25 to \$1 per sample. Although some traders from Eastern Province make use of this equipment, especially those seeking South African markets, this means incurring transport costs to and from Malawi before shipping. As a result, some wholesalers of groundnuts leave it up to the customer to test for aflatoxin if they so wish. Testing of aflatoxin in Zambia is only conducted at ZARI headquarters; Mount Makulu Research Station in Lusaka. Within the groundnuts value chain, it is mostly the companies that export to South Africa that test for Aflatoxin through ZARI.

Meanwhile, there seem to be very little public awareness about aflatoxin contamination in groundnuts and its implications in Zambia. ZARI in collaboration with the IITA and ICRISAT are carrying out awareness creation activities in an effort to inform the consumers.

3. GROUNDNUTS INPUT DISTRIBUTION

Seed is the main input used in growing groundnuts in all the areas of Eastern Province. None of the farmers interviewed applied fertilizer or manure to groundnuts fields. Generally, most of the farmers use recycled seed that has been retained from previous harvests. In cases where the farmers did not retain enough groundnuts for planting, farmers will frequently plea for or purchase recycled seeds from neighbours or relatives. The farmers also buy ‘cleaned’ groundnuts packed as seed in 500 g or 1 kg from the local agricultural input shops.

In this section, the roles of key players in the distribution of groundnuts seed and their interactions are discussed.

3.1. Seed Companies and Companies with Inter-linked Transaction

Seed companies in Eastern Province are becoming increasingly active in non-traditional distribution networks for groundnut seeds in order to expand the market demand for improved seed varieties and to help overcome the credit and off-take market constraints that often hinder smallholder adoption of improved seeds. In particular, the principle seed companies involved in supply and distribution of groundnut seeds, namely ZAMSEED, PANNAR, and Seed Co, are linking to farmers through companies that are developing interlinked transactions business models, such as COMACO and EPFC, which engage farmers through an out-grower arrangement. These companies distribute improved seed varieties produced at Msekera as well as the seed from the seed companies. COMACO and EPFC also engage farmers in multiplying seed, which is later distributed to other farmers participating in the scheme. In 2011, COMACO was working with 3,500 farmers throughout the province while EPFC had 650 farmers in both Chipata and Katete. COMACO distributed 2,000 MT and EPFC distributed 150 MT of seed. Through COMACO and EPFC, seed companies are able to sell the seed which otherwise would be difficult to sell directly. In the 2011/12 season, ZAMSEED, PANNAR, and Seed Co, sold less than 4,000 MT of improved commercial seed directly to the farmers.

ZAMSEED has collaborated with COMACO and EPFC to distribute seed to the farmers within the schemes. Through this arrangement, ZAMSEED is assured of ready market for seed. Farmers pay back to COMACO and EPFC twice the amount of seed received. Most farmers are happy with arrangement. Both COMACO and EPFC were planning to increase the number of participating farmers. COMACO, which was in the process of opening a new shed in Chipata, was planning to enroll 800 more farmers in the scheme in 2012.

3.2. Localized Large-Scale Agro-Input/Output Traders

Other than the out-growers and the seed companies, important distributors of seed are the local large-scale agro-dealers, owned primarily by Zambians of Asian origin. This category of distributor tends to stock both improved seed varieties from the seed companies, as well as recycled seed, which they buy from the farmers. The recycled seed is sold at prices 10 times lower than the price of improved seeds. Most common seed varieties distributed in the province by the large-scale agro-dealers are MG 4, Chalimbana, and Makulu Red. Chalimbana is the most common seed supplied as recycled seed, because the farmers believe the yield remains high even after several years of recycling. Currently, there is no regulation that stops the agro-dealers from selling recycled seed.

In each district, there is at least one key agro-input supplier who is also a key buyer of agro-produce. For example, there is Shifa and Mania in Chipata, Aliboo in Lundazi, Keson in Katete, and Shain in Chadiza.

Respondents report that that majority of seed sold in these agro dealer shops is in fact recycled seed that is acquired from local farmers and repackaged. The idea is to store the groundnuts and sell as seed at the time of planting (between November and December) when the prices of groundnuts increase. Although there are no formal contracts between the shop owners and farmers, the shop owners provide loans in terms of seed (usually recycled improved varieties) to the farmers based on trust relationships that have developed over time. The farmers are obliged to pay back twice as much after harvest as well as selling the rest of the produce to the same agro-dealers. So far, there are no reported defaults despite the fact that the loans carry no formal arrangements.

In addition to the large-scale agro-dealers, there has been an increase in the number of small-scale agro-dealers in the districts. However, because demand for groundnuts seed is low and much of the effective demand that exists is met through out-grower schemes, most of these agro-dealers focus on maize seed and other agro-inputs.

4. GROUNDNUTS PRODUCTION

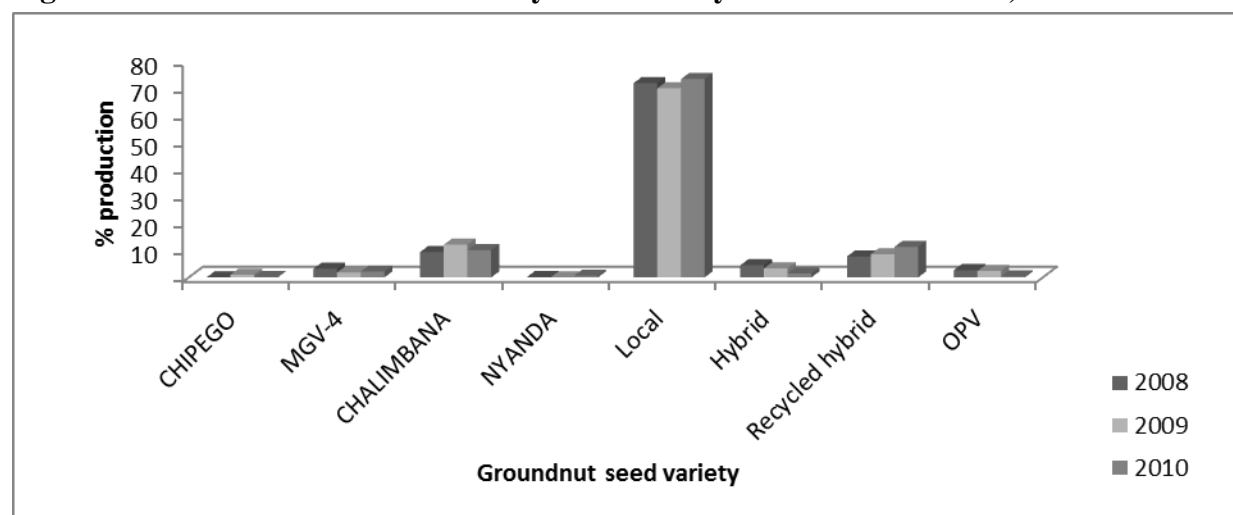
Yield, disease resistance, and days to maturity are the main determinants of seed choice by the farmers in the province. Chalimbana (released in 1966) is the most widely grown and known variety in all the districts in the province. MGV4 is also popular for its high yield. The improved version of MGV4, the MGV5 is not yet known by most farmers, although it is higher yielding and more disease resistance particularly to Rosette virus. In Chipata and Petauke, Chishango is becoming popular for its high yield.

In the 2010/11, close to 80% of the groundnuts planted were local varieties (Figure 8). These are varieties that have not been certified by MAL, but have been used by the farmers over the years. According to the farmers interviewed, there is a very thin line between what they refer to as local varieties and recycled OPVs. As shown in Figure 8, improved varieties like Chalimbana accounted for less than 10% and even less for other improved varieties. Most farmers do not know the actual names of the varieties, making it difficult to estimate the actual share of particular varieties.

