SMALLHOLDER MARKET ACCESS: THE CASE OF GROUNDNUT SECTOR IN MALAWI

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ABSTRACT

This thesis focussed on assessing smallholder groundnut farmers and traders' access to markets through quality improvement and also, determine the socio-economic factors that influence groundnut farmers when deciding to adopt quality management techniques and the extent/or level of involvement. The following research questions were tested: whether Malawi smallholder groundnut farmers have poor or limited access to markets; whether smallholder farmers face unequal bargaining relations with traders due perhaps to lack of competition in trading channels; whether belonging to a farmer organisation provides a framework whereby the prospects of higher prices could lead to higher quality regulated by the association?

Qualitative analysis was used to map out the main processes, key actors and relationships within the various groundnut value chains. Price spread method was used to assess market efficiency in price for the various groundnut market channels. Finally, a Selective Tobit model was used to assess factors that influence smallholder farmers to adopt technologies on quality management and decide the extent of adoption.

The study results indicated that smallholder farmers manage to sell all their groundnuts brought to the market. This means that smallholder farmers do not really have problems accessing the markets. However, there is a limited availability of structured groundnut markets that offer premium price as an incentive for farmers to invest in quality management. Another important finding is that belonging to an organised farmer organisation enabled smallholder farmers to access better agricultural services such as research, extension and quality certified seed. However, it was not enough to persuade the farmers to venture into collective marketing. The results suggest that the provision of economic incentives such as premium prices persuaded farmers to engage in collective action and also invest in quality management. There is convergence of prices for less quality sensitive regional markets and quality sensitive EU markets. As such, exporters have no incentive to invest more in quality management targeting EU markets.

Selective Tobit model results showed that farmers value most profitability-related variables such as land allocated, structured markets and prices when deciding level of involvement in quality management. The study results also indicate that groundnut market in Malawi is efficient in price as demonstrated by the Market Efficiency Index of greater than one. Gross margin analysis also indicated that, on average, groundnuts producers have good returns to labour if compared to the current national minimum wage rate of US$1.2 per day.

DEDICATION

To my dearly beloved husband Teddie and children Joshua-Tanthwe, Victoria-Mzati and David-Linga

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LIST OF ACRONMYMS AND ABBREVIATIONS

ADMARC	Agricultural Development and Marketing Corporation
AfDB	African Development Bank
AHLCX	Auction Holdings Limited Commodity Exchange
AIDS	Acquired Immune Deficiency Syndrome
AMC	Association Management Centre
APIP	Agricultural Productivity Investment Programme
ARET	Agricultural Research and Extension Trust
ASSMAG	Association of Seed Marketing Action Group
ATCC	Agricultural Technology Clearing Committee
CDC	Centre for Disease Control
CGIAR	Consultative Group on International Agricultural Research
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Centre for Tropical Agriculture
COMTRADE	United Nations Commodity Trade Statistics Database
CP	Consumer Price
DARS	Department for Agricultural Research Services
DARTS	Department for Agriculture Research and Technical Services
DFID	Department for International Development
DRC	Democratic Republic of Congo
DRC	Domestic Resource Cost
ELISA	Enzyme Linked Immunosorbent Assay
EMS	Export Market Shares
EU	European Union
FAO	Food and Agriculture Organization
FAOSTATS	FAO Statistics
FCTC	Framework Convention on Tobacco Control
FGD	Focus Group Discussion
FGP	Farm Gate Price
FINCOP	Finance Cooperative
FISP	Farm Input Subsidy Programme
FO	Farmers Organization
FUM	Farmers Union of Malawi

GB	Great Britain
GDP	Gross Domestic Product
GM	Gross Margin
GMA	Gross Margin Analysis
GoM	Government of Malawi
Ha	Hectare
HH	Household
HIV	Human Immunodeficiency Virus
HPLC	High Performance Liquid Chromatography
IBs	Intermediate Buyers
ICRISAT	International Crops Research Institute for the Semi-Ari Tropics
IFAD	International Fund for Agricultural Development
IHS	Integrated Household Survey
IMF	International Monetary Fund
ITC	International Trade Centre
LUANAR	Lilongwe University of Agriculture and Natural Resources (LUANAR)
MAC	Marketing Action Committee
MACE	Malawi Agricultural Commodity Exchange
MAL	Maximum Allowable Levels
MASFA	Mchinji Association of Smallholder Farmers
MBS	Malawi Bureau of Standards
MEI	Market Efficiency Index
MGDS	Malawi Growth and Development Strategy
MK	Malawi Kwacha
MLE	Maximum Likelihood Estimator
MoAFS	Ministry of Agriculture and Food Security
MoH	Ministry of Health
MPTF	Maize Productivity Task Force
Mt	Metric Ton
NARS	National Agricultural Research Services
NASFAM	National Smallholder Farmers' Association of Malawi
NES	National Export Strategy
NGO	Non-Governmental Organization
NPf	Net Farmers Price

NSCM	National Seed Company of Malawi
NSO	National Statistics Office
NTB	Non-Tariff Barriers
OIBM	Opportunity International Bank of Malawi
OLS	Ordinary Least Squares
ppb	parts per billion
PPECB	Perishable Products for Export Control Board
PS	Producer Share
QDS	Quality Declared Seed
QMS	Quality Management System
RBM	Reserve Bank of Malawi
RPO	Rural Producer Organization
RSA	Republic of South Africa
RUTF	Ready to Use Therapeutic Food
SACA	Smallholder Agriculture Credit Administration
SADC	Southern African Development Community
SAFEX	South Africa Futures Exchange
SANSOR	South African National Seed Organization
SAP	Structural Adjustment Programme
SGS	Societe Generale de Surveillance
SP	Selling Price
SPS	Sanitary and Phytosanitary Standards
SSA	Sub Saharan Africa
SSU	Seed Services Unit
STAM	Seed Traders Association of Malawi
TIP	Targeted Input Programme
TMC	Total Marketing Costs
TMC	Total Marketing Costs
TMM	Total Marketing Margin
TOSCA	Tanzania Official Seed Certification System Agency
TS	Trader Surplus
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund

UNIDO	United Nations Industrial Development Organisation
US$	US Dollar
USA	United States of America
USAID	US Agency for International Development
VCA	Value Chain Analysis
WHO	World Health Organisation

CHAPTER 1.0

INTRODUCTION AND STATEMENT OF THE PROBLEM

There is some rich empirical evidence suggesting that agriculture-led growth offers a powerful vehicle for broad-based poverty reduction (Gollin, Parente and Rogerson, 2002; Diao *et al*., 2007; Christiansen, Demery and Kuhn, 2010; de Janvry and Sadoulet, 2010). Economic growth experienced in the agricultural sector could be a catalyst for national output growth through its effect on rural incomes and provision of resources for transformation into an industrialized economy (Awokuse, 2009). Agriculture's links to non-farm sectors generate considerable employment, income, and growth in the rest of the economy.

Ellis (2013) has argued that growth and poverty reduction are distinct processes and it is possible to have high growth with little poverty reduction. The author further argued that for agriculture to be relied upon as lead sector for national economic growth, its size within the economy must be large and its growth rate superior to that of other economic sectors. These conditions will propel purchasing power to rise and stimulate growth in other economic sectors. This thesis focused on smallholder agriculture in Malawi as a case study. Lea and Hanmer (2009) indicated that growth in Malawi is dominated by agriculture, accounting for nearly three quarters of all economic growth between 1995 and 2003. However, recently economic growth has also been through an increasing contribution from the domestic services.

Agro-based economies in Africa can take advantage of agricultural sector's unique advantage and promote agriculture that delivers jobs and reduces poverty. Malawi, for example, has 85% of its population living in rural areas, of which 85% depends on agriculture for livelihoods and about 85% of its labour force is engaged in agriculture (NSO, 2012). This puts smallholder agriculture in Malawi as one of the most important pathways for growth transmission that reduces poverty as it supports a significant proportion of the population. Smallholder agriculture in most of the small agro-based economies in Africa, including Malawi, is labour-intensive, generating employment and incomes for poor households.

However, food security takes prominence in public policy of most small African agro-based economies such as Malawi (Lea and Hannmer, 2009). Malawi developed a Farm Input Subsidy Programme (FISP) as its flagship programme for agricultural growth, food security and poverty reduction. This programme provides affordable fertiliser and quality seeds to 1.6 million poor smallholder farmers to boost agricultural productivity. Chirwa and Dorward (2013) analysed the impact of the FISP and found that one of the economy-wide effects of this programme is its influence on rural wages relative to maize prices. According to this study, the real prices of maize have declined and rural wages increased during the FISP period leading to increased rural household income.

Also, there is evidence indicating that increased maize productivity and harvest has had a positive impact on GDP (Lea and Hanmer, 2009; Dorward and Chirwa 2013). However, in the same study Lea and Hanmer found a low correlation between maize harvest and GDP implying that although maize harvest is central to welfare and contributes to Malawi's GDP, it does not dominate the dynamics of growth. One reason given by the authors for this limited influence on growth is that the majority of smallholders in Malawi are subsistence farmers and therefore consume high proportion of the output. Only minimal surplus maize reaches the market. Thus although this production increases GDP by the amount produced, its multiplier effect is limited. The other reason is the low net profitability of low maize production (also low valued crop) relative to high fertilizer prices. This suggests that high value crops with high market potential to create more multiplier effects for the rural economy such as groundnuts would unleash growth that is poverty reducing.

Evidence from Malawi, and most likely for other small agro-based economies in Africa, is that agricultural exports are and continue to be the primary driver of the economy (Lea 2009; Malawi Economic Memorandum 2010; Binswanger *et al*., 2010). Exports create economic growth through their direct revenue and the on-going effect of expenditure of this income elsewhere in the domestic economy. There is evidence that shows strong multiplier effects of export revenue in Malawi. Because of the large numbers of smallholders growing high valued crops for overseas markets such as tobacco, tea and sugarcane, and the dependence of exporters on urban services[1], the export sector transmits

[1] Such as transport, communications and finance.

growth into the rural and urban economies. One additional Kwacha earned in exports adds nearly two Kwacha to GDP (Lea and Hanmer, 2009).

Despite the low economic growth and GDP per capita in Malawi, the extent to which this low growth contributes towards poverty reduction is good. As demonstrated in Figure 1.1, Malawi has a slightly lower $1.25 poverty headcount for its extremely low level of GDP per capita compared to Tanzania, Rwanda, and Zambia all with much higher GDP per capita. Malawi's economic growth is derived from a narrow export base, with heavy reliance on tobacco exports which contribute more than 60% of the total exports revenue (Lea and Hanmer, 2009). Burley tobacco accounts for 80% of Malawi's tobacco exports, of which 80% is produced by smallholder farmers on their small plots. This seems to support argument by Ellis, F. (2013) that a given rate of growth achieved through productivity increases in small farm agriculture leads to greater poverty reduction than the same rate of growth in large commercial farms or other sectors of the economy.

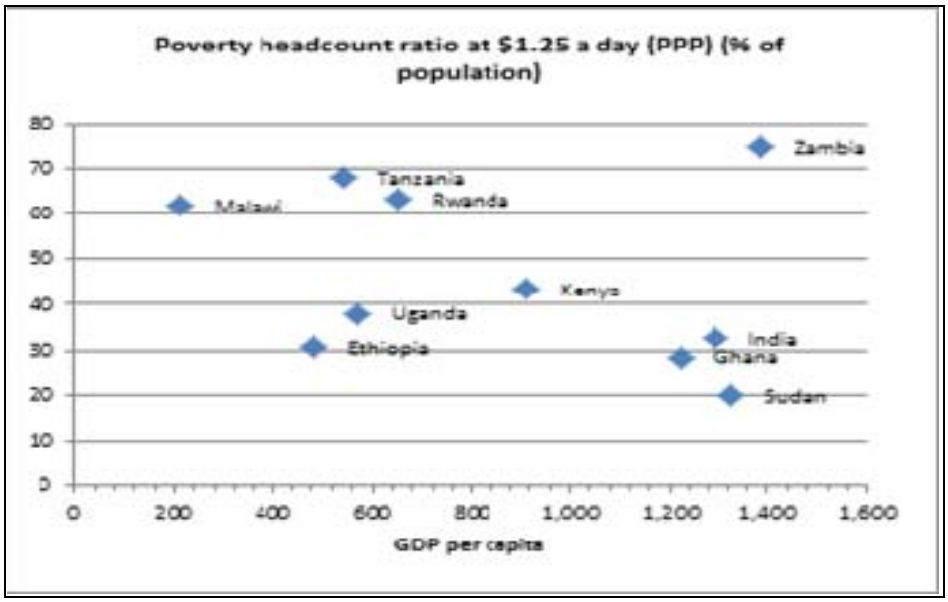
- 

Figure 1.1: Poverty headcount ratio for Malawi compared with other countries
Source: World Development Indicators, 2010

Small economies like Malawi that rely on agriculture need to increase land and labour productivity. Therefore there is need to encourage adoption of modern technologies and pathways to keep yields rising over time; substitute lower for higher valued crops; correct market failures and promote market access (Ellis, 2013).

Government and economic policy makers in Malawi, a small agro-based economy, are preoccupied with a strategic question of export diversification. This will help the country to cushion against the risks of relying on few exports. Malawi has a comparative advantage in production of a number of crops that can be promoted alongside tobacco to broaden and diversify the export base. Allison and Ellis (2001) argue that at the household level, diversification reduces the risk of livelihood failure.

In this vein, the Government of Malawi recently unveiled the country's National Export Strategy (NES), which alongside other potential sectors like tourism and mining, has identified and prioritised the promotion of the oil seeds cluster for exports. Within the oil seeds cluster, groundnut is identified as one of the high valued crops with high export potential (NES, 2012). A number of studies have indicated that Malawi has a comparative advantage in the production of groundnuts as demonstrated by the Domestic Cost Ratios (DRCs) ranging between 0.19 and 0.24[2] (GoM, 2005, Nakhumwa 1997). In addition, groundnut is well suited to a lot of agro-ecological zones in the country, including areas where tobacco is widely grown. Groundnut is the most important groundnut grain legume grown in Malawi in terms of total production, as well as the area under production (Chiyembekeza *et al*., 1998; Minde *et al*., 2008; NSO 2012). It accounts for 28% of Malawi's total legume production and covers 27% of total legume land (Simtowe *et al.,* 2009).

Unlike other high valued cash crops grown by smallholder farmers such as tobacco and paprika, groundnuts do not require a lot of inputs for minimum production. As such, smallholder farmers including women who are usually poorly resourced have historically been key producers of groundnuts, therefore gaining the necessary experience in the growing of this crop. More involvement of vulnerable groups like women in production and marketing of this high value crop offer great opportunity for poverty reduction. Particularly if proper incentives are put in place to help these smallholder farmers increase productivity, improve adherence to quality and standards demanded by reliable domestic and international export markets. Ellis *et al* (2003) argue that well-functioning markets and

[2] DRC <1 means a country has a comparative advantage i.e., less domestic resources are used in production to generate or earn a US$1 or more of revenue. DRC> 1 means a country has no comparative advantage in producing that crop as it uses more than US$1 of domestic resource used in production to earn US$1 of revenue (GoM, 2005; Nakhumwa 1997).

flourishing trade have potential to contribute to an increase in money circulating in rural areas providing households wider opportunities to construct pathways out of poverty.

Declining dominance of China as global supplier of groundnuts is an opportunity for small groundnut producers like Malawi. China is now struggling to satisfy its ever-growing domestic groundnut demand (Maftei, 1999). Increased prospects for groundnut to become one of the priority export diversification crops is also based on its previous performance record. Groundnuts ranked second to tobacco as the country's foreign exchange earner before Malawi lost its world market share in the late 1980s due to a number of problems including the country's failure to comply with the stringent EU Aflatoxin requirements (Babu *et al*., 1994; Simtowe *et al*., 2009; Monyo *et al*., 2010). Aflatoxin is the natural carcinogenic substance produced by *Aspergillus flavus* and *A. parasiticus* in several crops, including groundnut and maize, grown and stored in warm and humid climatic conditions (Williams *et al*., 2004; Gong *et al*., 2002; ICRISAT 2009). Of concern are Aflatoxins B1, B2, G1 and G2 which are usually found together in foods (Otsuki, *et al*., 2001) with Aflatoxin B1 being predominant and the most toxic (Wu, 2013). Moisture, temperature and composition of the substrate are the chief factors affecting fungal growth and toxin production. In their study to assess the occurrence and distribution of Aflatoxin in Malawi, Monyo *et al*. (2012) reported that Aflatoxin is a significant problem both in local markets, as well as shops and supermarkets with the results being worse in groundnuts than in maize samples.

Pre-harvest infection is associated with drought stress (three or more weeks of drought during pod formation/ end of season drought) making it difficult to manage without irrigation (ICRISAT, 2009; Monyo *et al*., 2010). High moisture and relative humidity (83±1% or higher at 30ºC varying with substrate and length of incubation period) and high temperature (optimum temperatures between 25-35ºC) leading to poor drying and storage are the main causes of post-harvest contamination (Ramos *et al*., 1998; FAO, 2001; Monyo *et al*., 2010). Groundnut pods are highly susceptible to Aflatoxin contamination due to the soil-borne nature of the fungi. Groundnut cultivated under rain-fed conditions is frequently exposed to terminal drought, which exacerbates contamination. Since Aflatoxin contamination occurs at different stages of crop production, drying, storage and

transportation to the market (Babu, *et al.*, 1994) prevention throughout the value chain is necessary.

Nearly 80% of groundnut is produced in South and Southeast Asia, and Sub-Saharan Africa (SSA), mainly by the moderately and extremely vulnerable poor. Studies have shown that about 20 to 25% of the groundnut produced in Asia and SSA contains Aflatoxin beyond statutory limits, thereby exposing people to potentially dangerous levels of Aflatoxin. This has contributed to 70% reduction in groundnut exports from Asia and SSA, with significant impacts on livelihoods (Diop *et al*., 2004).

The Aflatoxin problem coincided with the Structural Adjustment Programme (SAP) in the early 1990s, when for the first time the Government of Malawi opened up its highly restricted tobacco industry to allow also smallholder farmers grow and directly market the high value burley tobacco at the auction floors. This resulted in a lot of smallholder farmers in the major groundnut producing areas to shift their scarce resources, labour and land, towards burley tobacco production. However, to revive groundnut as a strategic export crop for Malawi will require a full understanding of past failures that led to the collapse of exports. It is important to understand how promotion of groundnuts as an export crop fits with the current capabilities of all key players in the value chain to comply with the necessary domestic and international quality standards. Also, assess the sensitivity of the different markets (domestic, regional and EU) to quality and standards, especially Aflatoxin contamination.

There is often an unwarranted assumption that the mere existence of a potential high value market will translate fairly effortlessly into a set of marketing arrangements and enforceable quality regulations that will ensure future quality supplies for the export market. But may not be the case always. Therefore, the overall purpose of this thesis is to critically examine this assumption in detail, as seen from the view point of smallholder farmers, farmer organisations and traders operating in the Malawi groundnut market.

This thesis further examines the question of adoption of quality management technologies among the smallholder groundnuts farmers. Despite existing knowledge and understanding of some of the quality and standard requirements, such as field management and post-harvest handling techniques, there is still low adoption of these technologies among

smallholder farmers in Malawi (Monyo *et al*., 2010; Emmott, 2012). The premise in this thesis is that policies to promote adoption of technologies among smallholder farmers have often times been misinformed because smallholder farmers' decision making process has not been understood. Most of the previous studies on adoption of technologies among smallholder farmers have mainly focused on the factors that influence the decision of producers to adopt but often times ignored the factors that influence farmers when deciding on how much to invest in the technology or the extent of adoption. This thesis, therefore, simulates the smallholder farmers' decision-making process; first, when deciding to adopt a technology and then, the extent of involvement or extent of adoption.

1.1 Research Objectives and Questions

The overall objective of this thesis is to assess the smallholder groundnut farmers and traders' access to markets through quality improvement and also, determine the socio-economic factors that influence groundnut farmers when deciding to adopt quality management techniques and the extent/or level of involvement.

1.1.1 In order to address the above, the thesis set out the following research questions

- Do Malawi smallholder groundnut farmers have poor or limited access to markets, such that opening up new export potential is essential to expand the market and allow the output to increase?
- Do smallholder farmers face unequal bargaining relations with traders due perhaps to lack of competition in trading channels
- What incentives does the market currently provide to raise groundnut quality, particularly in relation to reducing Aflatoxin contamination?
- Does belonging to a farmer organisation provide framework whereby the prospects of higher prices could lead to higher quality regulated by the association?
- Does contract farming or other structured markets offer an alternative means of improving farmer returns and increasing groundnut quality?
- Which are the key socio-economic factors that influence farmers' when deciding to adopt quality management practices/technologies and the extent of such investment/or level of involvement.

1.2 Structure of the thesis

The rest of this thesis is organized in chapters as follows: Chapter 2 provides the literature review and conceptual framework used in this study. Chapter 3 provides a background on groundnut in Malawi with focus on groundnut marketing, quality and seed systems. The research methods used in this study are discussed in Chapter 4. Chapter 5 looks at socio-economic characteristics of smallholder groundnut farmers in Mchinji District while Chapter 6 presents the groundnut value chain analysis. An economic analysis of smallholder groundnut production and marketing is presented in Chapter 7 followed by factors influencing investment in groundnut quality management by smallholder farmers in Malawi in Chapter 8. A general discussion of key results of the study is presented in Chapter 9. Chapter 10 provides conclusions and suggested areas for further research.

CHAPTER 2

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

Chapter one presented the statement of the problem, overall objectives and research questions. Chapter two reviews some approaches that have been used in value chain analyses and other interventions that have been promoted to increase market access by smallholder farmers and traders. It also presents the methods that have been used to assess factors that influence adoption and extent of adoption of technologies by smallholder farmers, with focus on quality management in this case. The chapter also presents a conceptual framework for this study. The rest of the chapter is organized in sections as follows; section two focuses on methods used in assessing market access; section three looks at the value chain approach while section four presents methods that have been used to study adoption of technologies, section five presents the conceptual framework used in this study and finally section six concludes the chapter.

2.2 Market Access and Linkages with Market Efficiency

Smallholder farmers' ability to participate in markets is closely linked to their opportunities to raise incomes (Markelova *et al*., 2009). However, smallholder farmer participation in markets can be limited by a number of factors. These include in availability of real time market information and poor technologies, credit and distortions in input and output markets (Markelova *et al*., 2009; Narrod *et al*., 2009; Poulton *et al*., 2010). The small nature of smallholder production contributes to the challenges faced and poor coordination of the value chains also limits the interactions between smallholder farmers and other actors in the value chain (Poulton *et al*., 2006).

Considering the above, farmer organizations have been promoted in an endeavour to address some constraints related to the numerous small production units and increasing smallholder participation in and benefits from markets (Bienabe and Sautier, 2005; Bernard and Spielman, 2009; Markelova *et al*., 2009; Poulton *et al*., 2010). Though smallholder farmers are at times competitive, they fail to exploit economies of scale and

incur high transaction costs along the marketing chain. This is exacerbated by their inability to engage in storage and other value addition activities. Farmer organization is considered key in ensuring farmer coordination and instrumental to address the problem of intra-seasonal price variations which are common in a liberalized market. Important also is the power and negotiation capacity of smallholder farmers in their relationship with other actors downstream.

Some evidence of successful farmer organizations in terms of improving smallholder farmer market access exist (Kaganzi *et al*., 2009; Markelova *et al*., 2009; Narrod *et al*., 2009). However, the same studies have also shown that farmer organization does not always lead to better performance in terms of marketing access despite the potential. Poor and low income countries still face some serious challenges to access reliable markets. This suggests the need to know what FOs can and cannot do considering the nature of commodities, the marketing systems in place and the market itself. Evidence suggests that market access conditions are diverse, multidimensional and also vary with time (Barrett, 2008; Jayne *et al*., 2010; Chamberlin and Jayne, 2013; Sitko and Jayne, 2014). Hence different methods have been used to assess market access in previous studies depending on the purpose of the study.

2.2.1 Use of Market Shares to Assess Market Access

Market shares have been used as one of the methods to assess market access (Michalopoulos, 1999; Mayer and Zignango, 2004; Latruffe, 2010). In this case time series analyses have been used to assess trade pattern. For example export market shares (EMS) were calculated for several dairy products in Germany for periods 1983-1993 and compared to the other countries in the EU (Latruffe, 2010). The study revealed that Germany had lost international market shares in terms of quantities and values. However, if such an approach is not supported by a strong econometrics and modelling background to link and pin down factors influencing the trends in volumes of trade, such analyses fail to identify constraints and potential areas for intervention. Competitiveness is a key factor that need to be considered alongside other technical and non-technical market requirements that affect market access. One of the limitations of using market shares is that

depending on how the shares are determined, the reported figures sometimes omit some key transactions (Mayer and Zignago, 2004).

2.2.2 Use of the Gravity Model to Assess Market Access

Gravity model has also been used to assess market access based on the border effects which requires bilateral data on production and trade for a given commodity (Mayer and Zignago, 2004). This method considers the flow of trade within the country and among different trading countries. Total volume of trade taking place in a country with no inflows of a commodity can be measured by taking the total production for a given commodity less the total exports. The balance is assumed to be used locally. One of the advantages of using the border effect methodology is the possibility to reveal trade challenges associated with national borders as they impact on trade. This method also enhances understanding of the effects of trade barriers that are imposed by different countries. The authors used the gravity model to assess trade patterns between developed and developing countries. They found that although tariffs have an influence on the patterns of trade, they are not an important barrier for southern exports to the northern countries.

However, assessment of market access based on trade flows requires benchmarking of trade patterns. This is quite a challenge for countries where data capturing is weak and inconsistent. Further, borders for poor countries like Malawi are quite porous resulting in substantial informal cross-border trade and therefore huge unaccounted trade volumes (Minde and Nakhumwa, 1998). The effects of non-tariff barriers (NTB) to trade such as border formalities and sanitary and phytosanitary measures further limits the use of this method.

2.2.3 Econometric Methods to Assess Market Access

Other studies have used econometric analyses to assess market access. For example, Mather *el al*. (2013) focusing on smallholder maize marketing in eastern and southern Africa, used an econometric analysis and found that improved farm productivity and land enhance market access. Amroul *et al.* (2013) used a Logit model to assess the impact of commodity development projects on market access. They made an assumption in this

model that smallholder farmers make their decisions based on utility maximization. The probability of a smallholder farmer accessing a market was assumed to be equal to the probability that utility derived by non-participation was less than that derived by participating. The study results indicated that household characteristics such as wealth, education of household head, age of household head and services provided particularly extension, training and access to credit improved market access for the smallholder farmers.

In another study, Magingxa *et al*. (2009) used a Logit model to assess factors influencing market access for smallholder irrigators in South Africa. Market access was measured based on whether what was meant for sale was sold. Physical access to the market, farmer skills and nature of access to the market was found to significantly influence market access.

Literature on econometric analyses to determine levels of market access also include use of co-integration approach. Much of the literature on cereal market performance has focussed on market efficiency, measured in terms of spatial market integration. Literature on spatial market integration explores the speed and extent to which price changes in one market effect price changes in another market, as well as the speed of adjustment towards long-run price relationships (Goletti and Babu 1994; Rashid and Minot, 2010). Various studies in Malawi have used co-integration method to determine cereal market performance based on market efficiency (Goletti and Babu, 1994; Ellis and Manda, 2012). Analysis of spatial and temporal price transmission provides important insights into markets but do not address concerns of how far smallholder farmers must go looking for markets, choice of who to sell to and price variations within the same area (Sitko and Jayne, 2014).

Overall, indicators for market access vary across studies and are rarely discussed in terms of marketing channels (Chamberlin and Jayne, 2013). The authors working on smallholder market access in Kenya found that indicators of market access changed based on the type of market channel used. It was also observed in the same study that improvements in markets access were more influenced by behaviour of the marketing agents than improvements in infrastructure. The authors argue that improved efficiency of local markets is an important factor to consider in a quest to achieve improved market access and sustained market participation (Chamberlin and Jayne, 2013).

In their study on maize marketing system in Malawi, Jayne *et al*. (2010) found that both remote and accessible rural areas had a considerable number of traders operating and seeking to buy from smallholder farmers. Yet smallholder farmers indicated limited market access as one of the challenges they face. This suggests that smallholder farmers value the actual market channels that are available and the levels of profitability derived from these channels, i.e., both market and price characteristics. However, literature on the comparison of the different market channels available for smallholder farmers, conditions for accessing the markets and the margins involved is still limited.

2.2.4 Costs and Benefit Approaches

Costs of production have been used to assess competitiveness of a particular commodity (Ahearn *et al*., 1990; Cesaro *et al*., 2008; Gallagher *et al*., 2006 in Latruffe, 2010). Based on this, a country with lower production costs for a specific good has a competitive advantage in the production of that good. However, in addition to cost of production, marketing costs need to be considered in order to assess competitiveness (Sharples, 1990). Total costs as a percentage of the value of total output; margin over costs per hectare and margin over costs per given volume of a specified crop, have also been used to measure competitiveness of cereal production in Denmark (Thorne, 2005). When calculating cost of production, the unit of measurement and whether family costs are included or not influence a country's or household's position.

Another measure of competitiveness is 'profit' which is related to costs of production and revenue generated from a particular commodity. This refers to the difference between revenue and costs (gross margin) or the ratio between cost and revenue. Positive profits indicate that a firm is able to maintain its market share showing competitive advantage (Kennedy *et al*., 1997). Several studies have been done using profitability measures to assess competitiveness (Viaene and Gellynck (1998); Van Berkum (2009). However, gross margin analyses alone do not easily reveal key individual factors that may hinder or promote competitiveness. It is difficult to capture contribution of interactions from key variables and other non-monetary influences (institutions) when using the common

methods for measuring profitability such as gross margin and cost -benefit ratios. As such other measures would be required to complement this analysis.

2.3 Value Chain Approach to Assess Market Access

The value chain is a description of activities involved in the production of a commodity from inputs up to the consumer. Among other things the value chain analysis (VCA) approach helps to understand the market in terms of who the players are, how they operate, what is required to access these markets and margins associated with the channels. The VCA restricts itself to a single marketing channel which can be within and outside the national borders but several chains can be studied. Over time, VCA started incorporating governance issues between and among actors in the value chain (Kaplinsky and Morris, 2001; Gibbon *et al*., 2008).

Where it has been used, for example VCA for Kenya Cotton-garment and coffee industry gave important information on the dependencies that exist and the areas that required intervention (Ingram, 2005). In Nigeria, VCA was conducted in the textiles, shrimp, leather, and cassava industries. The analyses revealed the need for reduction in policy uncertainty for investors, provision of more efficient services, development of the financial sector to increase access to credit and more focus on growth drivers in high potential industries to which the government and private sector needed to respond (El-Wahab, 2005). In Malawi, a quantitative value chain analysis revealed that competiveness for tobacco, rice, maize and cotton is reduced by low productivity, high input and transport costs (Tchale and Keyser, 2010). With its capacity to identify core rents and barriers to entry in specific value chains, VCA enables targeted interventions in specific sectors. In other words, VCA can inform formulation of strategies aimed at addressing multiple constraints. The interdisciplinary approach of VCA which includes economics, marketing, logistics and organizational behaviours is also useful when trying to address commercial sustainability.

Value chains recognise that the firms linking suppliers to producers and intermediaries to the customer at the end of the chain are the critical determinants of trade regardless of where they are (Mitchell, *et al*., 2009). This suggests that trade occurs in a more coordinated way (Gibbon, 2001). Global markets are increasingly demanding product

varieties and quality with specified standards which need to be incorporated in the various stages of the chain. This suggests that coordination in a given chain is a key aspect in the chain competitiveness (Gereffi *et al*., 2005). In this case, value chain analysis can contribute towards the understanding of how smallholder groundnut farmers can participate and benefit from domestic, regional and international trade and also be able to identify the chain that is most rewarding for them. In addition to its focus on markets, commercial viability and development, economic viability and sustainability can also be tackled using the VCA (Mitchell, *et al*., 2009).

2.3.1 Components of value chain analysis

The main components in VCA include value chain mapping, analysis of costs and profits, analysis of governance structures and institutional framework surrounding the chain and upgrading opportunities (Gereffi, 1994; Kaplinsky and Morris, 2001; Hillocks, 2010; Rich *et al*., 2011). Through mapping of the value chain, constraints and possible solutions at different levels of the chain can be identified. Drawing from the sub-sector mapping techniques, value chain mapping is done to depict structures and functions and illustrate relationships among actors in a chain (Kula *et al.*, 2006). Networks in the chain are depicted to get an understanding of connections between actors and processes and demonstrate interdependencies between them. This means that the structure and dynamic behaviour of firms or actors participating in production, distribution and marketing of a commodity in a given chain influences its performance. The ability to segment the value chains allows for a better understanding of constraints and opportunities within each segment and the context within which they operate.

Elements that constitute a value chain include end markets, business and enabling environment, vertical linkages, horizontal linkages and supporting services (Fig. 2.1). End-markets or buyers determine price, quality, quantity and time for a specified product, hence making them a key source of demand information and also provide an incentive for change along the chain.

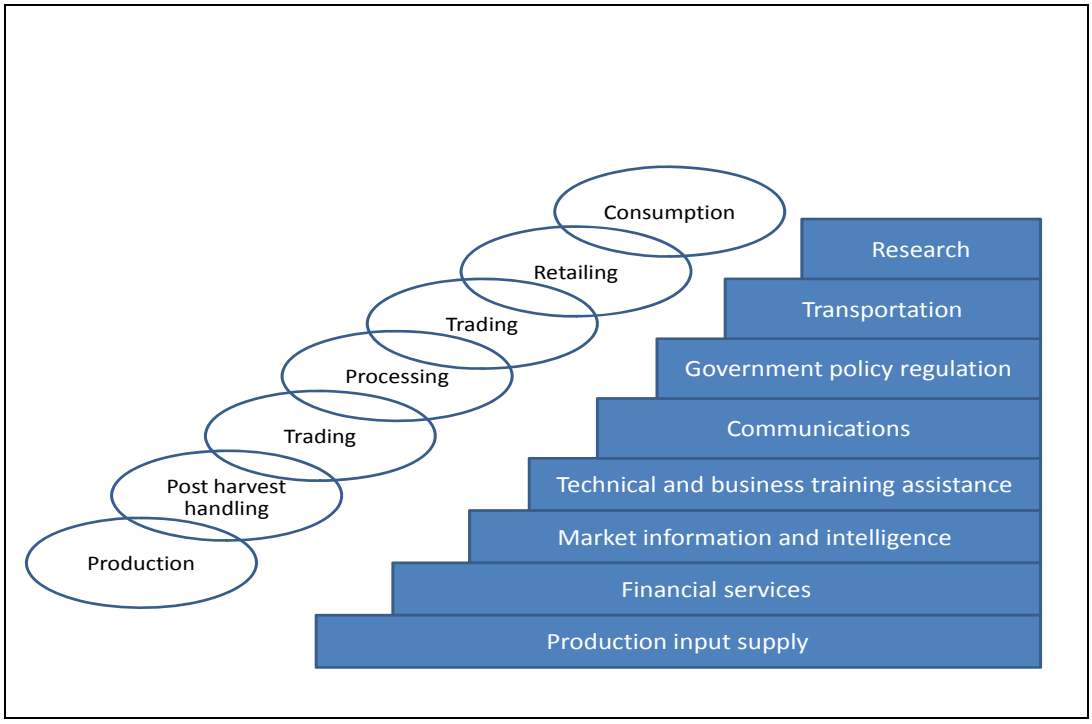


Figure 2.1: Links in the market chain and business support services
(Source: A Market Facilitator's Guide to Participatory Agro enterprise Development)

In value chain analysis, key activities and services required to bring a product from conception to end markets are examined (Kaplinsky and Morris, 2001; Kula *et al*., 2006). This helps to inform interventions aimed at increasing competitiveness which significantly influences market access. The emphasis on the interconnectedness and sequential nature of economic activity, in which each link adds value in a value chain, makes VCA a potentially important tool for analyzing and informing market access decisions. For an agribusiness to impact on its profitability, it should not only focus on the firms nearest to it but the entire chain (Gloy, 2005). Identification of the final destination of a product after production is especially important for farmers as it would influence their crop production and management decisions, and also options for upgrading, for instance in the case of quality standards. This entails asking how and in what ways the product reaches the consumer. This is important as among others it can enable the producers to identify the major channels or types of products that consumers want. For example, producers can begin to look at ways of differentiating their products to remain competitive in a chain and also identify markets that play to their strengths. VCA is a practical approach towards supporting specified target groups to access new value chains or improve their position within a particular chain (Mitchell *et al*., 2009) making it a practical way to understanding the interactions of people with markets at different levels.