4.1. Groundnuts Yields

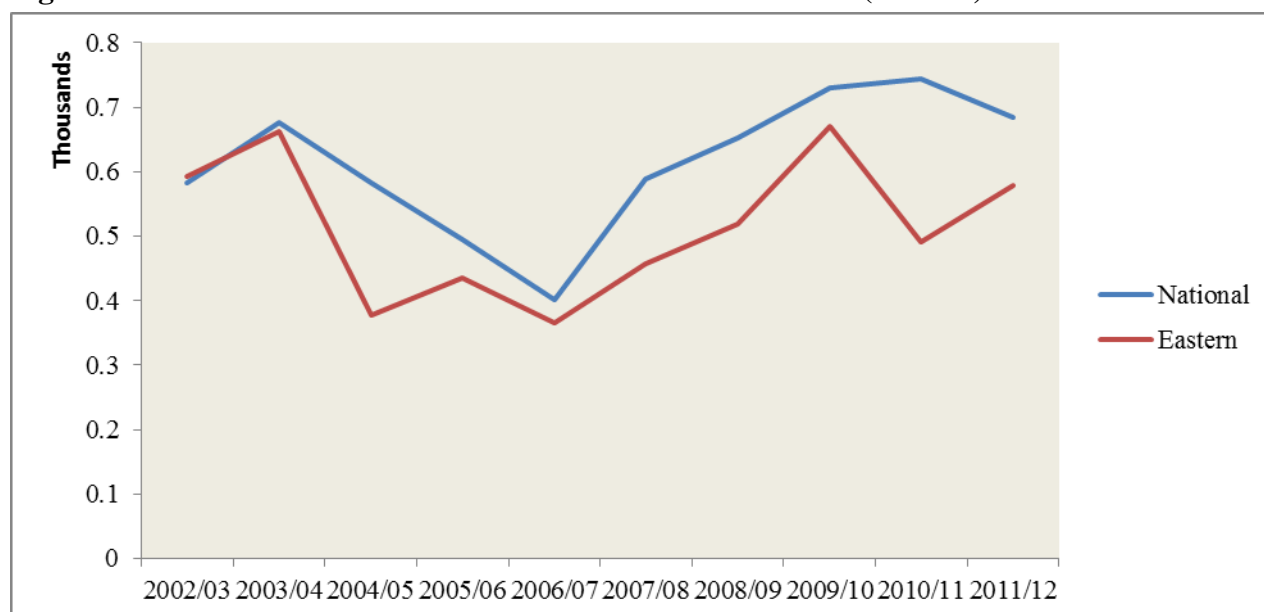
As stated earlier, groundnuts yields in Zambia remain far below the average global yields. In 2010/11, the average yield for Zambia was 0.7 MT/ha against the global average of 1.7 MT/ha (IAPRI/CSO/MAL 2012; FAOSTAT various years). In 2010/2011, the average yields for Eastern Province was even lower at 0.48 MT/ha (IAPRI/CSO/MAL 2012). Eastern Province yields have consistently lagged behind the national yield averages over the last two decade (Figure 9). The reason for this lag is not entirely clear. Agro-ecological factors, among other things, may contribute to lower yields. Further analysis is required to identify the reason for this variance.

Figure 8. Production of Groundnuts by Seed Variety in Eastern Province, 2008-2011



Source: CSO/MAL Crop Forecast Survey 2008 to 2010.

Figure 9. Groundnuts Yields in Eastern Province and Zambia (MT/Ha)



Source: CSO/MAL Crop Forecast Survey 2002-2012.

Comparing actual yields across the varieties, it is evident that the problem of low yields for groundnuts is not specific to some particular type of variety, but cuts across a wide range of varieties farmers use. Yields also vary widely across the categories of farmers. Contrary to conventional wisdom that households cultivating larger fields of groundnuts experience higher yields, in 2010/11, households cultivating less than one hectare had an average yield of 0.49 MT/ha while those cultivating between 2–4.99 hectares had an average yield of 0.26 (Table 4). This may be the result of challenges associated with mobilizing sufficient, timely labour to manage larger groundnut fields.

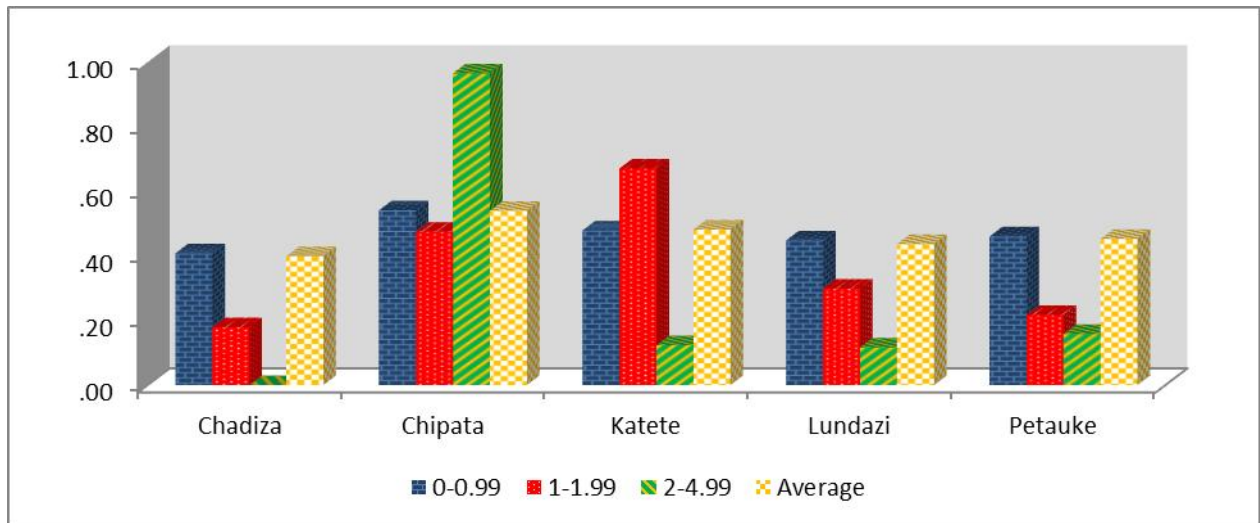
There are notable differences across the districts in terms of yield (CSO/MAL 2011). Districts like Chipata and Katete, where the out-grower schemes have a larger outreach, the average yields in the 2010/11 season were higher than 0.5 MT/ha by area cultivated category. The rest of the districts had on average yields less than 0.5 MT/ha by area cultivated category. Several factors can be associated with the differences in the yields across the districts. First, the extent to which the farmers use recycled (either improved or local) seed contributes significantly to the yields.

Table 4. Yields According to Household Category

Household Category (hectares cultivated)	Number of HHs	Proportion of HHs in each Category	Total Quantities harvested	Average Yields
		%	MT	MT/Ha
0-0.99	153,878	96.2	24,813	0.49
1-1.99	5,438	3.4	2,176	0.35
2-4.99	641	0.4	390	0.26
Total	159,957	100	27,379	0.48

Source: IAPRI/CSO/MAL 2012.

Figure 10. Average Yields (MT/ha) by Household Category, 2010/11



Source: IAPRI/CSO/MAL 2012.

This argument is supported by the fact that districts with more farmers engaged in out-grower (i.e., Chipata and Katete) arrangements, where the farmers plant new seed, have higher yields (Figure 10). In Lundazi, which had the lowest yields, most farmers indicated that they have been recycling the same seed for several decades.

Our research also suggests that field management practices between farmers contribute to significant variation in yields. During a field visit to Chipata’s Sisinje agricultural camp, it was noted that fields prepared using the traditional hand hoe cultivation led to lower yields than where minimum tillage technology was applied. One female farmer who ripped her field before planting MG4 achieved yields of more than 0.7 MT/ha compared to the average 0.5 MT/ha for Chipata.

Nonetheless, the study shows that there is significant potential for Eastern Province to transcend over all these challenges. The presence of organisations and institutions such as EPFC, COMACO, ZARI, and now ICRISAT provide great opportunities for pre take off conditions. Greater coordination amongst these players can potentially yield increased productivity and quality of the groundnuts produced.

4.2. Do Farmers Harvest Everything They Plant?

Survey data suggests that the proportion of area harvested to area planted for groundnuts is high across all the provinces in Zambia, an indication that farmers do harvest almost all the groundnuts they plant (Table 5). On average, over 90% of the hectares planted are harvested. This is possibly because groundnuts fields are normally small making it efficient for the farmers to harvest everything they plant. Also, groundnuts are less susceptible to droughts and floods, which is the most common reason in Zambia why farmers do not harvest all the area planted to crop for other crops (Shipekesa and Jayne 2011).

In the last three years, the proportion of area harvested to area planted ranges between 95% and 97% in the province (Table 5). Chipata has the highest area planted and harvested followed by Petauke district across all the years. Overall, farmers are harvesting almost all the area planted in Eastern Province.

Table 5. Proportion of Groundnut Area Harvested to Planted by District in Eastern Province, 2008-2011

District	Area planted (Ha)	Area Harvested (Ha)	Proportion of harvested to planted area	Area planted (Ha)	Area Harvested (Ha)	Proportion of harvested to planted area	Area planted (Ha)	Area Harvested (Ha)	Proportion of harvested to planted area
	2008			2009			2010		
Chadiza	3,026	3,026	1.00	4,077	3,795	.95	4,018	3,900	.98
Chipata	21,968	21,745	.98	24,419	23,600	.97	19,701	18,245	.94
Katete	5,418	5,345	.97	9,094	8,647	.94	6,954	6,482	.93
Lundazi	19,825	18,868	.97	23,763	23,118	.97	15,259	15,203	.99
Petauke	17,152	16,898	.99	19,904	19,037	.96	14,783	14,381	.98
Province	74,602	72,652	.97	89,036	85,565	.96	67,009	64,141	.95

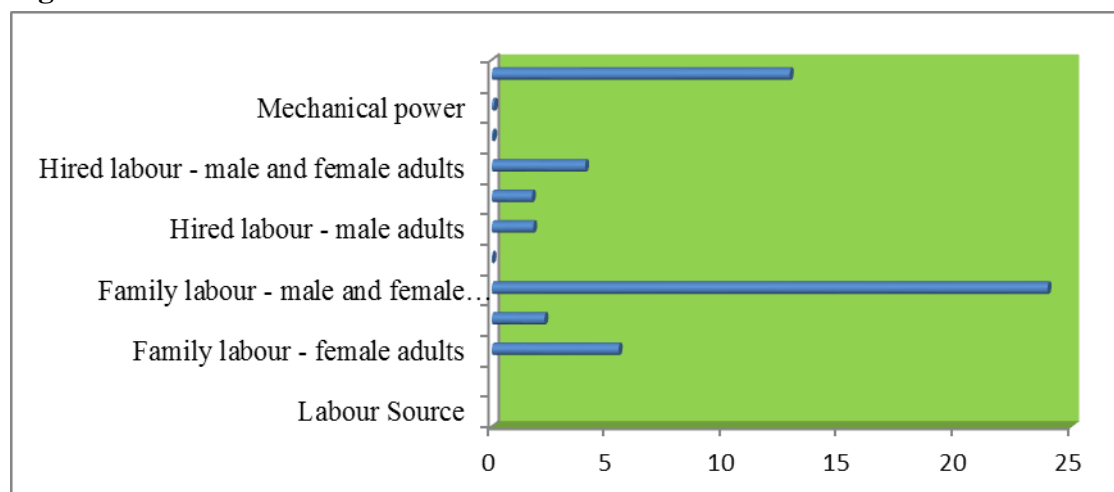
Source: CSO/MAL various years.

4.3. Labour Requirements and Costs

Labour is a critical factor in groundnuts production. This is because, unlike in maize production, there is limited use of mechanical power in groundnuts production, especially among very small-scale farm. Based on a survey question that ask “what is the primary source of labour used to cultivate this field” we determined that the most common response for of groundnut cultivation is that it is conducted by male and female household members using manual labour (25%) (Figure 11). This finding seems to contradict the common assumption that groundnut production is primarily considered a woman’s task. Our findings suggest that in fact, only 5.5% of households reported that groundnut cultivation was primarily conducted by female household labour.

Only about 12% of the households use animal draft power in groundnut cultivation, and virtually none use mechanical power.

Figure 11. Who Provides Most of the Labour for Groundnuts



Source: IAPRI/CSO/MAL 2012.

Land preparation and planting is commonly done manually. Unlike in maize planting, where farmers plant behind the plough, groundnuts are preferably not planted to the depth of a plough, because harvesting becomes difficult. Consequently, these households plant using hand hoes to ensure that the seeds do not go very deep. According to farmer's responses during the FGDs it takes two to three days for one female adult to plant one Lima (0.25 ha) of groundnuts. However, it is possible to make ridges for planting groundnuts using animals, although, traditionally, very few farmers use animal draft power in groundnuts cultivation.

Weeding is the most critical labour-demanding activity in groundnuts production. Unlike in other crops, weeding groundnuts involves making ridges to ensure the pods do not grow on the surface. According to most farmers, growing groundnuts on ridges makes harvesting easier. Labour demand in weeding is a decisive factor in area to be planted for most households. Even the large-scale households in the province indicated that labour demands during weeding discourage them from planting larger areas of groundnuts. When using animal draught power (ADP), weeding only takes a few hours and causes no significant pod damages if the groundnuts are planted on ridges. However, less than 5% of the households in the province use ADP for weeding groundnuts. Encouragement of ADP among groundnut producers may therefore provide important labour saving opportunities for farmers, leading to improved income from groundnuts.

Other activities like harvesting, threshing, and shelling groundnuts demand substantial amounts of labour compared to crops such as maize. Most farmers indicated that harvesting groundnuts, which requires use of hand-hoe and bending down for long periods, is more physically taxing than harvesting maize. Maize harvesting does not involve hand hoeing and bending. In order to save labour, some farmers have developed the strategy of using a plough for lifting groundnuts. This was particularly noted in Katete's Nyanje area where farmers remove the disc from the plough to ensure a deeper penetration in the ground in order to lift all the groundnuts.

Shelling groundnuts is also considered by farmer to be labour intensive relative to maize. For maize, farmers have developed a strategy for speeding the process of shelling where unshelled maize is packed in sacks and hit using wooden rods. In groundnuts, this is not feasible; instead, shelling is done by hand to avoid breakages. In all the areas visited in the province, hand shelling is far more widespread than mechanical shelling. Although, EPFC is promoting the use of mechanical groundnut shellers in its operational districts, most farmers indicated that using those shellers led to breakages of the nuts of up to 20% of the quantity shelled. This amount was contrary to the reported amount of less than 5% by EPFC. The difference in breakage rate may be the result of user error. Improved training in the use of shellers may therefore increase their adoption.

In cases where the labour is hired, weeding is the most expensive activity and planting is the cheapest. Table 6 presents the costs of hired labour per activity in groundnuts production.

Table 6. Cost of Hired Labour per Production Activities (ZMK/acre)

Activity	Labour Cost
Land Preparation	80,000
Planting	40,000
Weeding	300,000
Harvesting	100,000
Threshing	40,000
Shelling (40 bags of 50 kgs by volume)	150,000

Source: Author, based on focus group discussions with farmers in Chipata May 2012.

Table 7. Proportion of Gender Control of Groundnuts Fields by District, 2010/11

District	Who is mostly responsible for the groundnuts field?			
	Female		Male	
	Count	%	Count	%
Chadiza	2,414	22.9	8,146	77.1
Chama	5,360	61.3	3,377	38.7
Chipata	21,448	43.1	28,331	56.9
Katete	7,060	32.8	14,460	67.2
Lundazi	5,230	18.9	22,434	81.1
Mambwe	2,327	42.5	3,147	57.5
Nyimba	5,360	55.4	4,307	44.6
Petauke	16,515	40.1	24,718	59.9
Total	65,714	37.6	108,919	62.4

Source: CSO/MAL 2011.

4.4. Gender Control over Groundnuts

It is commonly believed in Zambia that groundnuts are mainly a woman's crop. From cultivation to planting, weeding, and harvesting, women play a significant role in providing more labour in groundnuts production (IAPRI/CSO/MAL 2012). Despite this fact, we find evidence showing that over 62% of men controlled the groundnuts fields in Eastern Province during the 2010/11 farming season (CSO/MAL 2011). Overall, 37.6% of the groundnuts fields in the province were controlled by women while 62.4% were controlled by men (Table 7). This level of women control is much higher than for maize where less than 20% of the women were in control of the maize fields (Shipekesa and Jayne 2012). However, distinguishing the gender roles across the production activities indicated that weeding, harvesting and shelling of groundnuts is done mostly by women and children while the men were more involved in planting and selling.

4.5. The Role of Farmer Organizations

Farmer organizations play a critical role in groundnuts production. Firstly, all the out-grower schemes operating in the province work with farmers that are organized in groups. This makes it easier for seed distribution, monitoring of production activities as well as provision of extension services. The EPFC have lead farmers who they train to help train other farmers in each group. These lead farmers are provided with bicycles to enable them visit other farmers. In this regard, belonging to a group enables the farmers not only access the seed but also extension services as well as a more organized and assured market. Secondly, bulking of groundnuts facilitates bargaining for higher prices especially when dealing with large-scale buyers and can provide a cost effective way of transporting to areas offering higher prices. However, issues of mistrust because of past swindling experiences in some areas and the desperation for cash, has led to failures in some bulking efforts. Nonetheless, some farmer organizations like Muthila-Kubili in Lundazi have been successful in selling at favourable prices due to bulking.

5. ASSEMBLING AND TRADING

Assembling/Trading in this case refers to the first stage of buying groundnuts from the farmers. As illustrated in Figure 6, assembling/trading is the most competitive stage of the value chain, where key players intensively compete in terms of price and the timing of purchasing from the farmers. These key players include local large-scale traders who operate input and output shops, and large processing companies. Other buyers are the local small traders (open market traders), traders from outside the province. Outside Zambia, there are traders mainly from neighbouring Tanzania that buy directly from the farmers. This section will describe the market behaviours of each of these key actors.

5.1. Localised Large-Scale Agro-input/output Traders

In each district, there is at least one dominant local large-scale agro-input/output trader whose main role is that of assembling, retailing, and wholesaling of groundnuts. (These key buyers are also the main input suppliers discussed in section 3.2 above). In Katete district, for example, one large-scale agro-input/output trader bought up to 10% of the groundnuts produced in the district in 2011.

These large-scale agro-input/output traders assemble the groundnuts from the farmers using different methods. The most common method of acquisition is for farmers to deliver the groundnuts directly to the large-scale agro-input/output traders' shop. At the time of the study, queues of farmers were seen waiting to sell their produce in front of Shifa Store in Chipata. The second method is for these large-scale agro-input/output traders to buy groundnuts from intermediaries who purchase the groundnuts in the villages. The intermediaries usually take the form of agents buying on behalf of a larger-scale traders and/using their own funds. Thirdly, the large-scale agro-input/output traders/ hire people to camp in the villages and assemble the groundnuts. When certain volumes have been collected, often after a week of camping, the groundnuts are transported to the stores.