2.3.2 Value chain governance

Governance is a description of the dynamic distribution of power, learning and benefits among players in the chain. Chain governance refers to inter-firm relationships and institutional mechanisms through which non-market co-ordination of activities in the chain is achieved (Humphrey and Schmitz, 2000). Governance issues arise whenever some actors work, or activities depend on parameters set by others which necessitate information transmission and enforcement of compliance. This has to do with the sharing of information and systematic standards promoted by the "governing" entity in a value chain.

Buyer driven chains are mostly found in generally more labour-intensive sectors, where market information, product design, international brand names and marketing/advertising costs (high order factors) set the entry barriers for would-be lead firms (Gibbon and Ponte, 2005). In developing countries, buyer driven chains are common in the agricultural sector. Different types of players can be in the role of a buyer in a buyer driven chain. These include retailers, branded marketers, processors and international traders. A limited number of buyers govern chains into which producers can feed, making the analysis of value chain governance important (Humphrey and Schmitz, 2000). For smallholder farmers, knowledge of the form of governance is important as it helps to assess opportunities for upgrading and market access.

Understanding the chain's governance also helps to understand the distribution of gains along the chain. This means examination of economic relationships that govern transactions at different stages in the value chain is important. These relationships could either be market relationship (arm's length transactions); balanced relationships, direct relationship or hierarchical relationship. These relationships are crucial as they can make price discovery difficult and can limit access to some value chains. With globalization, many retailers and manufacturers of branded products are developing networks of preferred suppliers who must qualify or meet certain specified standards to participate. Increasingly, the number of preferred suppliers is reducing meaning that smallholder farmers need to strategically position themselves if they are to participate in global value chains (Gloy, 2005).

2.3.3 Upgrading in value chains

Upgrading offers one of the viable options to respond to competition (Kaplinsky, 2000; Kaplinsky and Morris, 2001) and influences market access. Upgrading refers to technological, institutional innovation or market capabilities that increase competitiveness for a specific group. This might entail accessing viable value chains or improving on current position in existing value chains. Traditionally, upgrading can occur through processes, products, functions or movements to different chains (Humphrey and Schmitz, 2000; Kaplinsky and Morris, 2001; Schmitz, 2005). This implies that there is a possibility for producers in developing countries to move up the value chain (Gibbon and Ponte, 2005). However, upgrading in the agricultural sector may have additional categories. In addition to the four forms of upgrading mentioned above, horizontal coordination, vertical coordination and upgrading of the enabling environment also feature in the agricultural sector (Mitchell *et al*., 2009).

The process of organization in the production and processing units into a collective structure e.g., farmer organization is referred to as horizontal coordination. Some studies have found that this type of coordination allows producers to achieve economies of scale and reduce transaction costs (Kula *et al*., 2006; Markelova *et al*., 2009; Kaganzi *et al*., 2009). It is argued in this thesis that smallholder farmers risk being excluded from the competitive global groundnut market unless they strengthen the horizontal coordination by belonging to a farmer membership organization as part of upgrading. This would facilitate their participation in a competitive chain. Horizontal coordination is the first step in a series of interventions that can be implemented to ensure market access for smallholder farmers. The focus from spot transactions to long term relationships such as contract farming is referred to as vertical coordination. This suggests that vertical as well as horizontal linkages are critical in a value chain. In addition, vertical linkages facilitate the delivery of key services extension and research (transfer of information and skills) and other modern technologies such as quality seeds and inorganic fertilisers.

Actors in a particular chain have to cooperate to achieve systemic competitiveness. However, in most cases producers do not look beyond the individual buyers that deal directly with them and what happens to the product before it gets to the point of final consumption. This knowledge would help producers to understand internal and external

steps upon which their activities depend, and how they can improve their competitiveness by capturing more effectively those steps associated with the greatest value added (Tchale and Keyser, 2010). In other words, VCA shows the build-up of costs and allows for a disaggregating of costs up and down the supply chain enabling the key market-and-policy based impediments to be identified.

2.3.4 VCA and marketing margin analysis

VCA also allows for the analysis of margins for different players. Marketing margin is the difference between farm value and retail price. The marketing margin represents payments for assembling, processing, transporting, and retailing charges added to farm products. These are analyzed based on the data obtained on prices at different stages of the chain. Marketing inputs are the cost of providing marketing services while marketing outputs refers to the value added to the commodity as it passes through the marketing system. Market performance is assessed through analysis of marketing margins, level of profits, and marketing costs (including costs of transport, handling, marketing charges, assembling, processing and distribution).

Marketing costs are the costs incurred by various market intermediaries from the time when the commodity leaves the farm until it reaches the consumers. Major marketing costs include grading, packing, loading and offloading, transportation, commissions and market taxes. Distance between production and consumption markets, condition of roads, seasonality, perishability, packaging, storage and processing are some of the factors that influence marketing costs (Gangwar1 *et al,* 2007).

In addition to marketing margin analysis, the VCA also allows for assessment of market performance using the price efficiency based on price spread method. Price spread refers to the difference between price paid by the consumer and price received by the producer for an equivalent quantity of the product (Gadre *et. al*., 2002). The price spread consists of marketing costs and margins of the intermediaries, which ultimately determine the overall effectiveness of the marketing system. The pricing efficiency concept is on premise that prices which do not reflect costs of marketing services are indications of functional deficiencies (FAO 2014). Price efficiency is calculated using marketing efficiency indices

for the main marketing channels identified for smallholder groundnut farmers. Marketing Efficiency Index (MEI) was computed for each marketing channel for groundnuts to assess the efficiency in price of the individual channels. Calculated marketing efficiency indices greater than 1.0 reflect an efficient marketing system (Acharya and Agrawal, 2001; Murthy *et al.,* 2007; Gangwar1 *et al* 2007).

2.3.5 Limitations of VCA and proposed solutions

A lot of studies on VCA either focus on qualitative or quantitative analyses and not both at the same time. Qualitative analysis alone is weak because it is unable to adequately isolate points requiring interventions and how to invest or intervene (Rich *et al*., 2011). In addition, it is not possible to determine the economic impact of different interventions on different chain actors. The scale of analysis is often too aggregated to conduct specific types of policy analysis. For example in an analysis of sheep and goat leather chain in Ethiopia, various issues were highlighted including animal husbandry (GTZ, 2007). However, an analysis of the impact of interventions in animal husbandry would, among others, require more detailed, micro-level analysis of the production cycle, breeding and marketing decisions at the producer level (Rich *et al*., 2011). Hence the approach still needs to be integrated with appropriate quantitative techniques to enable systematic ranking and evaluation of the impact of alternative interventions in a given sector.

Most value chain analyses conducted in Malawi are mostly qualitative focusing on mapping. However, the most detailed study on quantitative value chain analysis was conducted by Tchale and Keyser (2010). Tchale and Keyser (2010) conducted a quantitative value chain in order to identify and quantify factors influencing competitiveness of the maize, cotton and the tobacco industry in Malawi. This thesis combines qualitative and quantitative VCA to understand smallholder market access using a case of the Malawian groundnut sector. Quantitative VCA included a gross margin analysis to determine profitability at production level, marketing margin for the different players and price spread analysis and Marketing Efficiency Index (MEI) to determine market performance based on market efficiency on price.

2.4 Adoption of Technologies

Despite the huge potential the country has in groundnuts as a viable export crop, Malawian nuts have struggled to penetrate lucrative international markets (including the EU) mainly due to high levels of Aflatoxin. Although, several interventions to reduce Aflatoxin contamination in groundnuts in a bid to improve access to quality sensitive markets have been recommended, adoption rates have been low and technology diffusion has been slow. Rate of adoption for agricultural technologies are generally low in Malawi (Mangisoni, 1999; Chirwa, 2005; Simtowe *et al*., 2010). Technology adoption is a dynamic process which is determined or influenced by different factors. While many studies in developing countries have mainly focused on the socio factors influencing farmers' decision to invest such as age, education awareness, social networks, economic consideration is usually the central issue when farmers decide to invest in any technology ((Boahene *et al*, 1999; Batz *et al*., 1999; Batz *et al*., 2003; Abdullai *et al*., 2011). In a case study in Meru, Kenya, Batz *et al.* (1999) found that innovations that demonstrated high speed of adoption were those that producers considered more profitable. This was directly linked to the rate at which farmers realised the benefits of adopting a given technology.

Most adoption studies are based on models for binary choice such as probit and logit models (Mulugeta, *et al*., 2001; Chirwa, 2005; Perret and Stevens, 2006; He *et al*., 2008; Madola, 2011; Mugonola *et al*., 2013) and have been conducted on technologies that are directly related to crop or animal production. Mulugeta *et al*., 2001 used a logistic regression analysis to determine factors that influence adoption of soil and water measures in Ethiopia while Chirwa (2005) used a bivariate probit analysis to determine factors that influence adoption of fertiliser and hybrid maize by smallholder farmers in Southern Malawi. Chirwa (2005) found that high levels of education, larger plot sizes, and high non-farm income positively influenced adoption of fertiliser by smallholder farmers. In addition to these factors, Mulugeta *et al* (2001) found that technology specific characteristics and wealth status of the household influenced adoption of physical soil conservation practices in central highlands of Ethiopia. Number of livestock units, access to extension, value of gross output, age of household head, family size and farmer attitudes have also been reported to influence adoption of technologies in various studies (He *et al*., 2008; Mugonola *et al*., 2013).

From the reviewed studies, there is still need to understand the environment and the processes of decision making by smallholder farmers when deciding to adopt and expand levels (intensity or depth) of investment in the new technology/practice. As opposed to viewing adoption of innovations as a one off decision, the stepwise nature of the process still needs to be understood. Greene (1998) indicates that the assumption that explanatory variables have the same direction of effect on the probability and intensity (depth) of adoption is one of the limitations of some of the most frequently used models in adoption, such as the probit and Tobit. In other words, the assumption in these models is that the factors that influence farmers' decision when adopting a technology are exactly the same as those that influence them when deciding the extent of adoption. Failure to understand the decision making process of smallholder farmers in adoption has sometimes resulted in prescription of misinformed policy interventions and in low adoption levels.

Most smallholder farmers are risk averse and will, therefore, not adopt or abandon a technology once the perceived benefits are below the costs involved. Therefore, the steps followed by the farmers in decision making process as they decide adoption and extent on adoption of technologies/practices still need to be understood.

To model for the factors that influence the adoption of quality management practices in groundnuts and extent of this investment, the approach used in this thesis will be based on arguments by Goezt (1992) that smallholder farmers take separate decisions when deciding to adopt a technology and thereafter to decide whether or not to expand use of the technology (quality management) adopted. Simulation of the stepwise farmer decision-making process is possible with the use of a selective Tobit model. It will be the first time this approach is applied on quality management. While a selective model has successfully been used on production and soil conservation technologies (Nakhumwa and Hassan, 2003), it will be the first time it is tried to simulate decision-making process on quality management in groundnuts (Greene, 2000).

2.5 Conceptual Framework

Based on the historical background of the groundnut sector in Malawi and literature reviewed, this section develops a conceptual framework that is used in this study (Fig 2.2). This is based on the argument that export-led poverty reduction seeks to ensure that poor

smallholder producers also benefit from new economic opportunities arising from improved access to high value regional and international markets (ITC, 2001). Applying this theory to smallholder groundnuts producers in Malawi entails that smallholder groundnut farmers need to step-up productivity and become more competitive in quality management, by upgrading quality and standards right from production all the way to the market.

It is argued that smallholder farmers can operate at economies of scale if they are organised into groups to facilitate collective marketing (Barrett, 2008; Markelova *et al*., 2009; Kaganzi *et al*., 2009; Tchale, 2009). The assumption is that collective marketing of groundnuts would help the farmers to strengthen their influence and voice in negotiating for a better price. It is therefore important to understand the incentives which influence smallholder farmers to get involved in collective marketing.

The low quality problem in groundnut may not be easily sorted without first solving the low productivity that leads to low supply. Productivity among the smallholder farmers can be improved if some of the supply-side problems such as poor access to quality seed, poor management of pests and disease, poor agronomic practices and post harvest handling practices are addressed (Hilderbrand, 1995; Kumwenda and Madola, 2005; Minde *et al*., 2008). On the demand side, it is usually assumed that poor access to stable markets for groundnuts also contribute to the low productivity of the crop. Inconsistent and frequent policy reversals limit the private sector to seriously invest in agriculture in Malawi (Chirwa *et al*., 2008; Ellis and Manda, 2012). As such, lack of serious investment in agriculture slows down the pace of developing the agro-processing and export industries. Strong agro-processing and export industry would provide stable ad expanded domestic market for groundnut.

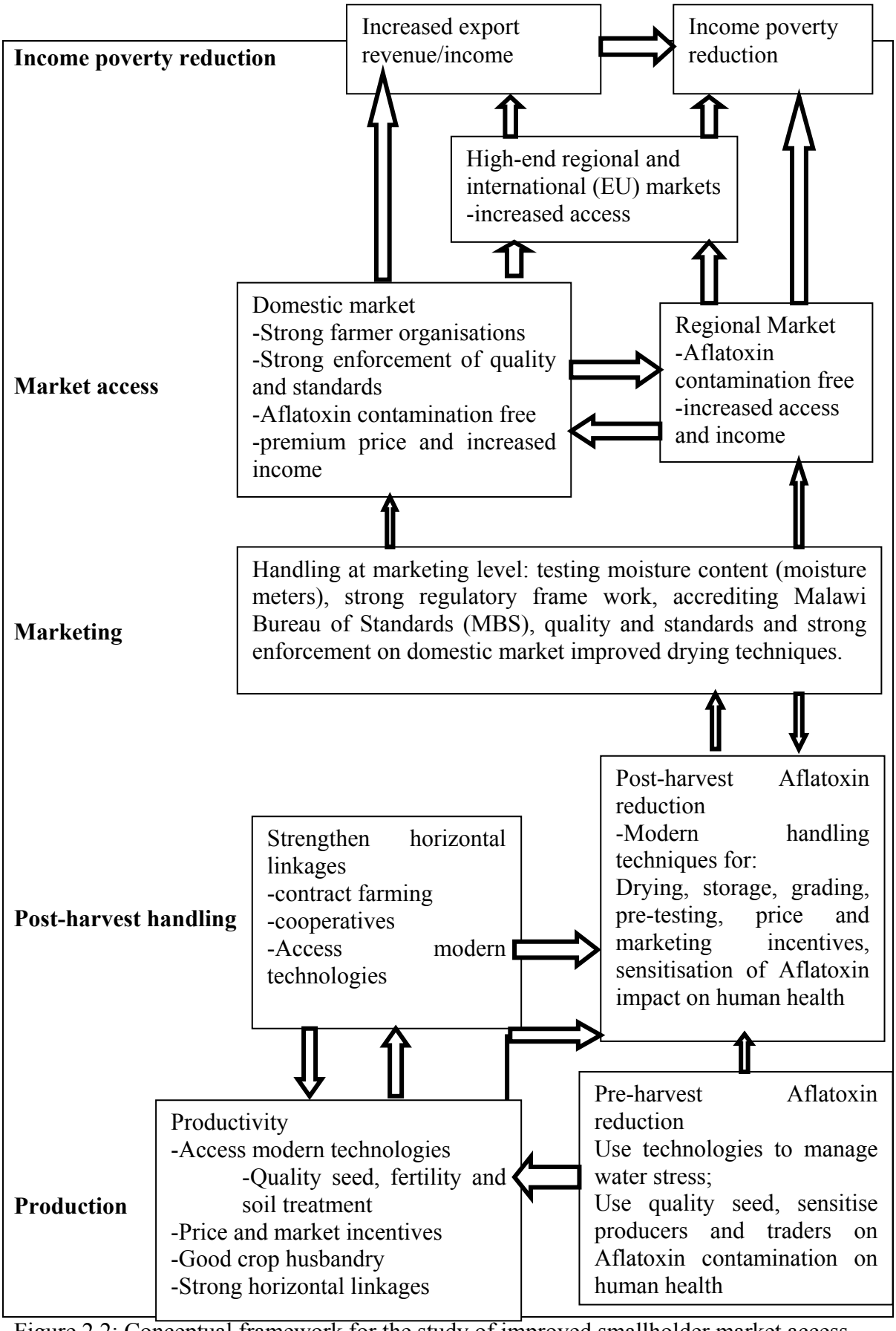


Figure 2.2: Conceptual framework for the study of improved smallholder market access

Economies of scale among smallholder farmers can be achieved if smallholder farmers are able to maximise horizontal linkages and getting involved in collective marketing. Collective marketing can also reduce some of the transaction costs (Barrett, 2008; Markelova *et al*., 2009; Kaganzi *et al*., 2009; Tchale, 2009).

It also assumed that problem of low quality and standards is perpetuated by low productivity and supply. Traders on the domestic market may be preoccupied to consolidate volumes demanded. Inconsistent and frequent policy reversals limit the private sector to seriously invest in agriculture in Malawi (Chirwa *et al*., 2008; Ellis and Manda, 2012). As such, lack of serious investment in agriculture slows down the pace of developing the agro-processing and export industries. It is believed that a strong agro-processing and export industry would provide a stable market for groundnut.

In recent years Aflatoxin impact on public health is gaining prominence in the development agenda for food safety/food security (WHO, 2006). Reviews on prevalence and exposure of humans to Aflatoxin on a global scale estimate that approximately 4.5 billion people in developing countries are potentially chronically exposed (Williams *et al*., 2004). Exposure to Aflatoxins also increases risk of hepatocellular carcinoma (Wu, 2013). Therefore, in order for Malawi to be competitive on quality and be able to increase export volume, to quality sensitive regional and European markets, investments need to be made in quality management in general and Aflatoxin in particular at pre-harvest, post-harvest and marketing levels.

Control of pre-harvest contamination is critical in any effort to manage Aflatoxin contamination as it is closely related to post-harvest accumulation. Pre-harvest handling interventions impacting on factors that predispose crops to mycotoxin contamination include use of quality seed and resistant varieties, timely planting, and managing field moisture stress. Post-harvest handling mainly involves moisture management and general handling for groundnuts (Monyo *et al*., 2010). Adoption and use of appropriate drying, shelling, storage and grading techniques could be critical interventions that may need to be promoted amongst the smallholder farmers, groundnut traders and the processors. In addition, awareness of the health impact of Aflatoxin contamination on humans is important to sensitise the producers and consumers in order to influence behavioural change (Jolly *et al*., 2009).

2.6 Conclusion

This chapter has reviewed some methods used in assessing market access and adoption of smallholder technologies. From the review the study proposed to use a combination of qualitative and quantitative value chain analyses to understand smallholder market access. The combination of VCA with an assessment of groundnut profitability using the margin analysis and also, efficiency of the various groundnut marketing channels using the price spread method was deemed crucial to inform market access options. The review has demonstrated that value chain analysis is quite a useful tool necessary to contribute information which is important for informed decision making by smallholder producers, traders and policy makers.

Profitability analysis at production level is useful to determine farmer returns considering that the farmers' main motivation is to maximize profit. The assessment of how prices are spread and profits shared within the marketing channels help to measure efficiency of the various channels based on price. Through the price spread method one is able to identify the areas which require interventions in order to improve efficiency along the value chain. The price spread analysis helps the smallholder farmers to identify efficient channels and also, specific points in the value chain that eats up part of their profits without adding any value.

The conceptual framework used in this study was presented. The theory of change is that if smallholder groundnut farmers and traders were well sensitised and using appropriate techniques/technologies to prevent pre-harvest, post-harvest and market-level contamination, it would reduce Aflatoxin contamination and increase quality. This will increase access to quality sensitive markets which usually are associated with premium prices resulting in increased household and export revenue. This increased revenue would stimulate demand resulting in other multiplier effects on the wider economy, which also positively impact on poverty reduction. The domestic market accounts for about 60% of the domestic production and should therefore be the first stepping stone where quality management is emphasised.

CHAPTER 3

MALAWI GROUNDNUT PRODUCTION AND MARKETING: A HISTORICAL PERSPECTIVE

3.1 Introduction

Chapter two presented review of literature on some of the various methods that have been used in assessing market access and adoption of technologies by smallholder farmers. This included a combination of qualitative and quantitative methods. Chapter three presents the role of groundnut sector to the Malawi economy, the groundnut value chain and the key players in the value chain with reference to the Malawi groundnut industry. A historical review of agricultural policy and market reforms was also conducted to see how agriculture and the groundnut industry have been impacted by these reforms.

Section Two of this Chapter highlights the importance of groundnuts in Malawi. Key agricultural policy reforms in Malawi are addressed in Section Three while groundnut marketing is covered on Section Four. Section Five and Six focuses on performance of the groundnut sub-sector and export destinations, respectively. Groundnut farming systems and seed systems are presented in Section Seven and Eight, respectively. Section Nine focuses on groundnut quality standards. Role of farmer organisations in groundnut marketing in covered in Section Ten and Section Eleven concludes the Chapter.

3.2 Agriculture and Malawi's Economy

Malawi, with a rapidly growing population (estimated at 15.9 million in 2012 growing at an average annual rate of 3.2% [African Development Bank (AfDB) Statistical Yearbook, 2013; World Bank, 2012] and a narrow resource base, is one of the poorest countries in Sub-Saharan Africa (SSA). Malawi's gross domestic product (GDP) is estimated at $4.6 billion and US$291 per capita (RBM, 2012; AfDB Statistical Yearbook, 2013). Agriculture contributed 29% (Table 2.1) to the economy and also accounts for over 80% of Malawi's export revenue (Malawi Government Annual Economic Report, 2013). The total labour force in Malawi is about 6.7 million, of which 85% is engaged in agriculture (NSO, 2012). Malawi's economic short-term growth is closely linked to strong agriculture performance, particularly tobacco, which accounts for 60% of the country's exports and

between 23% and 25% of the total tax base (Persaud and Meade, 2009).Therefore agriculture will remain the mainstay of the Malawi economy at least for the foreseeable future.

Table 3.1: Sectoral contribution to GDP for Malawi (%)

Sector	2009	2010	2011	2012	2013
Agriculture, forestry and fishing	30.6	29	29.9	28.7	28.9
Mining and quarrying	0.8	4.7	4.4	5	5.2
Manufacturing	10.4	9.7	9.5	9.3	9.4
Electricity, gas and water supply	10.4	1.3	1.3	1.3	1.3
Construction	2.8	3	2.8	2.8	2.9
Wholesale and retail trade	16.2	15.8	15.6	15.7	15.5
Transportation and storage	2	1.9	1.9	1.9	1.9
Accommodation and food service	1.8	1.8	1.7	1.8	1.7
Information and communication	3.6	3.5	3.5	3.7	3.8
Financial and insurance services	4.2	4.2	4.4	4.6	4.7
Real estate activities	7.5	7.5	7.4	7.5	7.4
Public administration and defence	3.3	3.2	3	3.1	3.1

Source: Malawi Government Annual Economic Report, 2013

3.2.1 The Agriculture Sector in Malawi

Malawi agriculture sector is divided into smallholder and estate sub-sectors (Mkandawire *et al*., 1990; Smith, 1995; Harrigan, 2003; Minde *et al*., 2008). The dichotomy is essentially reflected in the tenure systems under which land is cultivated. About 84% of smallholder agricultural land in Malawi is exclusively under customary tenure system, where land belongs to the government, with traditional chiefs as the appointed custodians (Mkandawire *et al*., 1990; GoM, 2002 in Lunduka 2009). The customary tenure system creates some insecurity of tenure and therefore limits crucial long-term investments on this land (Place and Otsuka, 2001). Lack of private property rights also means that smallholder farmers cannot use customary land as collateral to acquire loans from commercial banks.

The smallholder sub-sector occupies about 78% of the cultivated land estimated at 5.3 million hectares (FAO, 2003) and generates about 75% of Malawi's total agricultural output (Simtowe *et al*., 2010a). Maize is the main crop grown under this predominantly subsistence farming system and takes up about 70% of the total smallholder agricultural

land in Malawi (Chirwa and Matita, 2012). Other major dual crops (grown for food and cash) grown by smallholder farmers include groundnuts, beans, soybeans, cassava, sorghum and sweet potatoes. Smallholder farmers also grow a number of cash crops such as burley tobacco, cotton, coffee and spices.

The estate sub-sector comprises large-scale estates ranging from 10 to 10,000 hectares (with an average size of 35 hectares), mainly on leasehold or freehold land. Estates are exclusively involved in cash crop production for both domestic and export markets and are classified as a high input and high productivity sub-sector. Tobacco is the dominant cash crop grown under estate sub-sector. Other cash crops grown on estates include tea, coffee, sugarcane and macadamia nuts. Considering the strategic position of tobacco, substantial investments have been made by the Government of Malawi in the crop in terms of research, production and marketing infrastructure at the expense of other high valued cash crops such as groundnuts, macadamia nuts and paprika.

3.2.2 Groundnuts and rural livelihoods in Malawi

Groundnut is an important food and nutrition security legume among smallholder farmers in Malawi as it provides a cheap source of protein and energy (Monyo *et al*., 2010). Groundnuts are processed into meal or paste which is then added to other foods (vegetables) and served as a sauce with "Nsima" (Malawi's maize based staple food) rice or cassava. Having high protein content (12-36%) and oil content (45%-52%), (Misra *et al*., 2000; Maguire *et al*., 2004; Huntrods, 2013) groundnuts play a particularly important role in the carbohydrate-based diets of the rural poor). Groundnut meal is added to maize porridge to make a nutritionally-rich weaning food for babies. Groundnuts are also widely eaten raw, boiled or roasted as a snack by people from all age groups.

Groundnuts are also used as livestock feeds in various forms including groundnut residues and groundnut cake. These provide protein, crude fibre and minerals needed for healthy animal growth. However, use of groundnut residues in livestock feeds is currently being scrutinised especially with the possibility of high Aflatoxin which could be transferred to human beings through meat and animal products (Emmott, 2012).

As a cash crop, the most recent information available shows that groundnuts account for approximately 25% of agricultural cash income in Malawi (Diop *et al*., 2004). The introduction of early maturing groundnut varieties has also given the farmers an early and relatively higher income from the sales since it is availed on the markets early in the season before other crops mature (Monyo *et al*., 2010). Besides, the sale of early maturing groundnuts also prevents farmers from selling a lot of green maize to meet their immediate household cash needs. The sale of green maize for income reduces the harvest for dry maize and renders the households vulnerable to shortages in this staple food later in the year.

Groundnuts also have ecological benefits as the plants fix atmospheric nitrogen into forms available for plant use, enhancing soil fertility, which is a major concern in Malawian agriculture (Snapp *et al*., 2010). Declining soil fertility, coupled with rising fertilizer prices, has contributed towards the decline in agricultural productivity in Malawi. Inclusion of groundnuts in their farming systems would gradually contribute towards improved soil fertility.

3.3 Key Agricultural Policy Reforms in Malawi

Before market liberalisation in the early 1990s, smallholder farmers were required to sell their produce through ADMARC and commodity prices were pre-determined by this parastatal (Smith, 1995; Chirwa, 2004; Chirwa *et al*., 2008). The pre-determined prices set by ADMARC were usually below prevailing market prices; effectively an implicit tax on smallholder production. Only estates had access to international markets such as auction floor in case of tobacco.

During this period ADMARC practiced pan-seasonal and pan-territorial price policy. The operations of ADMARC were justified as a means of ensuring fair prices for smallholder farmers and also acted as a means for maintaining affordable food prices for consumers. However, this system extracted surplus from the smallholder sector, much of which was used to finance the development of the estate sector which was seen as an engine of growth (Chirwa *et al*., 2008). Policy biases towards maize as the main food crop and tobacco as the main cash crop hindered the development of other crops such as groundnuts.

However, some positive performance was experienced in the agricultural sector and the economy as a whole after independence until the late 1970s. During this time there was state-led and estate-led agricultural development alongside smallholder farmer activities. The economy grew at an average rate of 6% per year (Chirwa, 2004). However, policy inconsistencies and external shocks (including the oil shock of 1979, the civil war in Mozambique which interfered with international transport (Chilowa, 1998; Chirwa, 2004) led to government budget deficits and difficulties in balance of payments. The decline in commodity prices in the late 1970s made it difficult for most African governments, including Malawi to cut expenditures, resulting in fiscal deficits. Additionally, state owned marketing agencies incurred losses which worsened the problem and Government's efforts to solve the problem led to inflation (Kherallah *et al.*, 2000; Chirwa, 2004). This economic crisis led to the need for structural adjustments aimed at getting prices right and agricultural marketing liberalisation (Smith, 1995; Chilowa, 1998; Kherallah, *et al.*, 2000; Litchfield *et al.*, 2003; FAO, 2003; Chirwa 2004). Market liberalisation was also intended to encourage private sector participation in the marketing of agricultural commodities. At this time it was believed that reduction or elimination of state control over marketing would promote private sector participation and that competitive markets would lead to increased agricultural production (Smith, 1995; Kherallah *et al*., 2000; Chirwa, 2004).

From 1981, the International Monetary Fund (IMF) and the World Bank began providing loans to support the implementation of economic reforms which included adjustments in input and output prices. Major reforms in the agricultural sector in Malawi included deregulation of agricultural marketing activities in 1987, removal of fertilizer subsidies between 1984 and 1992, deregulation of special crops production by smallholder farmers by 1992 and liberalization of prices from the 1995/96 season (Chirwa, 2004). For the first time, smallholder farmers were also allowed to produce burley tobacco, followed by the repeal of the Special Crops Act in 1995. The Special Crops Act prevented smallholder farmers from producing and marketing high valued crops such as tobacco, coffee, sugar and tea. In order to stimulate growth and development of the agricultural sector, the above reforms were implemented with the aim of diversifying the export base, encouraging efficient import substitution, encouraging private sector participation in the marketing of smallholder crops and improving incomes for smallholder farmers, among others (Smith 1995; Chirwa, 2004).

Among trade policies that were implemented, the deregulation of agricultural input and output marketing activities occurred which were previously handled by the Agricultural Development and Marketing Corporation (ADMARC). For the first time, in 1987, private traders were legally allowed to participate in smallholder domestic and international marketing, under regulation and through licensing. A number of private traders were officially registered although their operations were limited. Unlike ADMARC, which had market centres spread across the country, even in remote areas, private traders' participation was limited to some selected markets (Chirwa, 2004). This is consistent with the observation by Poulton *et al.* (2006) that high potential and accessible areas are the ones which have strong competition in a liberalized market system. Even after liberalization, trade bans imposed at ADMARC's request in times when it was not able to compete with private traders, limited production incentives and frustrated the opportunities to develop new export crops (for example ban on private trader participation in beans in 1988 and in groundnuts between 1990 and 1993) (Smith, 1995).

Further deregulation of agricultural markets led to the abolition of trader licensing in 1996. As observed in other countries, private traders in Malawi faced several challenges. Problems with financing, limited and costly transportation, limited storage facilities, lack of experience in crop procurement and grading and marketing were some of the key factors that limited private trader operations (Scarborough, 1990; Smith 1995; Chilowa 1998; Chirwa, 2004). Poor access to formal and informal sources of capital worsened the situation for private traders. Despite allowing private traders to participate in the marketing of smallholder crop produce, ADMARC continued to operate pan-seasonal and pan-territorial pricing policies which further limited private trader operations, especially storage and long-haul arbitrage (Food Studies Group, 1992; Smith, 1995). Following the price liberalization in the 1995/96 season, private traders were able to determine prices for the purchase of smallholder crops except for maize (Chirwa, 1998). Limited pricing control was still executed with maize as part of the state's food security policy with ADMARC still determining the producer price within a fixed band.

Other institutional reforms included the closure of some ADMARC rural markets, the collapse of the Smallholder Agriculture Credit Administration (SACA) (which was the main provider of agricultural input credit) and the establishment of smallholder farmer associations such as the National Smallholder Farmers Association of Malawi (NASFAM)

(Chirwa, 2004). A number of initiatives have been introduced since the reforms to ensure input access for smallholder farmers. These include the introduction of a starter pack programme (1998-2000); the Agricultural Productivity Improvement Programme (APIP) and the Targeted Input Programme (TIP). However, marketing of agricultural produce, especially for smallholder farmers has largely remained undeveloped with more emphasis still put on maize as a food crop and tobacco as a cash crop than other crops.

Among others, economic reforms implemented were envisaged to influence market performance, agricultural production, input use and farm productivity. However, shortage of capital posed a significant barrier to expansion of private trader operations as it influenced trader transactions and limited their ability to invest. In addition, private trade expansion was limited by transport problems (cost and availability), limited storage facilities, pricing policy and domestic trading regulations which were restrictive in specifying limited times and places of trading and export restrictions (Smith, 1995; Kherallah, *et al*., 2000; Chirwa 2004).

Despite the agricultural reforms, the average growth of agricultural production per capita was negative in Malawi in the 1990s. This could be attributed to the elimination of government input and credit subsidies, such that where growth in production occurred, it was largely as a result of increases in land allocated to a crop rather than increases in productivity (Kherallah *et al*., 2000). In addition, slow progress made in the development of crop markets and marketing have contributed to limited gains from the reforms (Dorward *et al*., 2004). As in other countries where similar reforms have been implemented, low productivity growth due to inability to access output markets and lack of well-functioning or weak credit markets to finance input purchases, has limited the benefits of agricultural reforms (Poulton *et al.*, 2006). It was also hoped that smallholder farmers would respond to market opportunities and move towards more specialized commercial production systems (FAO, 2003). This failure might suggest that demand side constraints on agricultural growth still exist. For instance, in addition to increased demand for agricultural commodities, sanitary and phytosanitary standards (SPS) are an important consideration and whether these are seen as barriers or catalysts to export marketing for developing countries still need to be understood.