Unlike most other large-scale buyers, these localised large-scale traders pay the farmers immediately upon delivery. This is a preferred option for farmers that tend to be in desperate need for cash, even when the price offered is lower than the prevailing market price. Sometime, the farmers receive the cash even before the harvesting the groundnuts. In such arrangements, it is the traders that determine when to buy, what price to buy at, and to a greater extent, the quantity bought from farmers. In addition, groundnuts are also bought through barter trade with fertilizer, blankets, kitchen utensils, and other household goods. Through using all the possible methods of buying the groundnuts from the farmers and paying the farmers immediately, this category of assemblers tend to maintains large market shares. They have over the years established markets beyond the domestic Zambian market, through business partnership with other traders in the neighbouring Democratic Republic of Congo, Angola, and even Botswana through whom they channel the consignments.

5.2. Traders from Lusaka and Copperbelt Province

The Lusaka traders comprise mostly traders from Lusaka's Soweto Market. The traders from the Copperbelt Province buy groundnuts to sell across the Kasumbalesa boarder with Congo DR. These traders tend to set up camps in the villages for several days or weeks while assembling the groundnuts. The district agricultural office in Chipata estimated that, more than 200 metric tons was purchased in Chipata alone by this category and transported to

Lusaka through hired tracks. The traders provide an important market for farmers because they tend to penetrate into the villages to buy groundnuts, thus eliminating the costly and arduous task for farmers to transport to markets. However, there is usually a disparity of about K200/kg (or K10,000 per 50 kg bag) when traders purchase from the homestead¹.

Bartering for groundnuts is also extremely common. Different merchandise including blankets, clothing, and kitchen utensils are exchanged with groundnuts. In most cases, these farmers do not know the actual value of the merchandise and often perceive them not equivalent to the value of groundnuts. Despite this perception, farmers still go for the exchange because they need the merchandise. When buying cash, the traders can buy as low K1,500/kg and resell at Lusaka's Soweto market at an average price of K5,000/kg, and at the Kasumbalesa border, where the price can reach K8,000/kg.

5.3. Traders from Tanzania

Traders from Tanzania are mostly concentrated in Lundazi district. These traders enter into informal arrangement with local traders who purchase the groundnuts on their behalf. The groundnuts are later sold in Dar-es-laam and sometimes even as far as Kenya. During the 2010/2012 season, one local trader organized up to 200 MT of groundnuts for the Tanzanian market. Usually, the local agents start buying at K2,000/kg in May/ June when the marketing season begins and end up around K6,000/kg in October/ November when the supply of groundnuts is low. In Tanzania, Congo DR, and Angola, the groundnuts are sold at an equivalent of K8,500/kg. It can be hypothesised here that the farmers, through these traders, are presently linked into competitive regional markets. This regional trade is equally characterized by seasonal movements in price. Henceforth, opportunities exist for groundnut farmers in terms of regional trade at a competitive price. Sorting out production challenges, aflatoxin issues as well as facilitating regional trade in groundnuts would yield better outcomes for farmers.

5.4. Export Trading Group Zambia

The Export Trading Group of Zambia (ETG) is one of the largest buyers of groundnuts in the province. ETG is a global company operating in Africa, Asia, Europe, and North America. In Eastern Province, the company operates in two districts, Katete and Petauke. In Katete district, the company has been operating for more than four years and for the last three years in Petauke. In 2011/12 agricultural season, ETG assembled approximately 95 MT in Katete and 1,500 MT in Petauke, which was transported to Lusaka for the domestic and the export markets. The company has depots with a storage capacity of approximately 250 MT in the two districts. Normally, ETG buys through its own agents that are stationed at the trading posts within the districts. Advertisements are mainly done through the local radio stations concerning the purchasing price and the trading period.

5.5. Companies with Inter-linked Transactions

There is a growing presence of companies that operate in linked transactions from seed supply, buying of the process to processing. These companies go into contractual arrangements with selected farmers involving seed supply and buying of the produce. The

¹ K indicates un-rebased Zambian kwacha (i.e., in rebased currency K1,000 equals KR 1).

contractual arrangements are similar to out grower scheme arrangements. Such key companies in the province are COMACO, EPFC, and RABS.

COMACO is an important buyer of groundnuts in the province currently operating in four districts: Chipata, Katete, Chadiza, and Lundazi. As mentioned earlier, COMACO provides inputs to the farmers and get back groundnuts amounting to double the volume of the seed provided. In addition, COMACO buys groundnuts from farmers outside its credit scheme. In 2011/12, COMACO assembled approximately 800 MT of groundnuts from the province. The company is planning to purchase approximately 2,000 MT after completing the construction of the Chipata depot in 2012/13 season.

EPFC, which was established 2007, is currently operating in two districts - Chipata and Katete and has plans of extending to Chadiza. Similar to the COMACO arrangement, EPFC provides inputs to the farmers with inputs and gets back twice the amount of seed provided. In 2011, EPFC assembled 3,000 MT of groundnuts in Chipata and Katete.

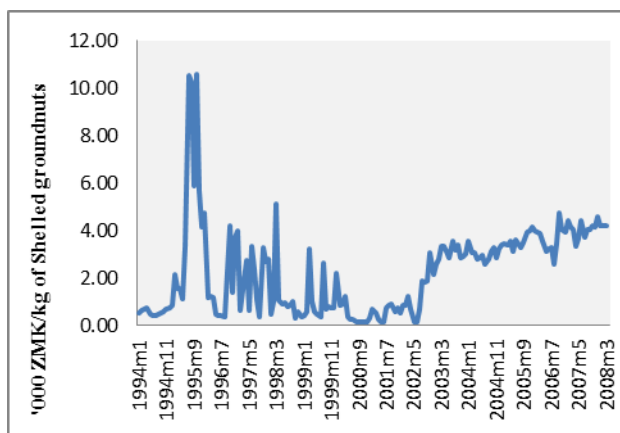
Rabs, a Malawian processing and whole-selling company with an outlet in Chipata, plays an important role in purchasing groundnuts from the producers. The company bought 500 MT of groundnuts during the 2011 marketing season. Rabs has also developed a model of providing inputs to farmers in the ratio of one 10 kg bag of groundnuts seed for 20 kg bag of groundnuts as payment. Farmers normally deliver to the company's sheds after harvest. Where Rabs collects from the farmers, the transport charge is passed onto the farmer in form of reduced purchasing price. The variety that is highly preferred by Rabs is Chalimbana, which is excellent for peanut butter processing. From the total groundnuts purchased, 40% is solely left for sale as raw groundnuts in company labelled and non-labelled packages and the rest is processed into peanut butter and peanut snacks. The processing is done at their headquarters in Malawi implying that the commodity has to cross the Zambia-Malawi border twice, once in raw form only to return in processed form. This, thereby, attracts double taxation, which is one of the major challenges the company is facing in the value chain. To this effect, Rabs is exploring options for a setting up a processing plant for the Zambian market in Chipata.

5.6. Pricing Issues

Overall, the domestic groundnuts prices have experienced intensive annual fluctuations. Zambia's domestic prices have followed the global price trend, particularly after 2002, indicating that they could be responding to world price changes. In both cases, prices significantly increased after having experienced a downward trend prior to 2002 (Figure 12). The domestic prices increased significantly (from K2,000 per kilogram to K10,000 per kilogram) in the mid-1990s following the country's economic liberalization. In part, this could be attributed to increased number of trade routes as well as increased number of private sector players.

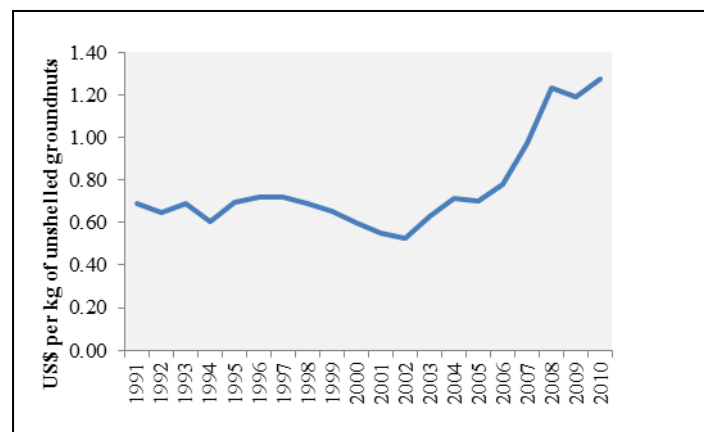
The steady increase after 2002, although experiencing monthly volatility, represents a real opportunity for the producers. Yet the capacity for producers to effectively benefit from these price trends depends on improvements in markets and production. Through increasing yields and bulking, farmers can increase production and sales to take advantage of the increasing prices.

Figure 12. Domestic and Global Average Prices
12a. Domestic Average Prices in Nominal Terms



Source: Author, based on FEWSNET various years.

12b. World Average Prices in Nominal terms



Source: Author, based on FAOSTAT various years.