While the period after reforms is associated with the emergence of new export crops such as coffee, pulses and rice, Chirwa (2004) also observed the loss of international groundnut markets. Pre-reform, groundnuts produced by smallholder farmers were purchased by ADMARC based on stipulated grades which attracted different prices and were exported. Prior to export, ADMARC ensured further grading and quality checking and standardisation based on importers requirements. ADMARC's role in groundnuts marketing has substantially diminished since liberalising the market. Most private traders, who are now the major buyers of groundnuts, have not put much emphasis on quality.

The country has continued to invest more on tobacco as the main cash crop and maize as the key food crop for Malawi with very little on other crops with comparative advantage such as groundnuts, paprika, macadamia nuts, cassava and sugarcane (Keyser, 1998). The result of this has been the delayed diversification of Malawi's export and food base and low production and productivity for smallholder crops whose markets are still limited.

3.4 The Performance of Malawi's Groundnut Industry

Leading global producers and exporters of groundnut include China, the United States of America (USA), India and Argentina. Main producers in Africa include Nigeria, Senegal, South Africa, Malawi and the Gambia. Based on FAO data, groundnut exports from Malawi, as part of the Sub-Saharan Africa (SSA), were highly volatile between 1961 and 1989 (Figure 3.1). After declining severely, exports began to pick up after 1996, but still depict declining volumes. From the figure, the decline started in the 1960s before food safety issues became important. This suggests that apart from Aflatoxin contamination, there were other problems too.

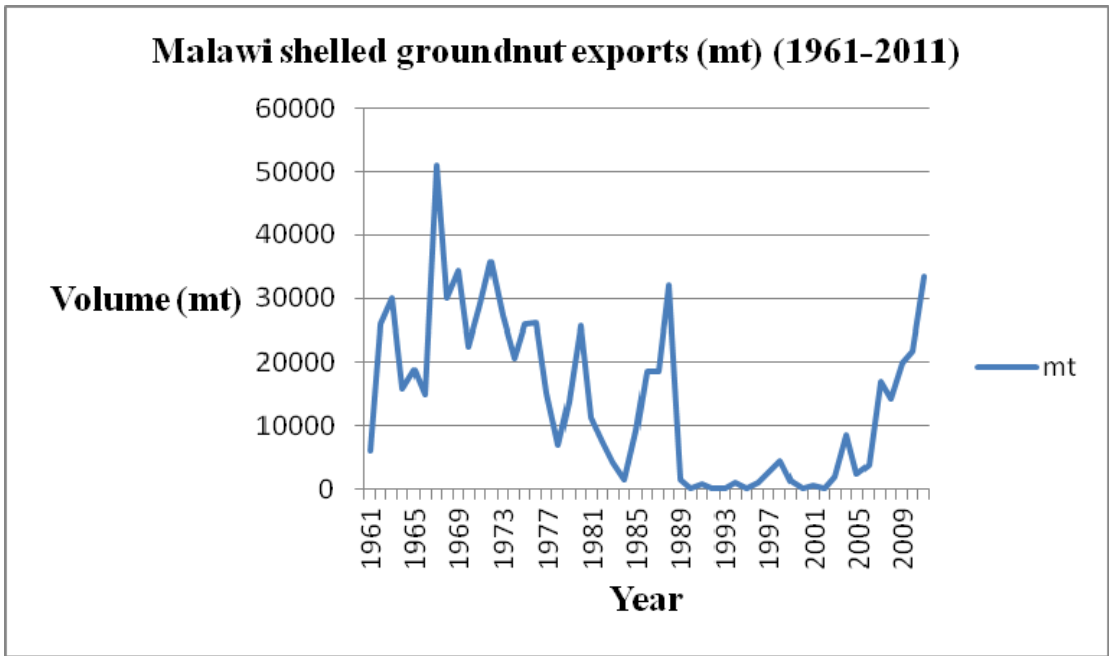


Figure 3.1: Malawi groundnut grain export (tonnes) (1961-2011)
Source: Based of FAOSTAT (1961-2012)

3.5 Malawi Groundnut Export Destinations

The bulk of Malawian groundnut exports were destined for the UK in the late 1980s (Table 3.2). However, this market was lost due to high Aflatoxin contamination in the groundnuts (Babu *et al*., 1994; Diop *et al*., 2004). To penetrate European markets, adherence to stringent quality and standards is required. High Aflatoxin level has been a major limitation to the penetration of European markets, making Aflatoxin the main impediment to the crops' marketability internationally. Currently Malawi's exports are largely within the region with insignificant amounts destined for international markets.

Table 3.2: Proportion of groundnut export flows by destinations for Malawi (1986-2012)

Year	Volume exported	0-1%	1-10%	10-25%	25-100%
2011	34220	UK, Netherlands, Pakistan, China	Zimbabwe, Zambia	RSA	Kenya, Tanzania
2010	21772	Zambia, UK, Pakistan, Niger	South Africa	Zimbabwe	Kenya, Tanzania
2009	19880	UK, Zambia, Botswana	Zimbabwe	Kenya, RSA	Tanzania
2008	14270	Indonesia	RSA, Zimbabwe, Zambia, UK	Kenya	Tanzania
2007	16985	Mozambique, Bolivia	Zambia, Zimbabwe, India, UK, Kenya, Indonesia	RSA	Tanzania
2003	1881		UK	Zimbabwe, Zambia	RSA
2002	225				UK, Zambia
2001	665	Zambia, Mozambique	Tanzania		RSA
1998	4335	Kenya	Tanzania, UK		RSA
1997	2628	Tanzania	RSA	UK	Zimbabwe
1989	1453	Zimbabwe		South Africa	UK
1988	31969	DRC, Mozambique, Zimbabwe			RSA, UK
1987	18598	Botswana, Iraq	Mozambique, Zambia		RSA, UK
1986	18531	Zimbabwe	RSA, Netherlands, Switzerland		UK

Source: FAOSTATS (Various years)

From Table 3.2 the UK and South Africa were the main export markets in the 1980s and 1990s. Both of these markets are quality sensitive making attention to Aflatoxin an important step if access is to be regained and sustained. Currently, the regional markets, especially countries in East Africa constitute the major export destinations for groundnut from Malawi.

The region offers the most opportunities for groundnuts and future expansion with slightly less stringent quality standards (Diop *et al*., 2004). According to Minde *et al*. (2008), Malawi is the second largest supplier of groundnuts to South Africa (after China), and

largest supplier to Zimbabwe (followed by Mozambique and Zambia). Current major importers of groundnuts from Malawi include Tanzania, Republic of South Africa (RSA), Zimbabwe, Zambia and Kenya. Other countries that also import groundnuts from Malawi are the Democratic Republic of Congo (DRC), India and the United Kingdom. However, both regional and EU markets are not yet fully exploited and Malawi needs to strategise on how it can exploit these markets and other new ones (Minde *et al*., 2008).

Ability to export demonstrates some underlying competitiveness. Exports for any crop are linked to the area, production, yields, availability and access to export markets as well as prices offered. Groundnut area, production and yields in Malawi remained fairly stable between 1983 and 1986 but sharply declined from the late 1987 (Figures 3.2), partially contributing to the decline in exports trend.

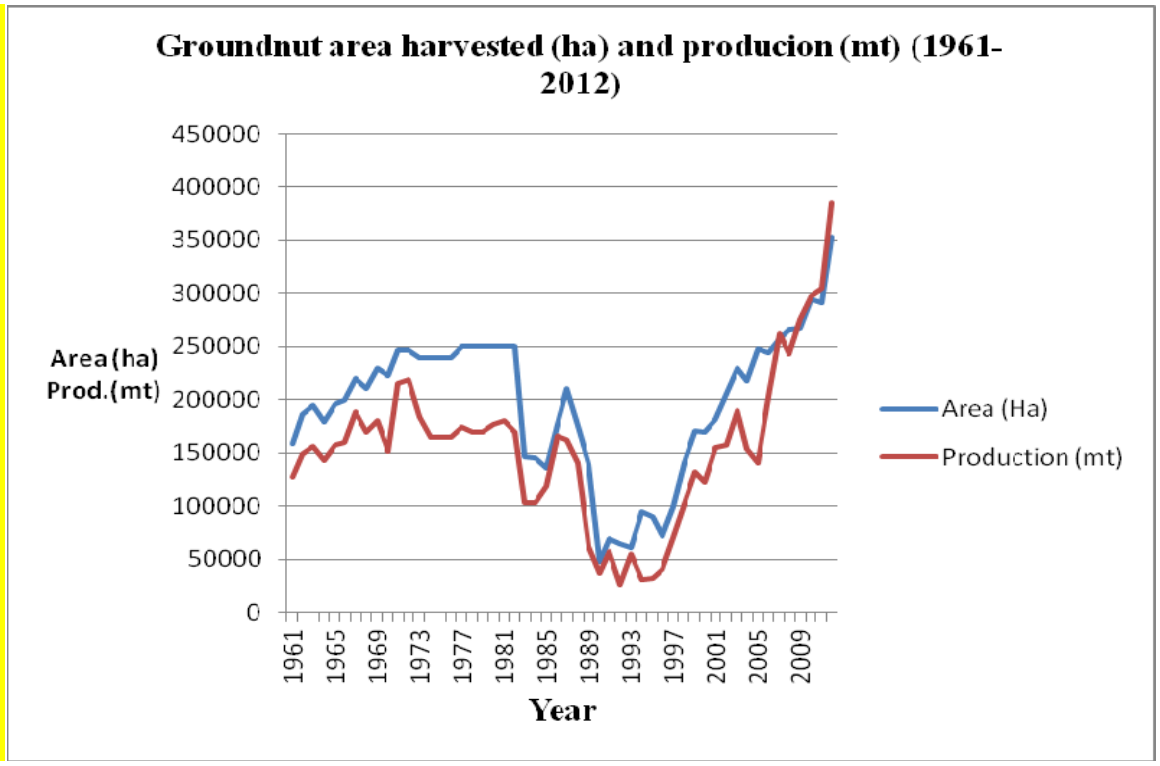


Figure 3.2: Groundnut area harvested in hectares and production (metric tonnes) in Malawi (1961-2012)
Source: FAOSTAT (1961-2012)

Malawi experienced drought in 1992 and 1994 which also affected groundnut production. Other factors that affected production and productivity include poor pricing structure, poor market access and lack of reliable export markets and lack of irrigation (Kumwenda and

Madola, 2005). Government policies placed considerable emphasis on production and marketing of maize as a food crop and tobacco as a cash crop, to the detriment of other crops such as groundnuts (Chirwa *et al*., 2008). The poor price structure for other smallholder crops was a disincentive to increase production and diversification. Groundnut quality problems, especially those associated with Aflatoxin contamination, led to the loss of Malawi's major export market, the EU, and further exacerbated the decline in production (Babu *et al*., 1994; Diop *et al*., 2004). Domestic markets often stimulate additional production and commercial sales. In addition, well established regional and international export markets also create demand and hence influence production decisions made by farmers (Wiggins *et al*., 2011) making the assessment of access to such markets crucial.

Area allocated to groundnuts and volume started picking up steadily around 2006, when the FISP was introduced (Figure 3.3 and 3.4). Increased groundnut production has been achieved through increased land allocation since 2006 due to the FISP, as the programme guaranteed stable seed market which assured availability of certified seed. This has also been supported by emerging of regional groundnuts markets, especially in East Africa. Increased availability of quality groundnut seed also partly explains the sharp rise in productivity and production (Figures 3.4 and 3.5). It is believed that the true potential impact of quality seed on productivity has been compromised due to the cheating tendencies of some private traders who mix certified legume seed with recycled seed.

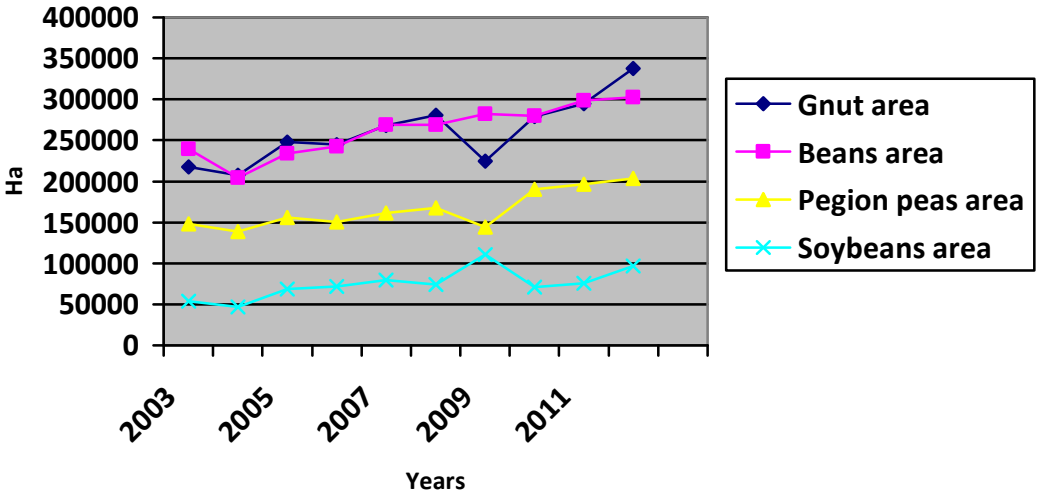


Figure 3.3: Trend legume area of production

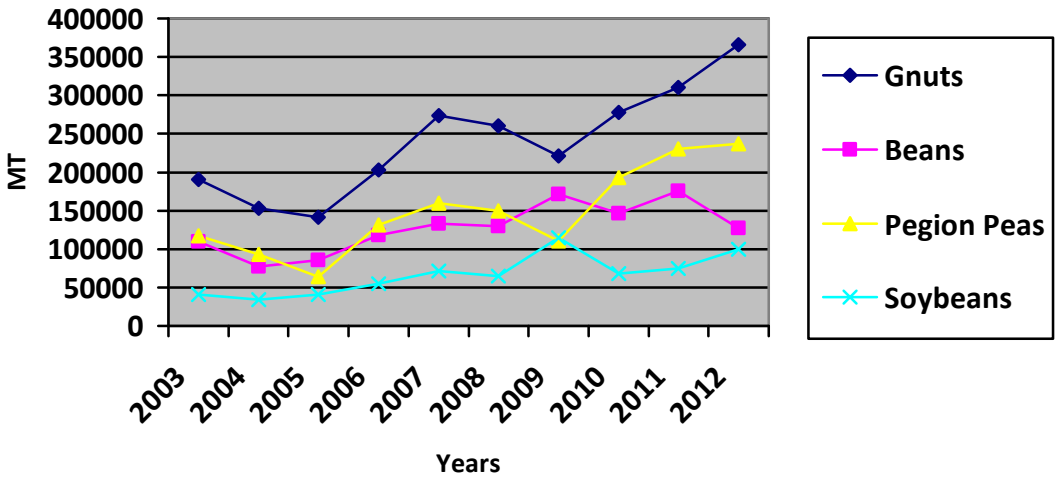


Figure 3.4: Legume production trends

However, Figure 3.5 demonstrates that groundnut productivity started picking up in 1995 with the introduction of improved adapted varieties such as CG7 which was released in 1990.

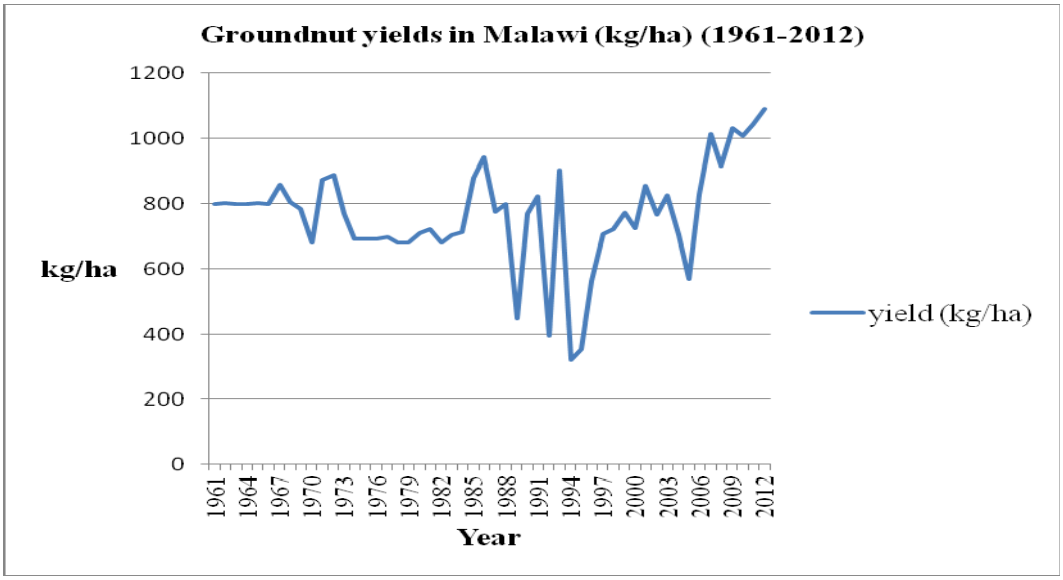


Figure 3.5: Groundnut yield trend in Malawi (1961-2012)

Source: FAOSTAT (1961-2012)

Recent increase in productivity and production has been at the back of a steady rise in farm-gate price of groundnuts (Figures 3.5 and 3.6). While tobacco still remains the number one cash crop for smallholder farmers, if based on the level of farm-gate prices, the steady rise in groundnut farm-gate price is attracting more smallholder farmers to grow the crop as evidenced by increased allocation of production area for the crop over the period. Groundnut is slowly growing in prominence as a reliable cash-crop. Tobacco farm-gate prices have been low since 2009. Groundnuts, unlike tobacco, do not have huge costs of production, another attraction for poor smallholder farmers. However, the gains in productivity and farm-gate prices are heavily reliant on the FISP as the only reliable source of quality certified seed and main driver of seed prices. This is a huge risk and a threat to long-term development of this crop, especially if the FISP was to be phased out soon.

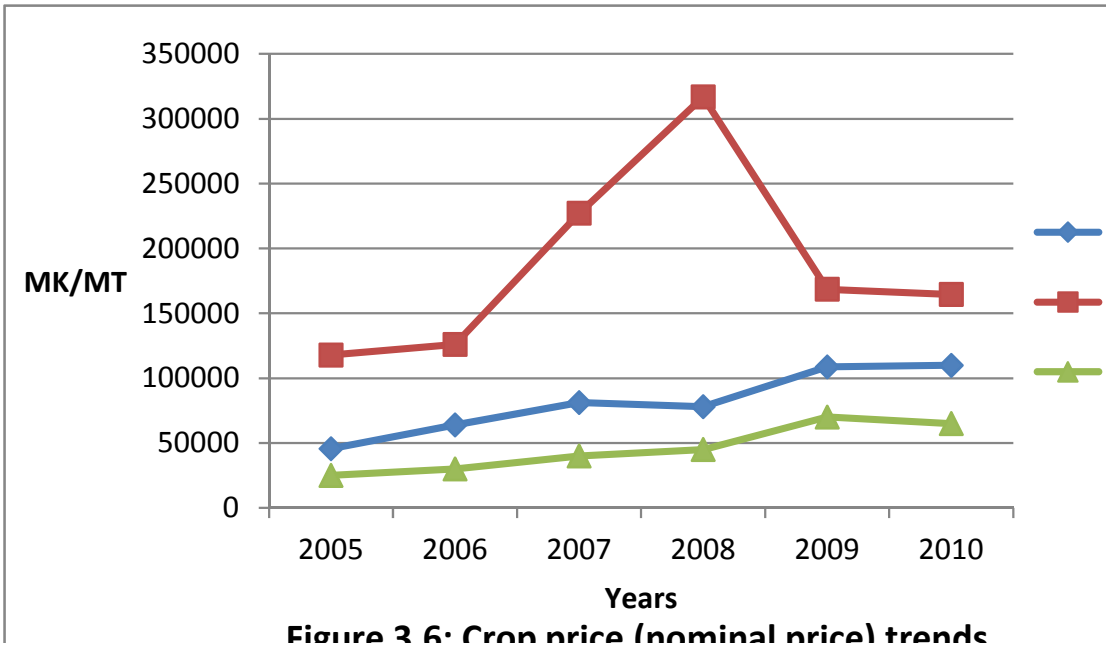


Figure 3.6: Crop price (nominal price) trends

3.6 Groundnut Farming Systems in Malawi

Groundnuts are well adapted to plateau areas of Malawi with their deep, well drained, sandy loamy soils and temperatures ranging between 25 and 28 degrees Celsius; rainfall between 500 and 1200mm and soil pH between 6 and 6.5 (Minde *et al*., 2008). Even though groundnuts are grown in most parts of the country, over 70% of groundnuts in Malawi are grown in the Central Region (Ngulube *et al*., 2001; Simtowe *et al*., 2010a). Lilongwe and Kasungu plains and Mchinji are the main growing areas where groundnuts features among key cash crops (Figure 3.7). However, groundnuts are well adapted to most areas where tobacco and maize are grown implying that competition for labour arises during peak seasons.

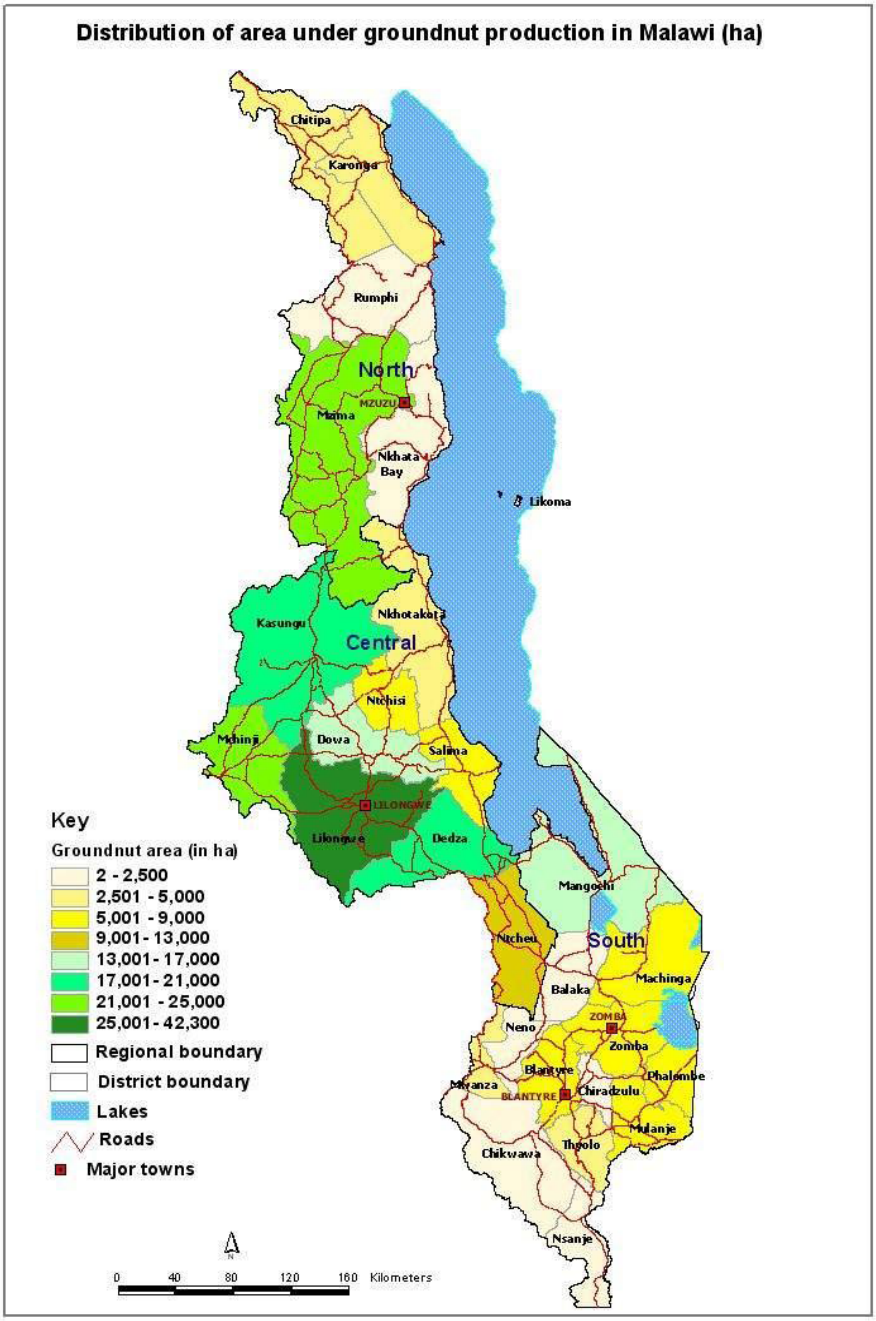


Figure 3.7: Map of Malawi showing the distribution of groundnut production in (ha)
Source: Simtowe *et al*., (2010)

Groundnuts are grown as a rain-fed crop either in rotation with other crops like maize and tobacco as a pure stand or intercropped with cereals or other groundnut grain legumes.

3.7 Groundnut Varieties and Seed Systems in Malawi

3.7.1 Groundnut varieties produced

Main confectionery varieties produced in Malawi include Chalimbana (big seeded with unevenly shaped kernels), CG7 and Nsinjiro. Improved varieties that have been released include CG7, ICGV-SM 90704 (Nsinjiro), JL 24 (Kakoma), and IGC 12991 (Baka) which are being promoted for commercial production (Table 3.3).

Table 3.3: Groundnut varieties developed and released in Malawi

Year of Release	Variety name		Yield potential (t/ha)	Groundnut grain size (mm)	Confectionery	Days to maturity
	Scientific	Released name				
1990	ICGV-SM 83708	CG7	Up to 2.5	19	Suitable, High oil content (51%)	Medium (120 days)
2000	ICGV-SM 90704	Nsinjiro	Up to 2.0	18	Suitable	Medium (120 days)
2000	JL 24	Kakoma	1.5	15	Suitable	Early (90 days)
2001	ICG 12991	Baka	1.5	15	Suitable	Early (90 days)
2005	ICGV-SM 99568	Chitala	2.0	15	Suitable	Medium (110)

Source: ICRISAT (2008)

Other varieties grown include Manipintar, Mawanga and Malimba which are varieties for oil extraction. CG7 features as both a confectionery and oil variety. CG7, Nsinjiro and Chalimbana are the most widely grown (Minde *et al*., 2008).

3.7.2 Legume seed distribution and marketing in Malawi

Simtowe *et al*. (2010) found that 58%, 16%, 9% and 8% of farmers in Malawi either used recycled seed, bought seed from a local producer, an agro-dealer or got seed through farmer-to-farmer seed exchange, respectively. These findings demonstrate the important role played by the informal seed system in supplying seed and also indicate the limitations of the formal seed companies in the legume sub-sector. In order to improve groundnut seed availability among smallholder farmers, ICRISAT and other partners tried three alternative approaches in different communities; contract seed production, small seed packs, and seed production and distribution through primary schools (Monyo *et al*., 2003). From their programme, approximately 80% and 55% of seed (including groundnut and other legumes) placed in urban and rural shops, respectively was sold. The International Centre for Tropical Agriculture (CIAT) and the national bean research programme in Malawi ran some trials in which bean seed was sold in small packs (0.5kgs or less) through rural merchants and grocery shops and proved that smallholder farmers buy seed (Phiri *et al.*, 1999 cited in Tripp and Rohrbach, 2001). These results demonstrate farmers' willingness to buy seed depending on the packaging and pricing.

Other studies on seed market activity in Southern and Western Africa show that the majority of smallholder farmers buy and sell seed in any given year usually at prevailing groundnut grain prices. In Kenya and Tanzania, for example, the demand for improved varieties of pigeon peas has been linked to the growing demand for groundnut grain for export to India (Jones *et al*., 1999 cited in Tripp and Rohrbach, 2001).

3.8. The Farm Input Subsidy Programme (FISP).

Domestic demand for legume seed in Malawi, including groundnuts, has been steadily increasing. Since the government introduced the Farm Input Subsidy Programme (FISP) (Logistics Unit 2013; Chirwa and Dorward, 2013**)**. The FISP is a flagship programme for the Government of Malawi to increase food production and food security, economic growth and poverty reduction. Through the programme, which is also supported by four development partners (UK, EU, Norway and Ireland) the Government of Malawi provides affordable fertiliser, quality maize and legume seed to 1.5 million poor smallholder farmers. Since FISP inception in 2005/06, more than 10 local seed companies have been

registered supplying mainly legume seed and OPV maize varieties. The FISP has also benefitted agro-dealers, as private seed companies channel 80% of the FISP seed through the agro-dealer network. The steady market provided by the FISP and the increasing use of the agro-dealer network by the seed private sector provide a reliable platform to develop and strengthen the seed market in Malawi. Over ten local seed companies have been formed since the FISP was introduced in 2005/06 (Logistics Unit Report, 2013). More than 222 agro-dealers were registered in 2012 season (Chirwa and Dorward, 2013). FISP provides each of the 1.5 million beneficiary households with either 10kg OPV maize packs or 5 kg hybrid maize pack and 2kg legume seed pack. For the legumes, farmers have a choice of groundnut, beans, soybean or pigeon peas depending on agro-ecological suitability and availability. However, if not covered under FISP, majority of smallholder farmers in Malawi still use recycled seed as they cannot afford commercial seed. Certified seed can be recycled at least three times and still remain viable because it is self pollinated with no potential to cross pollinate.

3.9. Value chains for groundnut grain and seed in Malawi

This study has found that several actors are involved in the groundnut industry from production to the final consumer (Figures 3.8 and 3.9). Smallholder farmers are the main producers of groundnuts in Malawi. ICRISAT leads as supplier of basic seed together with the Department of Agricultural Research and Services (DARS) (Figure 3.9). Seed Services Unit (SSU), under DARS, plays the oversight function to ensure seed is produced according to required standards. Major producers of certified seed are smallholder farmers organised in well functioning farmer organisations such as NASFAM and the Association of Seed Marketing Action Group (ASSMAG). These organised farmers are contracted by ICRISAT and seed companies under contract farming arrangement. This is a well structured market arrangement although not yet formalised by a legal framework or policy.

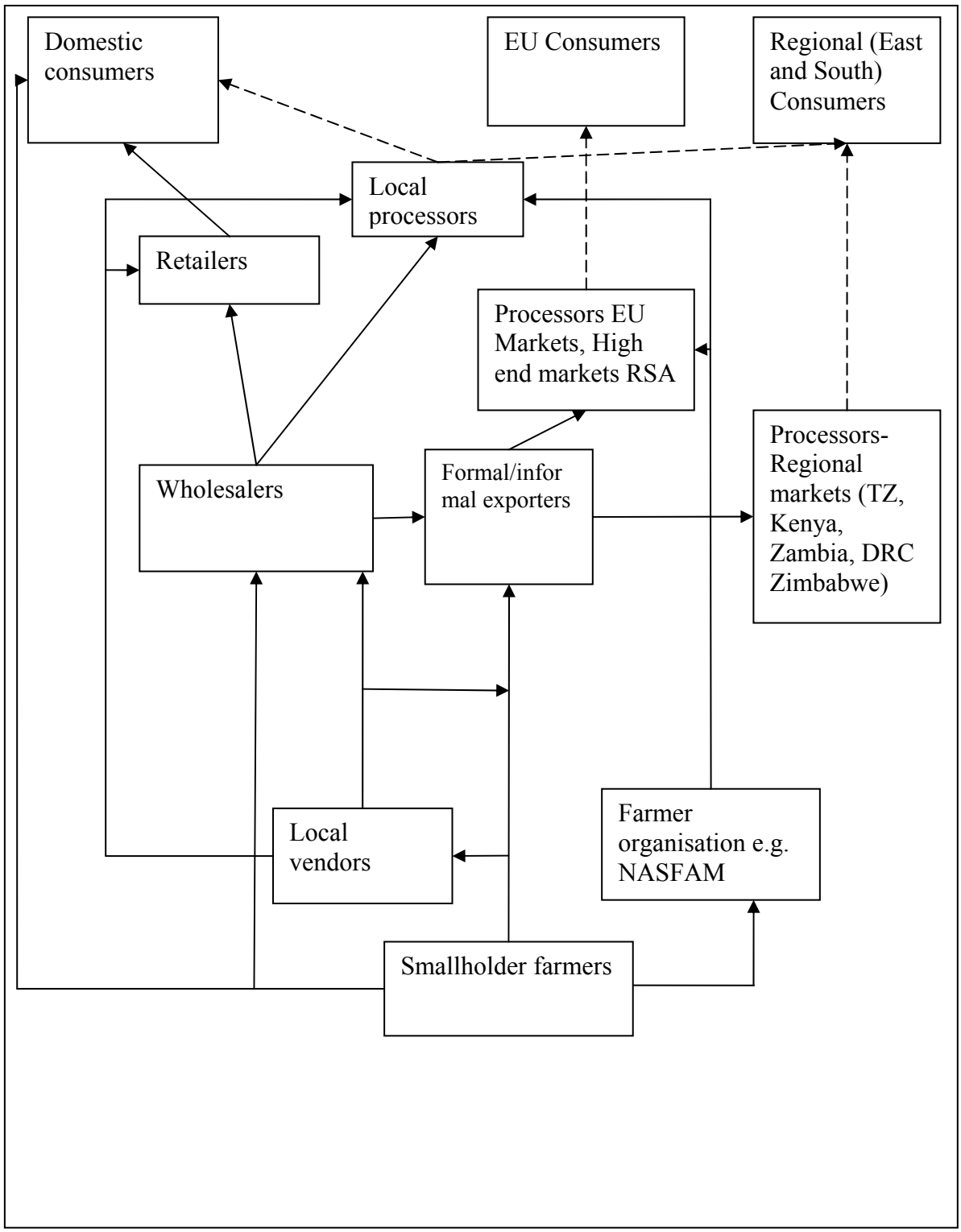

Domestic consumers
EU Consumers
Regional (East and South) Consumers
Local processors
Retailers
Processors EU Markets, High end markets RSA
Processors-Regional markets (TZ, Kenya, Zambia, DRC Zimbabwe)
Wholesalers
Formal/informal exporters
Local vendors
Farmer organisation e.g. NASFAM
Smallholder farmers

Figure 3.8: Actors in the general value chain diagram for groundnuts
Source: Own survey data

Dotted line represents processed products from groundnuts

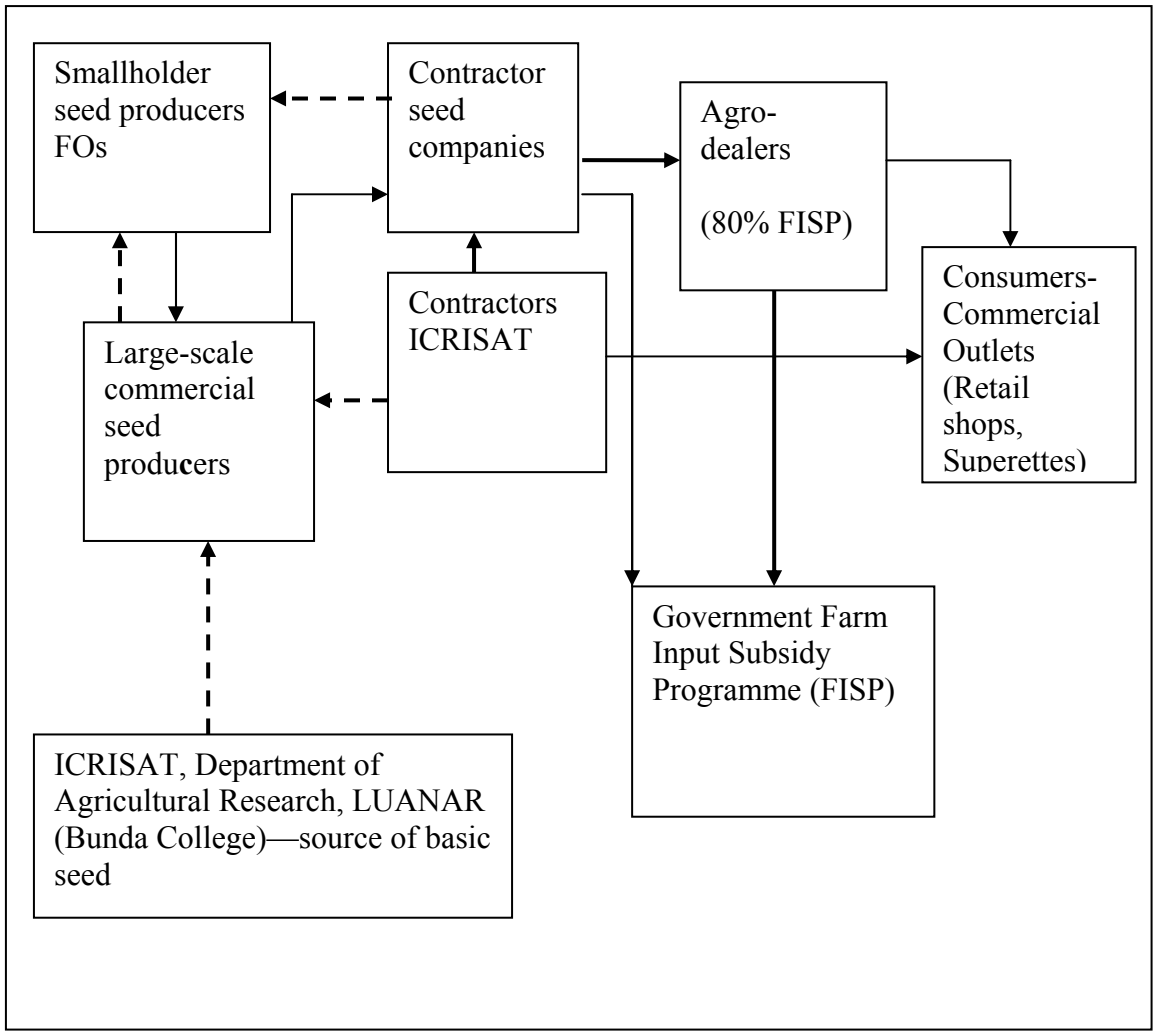


Figure 3.9: Actors in the certified groundnut seed value chain
Source: Own survey data

Dotted line is the seed supply chain from suppliers of basic seed (ICRISAT, Government's Department Agricultural Research to seed producers). Unbroken line represent a chain for the seed output. Agro-dealers are the main outlet used by the seed companies to deliver for FISP seed.

The main outlet for the certified legume seed is the Government's FISP (at least 80%), the remainder is shared between commercial markets and NGOs. FISP require about 3800 MT of a year of certified legume seed (of which about half is groundnut seed). FISP has had significant impact on the development of legume seed industry. Without the FISP, legume seed industry struggles to sustain high demand for legume seed as producers usually use recycled seed. Legumes such as groundnuts are open pollinated and therefore easily recycled.

3.10 Role of farmers' organizations in groundnut marketing at both domestic and export market levels

Following market liberalisation, the smallholder farmer's organization movement in Malawi started in 1998 through the establishment of NASFAM (Chirwa, 2004). However, to-date very few farmers belong to well functioning farmer organizations. Under liberalised market systems, producers in high potential and accessible areas seem to be better placed to benefit from commercialization, than those in remote areas. Greater efficiency is obtained when working with a small number of large suppliers so as to limit transaction costs. Smallholder farmers can provide such efficiency if they organised themselves in well functioning cooperatives and engage in collective marketing. Besides, with the restructuring of global value chains and increasing emphasis on food safety (Henson and Jaffee, 2006), buyers need to be able to trace the origin of products for purposes of guaranteeing food safety (Henson *et al*., 2008).

Introduction of farmer organizations or rural producer organizations (RPOs) is one intervention aimed at overcoming constraints related to the many, small production units and increasing smallholder participation in and benefits from markets (Bienabe and Sautier, 2005; Bernard and Spielman, 2009; Markelova *et al*., 2009; Narrod *et al*., 2009; Poulton *et al*., 2010). This would especially be beneficial in sub-Saharan Africa where smallholder agriculture is a significant sector. Apart from their low incomes and lack of capital, smallholder farmers in rural areas face challenges in the marketing of their commodities which include limited access to real-time information, lack of negotiation skills and influence in the price discovery process. The withdrawal of state operated marketing agencies (such as ADMARC) from some productive and economic functions when the private sector is still under-developed further exacerbates the situation (Chirwa, 2004; Bienabe and Sautier, 2005; Poulton *et al.*, 2006). With the increasing need for smallholder farmers to improve their competitiveness, belonging to a well functioning farmer organization is often times assumed as one of the reliable options available to strengthen smallholder farmer positions in the various agricultural value chain.

Competitiveness, in this case can be defined as the capacity to improve a market position, achieved via cost reduction strategies (which can be achieved through economies of scale) and on non-price factors such as reputation, commercial efficiency or quality attributes.

Farmer organization is considered key in ensuring farmer coordination and instrumental to address the problem of intra-seasonal price variations which are common in a liberalized market. Important also is the power and negotiation capacity of smallholder farmers in their relationship with other value chain actors.

Literature suggests that economies of scale can be achieved through aggregation of production, processing or marketing activities, which is possible with farmer organizations (Markelova *et al*., 2009; Narrod *et al*., 2009; Fischer and Qaim, 2012). Functions which can be performed by FOs include commodity assembly and collection, grading, post-harvest handling, storage and collective marketing. While there is evidence of successful farmer organizations in terms of improving smallholder farmer market access (Kaganzi *et al*., 2009; Markelova *et al*., 2009; Narrod *et al*., 2009), some studies have reported that this does not always lead to better performance. Thus, questions still arise why market access is still a challenge for smallholder farmers even with such promising interventions.

Successful market access development is possible with efficient management and clear marketing strategies which could easily be addressed with some farmer organization. According to Roche *et al*. (2004), based on his experience in setting up a differentiated cocoa supply chain in Ecuador, a complete and efficient process of involvement in a quality oriented supply chain for an FO may last up to 10 years. This takes into account the entire process, starting from information exchange with local leaders and technical staff, to a sustained commercialization of a product. In such a relationship, it is important that producers understand their responsibilities and tasks within the chain and their remuneration. It is also important for FOs to know what they can and cannot do. Although other stakeholders argue for specialization as a good means to promote efficacy and efficiency for FOs involved with marketing functions, FOs usually handle a mixture of different functions which include social, economic, representation, capacity building and coordination (Stockbridge *et al*., 2003).

In the current agricultural marketing environment, attributes of food products tend to be determined by buyers (including traders, supermarkets and agro-industries). This means that producers need to be in a position to know what their buyers want and this could be facilitated by farmer organizations that would facilitate the relations between farmers and other players downstream (Henson *et al*., 2008; Kaganzi, *et al*., 2009). In other words, FOs

would ensure that smallholder farmers have the information on what is required, knowledge and resources to meet the standards required. A number of FOs exists in Malawi including NASFAM (Box 3.1).

Box 3. 1: NASFAM and smallholder marketing in Malawi

The National Smallholder Farmers' Association of Malawi (NASFAM) is the largest independent, smallholder-owned membership organization in Malawi. It was initially founded on the principles of collective action although this is not the case, especially where marketing is concerned. NASFAM has grown out of a USAID funded project which was formed to support and organize smallholder tobacco production. Since 1995, in addition to tobacco, its focus has diversified into production and marketing of other crops including groundnuts, chilli, rice, soybeans and sunflower.

The smallest operational unit of NASFAM is a club, made up of 10–15 individual farmers. Several clubs form action groups which are the entry points for service delivery such as extension and bulking of member crops. Action groups combine to form associations. The Associations are grouped by geographical location under Association Management Centres (AMCs) which provide management and operational support to the Associations in terms of production, marketing and community development.

NASFAM endeavours to help to improve market access for its members by being involved in crop produce marketing at domestic, regional and international level. To ensure improved crop quantity and quality**,** custom-made trainings are provided depending on crop. This includes training on good agriculture practices and quality management. NASFAM nuts are quality-controlled in terms of size, type and Aflatoxin levels. NASFAM is also engaged with organizations such as ICRISAT who are involved in groundnut seed multiplication and distribution programmes to ensure that

Source: NASFAM website

However, there is still need to understand roles of farmer organizations like NASFAM and what motivates smallholder farmers in these organizations to engage cohesively in collective marketing (strengthen horizontal coordination in marketing).

3.11 Groundnut Quality Standards

3.11.1 Quality control in groundnuts

Before the market reform period, quality control of groundnut grain mainly emphasized visual aspects, e.g., uniform size of kernels, flavour, insect/pest damage and presence/absence of foreign matter, colour and moisture content. However, over time sanitary and phytosanitary issues, especially Aflatoxin standards became of paramount importance (Diop, *et al*., 2004; Diaz Rios and Jaffee, 2008). In addition to the quality standards for groundnut grain, germination percentages are also used to determine groundnut seed quality. Further, different quality standards apply in terms of product and process conformation for mainstream and fair-trade groundnut markets and whether the groundnuts are for direct human consumption or further processing.

In terms of groundnuts, Malawi still faces difficulties in meeting strict product and quality standards right from ensuring knowledge and understanding, to compliance of the evolving standards in quality management in production systems due to the regulatory system which is weak for monitoring for toxins and enforcements of standards. Sanitary and phyto-sanitary restrictions on groundnut export markets impact on exports of developing countries like Malawi and also, influence the decisions on which markets to be targeted. But high quality norms and standards are not just crucial to access international markets but also, for expanding the domestic and regional markets and health for all.

3.12 Evolution of Aflatoxin standards

Concerned about high and deleterious effects of Aflatoxin on human and animal health, industrialized countries have sought to strengthen their food safety management systems to better protect consumers against long-standing and emerging risks (Otsuki *et al*., 2001; Diop *et al*., 2004). The awareness of the safety risks associated with consumption of foods contaminated with mycotoxins, especially Aflatoxins, have led countries to put in place regulatory measures to protect consumers and ensure fair practices in food trade (Diaz-Rios and Jaffee, 2008).

In 1997, an EU regulation first set a uniform standard for Aflatoxins at 10 ppb in groundnuts subject to further processing, and at 4 ppb (of which 2 ppb of Aflatoxin B1) in groundnuts for direct human consumption. This regulation was amended in 1998 for the Aflatoxin level in groundnuts for further processing from 10 ppb to 15 ppb (8 ppb for Aflatoxin B1) (Table 3.5). The levels set by the EU are more stringent than those set by the Codex at 15 ppb for total Aflatoxins in groundnuts intended for further processing (Diaz Rios and Jaffee, 2008).

Table 3.5: Maximum allowable levels (MALs) of Aflatoxin in groundnuts

	Maximum allowable /recommended units of Aflatoxin in parts per billion	
	Groundnuts for further processing	**Direct consumption**
Codex	15	
Country		
USA/Canada	-	20
Australia	15	5
Europe	15	2
South Africa	-	10
Japan	-	0
Malawi	15-20	

In addition to the standards, EU market requirements and associated conformity assessment systems for groundnuts and groundnut products have evolved from the 1960s to recent times as depicted in Figure 3.7. From the literature, a drift is observed from mere product testing to process conformity (Gibbon and Ponte, 2005). Sampling[3] procedures and method of analysis are also specified under the new EU Aflatoxin regulation (Otsuki, *et al*., 2001). Since Aflatoxin contamination in groundnuts is variable in single fields, single test plots or single lots than other crops, the sample needed for testing is five times larger than that needed for crops such as maize. The non-homogenous distribution of Aflatoxin in groundnuts presents difficulties in implementing the procedures set for sampling, and could lead to unnecessary rejections for groundnut shipments (Otsuki, *et al*., 2001).

[3] The sampling methods specified by the EU Commission require that three tests are conducted on a randomly drawn 30 kg sample. Each sample has to pass the three tests before shipment is approved (Otsuki, *et al*., 2001)

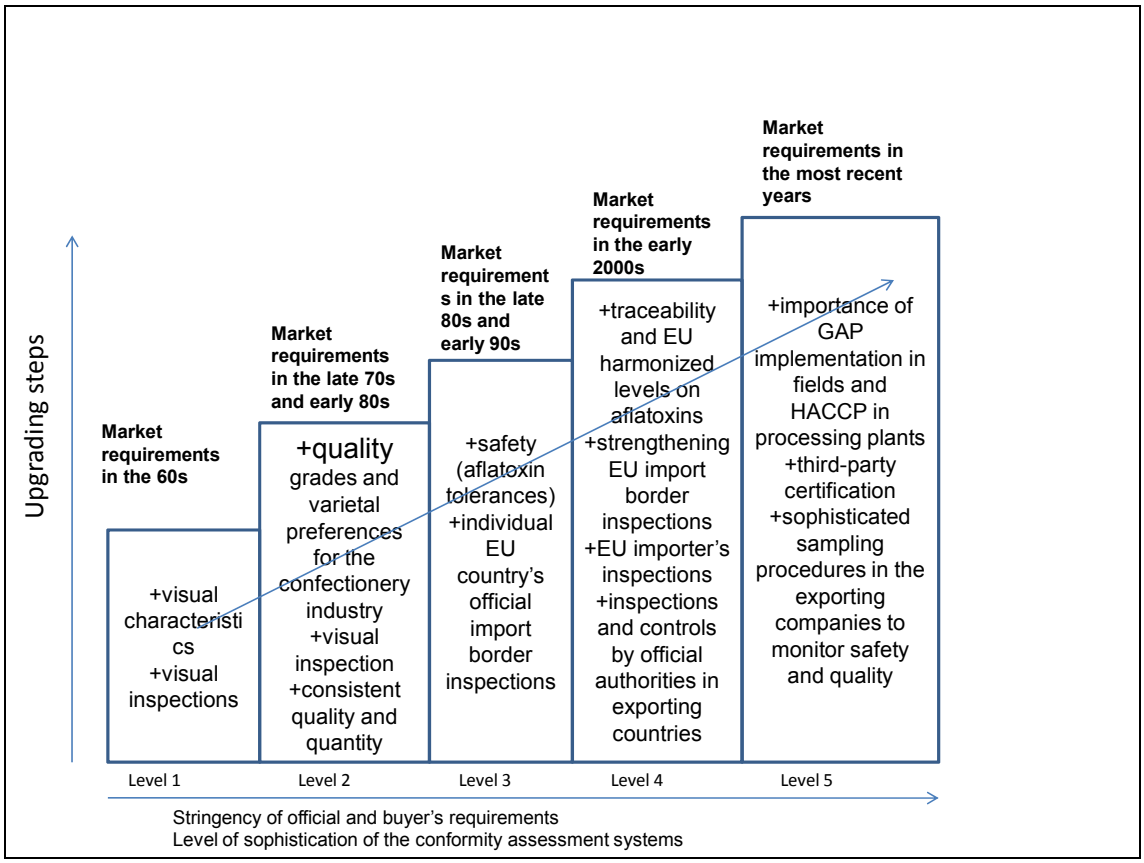


Figure 3.7: Evolution of EU Market Requirements and Associated Conformity Assessment Systems for Groundnuts and Groundnut Products
Source: Diaz Rios and Jaffee, 2008

This process-based assurance illustrated in Fig. 3.7 involve passing the burden of monitoring costs from buyers to suppliers, with strong implications for entry barriers for suppliers. So standards are often cast as barriers to trade for most developing countries (Diaz Rios and Jaffee (2008); Diop *et al*., 2004). Thus, grades and standards are a challenge for most smallholders not only due to the technical and financial capacity required to comply but also due to the dynamic nature of the standards set (Siambi *et al*., 2008).

The dynamic nature of the requirements for conformity, entail that more is to be done by the exporting countries to ensure that gained markets are retained. Loss of key exports markets for Malawian groundnuts is partly attributed to high levels of Aflatoxin (Babu *et al*., 1994; Diop *et al*., 2004; Minde *et al*., 2008). To understand the extent of the impact Aflatoxin contamination on export earnings, one needs to quantify the volume of

groundnut made available on the export market as a percentage of the total groundnuts purchased, apart from all costs associated with compliance, e.g. those under level 5 in Figure 3.7. Despite its importance, effects of Aflatoxin on Malawian groundnut exports have not been adequately studied neither the factors that would influence Aflatoxin management decisions at various levels. According to Diaz Rios and Jaffee (2008), 42% of the Malawian groundnut exports to the EU in 2005 were rejected due to Aflatoxin contamination. But proper management at farm level would contribute towards a reduction of Aflatoxin contamination (Monyo *et al*., 2010). Aflatoxin contamination in groundnuts often occurs in the field prior to harvest. Delayed and insufficient crop drying, insect and rodent infestations are the main causes of post-harvest contamination. Avoiding high moisture, slow drying and air circulation are common practices that can help reduce or stop contamination. However, both pre-harvest and post-harvest contamination occurs in groundnuts hence the need for management for Aflatoxin control by all players across the entire value chain.

Control of pre-harvest contamination is critical to any Aflatoxin management efforts as it is closely related to post-harvest accumulation. Higher Aflatoxin loads at harvest provide inocula for subsequent growth and contamination during post-harvest handling processing including drying and storage (FAO 2001; Craufurd *et al*., 2006). Some interventions impacting on factors that predispose crops to mycotoxin contamination are known. These include use of resistant varieties, timely land preparation, planting and weeding, use of water management techniques like box ridges, timely harvesting, optimum pest control minimum damage to plants at harvest time and timely and rapid drying and avoidance of re-moistening the pods after drying (Minde *et al*., 2008; Monyo, *et al*., 2010; Emmott, 2012). However, there is limited research and literature on factors that would motivate farmers and other actors in the chain to manage Aflatoxin and avoid contamination. This has been exacerbated by lack of information and policy to establish and enforce a national code of safety on mycotoxins. Information on Aflatoxin and human health and trade would inform policy makers on what would help redress the situation at both domestic and other levels.

As much as the EU has enforced stringent Aflatoxin standards, some countries have had positive impact on their groundnut production and supply chain, e.g. China and Latin America (Diaz Rios and Jaffee, 2008). Maintenance or enhancement of product quality is a

key challenge in export cash crop sectors. In order to enhance performance, public agencies (for example. those with regulatory or co-ordination function and crop research institutions) should be accountable to private stakeholders including producers groups, marketing and processing companies (Poulton *et al*., 2006). Even though some African countries have undertaken strategies to address the problem, challenges still exist in implementation and in ensuring collective action for the adopted strategies.

Farmer organization is seen as one of the options to ensure such coordinated effort among smallholder farmers and entry into quality sensitive markets. In Malawi, FOs such as NASFAM is working with farmers in selected associations to adapt to the requirements of quality sensitive markets like the EU markets and ensuring that farmers comply in order to access international markets, including those under fairtrade arrangements (NASFAM, 2009). With initial support from ICRISAT, NASFAM re-started exporting some groundnuts to the EU under fairtrade arrangements in 2004. This entailed changes in production processes and supply chains including provision of training on good agricultural practices and monitoring to ensure compliance. Several tests are performed prior to exports to the EU (Box 3.2). Such efforts require a thorough understanding to inform decisions about investment in groundnut production and marketing by both farmers and other players.

Box 3.2: Methods for testing for Aflatoxin and associated costs

VICAM Fluorometry Chromatographic Technology: With this method, sampling is done at 30 minute intervals at the grading belts before bagging. Approximately 10kg of groundnuts is collected from each tonne and is then split into 3 sub-samples. From a standard 18mt consignment to the EU, 180 kg are taken translating into 54 samples. Testing costs add up to K426, 600 (US$2585) for the 18mt consignment (or K23700 ($143/ton)). Intensive internal testing is done to ensure that the results of the next testing level are within acceptable limits. Since none of the national laboratories are currently internationally accredited. To address this further tests are done on groundnuts which are deemed fit for international export at an internationally accredited analytical laboratory. Samples are collected by quality surveillance agents, e.g., Societe Generale de Surveillance (SGS) and sent to their South Africa or Kenya's accredited laboratory. These labs use the high performance liquid chromatography (HPLC) to test for Aflatoxin which is an internationally acceptable method.

HPLC: Although this method is expensive, it is reliable and useful for sales to EU markets. This test may not be required for other groundnut markets but is necessary for EU markets. EU sampling standards stipulate that a 30kg sample is picked randomly from an 18mt lot for tests using HPLC. Three sub-samples are then derived from the 30kg before grinding, out of which three, 1kg composite samples are collected. This test costs US$85/sample bringing the cost to US$255. In addition to the testing costs paid to SGS, inspection and sampling costs based on volumes sampled and exact location of the consignment are met separately.
(Calculated based on reported costs for 2012)

From the above, the costs associated with Aflatoxin testing in groundnuts destined for the EU are high due to rigorous sampling and testing procedures. From the calculations above testing costs for groundnuts destined for the EU are estimated at US$157 per ton (2012 prices). In addition to the testing costs, other compliance costs, such as in house quality management systems (QMS), increase the costs incurred by companies attempting to sell to quality demanding markets. This includes costs for farmer training, information dissemination and quality monitoring. All these costs need to be recovered from the price received.

3.12 Conclusion

This review shows that groundnut is a key crop and plays a significant role in Malawi's economy, especially in rural livelihoods as a key source of income and food. However, low productivity mainly due to use of low yielding varieties and inadequate supply of

improved groundnut seed have limited the competitiveness of the groundnut sector. The informal seed sector, farmer to farmer exchange and recycled seed still remain the main source of seed for many producers. The government through the farm input subsidy programme has contributed to an increase in improved seed. But the balance between regulation and seed system development is still a challenge and there is still need to find the perfect combination of private public contributions in the process of seed provision.

Policy reforms did not fully lead to the desired/anticipated increase in agriculture production. Marketing of produce has largely remained undeveloped with more emphasis still put on government controlled crops such as tobacco and maize. Yet economic reforms were implemented to influence market performance, agriculture production, input use and farm productivity. Slow progress has been seen in the development of crop markets and marketing for crops such as groundnuts. In addition, Aflatoxin contamination further exacerbated loss in competitiveness, especially in terms of export to international markets evidenced in export volumes. UK was the major export destination in the 1960s and late 1980s but currently the region is the main destination for Malawian nuts. Aflatoxin contamination is still a challenge in accessing quality sensitive markets evident in the high proportions of rejected lots in the EU markets.

Groundnut is mainly grown as a smallholder crop in Malawi. Farmer organizations are instrumental in ensuring smallholder farmer access to agricultural markets. However, considering that agricultural production and marketing is dynamic, there is need to understand the types and roles of farmer organizations that would indeed enhance smallholder participation in various competitive value chains. Currently, groundnuts are sold through a number of marketing channels. A thorough understanding of the players and roles in the value chain and how competitiveness of the sector can be enhanced is desirable. This study attempted to do this by conducted qualitative and quantitative value chain analyses.

CHAPTER 4

RESEARCH METHODOLOGY

4.0 Introduction

Chapter 3 reviewed some known methods for assessing market access and adoption of technologies. The conceptual framework used in this study was also presented in this chapter. Based on the review, this chapter discusses the methods used in the research. These are qualitative and quantitative value chain analysis for assessing performance of the groundnut value chain using the different marketing channels and a selective Tobit analysis for assessing determinants of factors influencing adoption and extent of adoption of management of quality in groundnuts. Qualitative analysis captured most of the discussions through the focus group discussions and key informant interview, including perceptions and gender dimension in groundnut production and marketing. Choice of the study sites, sampling frame, sampling method used and methods of data collection are also elaborated. The two data analysis methods used are also discussed.

Section 1 presents the selection of study sites while Section 2 presents sampling methods used. Data and tools for data collection are outlined in Section 3 and Section 4 focuses on qualitative and quantitative value chain analysis. Section five focuses on method for assessing production and marketing margins while Section six specifies the empirical model used in assessing factors influencing adoption and extent of adoption of quality management practices. Section seven concludes the Chapter.

4.1 Selection of Study Sites

Groundnuts are widely grown in Malawi. However, the bulk of the crop is mainly grown in the central region especially in Mchinji, Kasungu and Lilongwe (Ngulube *et al*., 2001; Simtowe *et al*., 2009). Household (producer) survey was conducted in Mchinji district only, while the market survey was conducted in all the three districts (Mchinji, Kasungu and Lilongwe). At the time of this study, Mchinji Association for Smallholder Farmers

(MASFA), one of farmer associations under NASFAM was one of the suppliers of FLO-Fairtrade certified groundnuts to Liberation Foods a UK based Fairtrade Nut Company. Therefore, chapters from this association were purposefully selected for the producer survey.

To assess whether or not belonging to an organised farmer organisation has any impact on access to the market, in addition to farmer organisation (FO) members, non-members were also randomly selected as part of the control in the same area. The underlying assumption is that strong horizontal linkages/farmer organisation assist smallholder farmers to step-up their participation in the value chain, facilitate market access and price discovery.

The selected FO is organised as follows: the smallest operational unit is called a club, which is usually made of between 10 to 15 individual farmers. Several clubs come together to form the Marketing Action Committees (MAC). The MAC is the key entry point into the organization's extension network for information dissemination to members, and for the bulking of member input needs and produce during marketing season. A collection of MACs form a Chapter and several Chapters join together to form an Association under NASFAM. MASFA alone comprises six Chapters namely Msitu, Mkanda, Chiosya, Mikundi, Mlonyeni and Kalulu. Out of these, three Chapters were randomly selected for this study. These are Mkanda, Kalulu and Chiosya Chapters.

4.2 Sampling

4.2.1 Sampling frame

The sampling frame for the producer survey was the official list of groundnut farmers in Mchinji district held by the Ministry of Agriculture Irrigation and Water Development (MoAIWD). However, since the study had particular interest for groundnuts producers belonging to an organised farmer organisation, to have enough number of these farmers, the sample was stratified into FO members and non-members as a control. The second step was to cluster the FO members according to their Chapters. To ensure there was wide variation, three clusters were randomly selected. Households were randomly selected from these clusters. Non-members were also randomly drawn from the list of groundnuts farmers for the areas that covered the selected Chapters.

4.2.2 Sampling techniques for the household survey

This subsection provides a formula for computing sample size. Because the focus is on household surveys the sample size is therefore calculated in terms of the number of households that had to be selected.

Cochran (1963:75) in Israel, 1992 developed the following formula for calculating sample size to yield a representative sample for proportions; $n_0 = \frac{z^2[1-p]p}{e^2}$ where

n_0 is the parameter to be calculated, in this case the sample size in terms of number of households to be selected;

z is the statistic that defines the level of confidence desired;

p is the proportion of the total population accounted for by the target population. It is assumed in this study that groundnut farmers in Mchinji represent 30% of the population of groundnut farmers in Malawi, the bulk (more than 80%) being in central region.

e is the margin of error (level of precision) is the range in which the true value of population is estimated to be. This study, margin of error, *e*, or level of level of precision was ± 5.

In this study, the adopted *z*-statistic is 1.96 for the 95-percent level of confidence. This is generally regarded as the standard for assigning the degree of confidence desired in assessing the margin of error in household surveys (Israel, 1992). Based on this formula, we get a total sample of 323 households for the study, 163 being NASFAM members and remainder non-members. Each of the three selected chapters contributed proportionately to these samples as shown in Table 4.1.

Table 4.1: Proportional chapter contribution to the total sample

Chapter	Number of paid up members	Calculating weights (ni/N)	MASFA (N=163)	Non-member sample (N=161)
Mkanda (n_1)	699	0.36	59	58
Chiosya (n_2)	496	0.25	41	40
Kalulu (n_3)	774	0.39	64	63
Total *N*	***N*= 1969**	**1.0**	**163**	**161**
Sampled HH			**163**	**141**

Out of the above, 304 household interviews were conducted due to logistical challenges in the field.

4.2.3 Traders, processors, exporters and other key actors

Since the liberalisation of agricultural marketing in Malawi, private traders have become a key player in crop marketing. Numerous traders, especially mobile small traders are involved in crop marketing hence probability sampling methods were not used. Instead small traders participating in the market during the marketing survey and names of large traders operating in Mchinji, Lilongwe and Kasungu were tracked to be interviewed. A total of 33 small traders were interviewed. Well known groundnut processors, who are based mainly in the main commercial towns of Malawi, i.e., Lilongwe and Blantyre were also targeted. Some key actors who are involved in the Malawian groundnut value chain were also tracked and interviewed.

4.3 Data and Tools for Data Collection

In order to adequately address the research questions, data collected include demographic characteristics (type of household head, age, and education level) and groundnut production and marketing. Production data included information on varieties grown, type of seed used and seed rate, sources of seed, labour use and availability, post-harvest handling activities, knowledge of Aflatoxin, its impact on human health and control and other groundnut quality issues. Marketing information was also collected. This included cross-section data on prices, domestic and international groundnut markets, quality and standards and institutional support issues (extension, credit support). Some gender dimensions of groundnut production and marketing were also collected.

Data collection was done using both qualitative and quantitative methods. A structured questionnaire was used as a main tool for data collection during the household surveys. Other methods used included direct observations and participation in farmer activities (e.g., groundnut shelling), focus group discussions and semi-structured interviews with other key actors. The tools were used as discussed in the following sections:

4.3.1 Desk research

A review of relevant literature on the groundnut sector in Malawi was carried out. Secondary data was collected from other published sources including the National Statistics Office (NSO), crop estimates publications by the MoAFS, farmer organizations (NASFAM), University libraries (Lilongwe University of Agriculture and Natural Resources (LUANAR), seed companies and organizations working on seed, research institutions and ICRISAT[4].

4.3.2 Producer survey

Smallholder farming households were the major unit of inquiry on groundnut production issues. An initial focus group discussion on groundnut production and marketing was carried out to determine the issues to be included in the questionnaire for structured household surveys. Upon generation, the semi-structured questionnaire was pre-tested with a few households before use to interview sampled member and non-member households for actual data collection. Pre-testing of the questionnaire was conducted to allow for changes which ensured clarity of the questions, appropriate length of the questionnaire, relevant response alternatives for pre-coded questions and that the tool captured most of the required information.

4.3.3 Focus group discussions

Further focus group discussions (FGD) with members and non-members were conducted. This was done to complement information collected through household surveys. One FGD was carried out with each category in the three sites. Each group comprised 8-10 people to enable manageable discussions and to allow for wide range of views on issues discussed. Recruitment of FGD respondents was done based on the farmers' inclusion in the household survey. Each FGD was conducted in a central location within the farmer's community.

[4] ICRISAT is the research institution that has the mandate to work on groundnut breeding in Malawi and the region

During these discussions, participatory value chain mapping was also carried out. This helped to track the channels through which smallholder farmers sell their groundnuts and also ensured that the key links with the smallholder farmers are known and included in the key informant interviews. Value chain mapping is the initial step that was performed under VCA and was revisited with different actors to ensure collection of relevant information. Value chain mapping also helped to identify the position of the smallholder farmers in the chain and also to demonstrate the interdependencies among actors and processes in the chain. This followed the main stages in a typical agricultural value chain which flows from input supply, farm production, collection/assembly, processing and distribution. During the mapping exercise the following was undertaken:

- Identifying and mapping the main players involved
- Mapping flow of products and core processes in the groundnut value chain
- Mapping knowledge and flow of information, especially for price and quality
- Mapping relationships and linkages that exist in the chain
- Identification of opportunities, constraints, and potential solutions

4.3.4 Other key actors' interviews

In-depth face-to-face and telephone interviews were carried out to collect information from other key actors in the groundnut chain with the guidance of developed checklists. These interviews were conducted with seed producers and distributors, ICRISAT, service providers (government extension agents, credit institutions, quality monitoring and certification organizations (Malawi Bureau of Standards (MBS) and Societe Generale de Surveillance (SGS)), farmer organizations (NASFAM and Farmers Union of Malawi (FUM), private traders (small and big, wholesalers and retailers), selected processors (including NASFAM, Valid Nutrition, Project Peanut Butter, Rab Processors and Estrelli Trading), direct exporters, and some importers (Twin and Twin Trading Company and Liberation Nuts in the UK which deal with NASFAM under Fair-trade agreements and NOLA in South Africa (mostly for peanut butter processing).

Whenever possible, interviews were held at the respondent's facilities in order to observe and understand handling, sorting, grading, storage, packaging, and other transactional activities. Like any other commodity, groundnuts change hands through multiple chain

actors and at each transaction, costs are incurred and some form of value is added. These costs were collected as part of the information for quantitative analysis.

4.3.5 Data validation, entry, cleaning and analysis

The main household survey relied on recall responses to the production questions. In order to increase the reliability of the production data collected, a validation exercise was conducted with a sub-sample of the 33 households covering 45 groundnut plots. This sample was drawn from the initial households surveyed. This procedure involved measurements of area grown using a global positioning system (GPS), total pod yield per unit area, pod yield per hectare, standard weight of pail used, shelling percentage and weight of a 50kg sack filled with unshelled nuts. This exercise helped to validate information given by farmers during the household (producer) survey, which relied on memory recall.

Structured questionnaires were checked and edited in the field to verify completion of questionnaires. Post coding of open ended questions was carried out prior to data entry. Data processing and descriptive statistics were conducted using the Statistical Package for Social Scientists (SPSS). Depending on the variables under consideration analysis was performed based on gender of the household head and membership of a farmer organization to determine differences between samples. Independent samples t-tests between means and chi square tests were performed to test for significant differences in the results based on given level of significance. Gross margin analysis to determine profitability of producers and price spread to determine marketing efficiency for the different market channels was computed using Microsoft Excel. Finally, a Selective Tobit analysis was run using the Limited Dependent Package (LIMDEP) to determine the factors that influence adoption of quality management practices and the extent of adoption. These analytical methods are as described below:

4.4 Qualitative and Quantitative Value Chain Analysis

A comparative value chain study was conducted for groundnut grain and for groundnut seed. The groundnut grain value chain is assessed at local market and quality sensitive market level with external food safety issues. Groundnut seed value chain was considered separately as it is considered a high quality market which also has a subsidy component with policy and political implications. Value chain mapping was mainly undertaken during household surveys, focus group discussions and market surveys for both seed and groundnut grain. In addition to producers, this entailed tracking of the players involved in groundnut value chains from input suppliers and market players, their roles, costs incurred and flow of information. Quality management practices were also assessed at different stages in the chain.

Quantitative value chain analysis to assess competitiveness was done using gross margin analysis to assess profitability and a price spread method to measure efficiency of the different groundnut channels. Quantitative value chain showed the costs and returns that accrue to each of the key chain actors. This analysis revealed the key stages where interventions could be directed to improve competitiveness.