5.7. Factors Determining Selling Price of Groundnuts

5.7.1. Timing of Sales

Groundnuts experience seasonal supply and demand fluctuations leading to seasonal price movements. Prices can range from K1,500/kg and rise up to K6,000/kg within one year. Prices are usually set very low in May at the beginning of the marketing season and remain relatively low until September when the supply trends start going down. By October, prices start trending upwards, reaching their peak from February to April. For COMACO, the opening price at the beginning of the season is often around K2,400/kg of shelled groundnuts while by the end of the season the prices rise to about K6,000/kg. A good strategy for farmers to benefit from high prices would be to wait until late in the season when prices go up. However, as with many other seasonal crops, many farmers are faced with pressing financial needs after the harvest and cannot wait for prices to go up.

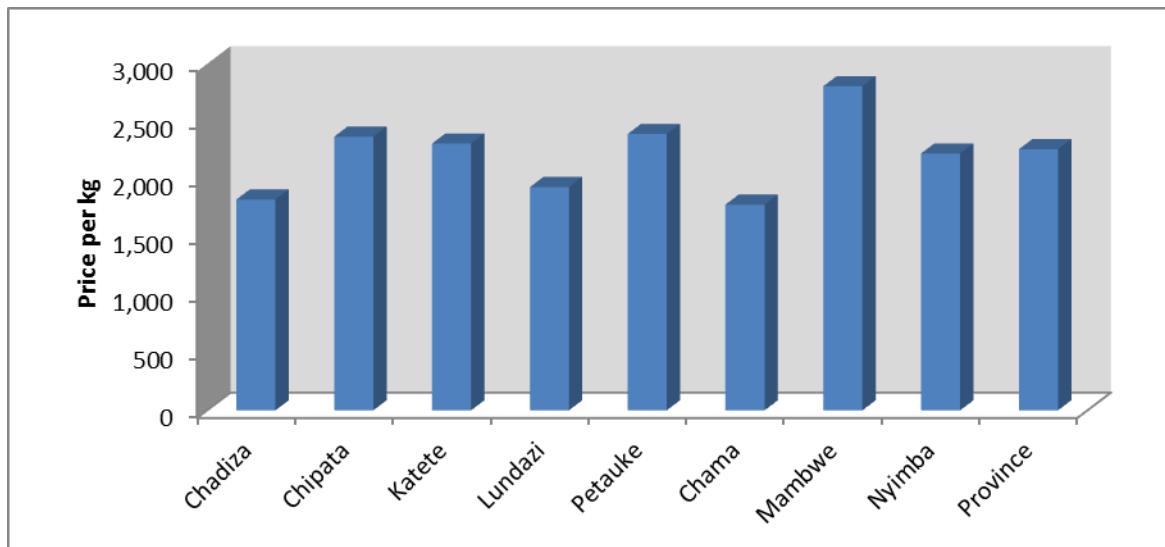
5.7.2. Shelling of Groundnuts

Prices differ according to whether the groundnuts are shelled or unshelled. Shelling is a form of value addition that can be performed on-farm, and can lead to a price increase of roughly of K15,000 per 50 kg bag. More than 80% of the groundnuts sold in the province are shelled despite the fact that shelling is a tedious task. It is a task mostly done by women and children. The use of shellers is minimal owing to perceived high levels of breakages.

5.7.3. Remoteness

There are also significant differences in prices between areas nearer to the Boma and those in more remote areas. For instance, farmers found in districts along the Great East road (i.e., Chipata, Katete, and Petauke) have higher groundnuts prices (with average prices above the Zambia Kwacha (ZMK) 2,000) compared to those further off the main road. These districts equally produce a lot more groundnuts compared to those off the main road. Lundazi is one

Figure 13. Average Groundnuts Prices per Kilogram, by Districts: 2010/11



Source: CSO/MAL 2011.

of the largest producers but due to accessibility problems, the district experiences lower prices compared to Chipata (the road from Chipata to Lundazi was still under rehabilitation by the time of the field visit)(Figure 13).

One of the concerns by the farmers is that the prices offered by the buyers are not reflective of the costs of production. Despite some local radio advertisements for markets offering high prices, farmers are unable to access those markets due to transport limitations and distances to those markets. As a result, the farmers opt to sell to traders that come round the villages. Some of these agents are fellow farmers employed by the major buyers in the province.

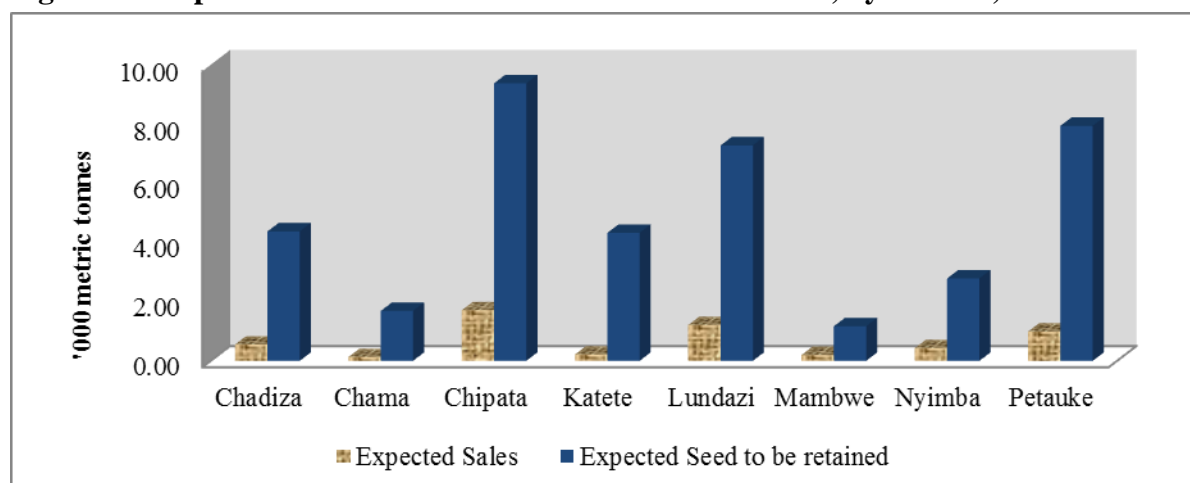
However, there is concern about the weighing machines that these traders use. The farmers feel they are being cheated by the traders through adjusting the weighing scales to have the commodity weigh less than the normal weight. In order to enable farmers participate effectively in these markets, one option is to encourage bulking the produce through farmer groups to minimise the cost of transportation to areas offering higher prices. Alternatively, investment to improve the mistrusts regarding the weighing scales can be made. This may include farmer organisations buying a scale that all the farmers will use when selling. The Government can also play a role in certifying the weighing machines, although this should be accompanied by monitoring to ensure that the scales are not being modified by either party.

Overall, there is no collaboration among the key players to address price issues. Some buyers, especially those that provide seed, are unhappy with pre-harvest buying by other buyers who do not even provide seed input. Lack of collaboration and trust has resulted in a muddled market structure at assembling stage, resulting in volatile prices thereby making the production of groundnuts, in general, unattractive to small-small farmers.

5.8. Groundnuts Sales and Retention

In the 2010/11 farming season, most households in the province indicated that they expected to retain most their groundnuts. On average, less than 20% of the groundnuts cultivated were expected to be sold while most of it was anticipated to be retained for home consumption and as seed for the following agricultural season (Figure 14).

Figure 14. Expected Sales and Retention of Groundnut Seed, by District, 2010/11



Source: CSO/MAL 2011.

5.9. Where Do the Farmers Mostly Sell the Groundnuts?

Over two-thirds of the groundnuts harvested are sold to private traders in all the districts. The data from the CFS showed that the second most important buyer of groundnuts is other households. These are mostly households who do not grow groundnuts and those that buy on behalf of other traders or households are simply buying seed to plant (Table 8).

Unexpectedly, farmers hardly sell to local farmers' cooperatives and NGOs.

5.10. Groundnuts Drying and Storage

Grains are stored dry to avoid fungal contamination thereby increasing storability. As such, proper drying of groundnuts becomes very critical in determining quality and storability. Okello et al. (2010) observe that the amount of moisture in a grain affects both grade and storability and has a critical effect on mould growth and mycotoxin production. Drying is actually one of the most important considerations in determining whether aflatoxin will develop in groundnuts after harvest.