4.5 Production and marketing margins for groundnuts

A marketing system comprises the production, distribution, regulatory and consumption subsystems. This section describes production and distribution of groundnuts in order to estimate the economic returns realized by the producers, and the performance of the marketing channels used. Inefficient marketing systems negatively affect returns to producers and lower the consumer's welfare. Producers will be forced to shift their scarce resources to other profitable enterprises if they fail to maximize profits or are making losses.

4.5.1 Profitability analysis based on Gross Margins

The initial component under the quantitative VCA is the profitability analysis. Gross Margin Analysis (GMA) is used to estimate the economic returns to producers. Gross margin for variety i of groundnuts and for particular scale of production, s, is given by the difference between gross income and sum of all variable costs as below:

$$GM_i^s = \sum (P_i Q_i^s - C(Q)_i^s)$$

[1]

Where: GM = Gross Margin (MK/ha); $\sum P_i Q_i^s$ is the value of total production, which is the product of the production for variety i under scale of production s and the producer price for variety i, minus $\sum C(Q)_i^s$ = sum of all variable cost (MK/ha) for particular groundnut variety i and scale of production s. A variable cost changes with the scale of enterprise (e.g. output), is specific to an enterprise and avoidable, e.g., cost of seed, cost fertilizer, pesticides and casual- labour costs.

In addition to the gross margin, returns to labour are also computed as

$$((\sum [(P_i Q_i^s - C(Q)_i^s) + W_L LQ_i^s] / LQ_i^s \qquad [2]$$

; where W_L is price of labour and LQ_i^s is the amount of labour used to produce output Q for variety i under scale of production s measured as person-days, therefore $\sum W_L LQ_i^s$ is the total cost of labour for producing output Q for variety i under scale of production s. Under normal circumstances, farmers would be better off dropping an enterprise that gives returns to labour of less than the minimum wage rate, as the opportunity cost for their labour is higher elsewhere. Cost of labour, amount of labour (person days) per activity from field preparation to harvesting, and the output (yield) were collected through the producer survey. Validation exercise was conducted to confirm the collected information which relied on memory recall.

Breakeven yield which gives the yield that would be required to cover the total variable costs was also computed as follows:

$$\frac{\sum C(Q)_i^s}{P_i}$$

[3],

and breakeven price computed as $\frac{\sum C(Q)_i^s}{Q_i^s}$

[4] is the price that would enable the producer to cover the total variable costs.

Distribution sub-system

The food supply system is a complex network of production, distribution and consumption linkages (Kaynak, 1986). The distribution channels for the groundnut industry in Malawi comprise middlemen including small intermediate buyers (commonly referred to as vendors) supplying to retailers, wholesalers and processors. Marketing channels for groundnuts were mapped through focus group discussions, key informant interviews and the traders' survey for the groundnut industry. The marketing channels help to identify the main players in the groundnut marketing system.

Marketing margin analysis

In order to assess market performance in the groundnut industry, the price spread method was adopted. Price spread refers to the difference between price paid by the consumer and price received by the producer for an equivalent quantity of the product (Gadre *et. al*., 2002). The price spread consists of marketing costs and margins of the intermediaries, which ultimately determine the overall effectiveness of the marketing system. The formation of the marketing margins through their influence on the price levels is a major determinant of the efficiency of resource allocation in production, distribution and consumption.

The trader's surplus, producer's or farmer's share of the retail price paid by the end user or consumer, the total gross marketing margin or farm retail price spread, and marketing efficiency indices were estimated for the main marketing channels identified.

Trader's surplus at each marketing level, i.e., wholesaler or retailer, was computed as below

$$TS^{h}_{i} = SP^{h}_{i} - \sum MC^{h}_{i} \quad [5]$$

where:

TS^{h}_{i} = *Traders' surplus for channel* $_i$ *and type of groundnut* $_h$*;*

SP^{h}_{i} = *Selling price for channel* $_i$ *and type of groundnut* $_h$*; and*

$\sum MC^{h}_{i}$ = *Total marketing cost for* $_i$ *and type of groundnut* $_h$*.*

There are two types of groundnuts considered, these are groundnut grain and groundnut seed. These types have different marketing arrangements that have different quality demands.

The marketing cost components include the buying price, all post-harvest handling costs such as grading and packaging costs, cost of storage, transportation cost, marketing fee, market search and cost of marketing losses.

Since the study is concerned with producers' welfare, producer's share in the selling price to the consumer was computed. Producer's share assesses the share of the producer in the marketing chain. This was computed as follows:

$$PS = (FGP / CP) * 100 \quad [6]$$

where:

PS = *Producer's share (%);*

FGP = *Farm-gate price (US$/kg); and*

CP = *Consumer price (US$/kg).*

Marketing Efficiency Index (MEI) was computed for each marketing channel for groundnuts to assess the efficiency of the individual channels based on price. Using Acharya's formula, the calculated marketing efficiency indices greater than 1.0 reflect an efficient marketing system. This study adapts Gangwar *et al.* (2007) expanded Acharya's formula which isolates and incorporates marketing losses (post-harvest losses) separately. Original Acharya's formula previously included marketing losses as part of profits either to the producer or retail and thereby over-estimating profits for these players. Therefore with this adjustment as proposed by Gangwar *et al. (2007)* market efficiency is calculated as below:

$$MEI = NP_f / (MM + MC + ML) \quad [7]$$

where:

MEI = *Marketing efficiency index;*
NP_f = *Net farmer's price (US$/kg);*
MM = *Total marketing margin (US$/kg) and*
MC = *Total marketing costs.*
ML = *Marketing losses (post harvest losses)*

The net price received by farmers was estimated as the difference in gross price they received and the sum of their marketing cost. This study adapted Gangwar *et al*. (2007) method of estimating separately the marketing loss component unlike previous methods which included it under profit margins of either producer or market middlemen. In this study, marketing loss was calculated at different stages of marketing along the value chain and multiplied by the relevant prices. The net farmer's price can be expressed mathematically as below:

$$NP_f = GP_f - C_f - (L_f x GP_f) \quad [8]$$

where:

GP_f = *Gross price to farmers (US$/kg); and*

C_f = *Cost incurred by farmer during marketing (US$/kg).*

GP_f = *Gross price received by groundnut producers in US$kg*

Total margins for the market middlemen (MM) is calculated as equation (9) below:

$$MM = MM_W + MM_R \quad [9]$$

Where MM_W is margin for wholesaler

MM_R are margins for retailer

Similarly, the total marketing cost (MC) incurred by the producer, middlemen, processors, wholesalers and retailers is calculated as in equation (10):

$$MC = C_p + C_M + C_W + C_R.. \quad [10]$$

Where $C_p + C_M + C_W + C_R..$ are marketing costs for producers, assemblers, wholesalers and retailers.

The total value loss due to damage during handling of groundnuts from the field to the ultimate consumer is estimated as in equation (11):

$$ML = (L_p xGP_f) + L_W xGP_W) + (L_R xGP_R) \quad [11]$$

Where $(L_p xGP_f) + L_W xGP_W) + (L_R xGP_R)$ is aggregated value of post-harvest loss for producers, wholesalers and retailers, respectively. L is a physical loss and GP is price paid for groundnuts at various stages of selling in the value chain, from production to retailer.

4.6 Specification of the empirical model for the smallholder farmers' decision making process for investing in quality management in groundnuts

Several technologies and practices have been developed and recommended for the prevention and control of Aflatoxin contamination in groundnuts. A selective Tobit model was used to simulate the stepwise decision making process of the smallholder farmers when deciding to adopt quality management practices and also deciding on the extent of investment in quality management. When data are censored (those observations that we do not know precisely, only that they fall above or below a certain value/threshold), the

distribution that applies to the sample data is a mixture of discrete and continuous distribution (Greene, 2000). Usually adoption studies work with groups that have adopted a given technology and those that have not. Adopters usually make the decision to adopt in stages. The initial stage is the decision on whether or not to adopt a given technology. This is then followed by the decision on how much (extent) they would want to invest in the adopted technology. For example, when a new groundnut variety is introduced, farmers first decide to adopt. Eventually they decide on the extent of adoption, e. g., whether to plant the variety covering the entire fields or partially.

Analysis of adoption decisions mostly use regression analysis based on a Tobit model. However, Greene (1998) observed that the use of the Tobit model limits the understanding of adoption decisions due to its underlying assumption that the factors that influence the initial and latter stages of adoption are the same. The selective Tobit model treats the different stages of adoption as separate and might provide useful insights into adoption decisions.

4.6.1 Specification of the empirical model

To analyse adoption of quality management practices by smallholder groundnut producers and the extent of investment in such practices this study used a selective Tobit model. Maximum Likelihood Estimation (MLE) is quite cumbersome and an alternative procedure, Heckman's (1979) two step estimation procedure (already embedded in Limited Dependent Packages (Limdep) was used instead.

To put the adoption of groundnut quality management and extent of adoption in a general framework for sample selection model (Greene 1998), let the equation that determines the sample selection be

$$z_i^* = \alpha' v_i + u_i \,, \qquad (1a)$$

And let the equation of primary interest be

$$Y = \beta' X + \varepsilon \qquad (1b)$$

where *X* is a vector of independent variables and Y is the dependent variable. The sample rule is that y_i is observed only when z_i^* is greater than zero and note that *y* is censored at zero. We therefore assume that the non-random (systematic) process that switches households into those involved in quality management, is given as below

$$z_i^* = \alpha' v_i + u_i, z_i = 1 \quad \text{if } z_i^* > 0 \qquad \upsilon_i \sim N(0,\sigma_\upsilon) \tag{2}$$

$$z_i = 0, otherwise,$$

The probability that farmer *i* is involved in quality management of groundnut (probit model based z*) depends on a set of explanatory variables X:

$$\Pr ob(z_i = 1) = \Phi(\alpha_i v / \sigma) \tag{3}$$

for those with $z_i = \alpha' v + u > 0$ or $z_i > 0 = \alpha' v > -u_i$ and

$\Pr ob(z_i = 0) = 1 - \Phi(\alpha'_i v / \sigma)$ otherwise

σ is the standard deviation and Φ(.) is the standard normal distribution function of the error term u in equation (3).

Estimation:

The Tobit model with sample selection uses the linear prediction of the underlying latent variable (variables not directly observed but rather inferred) for the fitted values. This is

$$E[y^* \mid z = 1 = \beta' X + \rho\sigma\lambda \quad \text{observed only if } z_i = 1, \ (u_i, \varepsilon_i) \sim \text{bivariate normal } [0,0,1,\sigma,\lambda] \tag{4}$$

where

$$\lambda = \phi(\alpha' v) / \Phi(\alpha'_i v) = \phi / \Phi)$$

λ is Mill's ratio or hazard function. We estimate a probit model and mill's ratio displayed and kept for MLE in LIMDEP (Greene, 1998). Other parts of the fitted values listing are the same as for the basic Tobit model.

$\phi = \partial\Phi(X'\beta)/\partial X'\beta$, is the ratio of the marginal to cumulative probability of a household involved in groundnut quality management. The term λ_i corrects for the bias associated with omitting households involved in groundnut quality management when it is included in an OLS regression of non-zero values (regression restricted only to households involved in groundnut quality management). The predictions are based on linear, single equation specification and they do not exploit the correlation between the primary equation and the selection model. Further manipulation is therefore required (Greene, 1998).

For the Tobit model with selection, we need

$$E[y \mid selection] = prob[y > 0 \mid z = 1] \times E[y \mid y > 0, z = 1] \quad (5)$$

The probability can be found from the bi-variate normal distribution below

$$\Pr ob[y > 0, z = 1] = \Phi_2[\beta' X / \sigma, \alpha' v, \rho] \quad (6)$$

The analysis starts with the probit model to provide starting values for the maximum likelihood estimator (Heckman procedure). The results of the probit model (equation 3) show the variables which determine the initial decision to adopt, i.e., whether or not a farmer decides to get involved in quality management of groundnuts. Probit model parameters are used for fitting the sample selection function. However, parameters at this point are still inconsistent since results are obtained by least squares as is the case in any basic Tobit model. Parameter estimates are not efficient because the error term is heteroscedastic. Using MLE of the selective Tobit model yields consistent and efficient parameters (Greene 1998). The selective Tobit model then analyses the variables that influence the farmer's decision on the extent they invest in quality management of groundnut.

4.7 Practical challenges faced during data collection

With VCA as the main analytical tool, data needed to be collected from different players in the chain. This is a practical tool that was used to help understand the groundnut chain and so assess intervention points that would help address market access and productivity challenges. However, limited data especially at the trader and processor levels has limited some analysis. In some cases multiple visits were conducted to help collect some of the

data. Lack of specialization at the trader level also made classification at this stage a challenge. Most actors are involved at more than one stage of the value chain.

4.8 Conclusion

Use of multiple approaches for data collection has proven to be helpful in studies of this nature. During the producer and trade surveys, recall data was collected using structured questionnaire and checklist, respectively. Producer survey data needed to be verified with what was happening during marketing season. Not only were traders interviewed during the marketing season but also some of the producers who were interviewed in the household survey. This enabled observations of what farmers and traders actually do in relation to what was reported to help in discussion of the study results. Observation of what traders do on the market helps to explain some of the behaviour demonstrated by farmers. Observations of the buying process, weighing scales used, shelling and grading were made. For example, farmers were able to demonstrate how they soak the groundnuts to ease shelling. Some of the traders interviewed were able to demonstrate the tricks they use to manipulate the weighing scales when buying from smallholder farmers. This interaction helped the researcher to have a better understanding of the value chain and the governance of the various groundnuts value chains.

CHAPTER 5:

SOCIO-ECONOMIC CHARACTERISTICS OF SMALLHOLDER GROUNDNUT FARMERS IN MCHINJI DISTRICT

5.0 Introduction

Chapter four presented an analysis of the research methodologies used in this study to assess groundnut smallholder profitability and market efficiency in price for the various marketing channels of groundnuts. Methods to determine factors that influence farmers' decision when deciding whether or not to adopt quality management practices of groundnuts and the extent of adoption were also presented.

Chapter five presents socio-economic characteristics of the sampled households. Socio-economic characteristics of households such as education, gender of household head and age may influence production and marketing related decisions made by different households in various ways (Chirwa, 2005; Abdulai, *et al*., 2011; Madola, 2011). This chapter also explains the validation exercise that was done to validate some of the estimates, including average land size, seed rate, yield, and shelling conversion rates.

Household interviews and focus group discussions were conducted with farmers that belonged to functioning farmer organisation and also, non-members to collect data from smallholder groundnut farmers in Mchinji. In addition, a validation exercise was also conducted with a sub-sample of the farmers to physically measure, using a hand-held global positioning system (GPS), average smallholder plot sizes allocated to groundnuts, average seed rate per hectare, average yield per hectare, validate conversion rate of non-shelled to shelled groundnut grain and average rate of grade-outs. The validation exercise revealed that smallholder farmers were on average overestimating the groundnut seed they use per hectare but underestimate their yields. Most of the smallholder farmers did not include groundnuts consumed while still in the field (usually consumed or sold before harvesting). Through the process conversion rate from non-shelled to shelled nuts was verified and also, estimated the rate of breakage on average for those farmers using

mechanical shellers. These verified figures helped to compute the gross margins with some precision.

5.1 Socio-economic characteristics of the smallholder households engaged in groundnut production

The number of smallholder farmers is estimated to be 2.5 million (NSO, 2008) out of which 675,000 are involved in groundnut production. Over 90% of groundnut in Malawi is grown by smallholder farmers under subsistence farming (Emmott, 2012). The bulk of this crop (70%) is produced in the Central Region (Simtowe *et al*., 2010a, Delargen and Phiri, 2012). Mchinji district, where household production survey for this study was conducted, accounts for 15% of the total smallholder groundnut farmers in Malawi.

5.1.1 Gender composition, marital status, age and education of sampled households

Analysis of the sample indicates that 82% of the sampled households (HH) were male-headed households. This was similar among both members of a farmer organisation (FO) and non-members (Table 5.1). Female-headed households in this context refer to those households where the woman is the major decision-maker, either because she is single or married under polygamy. The proportion of female headed households in this study was slightly lower than the national average of 24% reported in the third integrated household survey (NSO, 2012) but similar to figures reported by Simtowe *et al*., (2009) and Madola, (2011). This could be due to land shortage problem which is more acute among female headed households. Groundnut is normally grown under pure stand. As such, a household must have extra land to grow this crop in addition to maize, which is a staple food crop and therefore prioritised.

Computed average household size was 5.6 for male-headed households and 6 for female headed households. Dependency ratio was higher among female headed households (1.67) than for male-headed households (1.22). However, average household size among the respondents was higher than 4.5 reported in the Integrated Household Survey (NSO, 2012) and 5.1 reported by Simtowe *et al*. (2009). Dependency ratios among the respondents are

consistent with 1.2 reported for Malawi (NSO 2012) and 1 for male-headed households and 1.7 for female-headed households reported by Simtowe *et al*. (2009).

Table 5.1: Gender composition, marital status, and age and education level of household-heads

Gender of household head	**Member (n=163) (%)**		**Non-member (n=141) (%)**			
Male-headed household	82		82			
Female-headed household	18		18			
Marital Status of household-head	**Male-headed household**	**Female-headed household**	**Male-headed household**	**Female-headed household**		
Single	10	50	3	72		
Married	90	50	97	28		
Age of household head	45	48	39	44	Overall male	Overall female
Overall age	46		40		42	46
Education level of household-head	**Proportion of members**		**Proportion of non-members**		**Overall (male HH %)**	**Overall (Female HH %)**
None	10	17	10	25	10	20
Primary	71	70	58	50	65	61
Secondary	19	13	32	25	25	19

Overall female household heads are older than male household heads. An independent samples t-test shows that the difference between male and female household heads is significant at 5% level of significance.

Based on FO membership status, results show that members are older than non-members. An independent samples t-test shows that the difference between ages of the two categories of farmers is significantly different at 1% level of significance. A majority of smallholder farmers had attained some form of primary education. Overall, more female household-heads (20%) had no education than male household-heads (10%) (Table 5.1). However, chi square tests show that the difference between male and female household-heads is not significant at 5%.

By membership, 10% of male household-heads for both members and non-members had no education. Among female household-heads 17% of members and 25% of non-members had no education. Chi square tests show that the differences between member and non-member male-headed households are significant at 5%. However, differences between member and non-member female-headed households are not significant. The proportion of household heads that are not educated is higher among the female-headed households than the male household-heads. Illiteracy level is even higher among female-headed households that are not members of any organised farmer organisation.

On average, actual number of years spent in school is 6 and 5 for member and non-members male household-heads, respectively and 5 and 4 years for members and non-member female household-heads, respectively. An independent samples t-test shows that the differences between member and non-member male and female household-heads in terms of actual years spent in school are not significant at 5% level of significance.

5.1.2 Land acquisition, holding sizes and allocation to groundnuts

The most essential capital for smallholder farmers in Malawi is land and labour. Land acquisition in the district is mainly through inheritance from family among both male and female-headed households (Table 5.2). Small proportions of farmers were allocated land by the village head.

Table 5.2: Land acquisition by smallholder farmers in Mchinji district (%)

Gender of household-head	Mode of land acquisition	Member (%)	Non-member (%)
Male	Allocated by village head	13	5
	Bought	9	6
	Inherited from family	79	87
	Through marriage	2	2
Female	Allocated by village head	13	12
	Bought	0	8
	Inherited from family	87	76
	Through marriage	0	4

Average land holding size and land cultivated is presented based on validated data in Table 5.3.

Table 5.3: Average land holding size, land cultivated and land allocated to groundnut by smallholder farmers in Mchinji district (ha)

Land variable	Male-headed HH	Female-headed HH	Independent t-test results
Land owned (ha)	2.17	1.85	.427
Land cultivated (ha)	1.74 (80%)*	1.52 (82%)*	.105
Land allocated to groundnut (ha)	0.52 (30%)**	0.46 (30%)**	.174
	Member	**Non-member**	
Land owned (ha)	2.42	1.64	.003
Land cultivated (ha)	1.84 (76%)*	1.47 (90%)*	.000
Land allocated to groundnut (ha)	0.57 (31%)**	0.42 (28%)**	.000

*Figure in parentheses represents proportion of land owned cultivated

**Figure in parentheses represents proportion of land cultivated allocated to groundnut

Male-headed households owned and cultivated more land than female-headed households (Table 5.3). However, the differences are not statistically different at 5% level of significance. Further analysis of proportions shows that male and female headed households both allocated an average of 30% of their cultivated land to groundnut production.

On average, FO members have larger land holding size (above 2 ha/household) compared to non-members (1.64 ha). The differences in land owned, cultivated and allocated to groundnut between members and non-members are significant at 1% level of significance. Members owned, cultivated and allocated more land to groundnut than non-members (Table 5.3). On average members allocated 31% of the cultivated land to groundnut production while non-members allocated 28%. Land allocation for both categories of farmers will increase the more groundnuts is taken as a commercial crop.

Despite small land holdings, smallholder farmers grow multiple crops. Main crops grown by smallholder farmers in Mchinji include maize, groundnut, tobacco and soybeans.

5.1.3 Involvement of smallholder farmers in groundnut production and marketing by gender

The focus group discussions revealed that both men and women are actively involved in groundnut production and marketing. Groundnut production is no longer a woman's crop as previously perceived (discussion in Box 5.1).

Box 5.1: Farmers comments on gender roles in groundnut production and marketing

'*In the recent past men in our community mostly focused on tobacco production as their main cash crop and left the production of groundnut largely to women. For groundnut, men were mostly involved at the marketing stage. However, since tobacco prices started fluctuating in the past five years compared with stable groundnut prices, more men have now started producing groundnuts also as a cash crop. In this case men are actively involved at all stages from production to marketing*.' (Kalulu Chapter FGD)

'*In terms of specific roles performed, shelling of groundnuts is an example of an activity that was solely performed by women in the past. However, now men are involved throughout the groundnut value chain from production to marketing. Nowadays, it is normal to see men shelling groundnuts in readiness for marketing (Fig. 5.1). This is something which never used to happen before*.' (Chiosya and Mkanda FGDs)

Figure 5.1: Some men from Chiosya join women in shelling groundnuts

5.2 Smallholder Farmer Income

Table 5.4: Smallholder farmer income and groundnut contribution

	Total income (MK)	**Crop income (MK)**	**% of crop income to total income**	**Groundnut income (MK)**	**% groundnut income to total crop income**
Member male headed	156589	107237	68	63,559	63
Member female headed	85314	68885	81	48908	**71**
Non-member male	99210	77166	**78**	50,157	65
Non-member female	78440	41797	**53**	29,676	71
Overall members	139958	98288	**70**	63,887	65
Overall non-members	94636	68914	**73**	45,483	66

Source: Own survey data

Overall, crop income is slightly higher for those farmers that belong to farmer organisation than non-members. It was also revealed that crop income as proportion of the total household income is slightly higher for non-members than members. This may suggest that farmers who belong to farmers' organisations may be diversifying and slowly expanding their base for livelihoods more than non-members. Since it has also been demonstrated in this study that farmers that belong to farmer organisations have better access to other services (seed, extension and training), it is not surprising that these farmers are relatively well-off.

Groundnut income contributes more than 60% to the total agricultural income in this district. It can be inferred that groundnut significantly contributes to the total household

income and therefore livelihoods for the smallholder farmers in Mchinji district. This means increasing groundnut productivity and access to structured markets would have a significant impact on poverty reduction for the smallholder farmers, especially in the groundnut growing areas. The proportion of groundnut income in the total crop income is slightly higher for the female headed-households implying that these households may be less diversified in cash crops production compared to male-headed households.

5.3 Discussion

Respondents in the socio-economic survey were divided into members and non-members to determine if there are benefits to farmer organisation membership or differences between members and non-members. Some results were also disaggregated by gender to look for differences between the genders with respect to groundnut production and marketing. Female-headed households in this context refer to those households where the woman is the major decision maker either because she is single (never married, widowed or separated) or married under polygamy.

Study results indicate that average age for farmers was 44 with female headed households being older (46 years) than male household-heads (42 years). This finding is consistent with the findings reported in the third Malawi Integrated Household Survey (NSO, 2012), which reported that the proportion of female headed households increases with increase in age. Average age of smallholder farmers that belonged to farmer organisation was higher than those that do not belong to any farmer organisation. This is consistent with findings by Madola (2011) who also found that FO members were older than non-members and age of the household head had a positive but not statistically significant influence on membership decision. At 46 years, farmers may be more experienced and value farming differently as main source of livelihood. These farmers may also be easily attracted to invest more in agriculture unlike the young farmers that might still be exploring options.

A majority of the respondents have attained junior primary education. NSO (2012) found that 74% of the population in Mchinji had no formal qualification but had attained primary education. This study found that about a quarter of the respondents, especially non-members have not attended school. This is similar to the findings (20%) reported in the third integrated household survey for Mchinji (NSO, 2012). By gender, more female-

headed households have not attained any education than male-headed households. This finding is also consistent with the results from the third integrated household survey (NSO, 2012). These results mean extension messages on groundnut production and marketing need to be tailor made to be easily understood by all smallholder farmers. Considering the low level of education attained, simple graphic and audio messages would easily be understood than written messages. Importantly, a farmer organisation needs to be relevant to farmers based on their needs and benefits derived by being members would attract non-members to join.

Land is an essential input in groundnut production. Consistent with findings from the national integrated household survey (Simtowe *et al* 2009 and NSO, 2012) the results showed that a majority of male and female-headed households in the study area acquired land through inheritance from family. NSO (2012) reported that no differences were observed in land acquisition as 78% and 81% of male and female headed households respectively acquired land through inheritance. Mchinji is a matrilineal society and so women inherit some land from their parents as such land was not a constraint for them as is the case in patrilineal societies where inheritance is through the male children. Most of the smallholder land is under customary land law. This type of land has weak security of tenure as the law stipulates that the land belongs to the Government and the chiefs are simply custodians of this land on behalf of Government. Under this tenure, households own the plots that have been allocated but cannot use this land as collateral at times when they are looking for loans from commercial banks.

Average total cultivated area for male–headed households (1.74ha) in this study is higher than the national average reported (1.4ha) (NSO, 2012). However, the same national household survey also reported that around 8% of households in the central region cultivated between 4-6 acres (2.5ha) within which range male-headed households in this sample fall. The total cultivated area for female headed households is consistent with the average cultivated area for the central region of Malawi (1.54ha). Similarly, in their study, Simtowe *et al*. (2009) also observed that smallholder farmers in Mchinji owned larger plots of land than those from other districts within the country, especially in the southern region such as Chiradzulu, Balaka and Thyolo.

Male-headed households owned, cultivated and allocated more land to groundnuts than female-headed households which is also consistent with the findings reported by NSO (2012). However, in terms of proportion of cultivated land allocated to groundnut production, similar proportions were allocated by male and female-headed households. Average land allocated to groundnuts was slightly higher than 0.4ha reported by Sangole *et al*. (2010). In terms of proportion of cultivated area allocated to groundnut, figures in this study are also higher than the 17% reported by Simtowe *et al*. (2009). Male headed-households in Malawi usually have higher labour and incomes compared to female-headed households mainly due to the presence of the male figure. Female-headed households have a high dependency ratio of 1.7, compared to the national average of 1.2 as reported by the third Integrated Household Survey NSO (2012). This means that roughly one economically active person under the female-headed household supports approximately two economically inactive persons. Beyond this ratio, a household may start experiencing serious limitations on labour to effectively provide for the home. Similar results were reported by Simtowe *et al*. (2009) who found that dependency ratio for male headed households in Mchinji was 1 while that of female headed households was 1.7.

Apart from attending to farm activities, women have more care responsibilities in the home (Njuki *et al*., 2013). Due to limited labour availability, female-headed households may improve on management of groundnuts if they cultivate pieces of land they can easily manage and probably also encouraged not to grow many high valued crops that would compete for the same labour. In other words, female headed households should diversify slowly choosing a few crops at a time for them to be able to manage well the labour demands that come with diversification. Other labour saving technologies such as simple groundnut shellers can help free-up time for smallholder groundnut farmers. However, factors limiting adoption of such technologies need to be considered.

After losing its export market coupled with smallholder farmers' shift of attention to tobacco production, groundnut was mostly grown as a subsistence crop and referred to as a woman's crop in Malawi (Ngulube *et al*., 2001, Minde *et al*., 2008). Only the surplus was sold to get some cash for the household. During this period men became less involved in groundnut and increased their involvement in production and marketing of burley tobacco. Contrary to this belief, results from this study have shown that currently both men and women are actively involved in groundnut production and marketing. Male and female-

headed households allocated same proportions of land (around 30% of total cultivated land) towards groundnut production. This figure is consistent with the 34.8% reported by Minde *et al*. (2008). Less than buoyant demand and the low prices offered to tobacco smallholder farmers in Malawi in the past few years have contributed to the surge in men's involvement in other high value cash crops including groundnut production and marketing. Unlike tobacco, groundnut has in recent years enjoyed a stable demand and good prices. This attracted and contributed to the increased number of male smallholder farmers growing groundnuts, previously only associated with tobacco production. More involvement of males may imply enough labour which previously was trapped in tobacco production. More male involvement should not be viewed as displacing women, but rather bringing more labour and therefore complimentary efforts that should be harnessed to bolster quality and standards in groundnut production and marketing. Female headed households usually experience labour shortage (Njuki *et al*., 2013; Munthali and Murayama, 2013). Such households could find it difficult to invest in quality and standards.

The fluctuations in demand and low prices experienced in tobacco production and marketing have also recently led to the deliberate focus on export diversification. Recently the Government of Malawi launched the National Export Strategy (NES) which outlines the sectors to be promoted for export diversification alongside tobacco. Oilseed crops which include groundnuts, have been prioritised in the strategy and also in the Malawi Growth and Development Strategy (MGDS) (NES, 2012; GoM, 2009). This might entail more men as well as large commercial farmers moving into groundnut production among other oilseed crops, in due course.

The results have shown that women are also actively participating in the marketing of groundnuts. Women participation in marketing increases their chances to control that income and use it for the home. This is unlike in tobacco where participation of women in marketing is limited hence negatively influencing their level of control over income (Njuki *et al*., 2013). Since women have more care responsibilities around the home, groundnut production and marketing entails more opportunity and potential to improve household food security, nutrition and poverty reducing.

5.4 Conclusion

Overall the socio-economic characteristics in terms of marital status, age and education level of the sampled households were consistent with the findings of the National Integrated Household Survey for 2012 on the typical smallholder farmer in Malawi. Dependency ratio for female headed households of 1:2 means that one economically active person supports two economically inactive persons. Above this ratio, it may imply that concerned household could experience serious labour shortage and food insecurity. Land holding, owned and cultivated was higher for male-headed households than female headed households. This could be the influence of labour and income, which tend to favour male headed households. However, proportion of land allocated to groundnuts by male-headed and female-headed households was similar. Land holdings were larger among farmers that belong to farmer organisation than non-members. Also, members allocated more land to groundnuts than non-members.

The results have shown that both women and men are actively engaged in groundnut production and marketing. This is contrary to previous claims (Nguluwe 2002) that groundnut is a woman's crop only. Also, the proportion of land allocated to groundnut is increasing among smallholder farmers suggesting an increasing importance of the crop at household level for both male and female-headed household. If increased land allocation is sustained and supported by other investments such as labour and capital, this crop has potential to become an import export crop and therefore contributing towards diversification of the country's export base.

CHAPTER 6

GOVERNANCE OF THE GROUNDNUT VALUE CHAIN: ACTIVITIES AND RELATIONSHIPS OF KEY ACTORS IN THE VALUE CHAIN

6.0 Introduction

The previous chapter has given a description of the type of smallholder farmers currently engaged in groundnut production in Mchinji district. Chapter six presents the main actors, processes and roles played by these players in the various marketing channels as identified in this study. In addition, the flow of market information, relationships and linkages that exist in the groundnut value chain and other services feeding into the chain are also presented. This analysis was necessary to help assess the position of smallholder farmers, who are the main producers and how they interact and influence other players along the chain. Mapping out value chain actors was also done to understand the relationships and interactions, and identify policy issues that may hinder or enhance the functioning of the value chain. Focus group discussions with smallholder farmers, interviews with traders, processors, exporters and other actors and direct observations were conducted to map the groundnut value chain in Malawi.

Most smallholder farmers are based in the rural areas and it is usually assumed that they are challenged with poor access to markets. Poor access to markets may be characterised by failure to access safe storage facilities, all-weather roads and affordable transportation, poor access to real-time information about market prices and volume demanded which is important for informed production and marketing decisions. Improved access to markets and related improvements in rural infrastructure and marketing institutions are essential for facilitating adoption of new technologies and transformation of subsistence oriented smallholder agriculture (Zeller *et al*., 1998). Previous efforts have mostly emphasised on building smallholder farmers' production capacity. But besides production capabilities, improving access to markets has shown to be an important element for promotion of rural development and poverty reduction (Shepherd, 2007; Fischer and Qaim, 2012). Globalisation, liberalisation and urbanisation have contributed to the changes in agricultural marketing systems. Not only has this led to entrance of new market players

and new market opportunities, but has also exposed producers to market access and price instability risks (Onumah *et al*., 2007). Hence, interventions that will facilitate access to markets by smallholder farmers are needed. In addition to the smallholder producers there are other players that are involved in subsequent stages of the groundnut value chain. A value chain analysis would enhance the understanding of how poor people in the rural areas can engage with or improve their participation in markets. Sustained income growth for developing countries requires successful penetration into global markets, systemic competitiveness and an understanding of some dynamic factors within the value chain (Kaplinsky and Morris, 2001). This analysis is necessary as it allows the rural poor to understand how they can participate in trade and the factors that would enhance or hinder their competitiveness.

Section one of this chapter presents the main activities and actors in the groundnut value chain and section two focuses on farm production. Groundnut post-harvest handling issues are covered in section three while section four and five covers groundnut marketing. Groundnut marketing channels are presented in section six. Flow of market information and other services into the groundnut chain is presented in section seven while section eight describes the governance of the value chain. Section nine and ten presents constraints faced by smallholder producers, traders and processors. Opportunities in the groundnut value chain are presented in section eleven. Section twelve is the discussion of the key results and the conclusions are presented in section thirteen.

6.1 Main Activities and Actors in the Groundnut Value Chain

There are distinctive activities which occur in the groundnut value chain. These include input supply, production, assembly (trading), processing and distribution. These processes are performed by different actors but some actors are involved at more than one stage of the value chain as explained in sections below.

The Government's FISP has been an important and reliable market for the certified legume seed over the past years. Almost all local (more than 10) seed companies now existing in the country have been established in the past eight years after the launch of FISP in 2006 **(**FISP Logistics Unit 2013**;** Chirwa and Dorward, 2013**)**. These local seed companies either deal with OPV maize and legume seed or legume only.

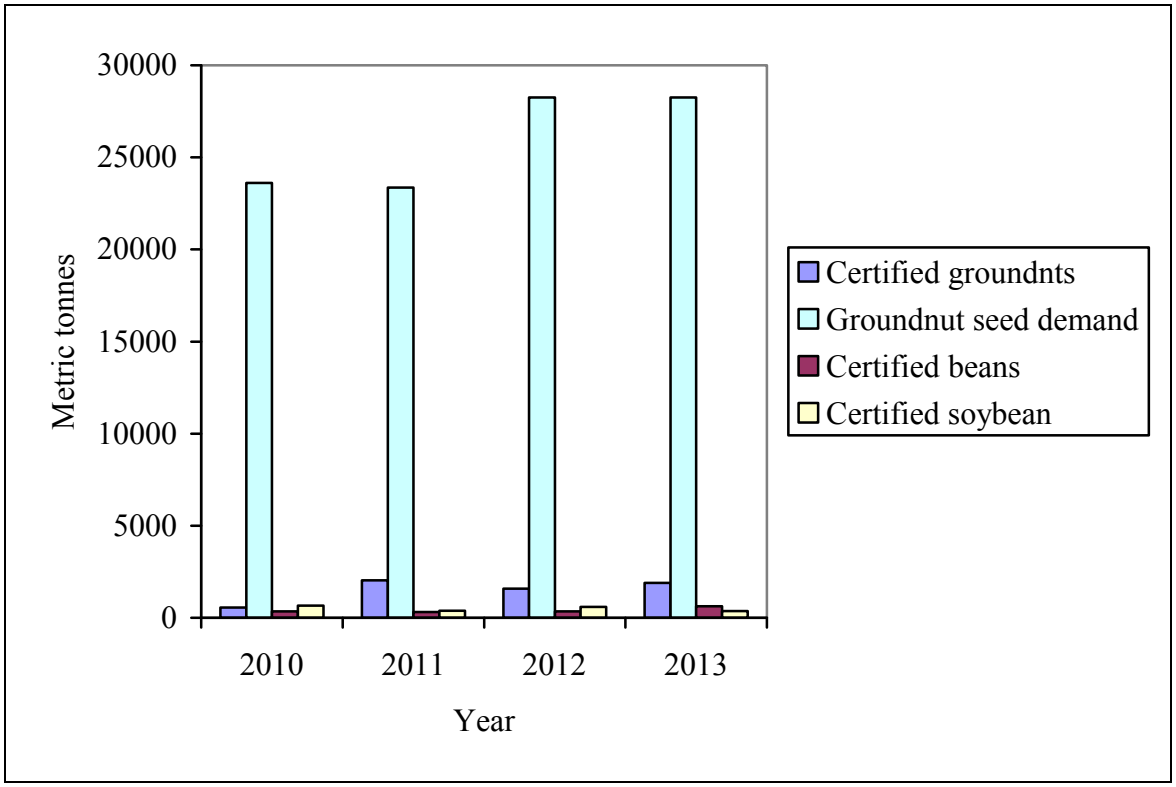


Figure 6.1: Certified groundnut seed demanded and supplied through Malawi FISP (mt)

Source: FAOSTATS (seed demand); Chaudhary, 2014; Logistics Unit 2013, Yearly Reports; STAM Yearly Reports

In addition to the FISP, seed companies also sell their legume seed on the commercial market and to the NGOs. NGOs are involved in production of seed which is distributed to the smallholder farmers in their project areas. In most cases smallholder farmers pay for this seed in-kind, by contributing part of their harvest to the village groundnuts banks, a model which is being encouraged by most of the NGOs (such as Care, Action Aid, World Vision). Recycled seed refers to seed kept from previous own harvest or supplied by fellow smallholder farmers who keep part of their harvested groundnuts up to planting time.

6.2 Farm Production

This stage focused on sourcing of seed, planting, and management of pre-and post-harvest handling practices of the crop by smallholder farmers.

6.2.1 Type and sources of groundnut seed used by smallholder farmers

This study found that more than 70% of the smallholder farmers interviewed used recycled legume seed. Only 29% of members and 6% of non-members are using certified groundnut seed (Table 6.1). Recycling of groundnut seed has been blamed for low productivity, especially if done continuously as is the practice when using local groundnut varieties or even when certified groundnut seed is recycled more than three growing seasons as the seed loses viability.

Table 6.1: Type of groundnut seed used by FO members and non-members (%)

Type of seed used	Male-headed households (%)		Female-headed households (%)		Overall (%)	
	Members	Non-members	Members	Non-members	Members	Non-members
Certified	30	6	26	8	29	6
Recycled	70	94	74	92	71	94

Chi square test showed that the difference between members and non-members using certified groundnut seed is significant at 1% level of significance. Chi-square test result shows that the difference between the proportion of male-headed member households and non-member households is statistically significant at 1%. This shows that the use of certified seed is higher amongst male-headed member households than non-members. The trend was similar for female-headed households but not statistically significant.

Sources of seed that are used by smallholder farmers were also assessed based on type of seed in a multiple response question (Table 6.2).

Table 6.2: Sources of groundnut seed used by smallholder farmers by type of seed (%)

Source of groundnut seed	% of respondents by type of groundnut seed used by smallholder farmers	
	Certified groundnut seed	Recycled groundnut seed
FISP	21	0
ICRISAT (certified)	51	0
Ordinary retail shop (certified)	8	0
Previous own harvest (recycled)	0	53
Farmer organisation (QDS)	20	0
Relatives/neighbours (recycled)	0	38
Local market (recycled)	0	11

From Table 6.2, 51% of the respondents mentioned ICRISAT as an important source of certified groundnut seed for smallholder farmers in Mchinji district. This is followed by government FISP and farmer organisations. Recycled groundnut seed is mainly supplied from farmers' own previous harvest (53%), relatives or neighbours and local market.

6.2.2 Groundnut varieties grown by smallholder farmers and reasons for choice of varieties

Smallholder farmers indicated that they grow more than one variety of groundnuts (Table 6.3). Out of the groundnut varieties grown in Malawi, CG7, Nsinjiro and Chalimbana are the most grown among smallholder farmers in Mchinji district.

Table 6.3: Groundnut varieties grown in the area (%)

Gender of household-head	Groundnut variety grown	% of respondents growing specified variety	
		Members	Non-members
		(n=132)	(n=114)
Male	CG7	93	91
	Chalimbana	62	73
	Nsinjiro	80	82
		(n=30)	(n=24)
Female	CG7	80	83
	Chalimbana	47	58
	Nsinjiro	67	75

CG7 and Nsinjiro are the most grown groundnut varieties in Mchinji district (Table 6.3). Though low yielding, Chalimbana is still widely grown. CG7 is the most grown variety among both male-headed households and female-headed households. This is followed by Nsinjiro then Chalimbana.

Farmers stated multiple reasons for choice of groundnut varieties grown presented in Table 6.4. Yield potential is the major reason for choice of groundnut variety among both male-headed and female-headed households, members and non-members. Other important reasons include time to maturity, demand from buyers and suitability of the variety to the agro-ecological zone. Farmers also stated that in other years Chalimbana has high demand and fetches a slightly higher price than CG7.

Table 6.4: Reasons for choice of groundnut varieties grown by smallholder farmers (%)

Gender of HH head	Reason for choice of groundnut variety grown	% of respondents	
		Member (n=133)	Non-member (n=115)
Male	High yielding	92	91
	Time to maturity	32	38
	Resistance to pests/diseases	18	12
	Demand from buyers	37	33
	Weight of the nuts	15	15
	Suitability to agro-ecological zone	26	19
Female		**(n=30)**	**(n=24)**
	High yielding	96	79
	Time to maturity	30	42
	Resistance to pests/diseases	11	8
	Demand from buyers	19	38
	Weight of the nuts	11	13
	Suitability to agro-ecological zone	11	4

A household's decision regarding which varieties to grow is usually jointly made between the husband and wife (Table 6.5).

Table 6.5: Decision on groundnut varieties grown by smallholder farmers (%)

Gender of HH-head	Family member involved	% of respondents	
		Member (%)	Non-member (%))
		(n=133)	(n=116
Male	Husband	29	39
	Wife	22	20
	Husband and wife	43	40
	Parents	6	2
Female		(n=30)	(n=24)
	Husband	17	12
	Wife	33	33
	Husband and wife	23	17
	Parents	27	38

Among male-headed households, 43% of members and 40% of non-members indicated that the household's decision regarding groundnut varieties to grow is usually jointly made

between the husband and wife. This suggests that women have a say in cultivation of groundnuts even if they are not head in some of the households interviewed. Out of the female-headed households 23% of members and 17% of non-members mentioned that both husband and wife agree on the groundnut variety grown. Notably, among female-headed households, besides the woman being the main decision maker, parents are an important influence on groundnut varieties grown.

6.2.3 Average groundnut yields for smallholder farmers

Average yields obtained by smallholder farmers were analysed based on both gender of the household head and membership of a farmer organization as shown in Table 6.6. Only figures for the male headed households that belong to farmer organisation were slightly higher than average national figure of 650kg/ha (MoAIWD 2014).

Table 6.6: Average groundnut yields for smallholder farmers (kg/ha)

Gender of HH-head	**Average groundnut harvested (kg/ha)**	
	Member	**Non-member**
Male	794	680
Female	655	494
		Independent t-test results
Overall members	770	.009
Overall non-members	644	
Overall male-headed households	749	.017
Overall female-headed household	585	

From Table 6.6, based on gender of household-head, yields obtained by male-headed households were 28% higher than female-headed households. An independent t-test shows that the difference in average yields between male and female-headed households is significant at 5% level of significance. Differences in availability of labour could explain the differences in yields between male and female-headed households. Male-headed households had more labour available than female-headed households. Besides, even among members, more male-headed households had access to improved seed than female-headed households which might also explain the differences.

By FO membership status, average groundnut yields for members were 20% higher than that for non-members. More FO members had access to improved groundnut seed and extension services than non-members which might explain the differences in yields obtained. An independent t-test shows that the difference in average yield between members and non-members is significant at 1% level of significance.

6.3 Groundnut Post-harvest Handling

This section presents the results on post-harvest handling activities performed by smallholder farmers including drying, storage, shelling and grading of groundnuts. Post-harvest handling comprises drying, storage, shelling, winnowing and grading process. Post-harvest losses therefore comprise losses made during these processes.

6.3.1 Drying of groundnut

After harvesting with a hand hoe and wilting along the ridges, the nuts are then left to dry in the field. Post-harvest losses in groundnut occur through loss in quantity or quality. This study mainly focused on quality aspects that contribute to reduction in Aflatoxin contamination. The 'Mandela Cock' is an aerated ventilated pyramid shaped stack which is a slow-drying method with a space in the middle for air circulation. This method was developed by scientists in South Africa as one way of reducing Aflatoxin contamination and was introduced to Malawi by a South African breeder at ICRISAT (Personal Communication, Country Director, ICRISAT-Malawi, 2011). Figure 6.2 presents the drying methods used by smallholder farmers.

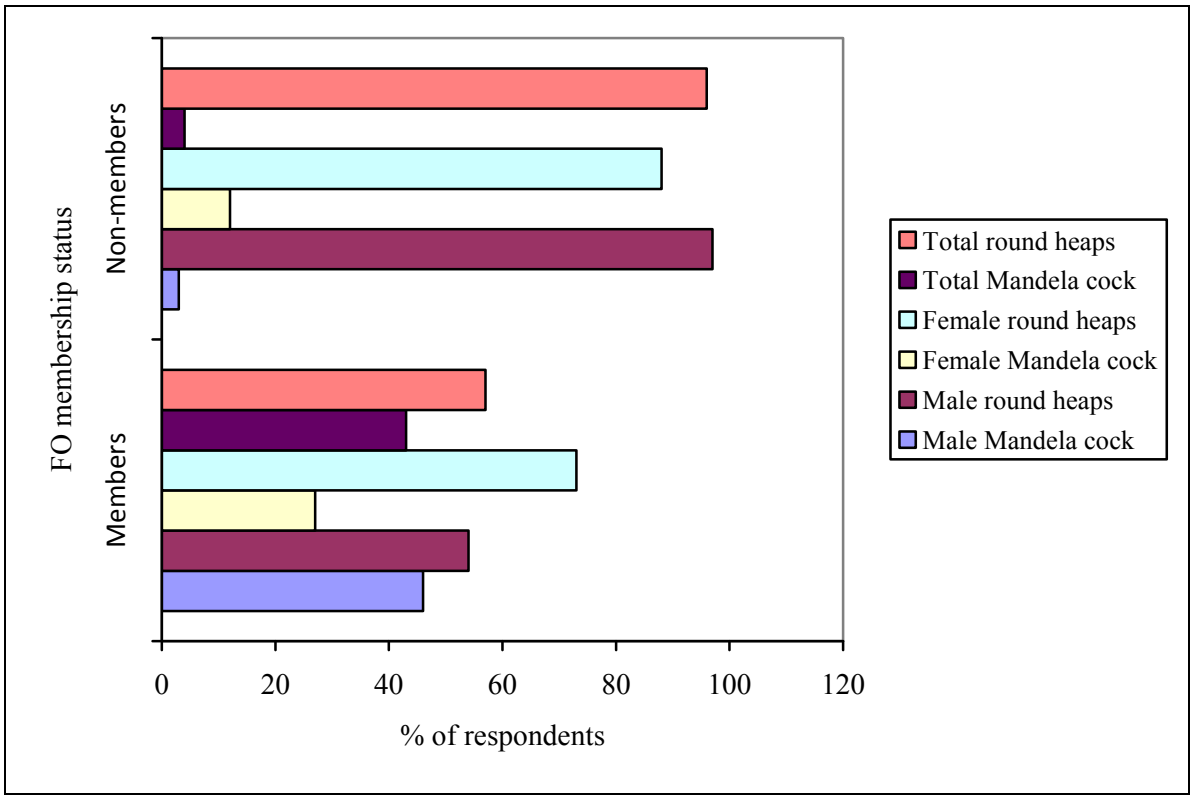


Figure 6.2: Groundnut drying methods used by FO member and non-member smallholder farmers (%)

Overall, the recommended Mandela Cock is used by 43% of members and 4% of non-members (Fig 6.2). The rest still use the traditional round heaps. Chi square test shows that the difference between members and non-members using the Mandela Cock method is significant at 1% level of significance, showing that adoption of this technology is greater among FO members than non-members.

Further, more male headed-households use the Mandela Cock than female headed-households. Chi square tests show a significant difference between member and non-member male-headed households using the Mandela Cock at 1% level of significance. For female-headed households the difference in the adoption of the Mandela Cock showed a similar trend but is not statistically significant.

6.3.2 Storage of groundnuts by smallholder farmers

Figure 6.3 shows the methods of groundnut storage used by smallholder farmers in Malawi. Polypropylene sacks are used for storing groundnuts and kept in the house by 50% of members and 56% of non-members (Fig. 6.3). Other farmers keep groundnuts in traditional granaries or just heaped in the house. The difference between members and non-members in terms of storage methods used is not statistically significant.

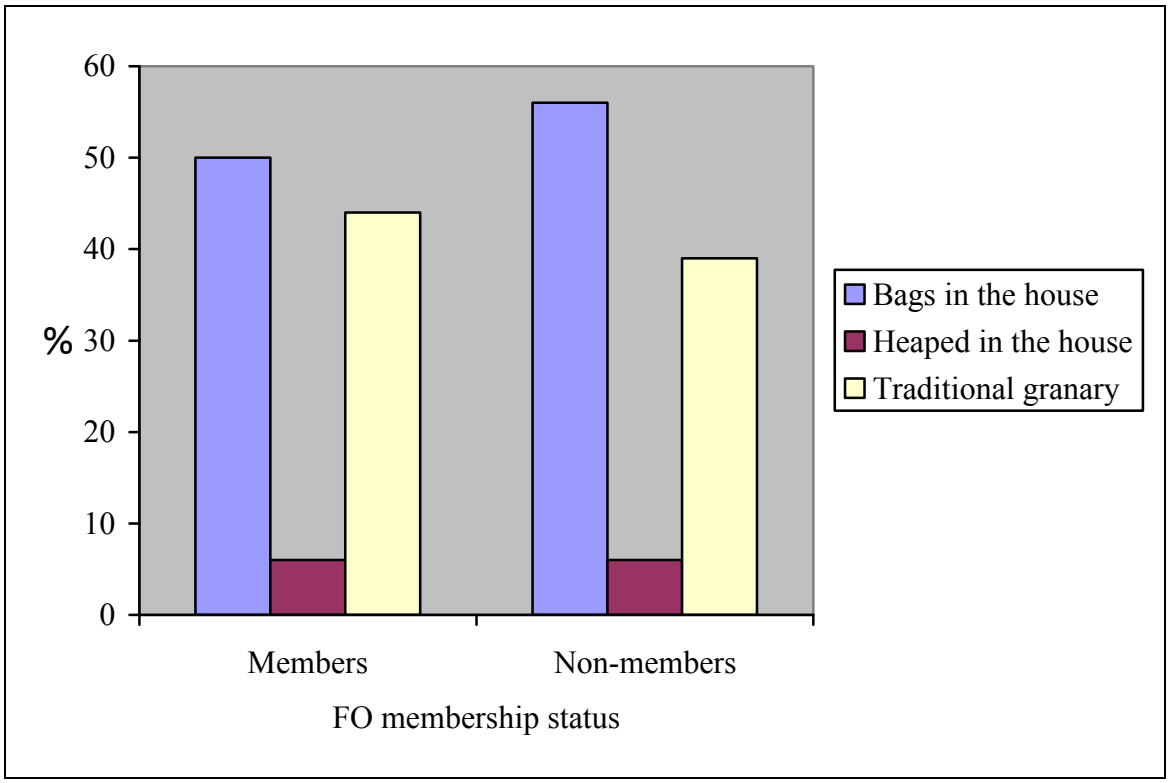


Figure 6.3: Groundnut storage methods used by smallholder farmers in Malawi (%)

By gender of household-head more male-headed households (47% of members and 41% non-members) also keep groundnuts in traditional granaries than female-headed households (29% members and 27% non-members) but differences were not significant.

6.3.3 Shelling and grading of groundnuts

Shelling is another critical post-harvest process performed by smallholder farmers. Methods of shelling used by smallholder farmers are shown in Table 6.7.

Table 6.7: Shelling and grading of groundnuts by smallholder farmers (%)

Method of shelling	Male-headed HH (%)		Female-headed HH (%)	
	Members	Non-member	Members	Non-member
Hand shelling	99	96	100	96
Machine shelling	1	4	0	4
Grading				
Yes	91	71	83	76
No	9	29	17	24

More than 95% of members and non-members reported that they hand-shell their groundnuts. In order to soften pods for easy shelling, 60% of both members and non-members from focus group discussions reported that they soak previously dried groundnut pods in water. Moist groundnuts provide a favourable environment for fungal growth. The recommended moisture content for groundnuts stored in shell is between 7% and 10% (Williams *et al*., 2004). After shelling the nuts must be kept at moisture content not more than 7%.

Farmers that reported to grade groundnuts (if not groundnut seed) indicated that this mainly refers to 'light touch' grading (removal of visibly rotten nuts) of groundnuts before selling. The rest of the farmers just winnow after shelling. The difference between member and non-member male-headed households that grade is significant at 1% level of significance. The difference between female-headed households is not significant.

The fact that farmers either do light touch grading or no grading at all was verified during the market survey. The nuts presented for sale or bought by small traders confirmed that no thorough grading was performed by a majority of smallholder farmers. A few farmers that thoroughly graded groundnuts mostly graded and presented the nuts based on colour, i.e., white for Chalimbana and red for CG7.

6.4 Groundnut sales by smallholder farmers and main buyers

Smallholder farmers sell both shelled and unshelled groundnuts. A total of 82% of both members and non-member smallholder farmers sell shelled groundnuts. The rest sell both

shelled and unshelled nuts. Differences between the two categories were statistically non-significant at 1% level. Smallholder farmers sell groundnuts to multiple buyers as shown in Table 6.8.

Table 6.8: Main groundnut buyers for smallholder groundnuts (%)

Groundnut buyer	Male-headed HH		Female-headed HH		Overall	
	Members	Non-members	Members	Non-members	Members	Non-members
Small traders	66	81	64	83	65	81
Big traders	11	12	9	8	11	10
Famer organization	43	14	57	18	45	16

From Table 6.8, a majority of both members and non-members sold groundnuts to vendors. Among big traders, NASFAM[5] was specifically mentioned as an important buyer of groundnuts in the area. Farmers stated that the transaction took place at the farm gate, local market or at buying points established temporarily or permanently by small traders, farmer organizations, and other traders.

[5] NASFAM buys through commissioned agents who buy from any farmer offering the same price

6.4.1 Reasons for choice of groundnut buyers

Smallholder producers gave multiple reasons for their choice of groundnuts buyers presented in Figure 6.4.

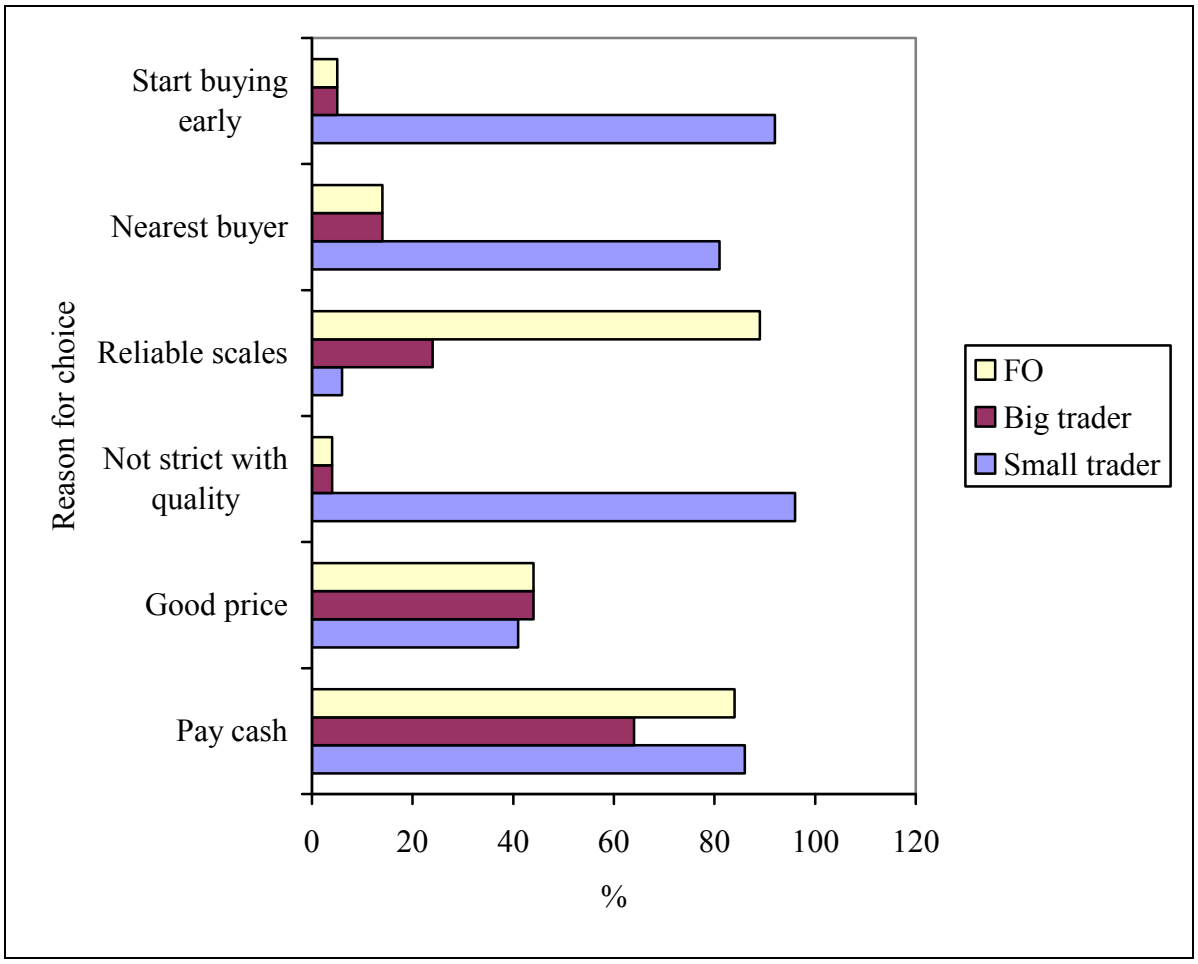


Figure 6.4: Reasons for choice of groundnut buyer by smallholder farmers (%)

The main factors that influence choice of buyers include reliability of weighing scales, distance, time for onset of buying and quality requirements (Fig. 6.4). Small traders are largely preferred for the early onset of buying (92%), closeness to the farmers (81%) and lack of strict attention to quality (96%). On the other hand, FOs are mostly preferred for the reliable scales used (89%). The same factors were given as key choice of groundnut buyer during focus group discussions (Box 1).

Box 6.1 Reasons for choice of buyer from focus group discussions

From the focus group discussions in the three study sites this is what farmers said on weighing scales used by small traders.
'*We know that most small traders (vendors) tamper with their weighing scales. Sometimes we carry an item with standard weight and request that we have it weighed on the scale before weighing our nuts. When the trader refuses the scale test, we know that the scale is tampered with and move on to another buyer. At times none of the traders are willing to have the test and we end up just selling to anyone at whatever weight they tell us. Whenever we have a test done and we establish that the scale is good, news about the particular buyer spreads to other farmers in the village*.'

Observations were made during the study to assess how weighing of groundnuts is carried out. These observations established that some traders use a different weighing scale for buying from smallholder farmers and use a properly calibrated scale when re-weighing to standardise the bags. At least 55% of the small traders buying from farmers acknowledged that they manipulated their weighing scales. Scale tests performed during the market survey confirmed that on average a 50kg bag of nuts would be bought at a weight 3 to 5 kilograms lower than the actual weight. Another observation was made where some small traders would buy from farmers at the same price as the one offered by large traders only to resell the nuts to the same big traders at the same price which they offered the farmers. This also made the farmers suspect that some small traders were actually cheating on their scales.

Malawi Bureau of Standards (MBS) is mandated to ensure that all weighing scales are properly calibrated and marked before the beginning of the marketing season. However, MBS rarely inspects the weighing scales making enforcement difficult.

6.4.2 Mode of selling groundnuts

The study also assessed whether smallholder farmers sold groundnuts as a group or not (Figure 6.5).

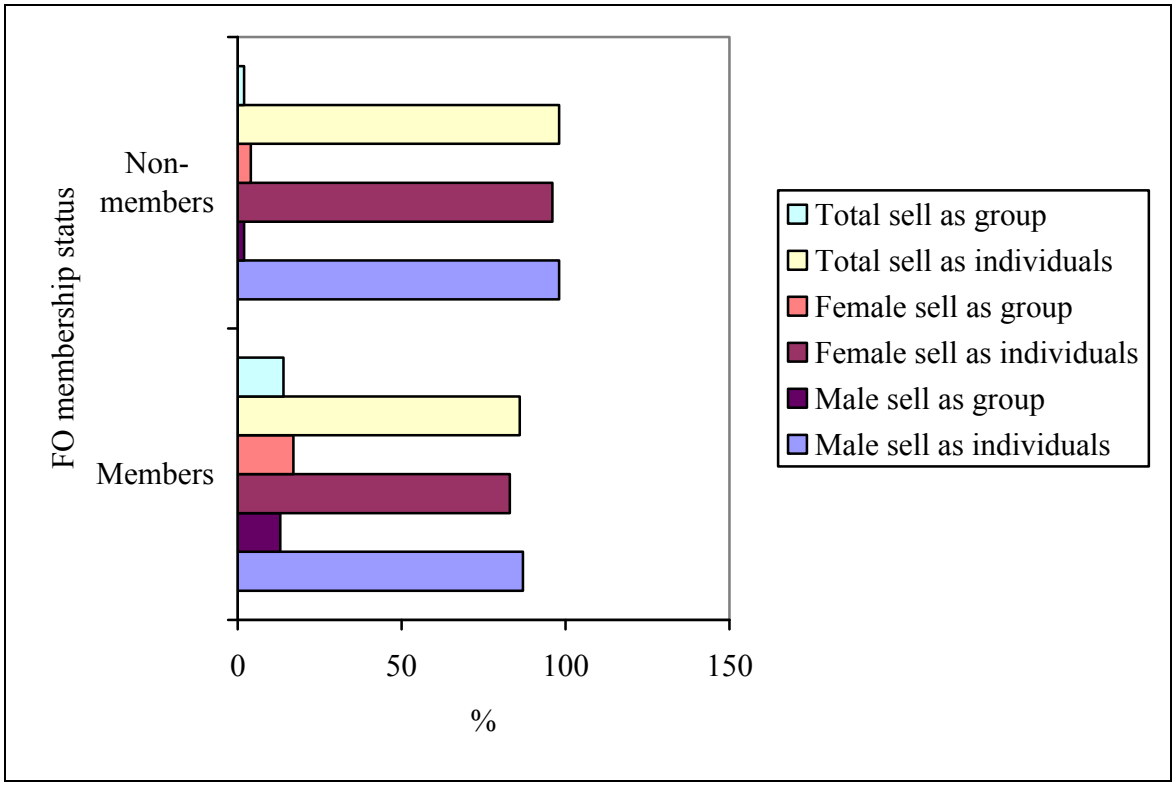


Figure 6.5: Mode of selling groundnuts by smallholder farmers (%)

Overall only 14% of members and 2% of non-members sold their groundnuts as groups (Fig. 6.5). The rest sold as individuals. Chi square test shows a statistically significant difference between members and non-members at 1% level of significance.

Chi square tests show that the difference between male-headed households for members and non-members selling as a group is statistically significant at 1% level of significance. The difference between member and non-member female-headed households selling as a group is not statistically significant.

Over 60% of both members and non-members sell their nuts in small quantities on more than one occasion (Fig. 6.6). However, difference between members and non-members is not significant.

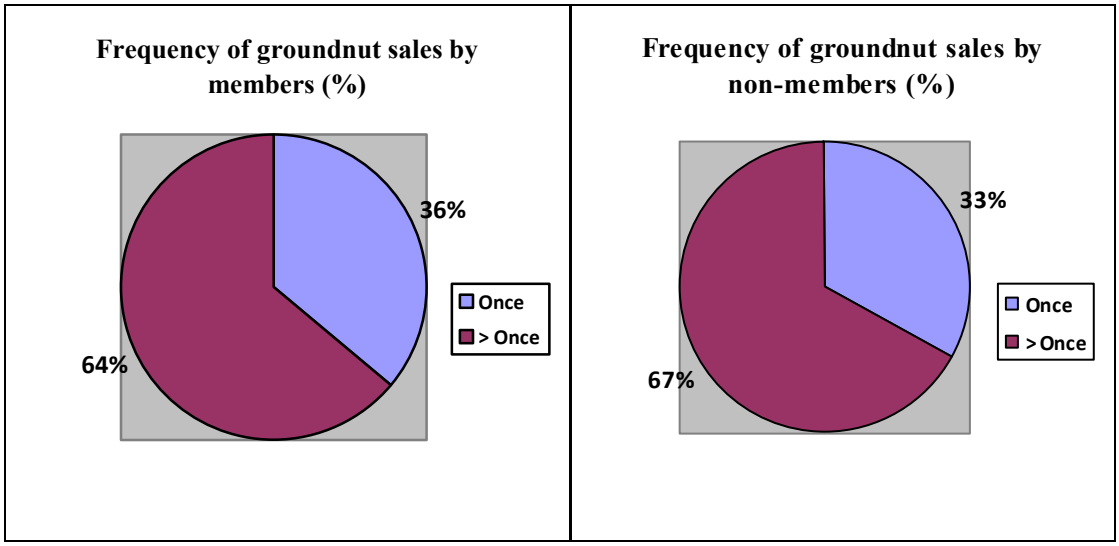


Figure 6.6: Frequency of groundnut sales by smallholder farmers (%)

6.4.3 Factors influencing smallholder farmers' decision to sell their groundnuts

Over 85% of respondents in all the study areas mentioned that prices at which they sell groundnuts are given by buyers. Table 6.9 presents the factors which smallholder farmers consider before accepting or rejecting a price offered by buyers. Household liquidity needs are the main consideration before accepting or rejecting a price offered by buyers for both members and non-members. This is then followed by cost of production.

Table 6.9: Factors considered by farmers before accepting or rejecting a price (%)

Factors considered before price acceptance or rejection	Male-headed HH		Female-headed HH		Total	
	Members (%) (n=130)	Non-members (%) (n=115)	Members (%) (n=30)	Non-members (%) (n=23)	Members (%) (n=160)	Non-members (%) (n=138)
Cost of production	56	36	57	48	56	38
Household liquidity needs	61	80	70	87	63	81
Demand level	3	4	0	4	3	4

Further, Table 6.10 presents the factors that influence smallholder farmers' decision on how much to sell.

Table 6.10: Factors considered by smallholder farmers when deciding how much to sell (% of respondents)

Factors considered when deciding how much to sell	Male-headed HH		Female-headed HH		Total	
	Members (%) (n=128)	Non-members (%) (n=115)	Members (%) (n=30)	Non-members (%) (n=23)	Members (%) (n=158)	Non-members (%) (n=138)
Predetermined quantity	23	14	17	13	22	14
Prevailing market price	16	26	13	13	16	24
Household liquidity needs	82	82	73	87	80	83
Amount harvested	31	36	20	35	29	36

Household liquidity needs is also the main basis for deciding how much groundnut to sell for more than 80% of NASFAM members and non-members (Table 6.10). This is

followed by the amount of groundnuts harvested among all categories. A similar result was obtained for the decision on when to sell (Table 6.11).

Table 6.11: Factors considered by smallholder farmers when deciding when to sell (%)

Factors considered when deciding when to sell	Male-headed HH		Female-headed HH		Total	
	Members (%) (n=123)	Non-members (%) (n=112)	Members (%) (n=30)	Non-members (%) (n=22)	Members (%) (n=158)	Non-members (%) (n=138)
Prevailing price	35	41	20	36	32	40
Volume harvested	15	20	10	9	14	18
Household liquidity needs	83	80	70	91	80	81
Expected gain in price	15	9	23	5	16	8

From all the focus group discussions it was revealed that smallholders are influenced by their liquidity needs at household level when deciding when to sell and accept a price. Smallholder farmers may even accept a low price with full knowledge if they are hard pressed for cash. However, smallholder farmers usually sell small portions of groundnuts but spread over time as a strategy to manage household cash needs. The staggering of sale is also used as strategy to wait in anticipation of price rise.

6.5 Groundnut Seed Marketing

Apart from producing groundnut grain for the market, some respondents indicated that they were involved in structured groundnut seed production and marketing with ICRISAT and other commercial seed producers through contracts (Table 6.12). Under this arrangement, in addition to seed, buyers provided farmers with extension services,

information on expected price[6] and quality specifications of the seed to be delivered prior to production.

Table 6.12: Involvement in contracted groundnut seed production and marketing

Involvement in contract farming and marketing	Male-headed HH (%)		Female-headed HH (%)		Total (%)	
	Members (n=131)	Non-members (n=116)	Members (n=30)	Non-members (n=24)	Members (n=161)	Non-members (n=140)
Yes	21	3	27	4	22	3
No	79	97	73	96	78	97

Overall 22% of members and 3% of non-members are involved in groundnut seed production and marketing. Chi square tests show that the difference between members and non-members involved in contracted groundnut seed production and marketing is significant at 1% level of significance. The difference between member and non-member male-headed and female-headed households involved in groundnut seed production and marketing is significant at 1% and 5%, respectively. Noteworthy, none of the smallholder farmers were engaged in similar structured production and marketing of groundnut as groundnut grain.