Table 8. Proportion of Households Selling Groundnuts by Type of Buyer, by District, 2010/11

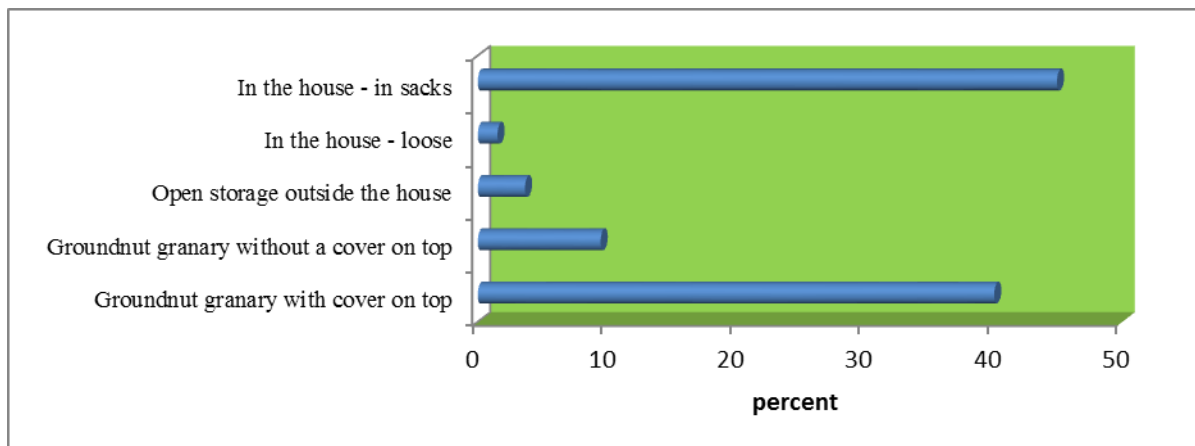
District	HH sold to what type of buyer?						
	Private traders	Marketer	Other households	Cooperatives	Millers	NGO	Others
	Row (%)						
Chadiza	90.7	3.6	5.6	-	0.0	-	0.0
Chipata	80.8	4.2	13.8	-	0.4	-	0.8
Katete	69.5	8.7	21.8	-	0.0	-	0.0
Lundazi	80.6	5.2	8.7	-	0.0	-	5.4

Source: CSO/MAL 2011.

In Zambia generally, and particularly in Eastern Province, farmers use various traditional methods to dry the groundnuts. The most common methods are where farmers leave the groundnuts in the field or on bare ground at the homestead. About 96% of the farmers in Eastern Province use these two methods, while the rest of the farmers dry either on the roof tops, mats, drying racks or on concrete floors (IAPRI/CSO/MAL 2012). Drying on the ground in the field or on bare ground at the homestead exposes the groundnuts to ground moisture. Okello et al. (2010) observe that field and bare ground drying is a major source of fungal contamination.

Poor methods of storing groundnuts, can detrimentally affect crop quality. Throughout Zambia, groundnuts are commonly stored in shells/pods or what is referred to as unshelled groundnuts. In Eastern Province, about 98.6% of the farmers store their groundnuts in shells/pods (IAPRI/CSO/MAL 2012). Storing groundnuts in this form is recommended because shells offer protection against mould infection. When stored in kernel form (shelled), groundnuts deteriorate very fast because they pick-up moisture and are easily invaded by moulds, insects and rodents (Okello et al. 2010). However, another determining factor of quality in groundnuts is where the groundnuts are stored. To avoid fungal infection, storing groundnuts in a place with lots of air circulation is recommended. In Eastern Province, most of the households store groundnuts either in sacks inside the house and/or in a groundnuts granary (Figure 15). Groundnuts stored inside the house in sacks are often not exposed to enough air circulation considering that the houses have very little space. Again, this remains a challenge in controlling aflatoxin contamination levels.

Figure 15. How Most Households Store Groundnuts



Source: IAPRI/CSO/MAL 2012.

6. PROCESSING

There is very little value addition in terms of processing of groundnuts taking place in the province. The main forms of processing are shelling, oil extraction, and peanut butter processing. A distinction is made between on-farm processing and the factory processing.

6.1. On-farm Processing

After harvesting, groundnuts go through a process of shelling. Shelling is a form of value addition although the value-added is minimal. Sometimes there is only a difference of ZMK 10,000 (about US\$2) between unshelled and shelled groundnuts of the same weight. There is a higher demand for shelled groundnuts than for unshelled groundnuts because most buyers do not want to invest in the high labour demand and cost of shelling. As mentioned earlier, labour requirements in groundnuts shelling is high. Usually this task is carried out by women and children.

Other forms of processing groundnuts at farm-level include oil pressing, grinding into peanut powder and peanut butter making. Oil pressing, although done at low levels, is mostly for selling while peanut butter and peanut-powder are primarily for consumption. Both the powder and the butter are important ingredients for local recipes in Zambia. In oil processing, a 5 kg unshelled bag produces a 0.75-litre bottle of cooking oil. This is normally done at local oil expellers. The 0.75-liter bottle of cooking oil is sold for between K8,000 and K10,000. This proves to be a profitable venture given that the 5 kg unshelled groundnuts (about 2 kg shelled) can sell at only K4,000 (if the price is K200/kg) and K500/5kg is paid for processing the groundnuts. However, most households prefer pressing oil from sunflower and leave groundnuts for consumption. Sunflower is mainly grown for oil and is rarely consumed in other forms.

6.2. Factory Processing

Factory processing is minimal in the province. At the time of the study, only COMACO was involved in processing groundnuts. COMACO is actually one of the largest groundnuts processing companies in the country. COMACO processes shelled raw groundnuts, peanut butter, and peanut snacks. In 2011, COMACO at its Lundazi factory processed 200 MT of peanut butter. Of all the groundnuts that COMACO buys from the farmers, 60% is processed into peanut butter while the remainder is packed and sold as raw groundnuts. COMACO supplies the Chipata Spar and Shoprite supermarket outlets directly, as well as to the Lusaka head offices for distribution to other outlets nationwide. Processed weight is 80% of the weight of the raw material. The processed products are mainly channelled through the supermarkets within the country and smaller quantities exported to other countries within the Southern African Development Community (SADC) region.

In addition, other Lusaka and Lilongwe-based processing companies provide important markets for groundnuts from Eastern Province. These include Speciality Food, Freshpikt, and Rabs. Freshpikt, which had been one of the largest groundnuts processing company, was at the time of the study undergoing liquidation and thus information could not be obtained from the company. Rabs, is a Chipata and Lilongwe based processing company with a whole-selling outlet in Chipata. Rabs buys groundnuts from Eastern Province, take them to Lilongwe for processing, and brings the finished products back into Zambia. Rabs sells its products through different supermarket outlets. It is critical to note that, aflatoxin levels do

not play any role in most of the aforementioned processors choice and buying price of the groundnuts. Therefore, the producers have no incentive to invest any resources in minimizing the levels of aflatoxin. None of the processing companies was testing for aflatoxin levels before processing the groundnuts. Research shows that processing groundnuts does not reduce or eliminate aflatoxin in groundnuts. As mentioned earlier, only when the groundnuts or groundnuts products are exported to South Africa is there requirement to test for aflatoxin. At the time of this study, COMACO was not able to export to South Africa due to high aflatoxin levels in groundnuts from Zambia. None of the companies has considered exporting beyond Africa, as they cannot meet the quantity and quality requirements.

7. RETAILING AND EXPORTS

7.1. Local and Foreign Retail Supermarkets

The retail outlet, which comprises mainly of local supermarkets and the large South African chain-retail supermarkets, provides significant markets for both unprocessed and processed groundnuts products. Supermarket outlets in Zambia have grown tremendously in the last decade. This is largely attributed to the rapid expansion of the South African supermarkets in the country. At the time of this study, three South African chain supermarkets were operating in the country providing significant market to groundnut producers, traders, and processors. Although previous studies found that more than 80% of the processed foods in those supermarkets were imported from South Africa, participation in the supermarkets channel had a positive impact on small-scale farmers' incomes (Emongor and Kirsten 2009). The study also showed that farmers who supplied to supermarkets had a significantly higher income than those who supplied to traditional markets.

Small-scale retailing is a common market outlet for smallholder groundnuts in all the districts. In Eastern Province, only one of the three supermarkets is operating in the Provincial capital - Chipata. The supermarket is the main retail outlet groundnuts processed groundnuts in the province, particularly peanut butter. Peanut butter is also distributed to other outlets all over the country. This has led to a significant increase in the market for locally processed peanut butter in the country.

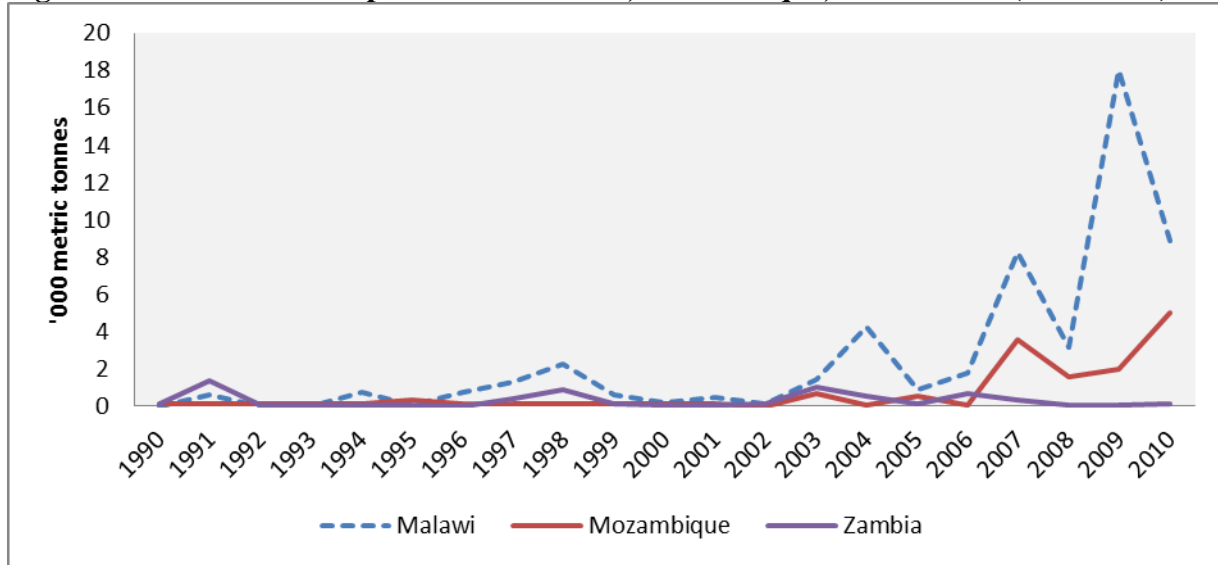
Other than the supermarket channel, local retail shop owners also provide market for raw groundnuts and locally processed peanut butter. The groundnuts bought directly from the farmers are repacked into small plastic bags, which are later sold to the consumers in the retail shops. However, what is sold in these shops is estimated at only 10% of the total volumes of groundnuts which these shop owners trade-in in a given year. The remaining 90% is sold to other traders in Lusaka as well as exported to other countries.