6.5.1 Groundnut trading

Groundnut marketing involves various players and these are smallholder producers, small mobile traders (vendors), resident traders, wholesalers, and retailers, exporters (formal and informal) and processors. While licensing is required for one to export, it is not required or at least not enforced when one is trading locally. As such, foreign traders from Burundi, Tanzania, and Kenya are able to buy groundnuts directly from farmers. Key actors and specific roles are summarised as below:

[6] Due to the frequent changes in the exchange rate ICRISAT pegged the price of seed to the US dollar payable at the prevailing exchange rate at the time of seed delivery

Mobile traders commonly known as 'Vendors'

Small mobile traders are the traders that either travel on foot or by bicycles to reach large numbers of smallholder farmers in scattered villages in Mchinji and beyond to buy and assemble groundnuts. Out of a large number of small traders, a total of 33 small traders were interviewed during the market survey. These small traders buy groundnuts at the farm gate, from the local market during designated market days or from temporarily established buying points then sell to medium and large traders (wholesalers). Usually small traders use limited amounts of money. Some of the small traders are given working capital and commissioned to buy on behalf of large traders (wholesalers and exporters). Out of the small traders interviewed, 83% only bought shelled nuts from farmers. The rest bought both shelled and unshelled nuts and engaged labourers to hand shell or used mechanical shellers.

Wholesalers

Small mobile traders sell their groundnuts to medium and large-scale wholesalers either residing at the trading centres or in town but with warehouse facilities in the producing areas. The large wholesalers sell to exporters and processors. Depending on the requirements by their targeted buyers, wholesalers will be involved in some form of moisture and quality management i.e., re-drying and grading the groundnuts before selling.

Exporters

Exporters are those traders that are involved in buying and selling of groundnuts across the national border and vary in size. The study found that both national and foreign traders participate at this level. Also both formal and informal groundnuts exports are made from Malawi. Some of the large commodity traders included Farmers World, Mulli Brothers, Rab Processors, Export Trading Group, NASFAM, Takondwa Commodities, Dalitso Commodities, Linthipe Traders and Chitsotsa. From the information collected, the actors interviewed at this stage handled an estimated total of 22,000mt of groundnuts. However, traders do not readily release data on volumes handled and a lot of informal exports are done for groundnuts. Exporters buy groundnuts from multiple sources including farmers (small volumes) but mostly from small, medium and other large traders. All the exporters interviewed also indicated that they also have small depots in the main groundnut producing areas where they were buying directly from farmers, small traders and other

resident traders. The study observed that actors at this stage have well established central warehouses where activities such as re-drying, grading, weighing and re-bagging of groundnuts bought from different sources is done before exporting based on their customer requirements.

Processing

Processing in this case refers to grading and packaging of raw nuts for direct human consumption and/or the transformation of raw groundnuts into other value-added groundnut-based products such as roasted nuts, peanut butter, nutritional supplements, groundnut meal and groundnut oil. Both small and large-scale processing of groundnut is done with some actors operating at other stages as well. Processors bought groundnuts from farmers, and small, medium and large traders. At this stage groundnuts bought as farmer stock are subjected to thorough grading (based on colour, size, removal of foreign matter and rotten nuts) re-bagging and Aflatoxin testing (depending on the type of product and specifications by buyers). For example, ready-to-use therapeutic food (RUTF), locally known as 'Chiponde' is a nutrient and energy-dense food made from peanut paste, edible oils such as palm oil, skimmed milk and other ingredients. As a therapy for addressing acute malnutrition[7] in children and sick adults, this food supplement has strict international quality standards, especially for Aflatoxin (≤10ppb in peanut paste and <5ppb in the finished product) (Valid Nutrition, 2010). Processors that were involved in the manufacture of groundnut-based nutritional supplements (Valid Nutrition and Project Peanut Butter) source peanut paste from NASFAM and Afrinut or at times import from South Africa depending on availability of quality nuts.

Other processors such as Rab Processors, NASFAM, Universal Industries, Estrelli Trading are involved in processing of roasted nuts, peanut meal, peanut butter and graded raw nuts.

Distribution

Various levels of distribution occur in the groundnut value chain in Malawi covering wholesale and retail sales, domestic as well as export distribution. This stage handles both

[7] The major customers for RTUTFs are UNICEF, Medicines san Frontiers (Malawi and Zimbabwe), Ministry of Health (MoH) and other NGOs with projects in the health sector. Use of this product is usually prescribed by trained health and nutrition practitioners.

raw and processed groundnuts. Multiple actors participate at this stage including some smallholder farmers, small, medium and large traders and processors. At the domestic level, processed products as well as raw packaged nuts are mostly sold in supermarkets and other shops throughout the country. Traders in local markets sell loose groundnuts.

At the export level, groundnut exports are done both formally and informally. Informal exports are those where traders bypass official borders to evade taxes or clearing delays. Major export destinations for groundnuts from Malawi include Tanzania, Kenya, South Africa, Democratic Republic of Congo, Zambia, Zimbabwe and Burundi within the region. Most exports target regional markets that currently do not have stringent quality requirements. Limited exports are made to the UK under the fair-trade arrangement and NASFAM is currently the only exporter under this arrangement. Exports to the UK and South Africa are strictly checked to ensure that they meet the stipulated grades and standards set by the buyers, including that of Aflatoxin levels.

6.6 Groundnut Marketing Channels

After mapping the main activities and actors, marketing channels for groundnuts were mapped. From Figure 2.5 under Chapter 2, six groundnut marketing channels for smallholder farmers are identified as follows:

C1: Smallholder producer –> Local market ->consumer;
C2: Smallholder producer –> Small trader (Assembler) -> Wholesaler->Consumer;
C3: Smallholder producer –> Small trader -> Wholesalers>Retailers>Consumers
C4: Smallholder producer –> Small trader ->Wholesalers -> Exporters;
C5: Smallholder producer –> Small trader -> Wholesalers -> Processors-> Retailers-> Consumers
C6: Smallholder producer -> Small trader -> Processors -> Exports (formal and informal)

The bulk of smallholder groundnuts are sold through the small traders who start buying early and operate closer to where the farmers are. However, regardless of having several options for selling groundnuts, through focus group discussions and household survey

farmers still indicated lack of access to better markets as a challenge further discussed in Chapter 7 and Chapter 9.

6.7 Flow of information and other services among players in the groundnut value chain

In addition to marketing channels, the study also focused on assessing the flow of information in the chain. Availability and access to information is one of the key elements for effective functioning of players in any value chain.

6.7.1 Type of market information accessed by smallholder farmers

Information on selling price and available buyers is known at the time of sale (Table 6.14).

Table 6.13: Type of information received by smallholder groundnut farmers (%)

Type of market information received	Male-headed HH		Female-headed HH		Total	
	Members (n=123)	Non-members (n=102)	Members (n=29)	Non-members (n=21)	Members (n=152)	Non-members (n=123)
Spot price information	80	82	76	86	80	83
Quality standards	39	9	41	5	40	8
Volumes demanded before production	12	1	3	9	11	2

From focus group discussions it was established that farmers do not have advance information regarding available market demand, price and quality prior to production. Supply of real time market information such as prices and volume demanded is necessary to guide informed production and marketing decisions by both producers and buyers. So far, only smallholder farmers contracted to produce seed for ICRISAT and seed companies are given information on price and volume of seed to produce. However, most of the market information is only known to farmers at the time of sale. This is a limitation to market access as defined in this thesis, which include availability of real time information

to enable both the producers and traders to make guided production and marketing decisions.

6.7.2 Sources of market information for smallholder farmers

FOs are an important source of market information for members (80%) while 65% of non-members said small traders were their main source of market (especially price) information (Table 6.15). The FOs are well linked to other service providers such as ICRISAT and public research institutions and extension services. These are the main sources of information for these FOs.

Table 6.14: Sources of information for smallholder farmers (%)

Source of market information received	Male-headed HH		Female-headed HH		Total	
	Members (n=124)	Non-members (n=107)	Members (n=29)	Non-members (n=19)	Members (n=153)	Non-members (n=126)
Small traders	63	66	40	57	59	65
Friends	31	36	24	37	30	36
FO	80	20	83	21	80	20
Government market agency	1	5	0	0	1	4
Print media	6	9	3	0	5	8
Farmer radio programme	27	37	17	32	26	37

Other important sources of information for farmers include fellow smallholder farmers and farmer radio programmes. From the focus group discussions, information available to smallholder farmers was also assessed based on timeliness and adequacy summarized in Box 6.2.

Box 6.2: Smallholder farmers' comments on timeliness and adequacy of market information accessed

*'We start selling groundnuts soon after harvest. We only get to know the price at the time of sale such that it doesn't influence our decisions on groundnut production for the current season. We have no prior information on how much groundnut is demanded by buyers. Small traders start buying early and they are the ones that mostly inform us of price. By this time, most big traders are not yet on the ground to start buying. With the uncertainty on when these other buyers will enter the market and how much they will buy we fail to wait due to immediate household needs such as school fees and clothing. Depending on how much we produced, we sell in small portions while also observing the price movements. Usually by the time prices get better, most of us have either sold everything or have very small quantities remaining for sale. Hence it is the small traders who mostly benefit from good prices later in the season.' (*FGD in Kalulu*).*

*'I produce groundnut seed for ICRISAT and I know the price in advance. This knowledge influences what I do with my groundnut crop in terms of field management and post-harvest handling.' (*Comment from a groundnut seed producer in Chiosya*).*

*'We produce groundnuts knowing that we will always find a buyer. However, our problem is accessing better markets than we currently do. In the current set up, price is known at the time of sale. Normally small traders display the prices for us to see and decide whether to sell or not. Information on projected prices for lean months and guaranteed buyers is not available to us. (*FGD in Mkanda*)*

*'In the past ADMARC used to have different prices for different grades of groundnuts. This knowledge helped us to make decisions on how to present our nuts. Currently, none of the buyers is offering prices based on grades. This makes us feel like grading is not necessary. (*FGD Chiosya*)*

Unlike smallholder farmers, small and large traders, processors and exporters reported more sources of information on various aspects. Apart from their usual trading partners, big traders stated that they also get information from online sources such as the South African Futures Exchange (SAFEX), Agricultural Commodity Exchange for Africa (ACE), Auction Holdings Limited Commodity Exchange (AHLCX) and other online sources which are proving to be other credible sources of real time market information for traders (Fig. 6.7). Commodity exchange provides a platform for price discovery and efficient price risk management for the shelled groundnut, connects buyers and sellers and

helps to limiting exposure to adverse price movements (Onumah, 2010). These sources of information help to facilitate market access for these categories of traders.

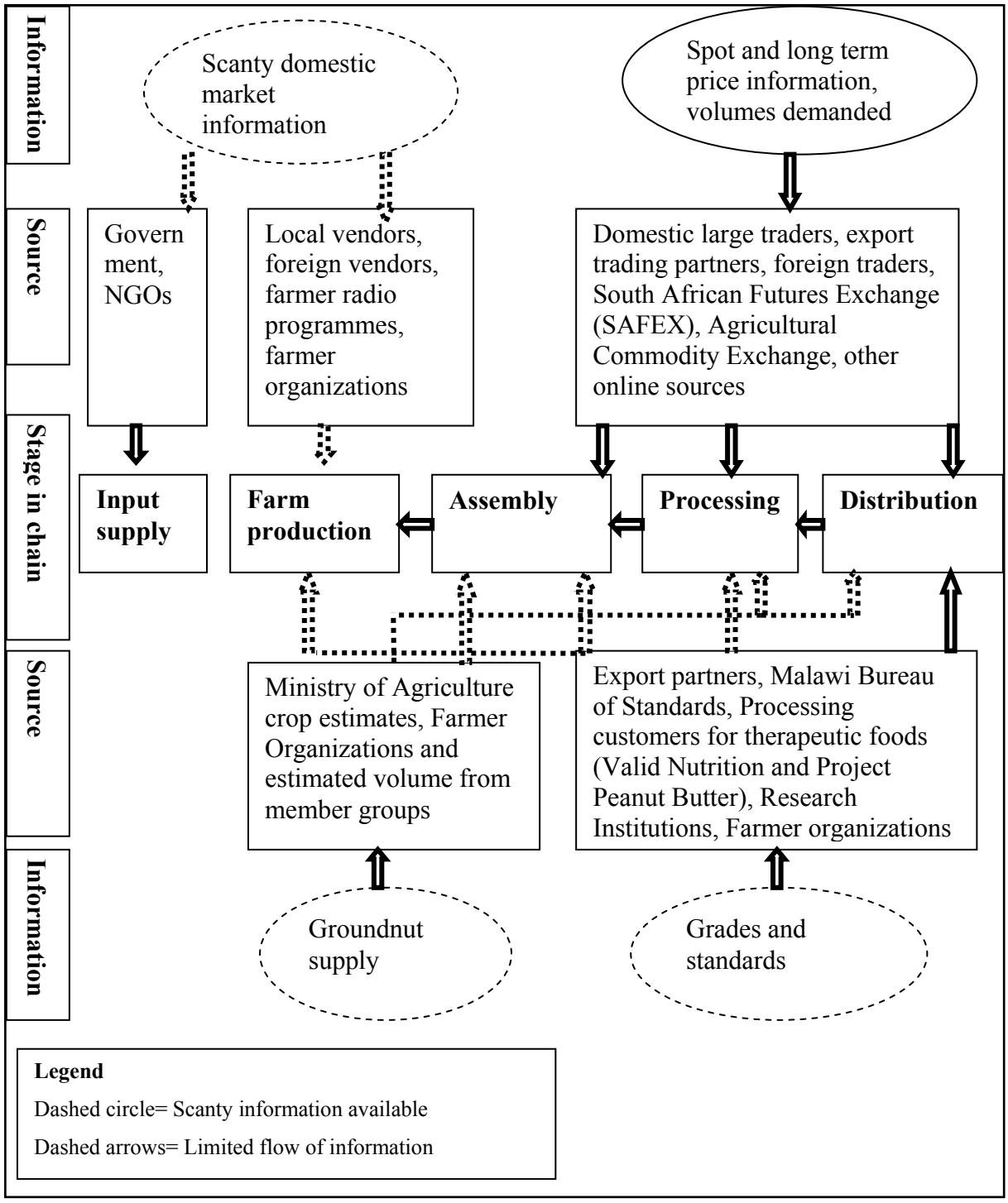


Figure 6.7: Sources and flow of information among actors in the groundnut value chain in Malawi
Source: Own survey

At the formal export level, exporters said information on volumes demanded, prices, grades and standards are specified by the importing partners. For example, in the case of exports to the UK, Twin and Twin Trading is a key source of information for NASFAM on quality specifications including Aflatoxin levels, variety and size of the nuts. Similarly, the study observed that domestic processors for nutritional supplements specify the maximum allowable level of Aflatoxin and other quality specifications for groundnuts to be used for production of peanut paste and the quantity demanded on a monthly basis to potential suppliers.

Ministry of Agriculture and Irrigation and Water Development (MoAIWD) is the main source of information on groundnut production levels through its crop estimates reports generated quarterly. However, this information has restricted circulation and therefore not easily accessed by most traders. Worse still this is not real time market information which farmers and traders require to help them make informed timely decisions about production and marketing.

6.7.3 Other services available to smallholder farmers in the groundnut value chain

Availability of other services that feed into the groundnut value chain such as extension and credit were also mapped. Smallholder farmers' access to extension is presented in Table 6.16.

Table 6.15: Access to extension services by smallholder groundnut farmers (%)

Access to extension	Male-headed HH (%)		Female-headed HH (%)		Total HH (%)	
	Members (n=129)	Non-members (n=113)	Members (n=28)	Non-members (n=25)	Members (n=157)	Non-members (n=138)
Yes	90	24	86	20	89	23
No	10	76	14	80	11	77

Overall 89% of members and 23% of non-members had access to some extension services on groundnut production. Chi square tests results show that the difference between

members and non-members is statistically significant at 1% level of significance. Similarly, the test results show significant differences between male and female-headed households at 1% level of significance. Members mentioned their FOs as the main source of extension services (86%) followed by NGOs and government extension staff. NGOs are the key extension service providers for non-members (29%) followed by government extension staff and FOs.

Access to credit by smallholder farmers is presented in Table 6.17:

Table 6.16: Access to credit by smallholder groundnut farmers (%)

Access to credit	Male-headed HH (%)		Female-headed HH (%)		Total (%)	
	Members (n=133)	Non-members (n=114)	Members (n=30)	Non-members (n=25)	Members (n=163)	Non-members (n=139)
Yes	56	6	63	8	57	6
No	44	94	37	92	43	94
Type of credit accessed					**(n=93)**	**(n=9)**
Cash					9	11
Inputs					91	89

Overall 57% of members and only 6% of non-members accessed some credit. Chi square test results show significant differences between members and non-members at 1% level of significance. By gender of household head, the differences between member and non-member male as well as female headed households are also significant at 1% level of significance. More members have access to credit through their FOs than non-members.

Further, out of the farmers that accessed loans, 9% of members and 11% of non-members accessed loan in form of cash. The rest accessed the loan as inputs. Source of cash credit for smallholder farmers include the Opportunity International Bank of Malawi (OIBM) and Finance Cooperative (FINCOP). FOs were seen as eligible vehicles through which these service providers could provide cash and input loans as the FOs demonstrated the responsibility of ensuring repayment among the members to sustain access.

6.8 Governance of the Groundnut Value Chain

The value chain mapping exercise also assessed the governance of the groundnut value chain. This focused on relationships, linkages, power relations and influence on price and standard setting, and leadership that exist in the groundnut value chain. At the smallholder farmers' level, this focused on horizontal and vertical integration and the influence on farmers' position in the value chain. Some stages in the groundnut value chain exhibited some defined form of relationships either between actors at the same stage or between actors operating at different stages as explained in sections that follow.

Overall, a multitude of producers are involved in production and marketing of groundnuts, but only a few are organized into functioning farmer groups. At the production level both vertical as well as horizontal linkages were observed among farmers belonging to a farmer organisation. In terms of vertical linkages smallholder farmers were mobilized into clubs which came together to form an Association. Access to produce markets (76%) and training (73%) were the major reasons given for joining a farmer organisation. To belong to an Association, farmers pay an annual membership fee. Paid-up members receive extension services and training on crop husbandry and agribusiness skills among others.

During the study the vertical linkages amongst FO members were also seen to facilitate some horizontal linkages with other players in the value chain. For example, farmers belonging to a farmer organization utilize horizontal linkages taking advantage of their numbers to negotiate, as a block, their participation in seed production under contract farming arrangement with ICRISAT or other commercial seed companies. ICRISAT is also interested to reduce its transaction costs. Contractors reduce transaction costs because they are able to offer training, extension and bulking of produce when farmers are organised at one place. It was observed that farmers under this arrangement were able to monitor each other to ensure conformity to the requirements set by ICRISAT. Because there was an incentive in terms of good price and assured/steady market, farmers demonstrated a lot of organization and commitment to ensure that the group does not fail and lose this reliable market. This model experienced low default rate in terms of loan repayment as farmers were able to manage each other. Farmers under contract farming were able to utilise training received and upgrade their skills to competently produce quality seeds that met required standards. To sum up, the governance of the seed value

chain is strong with well established relationships. This is facilitated by a well- structured market.

Otherwise, there is no serious long-term relationship between smallholder farmers and traders. Small traders are quite mobile going to where the crop is found in abundance. Their interaction with smallholder farmers is a one-off process during the buying time. In addition, mobile vendors are usually not specialised in one crop but trade in any other crop that is on demand and has a good market and price. There is no time to build a long-term relationship based on trust as this interaction is brief. Farmers also cited cheating through manipulation of the weighing scales by small traders, straining their poor relationship further and increasing level of mistrust.

Small traders also mistrust the smallholder farmers citing the following: smallholder farmers soak groundnuts before shelling or even add water to the nuts after shelling. Small traders therefore incur costs of re-drying and occasionally throw away rotten or mouldy nuts as a result of this mal-practice by smallholder farmers. This vicious cycle needs to be broken if quality is to be promoted in the groundnut value chain.

At informal export level, buyers from the regional markets, especially East Africa (Tanzania, Kenya and Burundi) offer Malawi a big market for groundnuts but most of the trade is informal and not organised. No formal relationships or linkages were observed among buyers from these countries and producers. Foreign traders come and buy groundnuts from any supplier including producers and other traders. Some Malawian-based companies that export to different countries in the region operate based on demand. This is a fluid relationship and producers have no incentive to invest in quality and standards as prices are less competitive. Quality enforcement is also not strict as this channel targets low-end export markets.

However, some form of relationships and formal linkages were observed among some buyers engaged in formal exports. For example, NASFAM exhibited some two way relationship with its foreign buyers, especially Twin and Twin Trading in the UK. Similarly other exporters engaged in formal exports, such as Farmers World and Export Trading Group; agree on specifications with their importing partners. These specifications include quality standards, volumes demanded and time of delivery. Processors and

supermarkets in the importing countries usually drive their own brands hence inform the importing partners of their quality specifications. Prevailing country specifications and customers' demand guide the importers demand from the exporters. However, though these local exporters may establish a long-term relationship with their traditional buyers outside the country, they do not have a long-term relationship with their suppliers in the country, and these are smallholders.

Despite having own quality specifications, the Malawi Bureau of Standards (MBS) cited limited capacity to enforce this on the numerous actors in the groundnut value chain as one of their challenges. MBS indicated that currently quality compliance depends on exporter and importer agreement. The players in the formal export market try to observe quality and standards although much of the effort is conducted at post-harvest by exporters themselves. Key informant interviews with big traders and processors involved in export revealed that they spend a lot of money on quality, which they could have easily used to offer premium prices to buy well graded and high quality groundnut grain from smallholder farmers. Domestic processors invest on quality management for the portion intended for export and retain the grade-outs for processing products for the domestic market. They take advantage of poor enforcement of quality and standards on the domestic market.

The observed interactions in the groundnut value chain are presented in Figure 6.8:

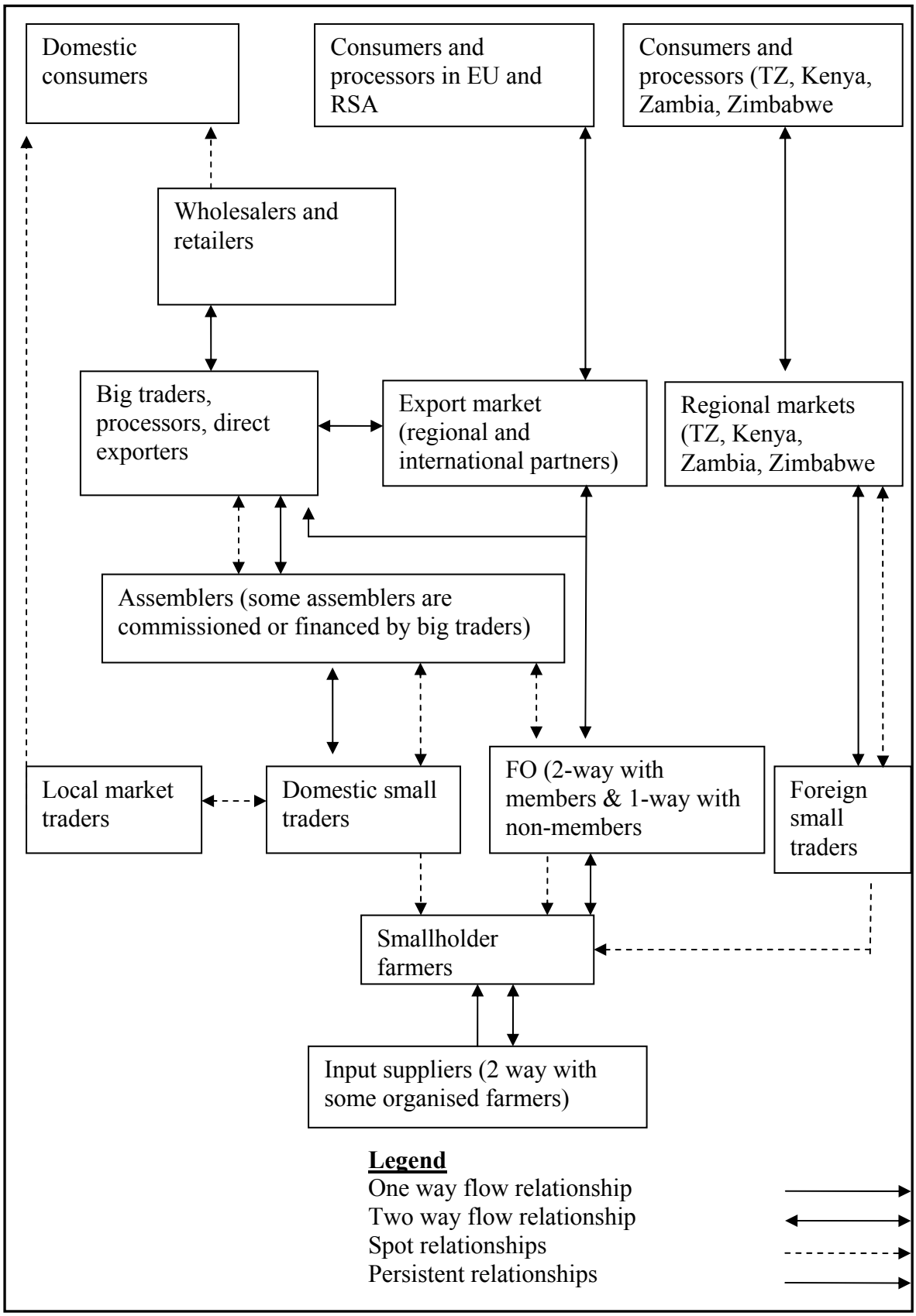


Figure 6.8: Relationships and linkages that exist in the groundnut value chain
Source: Own survey

Activities and linkages as shown in the groundnut value chain do not show any form of leadership especially at the domestic level (Fig. 6.8). Any actor is free to enter and leave the market and conduct their transactions in any form. At the production level some form of relationship is seen between members and FOs to which they belong. Also at the formal export level some form of relationship is evident especially with importers from South Africa and the EU.

6.9 Opportunities and Constraints

Despite the importance of groundnut as a food and cash crop in Malawi, the performance of the crop has been poor in terms of production, productivity and marketing. There are a number of opportunities and constraints that have been identified in the production and marketing of this crop. Table 6.18 gives a summary of the constraints from the farmers' perspective.

Table 6.17: Constraints faced by smallholder farmers in production of groundnuts (%)

Groundnuts production constraints faced	Male-headed HH (%)		Female-headed HH (%)		Total HH (%)	
	Members (n=131)	Non-members (n=111)	Members (n=26)	Non-members (n=25)	Members (n=157)	Non-members (n=136)
Limited access to quality seed	62	85	50	56	60	79
Poor soil fertility	17	20	54	32	23	22
Limited access to credit	15	11	8	20	14	13
Poor extension services	12	26	15	16	13	24
Pest and diseases	16	15	23	12	17	15
Competition for labour	36	39	38	40	36	39
Late delivery of seed	18	4	4	8	16	4

Poor access to quality seed was reported as one of the main limitations to increased smallholder productivity and production. Inadequate availability of quality seed has also pushed up the price of seed which makes it unaffordable to majority of poor farmers. Currently the FISP is the main source of the quality seed. But majority of smallholder farmers continue to use recycled seed. Despite the FISP providing a steady market for legume seed, big multilateral seed producers have not yet been attracted to invest in legume production because of limited demand, which they believe would not provide good return to their expected huge investment in legume seed production. Groundnuts and other legumes like beans are open pollinated as such are easily recycled by smallholder farmers limiting demand for certified seed. This is evidence by seed companies failing to attract more smallholders to buy certified seed on the commercial market (Table 6.19).

Table 6.18: Groundnut seed production and sales by one of the interviewed seed companies in Malawi

Year	Production (mt)	Total Sales (mt)	Price (MK/kg)	Commercial sales (mt) (excludes FISP)	Proportion of cash sales (%)
2007	15	15	110	15	100
2009	110	108	250	8	7
2010	425	415	300	10	2
2011	641	641	370	55	9
2012	645	645	408	50	8
2013	800	800	500	50	8

Source: One Seed Company in Malawi, 2012

Approximately 90% of all certified seed being currently produced is supplied to the FISP (Table 6.19). These low commercial groundnut sales (excluding FISP) are common for all legume seed companies interviewed.

Low multiplicative ratios for groundnuts seed against a high seed rate make the cost for producing groundnut seed high. Seed producers also highlighted the short shelf life for groundnut seed as another limitation for massive production (using economies of scale) if they were to be involved considering their huge capacity. With the limited demand for

certified seed, it means a lot of the seed would have to be sold as groundnut grain yet the cost of producing groundnut seed is high.

Growing of groundnut usually faces serious competition for labour, especially if the household is also involved in production of other high valued crops such as tobacco. Lack of adequate labour at critical periods like harvesting and grading is likely to impact negatively on yields and quality management. If left too long in the ground before harvesting, a lot of the nuts will remain stuck in the ground, build Aflatoxin due to moisture stress and therefore affecting quality of the nuts. Lack of labour at grading means that the farmer is likely to fetch low prices for the ungraded nuts.

Table 6:19: Constraints faced by smallholder farmers in marketing of groundnuts (%)

Marketing constraints faced by smallholder groundnut farmers	Male-headed HH (%)		Female-headed HH (%)	
	Members (n=117)	Non-members (n=111)	Members (%) (n=29)	Non-members (n=24)
Poor access to reliable markets	62	62	52	63
Low farm gate prices	60	72	55	79
Late entry of established buyers into the market	70	23	59	21
Smallholder farmers not organised to influence buying price	6	31	3	21
Quality not rewarded with price	50	40	31	50
Unreliable weighing scales used	60	72	59	63

Issues related to markets and prices also affect groundnut production by smallholder farmers (Table 6.20). Poor incentives in the form of low farm-gate prices and limited access to reliable markets (i.e., structured markets that offer premium price) are some of the problems faced by farmers in marketing their crops. Late entry into the market by reliable big traders exposes the smallholder farmers to vendors who are accused of manipulating their scales. Big traders usually delay their entry into the market to ensure groundnuts have attained the right moisture content in order to reduce the risk of moisture losses and build up of Aflatoxin. The domestic market which takes up more than 60% of the local production is less sensitive to quality. As such, investing in quality management is usually not rewarding and risky for the farmers as they are likely to make a loss.

Majority of smallholder farmers usually sell as individuals as such they are price takers. They cannot influence price on the market as individual farmers (Table 6.21)

Table 6.20: Price negotiation by smallholder farmers (%)

Were you able to negotiate the price at which you sold groundnuts?	Male HH (%)		Female HH (%)		Total (%)	
	Members % (n= 131)	Non-members (n= 115)	Members (n=30)	Non-members (n=24)	Members (n=161)	Non-members (n=139)
Yes	34	18	40	33	35	21
No	66	82	60	67	65	79

However, some 35% and 21% of members and non-members indicated they were able to negotiate the price at which they sold groundnuts. Chi square tests shows that the difference between members and non-members that are able to negotiate price is significant at 1% level of significance. This shows that membership to a well functioning farmer organisation, though not maximised currently, could help the smallholder farmers to negotiate for a better price if they bulked their produce to sell as a group.

Chi square tests conducted based on gender of household head show that there is a significant difference between member and non-member male-headed households at 1% level of significance. More male-headed households were able to negotiate prices than non-members. However, the difference between member and non-member female-headed households is not statistically different.

Based on these results, groundnut farmers in Malawi are mainly price takers with a few exceptions. Only 14% and 2% of members and non-members, respectively, sell their groundnuts as groups. Failure to sell as a group limited smallholder farmers' ability to bargain for a better price. In addition to the above, Box 6.2 presents some of the constraints from focus group discussions.

Box 6.2: Constraints faced in groundnut production and marketing from FGDs

Groundnut is a labour demanding crop but we perform all pre-and post-harvest activities manually. Mechanical shellers have been introduced but they have a high rate of breakage. Most small traders who eventually sell some of their groundnuts to regional informal exporters do not like to buy nuts that are split because they target low end market for roasting. Such buyers prefer whole nuts as such hand-shelling is preferred (FGD, Chiosya)

Price information is usually communicated at the time of selling. As such, production is not guided by any prior price information given nor projected crop demand for the season. This also limits farmers marketing decisions (FGD, Mkanda)

6.10 Constraints faced by Traders, Processors and Exporters

Multiple constraints were cited by groundnut traders, processors and exporters (Table 6.22).

Table 6.21: Constraints faced by groundnut traders (%)

Constraints faced with groundnut marketing by traders	% of traders
Limited and inconsistent groundnut supply	73
Poor road and transport network	64
Poor quality of groundnuts supplied by smallholder farmers	56
Lack/limited warehousing facilities	64
Limited knowledge on groundnut storage conditions	43
Limited access to finance	65
High cost of finance	80
Limited information on expected groundnut supply	70

From Table 6.22 above, traders face multiple technical as well as financial challenges in groundnut marketing. While most traders indicate access to finance limit their operations, their major constraint is actually the cost of finance which is prohibitive. Commercial bank rates, at 50%, are quite prohibitive and risky for business. Traders complained that the high interest rates wipe out any profit a business would make. In fact, one ends up just working for the commercial banks.

Most traders (68%) also complained of limited and inconsistent supply of produce (Table 6.22). This is coupled with unavailability of real-time market information regarding production levels. Unaware of production levels due to poor agricultural statistics, traders usually scramble for whatever is brought to the market. As such traders do not usually insist on quality as their priority is first to acquire the desired volumes. The speculative buying behaviour sometimes triggers price wars with other buyers. However, this benefits the smallholder farmer as they get a good price.

Lack of warehouse facilities (64%) was also mentioned as another problem faced by small traders. Traders do not have moisture meters for checking moisture content at the buying point, therefore mostly rely on hand feeling to check for moisture content. With lack of warehouse space means that some traders just pack groundnuts into sacks soon after purchase before further drying risking Aflatoxin build-up in store. Even though traders mentioned poor quality as one of the constraints faced, their behaviour on the market suggests that they contributed to the situation though they did not view themselves as part of the problem. More than 90% of groundnuts in Malawi are produced by smallholder farmers who are scattered in rural areas. Small traders travel to such areas to buy from producers. Poor road and transport network was also cited as a key constraint which increases the costs of transaction through high search and transport costs.

Table 6.22: Constraints faced by groundnut processors in Malawi (%)

Constraint faced with groundnut marketing	**% of processors**
Limited and inconsistent supply	68
Poor road and transport infrastructure	42
Lack/limited warehouse facilities	47
Limited access to finance	76
Unreliable energy supply	65
Poor quality of groundnuts supplied	45
High cost of finance	86
High cost of quality management and Aflatoxin testing	58
Weak regulatory framework and limited enforcement	63
Inadequate training in quality management for traders	66

In a multiple response question, limited and erratic supply of groundnuts was also mentioned by most of the processors as one of the major limitations faced (68%) (Table 6.23). Quality management was also featured but not much pronounced (45%). This is not

surprising as most processors target the domestic market which is less sensitive to quality, especially Aflatoxin contamination which is recently being recognised as a human health problem. Domestic processors take advantage of the weak regulation and poor enforcement mechanism due to current limited capacity of the Malawi Bureau of Standards (MBS). However, domestic processors acknowledge that quality management is crucial for anyone targeting EU and other high end markets like South Africa. At that point, high cost of Aflatoxin testing and management was mentioned (58%) as another limitation. Limited access to finance (76%) and cost of finance (86%) also featured highly here as was the case for traders (assemblers). The economy remains fragile with high inflation.