Other than the local shop owners, retailers in open markets trade in groundnuts, which they sell for between K1,000 and K2,000 per 250g cup. The open market traders target lower income urban households who cannot afford to buy in bulk.

7.2. Export Volumes

Official records on raw groundnuts exports indicate volumes of less than 200 MT per year over last two decades (FAOSTAT various years). These figures are very low compared to exports by other countries in the region with similar climatic conditions for groundnuts production (Figure 16). Also, these statistics may not reflect the actual quantities of exports, due to the high level of informal cross-border trade in groundnuts that occurs in the region. Indeed, discussions with traders and producers from Eastern Province revealed that thousands of metric tonnes pass through the Kasumbalesa boarder to the Congo DR and Angola. Other traders, particularly from Lundazi also indicated that on average they export 200 MT of raw groundnuts per year, through the Malawi boarder to Tanzania and Kenya. A critical constraint that the country is facing is the inability to capture such data. Consequently, it becomes difficult to provide accurate information to producers and traders on export market opportunities.

Figure 16. Groundnuts Exports from Zambia, Mozambique, and Malawi (1990-2010)



Source: FAOSTAT various years, 1990-2010.

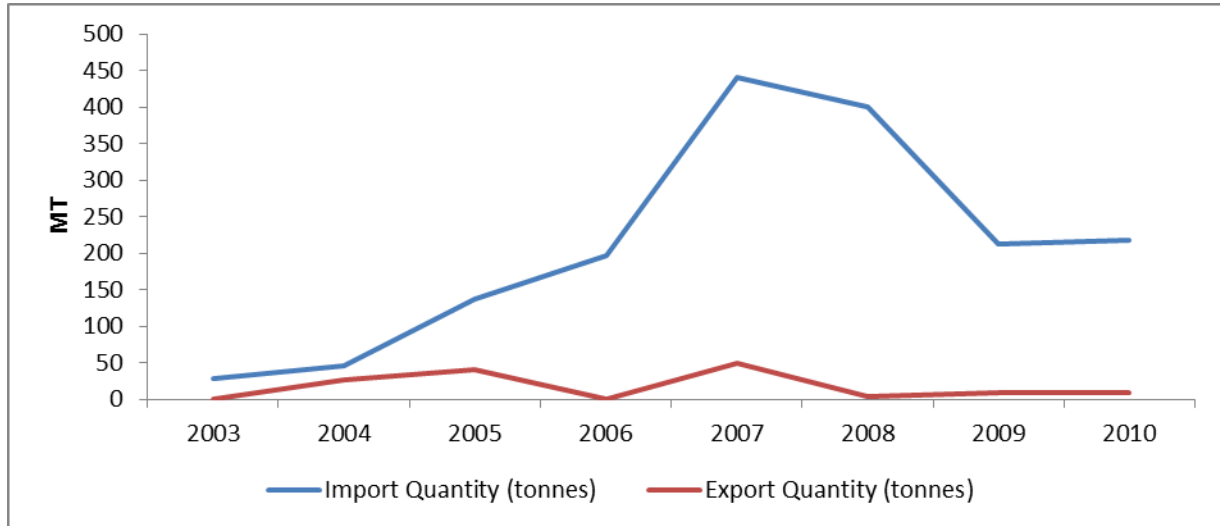
Unlike Zambia, other countries in the region have experienced significant growth in groundnuts exports. Malawi’s exports increase from about 4,000 MT in 2008 to 18,000 MT in 2009. During the period between 2004 and 2008, Malawi commanded the greatest share in South Africa’s imports of groundnuts (Republic of South Africa Department of Agriculture, Forestry, and Fisheries 2011). Similarly, Tanzania and Mozambique’s exports doubled between 2009 and 2010. Malawi therefore provides an important case study for Zambia, as it seeks to improve the export capacity of its groundnuts and, by lowering aflatoxin levels, improve the health of Zambian consumers.

How did Malawi achieve significant improvement in aflatoxin levels and production leading to increased groundnut exports? In part, it has required close coordination between farmer’s association and research institutions. Since 2003, ICRISAT have been working with Malawi’s National Smallholder Farmers’ Association of Malawi (NASFAM) to establish a *hybrid* system for ensuring achievement of standard requirements for the export of groundnuts from smallholder farmers’ associations in Malawi. This hybrid system included the following key investments. First, intensive farmer training was carried out through NASFAM to help farmers improve agricultural practices, increase yields, and improve crop quality. This training was then tied to a system of ‘production standards,’ which would ensure farmers followed best practices to reduce the chances of infection by the fungus. These targets complement the ‘performance standards’ that are used in European markets, which determine the levels of a contaminant in a product. The ICRISAT/NASFAM team also established an aflatoxin analytical laboratory in Malawi to help identify the sources of contamination and provide the necessary solutions, to help increase farmers’ chances of meeting the minimum allowable levels of aflatoxin. Finally, steps were taken, including organizing farming groups into clubs who sell their produce at designated areas, to allow for easy traceability (Farming First 2010).

Exports of groundnuts products such as peanut butter have fluctuated over the last few years (Figure 17). However, after 2007, both peanut butter imports and exports started experiencing downward trends. There could be several reasons for these trends. Possible explanation for the reduction in exports might be due to the declining trend in groundnut production as well as increased cross-border exports of unprocessed groundnuts. Another explanation could be

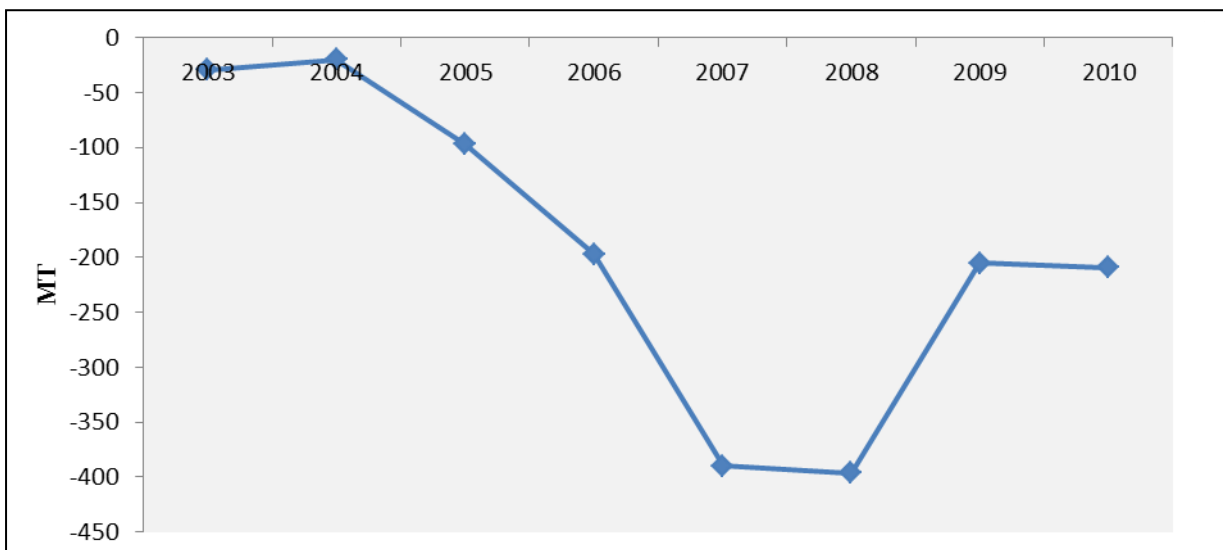
that there has been an increase in consumption of locally processed peanut butter leading to a reduction in imports and exports. Nevertheless, Zambia's net exports have remained in the negative although significantly declining (Figure 18).

Figure 17. Peanut Butter Exports and Imports 2003-2010



Source: FAOSTAT various years, 2003-2010.

Figure 18. Peanut Butter Net Exports 2003-2010



Source: Author's own calculation based on FAOSTAT various years, 2003-2010.

8. PATHWAYS FOR PUBLIC AND PRIVATE SECTOR PARTICIPATION

Throughout the groundnuts value chain, the farmers and the private sector play a key role in the development of the industry. There is great potential for private sector to participate in the enhancement of production and food security through the provision of ready markets for farmers. In addition, the private sector can be incentivised into establishing processing plants in the areas of production. Linkages between government, farmers, and private sector will nurture inclusive participation and growth that ensures sustainable food production and supply. These relations include farmers and researchers and/ or researchers and seed suppliers and/or assemblers and processors. Such symbiotic relationships will yield win-win outcomes where cheap raw materials will be readily available for processing plants and in turn, the much needed income and sustained food security for rural households in Eastern Province can be achieved. However, there is need to strengthen the interactions and coordination at all levels of the chain, both within and without the chain, for the value chain to function efficiently. This is where public investment becomes crucial, particularly in infrastructural development such as roads and market places.

At research and input supply levels, the private sector (especially the seed companies) in collaboration with ZARI, can jointly invest in the development and supply of hybrid seed varieties. The COMACO and EPFC models show that there is potential for out-grower schemes to increase the supply of improved seeds. With such schemes in place, repayments are negotiated in advance, further motivating farmers to produce and avoid unprofitable and unpredictable transactions with intermediaries. Feedback on yield vigour and other varietal traits of importance to the research and input companies can be channelled by these out grower schemes. Seed companies can also obtain the demand profile for groundnut seed and project production and distribution of the input. Agro-dealers can also participate effectively in input provision if government considers an electronic voucher (e-voucher) system in providing inputs to farmers.

Groundnuts production from planting to harvest to shelling is labour-intensive. So far, the private sector has been instrumental in the distribution of grain bags, shellers, scales, and calculators at harvest and marketing periods as a way to help farmers reduce labour hours. However, the current shelling technology has not been satisfactorily used by the farmers, given the high levels of breakages reported. Part of the solution is to intensify extension and training in the use of these shellers. In addition, using ADP for ripping at planting and for harvesting groundnuts using the modified plough would significantly save labour. Such labour-saving technologies can be promoted by the private sector through a credit scheme arrangement. As already alluded to, improving on yields through utilization of improved seed is another avenue the private sector can participate. Understanding varietal traits that are preferred by farmers is one step to engaging farmers into seed production and multiplication that will be effectively demanded.

At the assembly stage, farmers mainly experience markets that are not stable and tend to sell at below market prices. In other instances, there is wide spread transaction even before groundnuts are harvested. Due to the farmers' urgent need for cash, they tend to accept these upfront payments. Usually, the price in such arrangements is much below the actual market. Options for improving the selling price for small-scale farmers include group selling (bulking) which enables the farmers to effectively bargain for better prices. Second, farmers have an option to store the groundnuts until the prices are favourable that prices go up later in the marketing season. Also, credit provision to alleviate the urgent need for cash, is another option to reduce farmers total dependency on groundnuts sales for such cash needs.

Another opportunity for private sector investment is through aflatoxin mitigation. Currently, there is no capacity for aflatoxin testing to meet EU or South African-export standards. This demands a significant investment and an opportunity for private sector investment in collaboration with the EU and private and public research institutions. In addition, part of the subsidy disbursement to Food Reserve Agency (FRA) and the Farmer Input Support Program (FISP) can be earmarked for setting up such aflatoxin testing centres. Such investments will not only lead to increased market for raw groundnuts but also for processed peanut in the region and overseas.

Oils seed processing from groundnuts has not been fully exploited in Zambia. With the increased demand in oil seed consumption within the region, Zambia may stand to benefit from being a net exporter of groundnuts. This also provides great opportunities for private sector participation. In addition, technologies are developing in the province to utilize groundnuts as feed for chickens. Through such technologies, feed companies can deliberately earmark production of feed using groundnuts as protein ingredient. However, such deliberate moves must be complemented by government efforts in providing a regulatory framework for the industry.

9. CONCLUSION AND POLICY IMPLICATIONS

The groundnuts industry in Eastern Province is dominated by an increasing number of assemblers/traders that include localised large-scale buyers who purchase high volumes of groundnuts directly from the farmers for reselling in Lusaka, Congo DR, and Angola. In addition, buyers from Lusaka, Copperbelt Province, and Tanzania form other important output markets for groundnuts. Processors such as COMACO also tend to buy directly from the farmers. Thus, small-scale groundnut farmers in Eastern Province increasingly find themselves engaged in competitive, regionally integrated markets. This provides a significant opportunity to leverage groundnut production as a source of smallholder income generation leading to poverty reduction.

This high demand for groundnuts should trigger increased production. However, there are various impediments limiting groundnuts production in the province. First, the continuous recycling of groundnuts seed has resulted into a deterioration of yields. Even when farmers want to plant hybrid seed, the cost of the seed is above what most small scale farmers can afford. As such, scaling up out-grower schemes seems to be an effective strategy for seed provision in these areas. In addition, lack of adequate financing for groundnuts research limits the frequency of release of improved varieties. Increase demand generated through out-grower schemes linked to seed provision should encourage greater investment in seed development.

Second, despite increasingly competitive markets, pricing issues for groundnuts remains a concern for farmers. For most farmers, the prices offered by the buyers are not attractive enough to engage into more production by investing in high yielding varieties. As a result, there are a significant number of farmers who grow local and recycled groundnuts mainly for consumption and rarely participate in the markets. The study has shown that only 45% of the producers are currently participating in the market.

Third, in the last decade, the government has been providing subsidies on fertilizer and hybrid maize seed through FISP and market subsidies through the FRA. Consequently, most farmers allocate most of their limited land to maize production leaving only small areas for other crops such a groundnuts.

Lastly, high levels of aflatoxin limit the export of groundnuts. The high levels of aflatoxin in groundnuts also pose serious threats to human health. Currently, it is not known how much damage aflatoxin has caused among the consumers. At the time of the study, testing for aflatoxin was not available in the province. Thus, traders seeking to export to South Africa had to either take samples to ICRISAT in Malawi or ZARI headquarters in Lusaka. Investing in aflatoxin testing and detection centres as well as sensitizing farmers on appropriate methods of drying and storing will promote exports.

This study has identified many opportunities for private sector participation:

- Support the development of farmers' organizations to encourage bulking and coordination in negotiating prices. Farmer organizations also facilitate bulk selling which facilitated improved pricing.
- There is still great potential for value addition to groundnuts into peanut butter and other products. COMACO and to a lesser extent, the Chipata-based Malawian company RABS Processors, are the only companies in the districts processing groundnuts. It is evident, that demand for processed groundnuts is high especially by the local supermarkets.

- To improve the production of groundnuts in country, it is imperative that the FISP includes groundnuts seed. This way farmer will be able to plant hybrid seed, which produces higher yields. However, the FISP should adopt the e-voucher system to enable efficient delivery and effective participation of the private sector.
- Research into the impact of aflatoxin on exports and on human health is necessary to guide government on policy measures to reduce the levels.
- Overall, there is need for collaboration among key players along and outside the value chain if the chain is to function effectively. Importantly, Eastern Province already has in place a number of the necessary institutes to achieve a similar increase in production and exports as witnessed in Malawi. These include a functional farmers' organization EPFC, private sector investment through COMACO and other, and dedicated research institutions, including ZARI and now ICRISAT. Coordination between these actors can result in investment and strategies to increase productivity and improve quality.

**ANNEX 1. ORGANIZATIONS WORKING IN THE GROUNDNUTS
SECTOR IN ZAMBIA**

Organisation	Type of Support engaged in	Location
Msekera Research Institute	Variety research and support to seed certification	Eastern Province
Misamfu Research Institute	Variety research and support to seed certification	Northern Province
Zambia Agriculture Research Institute	Agricultural research and aflatoxin issues	Nationwide
Seed Control and Certification Institute	Seed certification and control	Nationwide
Seed companies	Possible seed multiplication and distribution	Eastern and Northern Provinces
Profit +	Farmer training, household food security, market access and Aflatoxin control	Eastern Province
FISP	FISP has been extended to cover groundnuts. This will create a major pull for private sector investments in inputs, processing and marketing	Nationwide
Dunavant	Groundnuts input supply and marketing. Possible out-grower development	Eastern Province
Cotton Association of Zambia (CAZ)	Farmer mobilisation into growing of groundnuts	
Musika	Support to out-grower development in groundnuts	Eastern Province
Zambia National Farmers Union	Support to the development of oilseed commodity association which includes groundnuts	Nationwide
IAPRI	Commodity research and policy development and also support to commodity association	Nationwide
World Vision	Seed distribution to small scale farmers	Eastern Province
Katopola Agriculture Engineering Services	Manufacturing of groundnuts shellers and lifters	Eastern Province
Groundnuts Industry Association of Zambia (GIAZ)	Groundnuts Commodity Association	Nationwide
COMACO	Groundnut out-grower and processor	Eastern Province
Jungle Beat	Groundnut out-grower and processor	Eastern Province
Kingdom Delicacy	Groundnut out-grower and processor	Eastern Province

Source: Stepman 2013.

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