High cost of testing for Aflatoxin and risk of rejection at export destination further limits the participation of most exporters to countries where quality requirements are strict. Some of the exporters have attempted to export to lucrative but quality sensitive markets in the region and Europe. They mentioned rejection as another cost that should not be ignored and therefore discouraging domestic exporters to target quality sensitive markets like the European markets.

Quality standards for groundnuts in terms of moisture content, size, Aflatoxin and foreign matter are stipulated in Malawi Standards MBS 213:1990 developed by the Bureau of Standards. However, all the processors and exporters said weak regulatory framework and limited enforcement of quality standards is one of the key constraints which contribute to failure to adhere to quality requirements. In addition, the MBS Laboratory is not internationally accredited and Aflatoxin testing results obtained from the laboratory are not accepted by quality demanding importers. In addition to testing in local laboratories including the MBS and NASFAM laboratories, exporters targeting quality demanding markets also send some samples to accredited laboratories either in South Africa or Kenya whose Aflatoxin testing methods are internationally acceptable. This further contributes to high cost of Aflatoxin management.

Inadequate training in quality management systems at the trader level is another compromise in quality management in the value chain (66%). Most efforts target farmers yet it is supposed to be one of the activities at all stages in the chain. The common factors

that hinder growth in Malawi were also mentioned and these are inadequate financing and high cost of financing (86%).

6.11 Opportunities that exist in the groundnut value-chain

At production level more smallholder farmers still use recycled seed which compromises productivity per unit area. Continued efforts on production and promotion of use of certified groundnut seed among farmers has potential to contribute to increased productivity among smallholder farmers. Increased groundnut productivity due to use of quality seed will positively impact on land and labour productivity and profitability for the groundnut producers. FISP has presented a good opportunity to grow the local seed industry as contractors have a steady market and an opportunity is extended to smallholder producers to supply this quality seed for the programme. So far predictability of seed demand from this government programme has facilitated decisions by the private sector to invest more in the industry. However, too much dependency on the FISP by the private sector in seed production has also limited their capacity to explore other avenues for expanding the commercial market.

Demand for groundnuts is increasing in both domestic as well as regional markets. This study did not do a demand analysis. However, increased demand for seed is also clear evidence that production of groundnut has been growing. The increase in small, medium as well as large domestic groundnut processing companies is also evident. For example, there is high demand for peanut paste, the main ingredient in locally manufactured nutritional supplements which are on high demand especially from NGOs working with children and other health projects. This segment of the market has strict quality requirements, offers a premium price and has potential to influence marketing of groundnuts in Malawi. Therapeutic feed processors in Malawi such as Valid Nutrition are still importing peanut paste from South Africa due to quality concerns of the locally produced groundnuts. For example Valid Nutrition alone requires 20MT per month of groundnuts for paste making. This market can be captured easily if smallholder farmers and traders improved their groundnut quality and standards.

Emphasis on groundnut quality at domestic market would help prepare Malawian producers and traders for the international quality sensitive markets. Opportunities exist to

sensitise smallholder farmers and population at large of the negative health impact of Aflatoxin. But market incentives, especially price linked to specific quality have more direct influence in the short term to influence farmers to invest in quality management than concerns for health. Harmonisation of groundnut grades and standards within the region would promote quality management at all stages of the value chain in Malawi. Farmers would be encouraged to invest in quality management when traders insist and are willing to pay premium price as an incentive.

Organisation of the local industry players to consolidate their demand, linkages with organised smallholder farmers and provision of the right market incentives would facilitate quality monitoring and regulation on the domestic market. For example, smallholder farmers positively responded to price incentives provided by the seed market to step up on quality and standards.

Accreditation of the MBS laboratory would reduce the cost of Aflatoxin testing which currently is performed in external private laboratories and outside the country. Improving the capacity for enforcement, monitoring and regulation of quality standards by the MBS would send the right signals to actors in the groundnut industry. This also would give more confidence to foreign importers of Malawian groundnuts.

Focus group discussion revealed that women are able to market their groundnuts and therefore giving them more control of cash from sales compared to tobacco, where men dominate sale and control of income. Increasing access to production resources to improve groundnut productivity for women has potential to improve livelihoods at household level.

6.12 Discussion

The study results show that the majority of the smallholder farmers in Malawi produce more than one variety of groundnuts. Groundnut varieties commonly grown include CG7 and Chalimbana. CG7 is mainly being promoted by ICRISAT, farmer organisations and NGOs because it is high yielding. Government with support of the development partners is also providing affordable quality seeds, including legumes (groundnuts) through the FISP. So far, the bulk (about 80%) of certified groundnut seed is supplied to the FISP although majority of smallholder farmers still use recycled seed. The FISP is also aimed at

introducing modern technologies to smallholder farmers so that they can appreciate the benefits in terms of productivity from use of quality certified seed. This should eventually convince them to buy using own resources even after FISP.

Results from key informant interviews suggest that big multinational seed companies are less interested in investing in legume seed production because it is open pollinated and therefore easily recycled by farmers. This limits the demand for quality certified legume seeds by smallholder farmers and therefore not easy for big multinationals to get their desired returns to investments. This is also worsened by high cost of certified seed. The study results showed that more farmers that belong to farmer organisations use improved seed than non-members. However, overall the results showed that there is still limited use of certified groundnut seed among smallholder farmers which still limits groundnut productivity. This is consistent with Simtowe *et al*. (2009), who reported that only 40% of area allocated to groundnut was under improved varieties.

An assessment of choice of variety by farmers, based on focus discussions, suggest that smallholder farmers are more concerned with agronomic factors such as yielding potential and time to maturity. Yield potential has a direct link to profitability of the crop. Farmers mentioned that yield and weight of the nuts are important marketing aspects for groundnuts. Even though CG7 has smaller kernels it is high yielding and is heavier than traditional Chalimbana which is big seeded but has light weight. However, Traditional Chalimbana though low yielding is still preferred by some traders targeting confectionery groundnut export markets.

Results have shown that members had higher yields than non-members. Higher yields obtained by members could be attributed to better access to inputs such as improved groundnut seed and extension services through their FOs than non-members who were dependent on government extension system. Madola (2011) also observed that cotton farmers that belonged to a farmer organisation in Balaka District in Malawi had better yields than non-members due to improved access to inputs. Tchale (2009) found that farmers who are members of an organisation that facilitated access to extension, credit and markets exhibited higher levels of farm efficiency than non-members.

The study results have also revealed that inadequate information and information asymmetry are some of the major challenges to informed decision making by producers and traders regarding production and marketing of groundnuts. Otherwise, farmers just take a step of faith producing without reliable information regarding price or volumes required. Information asymmetry would limit producers and traders access to good markets as they are unable to know in advance the varieties that are demanded and quality specifications of these markets. This uncertainty limits smallholder farmers from seriously investing in agriculture and hinders productivity. However, only smallholder seed producers under contract farming arrangement were better supplied with information than groundnut grain producers. Contracted seed producers were told in advance the information regarding prices, marketing arrangements, volumes and quality of seed required was specified by the contractor. This may also explain the reason why smallholder seed farmers under contract farming were able to make serious investment decision in quality management.

An assessment on yields was also made at household level. Male-headed households were found to have higher yields than female-headed households. This is consistent with observations made by Munthali and Murayama (2013). Male-headed households had more available labour for farm activities than female-headed households which might be one of the factors explaining the differences in yields. They also have better access to credit. Njuki *et al*. (2013) also observed that the burden on women in terms of labour is higher than that of men. Besides, male-headed households had more access to improved seed than female-headed households.

Most smallholder farmers sell groundnut grain through multiple channels. However, a high proportion of both members and non-members sell their groundnuts to small traders commonly known as ‘vendors’. This is consistent with findings by Sitko and Jayne, 2014, Sangole *et al*., 2010, Simtowe *et al*., 2009, Minde *et al*., 2008 and Mofya-Mukuka and Shipekesa, 2013. In their study on maize markets in Eastern and Southern Africa, Sitko and Jayne (2014) observed that small-scale traders (vendors) were the most important market channel used by farmers. Farmer organisations, especially NASFAM were also mentioned as an important groundnut buyer by smallholder farmers in Mchinji district. Small traders then sell their nuts to other players including medium and large traders, processors, wholesalers, retailers and exporters.

The main factors influencing the choice of buyers by smallholder farmers are time of onset of marketing, proximity of market to the farmers, reliability of weighing scales used and lack of strictness on quality. Similar reasons were reported by Simtowe *et al*. (2009) and Sitko and Jayne (2014). Small traders have no strict requirements on quality and buy whatever farmers bring to the market. But these traders strategically enter the market earlier than anybody else and offer lower prices because there is no competition at this point. This is a calculated risk as the loss they make from buying groundnuts with high moisture content is off-set by the low prices they offer the farmers. These traders will dry these nuts and resell to other traders at the appropriate time and at higher price.

Most big buyers do not start buying until the groundnuts have been adequately dried later in the marketing season. Big traders such as NASFAM wait until the groundnuts have attained the right moisture content before they enter the market as a strategy to avoid buying wet nuts that easily build up Aflatoxin and also avoid huge moisture losses. Minde *et al*. (2008) and Simtowe *et al*. (2009) found that crop sales are a major source of income for smallholder farmers hence soon after harvest, farmers want to start selling their crops. These studies reported that crop income represented 87.8% of average household income among smallholder farmers. Among the areas where their study was conducted (Mchinji, Chiradzulu, Thyolo and Balaka, Simtowe *et al.* (2009) found that the contribution of crop income to household income was highest in Mchinji (88%) as opposed to the other areas.

Despite knowing that most small traders use unreliable weighing scales, producers still sell to them in order to address their immediate household needs. Estrada (2004); Sangole *et al*. (2010); Fafchamps and Gabre-Madhin (2001); Mofya-Mukuka and Shipekesa (2013) and Sitko and Jayne (2014) also reported the use of unreliable weighing instruments by small traders. From the results it is clear that smallholder farmers' decision on when to sell and how much to sell is largely influenced by immediate liquidity needs at the households. Previous studies on crop sales by smallholder farmers by Alene *et al*. (2008) and Mofya-Mukuka and Shipekesa (2013) obtained similar results. In their study in Kenya, Alene *et al*. (2008) observed that many farmers sold maize right after harvest to satisfy household cash needs and that at this stage price did not influence decision to participate in the market but marketed surplus increased with increase in price.

Group marketing or collective action is one of the key strategies recommended for ensuring and enhancing participation of smallholder farmers in competitive and dynamic markets. Despite belonging to a farmer organisation, the study shows that a majority of member producers still sell their groundnuts as individuals. This is contrary to the assumption of this study that belonging to farmer organisation will strengthen collective action in marketing. This may mean that FOs fail to play their important role of negotiating for better prices such that the members see no need to sell as a group. Smallholder farmers pressed for immediate cash needs see no reason to postpone and wait longer if prices they get through the collective action is not any better than selling as an individual. Gadzikwa *et al*. (2006) and Shiferaw *et al*. (2006) also found that a household can participate in collective action if the membership will improve the expected benefits beyond what they can achieve on their own.

Lack of group/community storage facilities also exacerbates the situation as farmers store their produce at home making decisions on when and where to sell easily. Group marketing would help farmers to assemble or mobilize their commodities and back up negotiations for better prices. Assembled produce belonging to properly governed farmer groups could also be used as collateral to access finances. In the absence of such services, a majority of smallholder farmers would still be selling as individuals. Innovative financing solutions which could be implemented in conjunction with functional farmer organisations might bridge the gap and facilitate group marketing. A few farmers sold all the groundnuts meant for sale at once. However, the majority sold in small portions on several occasions depending on household needs and changes in prices. Farmers considered their produce as an insurance which they could turn to whenever they had needs. This further makes group marketing difficult in absence of perceived substantial gains.

However, strengthening farmer organizations still remains an important strategy to enable smallholder farmers overcome limitations associated with smallness. Literature suggests that if farmers assemble and collectively sell under different forms of farmer organisations, they will reduce transaction costs and have bargaining power to negotiate for a better price. Successful examples have been reported in Markelova *et al*. (2009); Narrod *et al*. (2009); Kaganzi *et al*. (2009) mostly for high value crops such as fruits, vegetables and dairy. The study results have demonstrated that FO members have better access to improved

groundnut seed and services such as credit and extension which contributed to the higher yields than non-members. Similar observations were made by Mofya-Mukuka and Shipekesa (2013); Fischer and Qaim (2012); Simtowe *et al*. (2012); Madola (2011); Shiferaw *et al*. (2009); Tchale (2009); Alene *et al*. (2008); Chirwa (2005). These studies found that at the production level, farmer organisations facilitated access to extension and credit services and function as important catalysts for technology adoption and contribute towards technical efficiency on farm.

Cases where collective action for marketing did not work as expected have also been reported by Mofya-Mukuka and Shipekesa (2013); Poulton, Dorward and Kydd (2010); Markelova *et al*. (2009). Berdegue (2008) and Markelova *et al*. (2009) observe that there is little evidence that while farmer organisations have been successful in terms of marketing of high value crops (fruits, vegetables, dairy, coffee, etc), the same holds for food groundnut grain and other staples. But Bernard and Spielman (2009) found that higher prices were achieved by smallholder groundnut grain marketing cooperatives in Ethiopia. This suggests that there are more factors that influence access to markets apart from farmer organisation. An understanding of conditions under which collective action works for smallholder farmers would better inform action.

This study found that farmers of same typology and belonging to same farmer organisation behaved differently and were able to sell as a group under contract farming arrangement when producing legume seed. This was possible when the incentive structure (benefits) improved assuring the farmers of a steady market and offering them a premium price for their groundnut seed. Under seed contract farming, contractors provided seed, extension services, agreed a premium price in advance, and volume with specified quality standards. Certainty and flexibility of price, agreements on delivery times and quality standards under the contract farming arrangement positively influenced the behaviour of the same smallholder farmers who failed to stick to collective action when producing groundnut grain currently not being sold under any structured market arrangement.

Abebe *et al*. (2013) also observed that success of contract farming depends on several factors including incorporation of preferred design attributes such as supply of inputs by the buyer and flexibility of prices. Smallholder farmers have been reported to be risk averse especially in the input market. This is especially in developing countries where

input markets are missing or imperfect (Fafchamps, 1992). Dorward *et al*. (2004) observed that government interventions in input markets also face implementation challenges making receiving inputs from the buyer desirable. Wiggins (2012) and Wiggins *et al*. (2011) also observed that success of contract farming depend on a good business opportunity that both the contractor and farmers benefit from.

Implementation of structured marketing arrangements, such as contract farming, with right market and price incentives for the producers, as that of seed marketing might help to positively influence right farmer and trader behaviour and address some challenges currently faced. Processors could consolidate their demand and work with farmers organised in groups to supply according to agreed specifications. Incentives provided would influence farmers' loyalty to supplying to contractors. However, this will need to be backed by a strong regulatory framework and monitoring for the groundnut grain marketing.

Apart from the small traders that buy at the farm gate or closer to the villages, more traders came to buy groundnuts during designated market days. Depending on the distance from their homes, farmers go to such markets a day earlier to ensure quick sales and allow for time to access other things from the market before returning home. Due to the social system in place in Malawi, women are responsible for care of children and other household duties. Besides, household responsibilities, poor road and transport infrastructure makes travel to such markets difficult especially for women. Main modes of transport to the market centres are bicycles and oxcarts which further limits participation of women in such distant markets. This was also observed by Simtowe *et al*., 2009 and Sangole *et al*., 2010. Women sometimes still go to such markets but are limited in terms of quantities which they can take as a head load. In this case mostly men are the ones who go to such markets to sell groundnuts. With no receipts issued at the point of sale to show quantities sold, price and total revenue, women depend on the men to declare how much was realised from the groundnuts sold.

The assessment also revealed that there is limited coordination among actors in the groundnut value chain. In addition, lack of relationship and trust was observed amongst most players. It was also observed that since these traders are always mobile searching for areas where the crop is found in abundance, they usually do not establish any reliable long-

term relationships with smallholder producers. This limited flow of information influenced behaviours of the actors and to a certain extent limited the efficiency of the chain. For instance farmers mostly knew about prices at the time of sale. Traders also had limited access to information on estimated volume of supply. This was given as a reason for early onset of buying and failure to reinforce quality standards at the buying point. At this point traders said they are more concerned with quantity than quality of the groundnuts since they do not know how much farmers still have. Lack of relationship, trust and transparency between small traders and farmers contributed to cheating by both parties.

Since liberalization of the market there are no restrictions to participation especially at small trader level where often times own capital is used to procure groundnuts. Agricultural commodity companies are also free to decide what commodities and where they buy and procurement process used. At the time of the study, overall poor coordination was observed in the groundnut value chain with no buyer clearly seen as leader to drive agenda for quality and standards in the value chain. This is unlike what used to be before market liberalization when ADMARC was the sole buyer of smallholder crops including groundnuts. Then groundnut was bought based on grades which were well known to farmers. Poor coordination of the chain limits options for upgrading. Yet it is argued that upgrading is effectively stimulated through learning from lead firms rather than interactions between firms in the same functional position. Schmitz (2005) argues that knowledge that is transferred along the value chain from the buyer to the producer is critical for upgrading of processes and products. VCA helps to choose the pathways to upgrading to be adopted depending on the barriers to entry. In this case the assessment of value chain governance helps the actors in the chain to determine the agencies of upgrading.

Due to its uses, groundnut has domestic, regional as well as international markets. Regional and domestic demand has been increasing in the last few years due to an increase in demand for fresh, roasted nuts, peanut butter and nutritional supplements. Longwe-Ngwira *et al*. (2012); Sangole *et al*. (2010) and Simtowe *et al*. (2009) have also reported that growth in groundnut production has not kept up with the growing demand. The high prevalence of HIV/AIDS and malnutrition has increased demand for nutritional supplements (Personal communication, Manager, Valid Nutrition, Lilongwe, Malawi). Due to the strict quality requirements for groundnuts for the manufacture of nutritional

supplements, these companies prefer working with groups that are organised for easy monitoring.

6.13 Conclusion

In summary, the study results show six main marketing channels that are being used for marketing groundnuts in Malawi. Key players involved in groundnut marketing are producers, mobile small traders (assemblers), assemblers, wholesalers, retailers, processors and exporters. Mobile assemblers are the most active engaging the farmer as they move groundnuts from small plots that are geographically scattered. This means bulking this crop attract huge transaction costs, especially transport. The relationship between players in the groundnut grain value chain is rather weak and short-term as the main contact with the farmer, mobile vendors, are usually not specialised in one crop but take on any crop that is profitable at any particular time. This applies mainly to groundnut grain trading.

The weak short-term relationship also contributes to the huge mistrust between smallholder producers and the buyers in the groundnut grain marketing. Smallholders are quite suspicious of mobile assemblers accusing them of being unscrupulous and that they manipulate weighing scales to gain weight. On the hand, traders accuse smallholder farmers of soaking nuts, which introduces Aflatoxin contamination.

However, groundnut grain and seed channels exhibit distinct relationships amongst players involved in these value chains. Seed value chain players display a strong relationship compared to quite fluid relationships displayed in the groundnut grain value chain, especially for groundnut grain intended for the local market and regional low-end market where quality is of less concern. Seed market is well structured and operate under contract farming arrangement, albeit less formal (less binding) because there is no policy on contract farming yet. The functioning farmer organisations contracted to produce seed are able to enforce the agreed rules and compliance in quality and standards, which is not possible under groundnut grain by the same farmers. But farmers revealed that adherence to these rules and compliance requirements are mainly to protect this reliable market that offers them premium prices. Since default of one member affects the entire group, members of the association will ensure that everybody adheres to the requirements or face

disciplinary action from the group. This approach has also reduced transaction costs for the contractors.

In addition to adhering to quality and standards requirements, farmer belonging to farmer organisation were able to take collective action in marketing their seed unlike those farmer organisations that were producing groundnut grain. The key difference in these groundnut farmer organisations is that seed was marketed under a structured market that offered both market and price incentives unlike the groundnut grain market. Therefore, belonging to a farmer organisation is not enough to persuade member farmers to bulk and collective market their crop. Belonging to farmer organisation should help them use the numbers to attract right incentives and provide economic gains they cannot get if they operated as individuals, especially when it comes to selling their crop. This is not the case in the groundnut grain marketing. These smallholder farmers are usually hard pressed for immediate cash to meet other household needs and therefore cannot bulk and store their crop to sell as a group if they will not get a premium price after waiting. It was also revealed that even farmer organisations that buy from their members in order to bulk the produce do not offer better prices than other ordinary buyers such as mobile assemblers. With such low prices and sometimes cash flow problems that lead to intermitted buying, member farmers are forced into side-selling.

The other critical result from the study is that the majority of smallholder farmers in Malawi still use recycled groundnut seed. This is a major hindrance to increased smallholder groundnut productivity. Availability and access to quality seed is still a problem for majority of smallholder farmers because of inadequate supply of certified groundnut seed. Although there has been some steady increase of certified seed in Malawi due to the FISP, failure to attract huge investments from multinational seed producers such as Monsanto has undermined the capacity to increase production in order to meet the demand of certified seed. Groundnut is self-pollinating and this means smallholder farmers are able to recycle their seed several times thereby limiting demand for certified seed among smallholder farmers. This has undermined potential investment in the legume seed industry.

Usually legume seed is very expensive and unaffordable, thereby pushing farmers into using recycled seed. Simple demonstration of how incremental yields, due to use of

certified seeds, positively impact on net farmer incomes will help to convince smallholder farmers to start investing in quality seed. Use of genuinely certified legume seed in such programmes as FISP, and not groundnut grain, provides opportunity to demonstrate positive impact of using improved seed.

Some of the other identified problems can be dealt with if the smallholder farmers strengthened their position and influence in the value chain. One way is to promote some of the well-functioning groundnut associations into cooperatives. Cooperatives would perform some of the functions currently done by other players such as bulking and grading. Enabling these farmer organisation/associations access structured markets that would reward investment in quality such as contract farming, commodity exchange platforms which are linked to a warehouse receipt system will also enable smallholder farmers to access much needed credit, modern technologies such as quality inputs, research and extension services. But all these strategies require proper legal framework to ensure a win-win situation is created for both producers and buyers.

CHAPTER 7

PROFITABILITY ANALYSIS OF SMALLHOLDER GROUNDNUT PRODUCTION AND MARKETING IN CENTRAL MALAWI

7.0 Introduction

The previous chapter presented and summarised results from a qualitative analysis of the groundnut value chain in Malawi. Results showed that smallholder farmers sold their groundnuts through multiple channels but stated the need for better markets. This chapter presents the economic analysis of smallholder groundnut production and marketing (as described in chapter 4) with reference to major marketing channels used. Gross margin analysis (GMA) was conducted to assess profitability of groundnut production. This analysis was conducted on two groundnut varieties commonly grown in Malawi, Chalimbana (confectionary nut) and CG7 (oil type). Production levels were based on the typology of the farmers. Two types of farmers were considered and these are smallholder and large-scale. The analyses were also differentiated by type of groundnuts (whether seed or groundnut grain) and the type of buyer. In order to understand the performance of the groundnut market, a price spread method was used to assess market efficiency in price for the various groundnut market channels. Groundnut grain has a long value chain compared to groundnut seed which is mainly traded and sold under structured marketing arrangements through contract farming arrangement.

Section one of this chapter focuses on smallholder farmer profitability for groundnut grain sold to small and big traders while section two focuses on smallholder farmer and large-scale producers' profitability for groundnut seed under structure marketing. Section three focuses on market efficiency based on price. Section four and five is the discussion of the results and conclusion, respectively.

7.1 Smallholder groundnut profitability

Small traders (either as own businesses or contracted as middlemen) are the main buyers of groundnuts from smallholder farmers. Usually small traders offer same price at farm-gate as big traders. Serious price wars amongst buyers are rare but sometimes occur when

the commodity is scarce. Small traders are able to compete with big traders on price for two reasons. First, they usually enter the market early when groundnut is just being harvested and moisture content is still high. This is quite risky for big traders who buy large volumes considering that high moisture content in groundnut is recipe for high Aflatoxin contamination. Small traders usually buy low volumes at a time and are therefore able to dry their nuts before reselling to big traders at a higher price.

Table 7.1: Gross Margin Analysis for Smallholder Groundnuts (Hand shelling)

Description		**Groundnut Variety**					
		Chalimbana nuts			**CG7**		
	Unit	Qty	Cost	Value	Qty	Cost	Value
Product (shelled nuts)	Kg	625			750		
Weight loss due scale	Kg	62.5	0.63	39.06	75.0	0.58	43.13
Total Revenue (A)	US$/ha	625	0.63	390.63	750	0.58	431.25
Revenue (B) with scale loss)				351.57			388.12
VARIABLE COSTS							
Seed	Kg/ha	75	0.63	46.88	75	0.58	43.13
LABOUR							
Land preparation	US$/ha			21.25			21.25
Planting	US$/ha			30.00			30.00
Weeding	US$/ha			18.75			18.75
Harvesting	US$/ha			23.75			23.75
Stripping	US$/ha			42.61			51.14
SHELLING COSTS							
Hand shelling	US$/ha	625	0.14	85.23	750	0.14	102.27
Machine shelling	US$/ha						
Grading	US$/50kg	13	0.63	7.81	15	0.63	7.81
Packaging material	Bags	13	0.30	3.75	15	0.30	3.75
Total Variable Costs				280.03			280.03
Labour	Person-days	120		229.40	120		229.40
Total Variable Cost (C)				280.03			304.16
Gross Margin/ha (A-C)				110.60			127.09
Breakeven Yield/ha				448.05			522.45
Breakeven Price/kg				0.45			0.40
Gross Return Labour				2.83			3.20
Factoring weight loss due manipulated scale by vendors							
Total variable costs				280.03			304.16
Gross Margin (US$/ha) (B-C)				71.54			83.97
Breakeven Yield/ha				448.05			522.45
Breakeven Price/kg				0.45			0.40
Gross Return Labour (US$/person day)				2.51			3.20

Source: Own Survey Data

At this time, small traders (vendors) normally offer very low prices to factor in the risk of moisture loss which they shoulder. These traders take advantage of the vulnerable and desperate farmers whose main source of income is the crop sale. On the contrary, big traders looking for big volumes at once are usually risk averse and would want to minimise moisture losses and any other losses that are triggered by high moisture content in groundnuts. As such big traders (including wholesalers and processors) enter the market to buy from smallholder farmers when groundnut is well dried and attained the right moisture content. This is when the groundnut marketing season is almost mid-way and prices have gone up. Small traders will partly offset any losses due to rise in price at this point by the profits made at the beginning of the season.

As reported in the focus group discussions, most small traders are also able to sustain competition in the market by manipulating their weighing scales to cheat on weight. Using their manipulated weighing scales small traders are able to buy more kilogrammes for the same price paid by everybody else in the market. This is why the small traders are able to resale groundnuts to big traders at the same price they used to buy the crop from smallholder producers. Further, small traders are able to come and operate close to the homestead and act as middle men for big traders. In such instances, they operate on small mark-ups but make profit through quick turnovers of volumes sold. This finding also agrees with Sitko and Jayne (2014), who found that mobile assemblers in Eastern and Southern Africa have low marketing margins but still operate with reasonable degree of competitiveness.

Gross margins per hectare for smallholder groundnut grain farmers ranged from US$71 to US$127 (Table 7.1). Despite selling at almost same farm-gate prices, farmers selling to big traders fetch higher gross margins compared to those selling to small traders. Gross margin computations for smallholder farmers selling to vendors/small traders factored in weight losses due to scale manipulation. It was necessary to factor in this weight loss as this practice is widely done by vendors, more than 50%. However, despite displaying this weakness, small traders still play an important role in the groundnut value chain, especially of assembling the produce from scattered small pockets of production. CG7, though it fetches lower price on the groundnut grain market than Chalimbana, has higher gross margins on account of larger volume than low yielding Chalimbana. This underscores the need for increasing groundnut productivity for smallholder farmers in order to increase

their profitability. Therefore, use of quality certified seed and high yielding varieties should be prioritised amongst smallholder farmers in order to attain increased land productivity.

Returns to labour for smallholder groundnut grain producers ranged from US$2.51 to US$3.20 and all above the current Government instituted minimum wage rate of US$1.20 per person day. This means scarce labour has higher opportunity cost in groundnut production than someone being employed as a labourer earning a minimum wage rate. Comparatively, scarce labour is more valuable if allocated to growing of CG7 than Chalimbana though the difference is marginal (Table 7.2). Thus high yielding varieties (CG7) contribute to increased labour productivity. Gross margins for smallholder farmers using mechanical shelling range from US$103 to US$167, slightly higher than those using hand shelling (Table 7.2). This is despite revenue for groundnut farmers using mechanical shellers being slightly lower than those using hand shelling, due to high percentage of broken nut (7-15%). However, the cost of mechanical shelling is about half that of hand shelling and also, the grade-outs from broken nuts are still sold, albeit, at lower price. Revenue from the grade-outs is added to the total revenue.

Profitability for smallholder farmers using mechanical shelling could increase further if rate of breakage was reduced to below 5%. This can be easily achieved by training farmers to shell groundnuts at the appropriate moisture content, improve calibration of their shellers and also, if high quality certified seed is used to enhance pod filling and pod uniformity. Use of mechanical shellers would also help smallholder farmers to spend less time on shelling and save their scarce labour for other important economic activities. Despite these advantages, there is still low adoption of mechanical shellers amongst smallholder farmers in Malawi. Farmers are lacking proper training and information. Low-end roasting market in East Africa seems to be dominating groundnut exports. Exporters to this market do not buy broken or peeled nuts and this discourages smallholder farmers from using machine-shellers currently recording more than 5% breakage.

Table 7.2: Gross Margin Analysis for Smallholder Groundnuts (Machine shelling)

Description		Groundnut Variety					
		Chalimbana nuts			CG7 nuts		
	Unit	Qt	Cost	Value	Qt	Cost	Value
Product (shell)	Kg	625			750		
Wt loss due scale	Kg	62.50	0.63	39.06	75.0	0.58	43.13
Loss due to Breakage	Kg	43.75	0.38	16.41	52.5	0.38	19.69
Total Revenue (A)	US$/ha	581.25	0.63	379.69	697.5	0.58	420.75
Revenue (B with scale loss)				340.63			377.63
VARIABLE COSTS							
Seed	Kg/ha	75	0.63	46.88	75	0.58	43.13
LABOUR							
Land preparation	US$/ha			21.25			21.25
Planting	US$/ha			30.00			30.00
Weeding	US$/ha			18.75			18.75
Harvesting	US$/ha			23.75			23.75
Stripping	US$/ha			42.61			51.14
SHELLING COSTS							
Hand shelling	US$/ha	625	0.0	0.00	750	0.00	0.00
Machine shelling	US$/ha	625	0.07	42.61	750	0.07	51.14
Grading	US$/50kg	13	0.63	7.81	15	0.58	9.38
Packaging material	Bags	13	0.30	3.75	15	0.30	3.75
Total Variable Costs				237.41			253.02
Labour	Person-days	110		186.79	110		205.40
Total Variable Cost (C)				237.41			253.02
Gross Margin/ha (A-C)				142.27			167.84
Breakeven Yield/ha				379.86			440.04
Breakeven Price/kg				0.38			0.34
Gross Return Labour				2.99			3.39
Factoring weight loss due manipulated scale by vendors							
Total variable costs				237.41			253.02
Gross Margin/ha (B-C)				103.21			124.60
Breakeven Yield/ha				379.86			440.04
Breakeven Price/kg				0.38			0.34
Gross Return Labour (US$/person day)				2.64			3.0

7.2 Smallholder Groundnut Seed Profitability

Unlike legume groundnut grain market, the seed market is well structured where commercial seed companies (such as Seed Co, Demeter) and ICRISAT directly engage smallholder farmers and a few large-scale farmers to produce legume seed, including groundnuts. High yielding CG7 is the seed being promoted by ICRISAT and also

demanded on the Farm Input Subsidy Programme (FISP), which takes up over 80% of all the groundnut seed being produced in the country.

Profitability analysis for seed was conducted to understand the effect of structured market arrangements on farmer response in terms of quality management and profitability. Producing seed under a structured market, in this case using the contract farming arrangements, was more profitable with a higher return to labour than growing for groundnut grain (Table 7.3). This is due to increased productivity for those smallholder farmers under contract farming, as demonstrated by yield levels of 900 kg/ha compared to 650kg/ha for groundnut grain. This is due to increased use of quality certified seed, augmented by more investment and adherence to quality management as smallholder farmers respond to price incentives offered by the contractors.

Gross margins for smallholder seed producers ranged from US$499 to US$595 per hectare and are higher than smallholder groundnut grain producers (Table 7.3) due to increased productivity and premium price offered. Returns to labour for groundnut seed producers were also high implying that output productivity and premium prices resulted in increased labour productivity evidenced by increased value of labour under groundnut production. High returns to labour also demonstrates that groundnut seed has high opportunity cost in this area which is comparable to tobacco. It should be noted that smallholder farmers invested in quality management under the contract farming arrangement in response to the premium price. This is evidence that smallholder farmers respond to price incentives and would invest in any new technology as long as they are able to offset the extra cost incurred and have positive returns to their investment.

A sensitivity analysis was conducted to assess the impact of different levels of breakage on profitability in the seed market (Table 7.3). The results indicate that reducing levels of breakage by one percent increased levels of gross margin by two percent or farmers increased gross margins by US$8.1 per hectare (Table 7.4).

Table 7.3: Contract Farming for Groundnut Seed

Description	Groundnut Variety						
	CG7 (ICRISAT)				CG7 nuts (Seed companies)		
	Unit	Quantity	Unit Cost	Value	Quantity	Cost	Value
Product (shelled)	Kg	900			900		
Product (machine shell)	Kg	675	1.28	860.63	675	1.40	928.13
Grade outs	Kg	225	0.38	84.37	225	0.38	84.37
Total Revenue (mc shell)	US$/ha			945.00			1012.50
Product (hand shell)	Kg	765	1.28	975.38	765	1.40	1051.00
Grade-outs (hand shell)	Kg	135	0.38	975.38	135	0.38	50.63
				1026.00			1102.50
VARIABLE COSTS							
Seed	Kg/ha	80	1.63	130.00	80	1.63	130.00
LABOUR							
Land preparation	US$/ha			38.75			38.75
Planting	US$/ha			37.50			37.50
Weeding	US$/ha			53.75			53.75
Harvesting	US$/ha			37.50			37.50
Stripping	US$/ha	900	0.07	61.36	900	0.07	61.36
Grading	US$/ha	18	1.13	20.25	18	1.13	20.25
Packaging material	US$/ha	18	0.30	5.40	18	0.30	5.40
SHELLING COSTS							
Hand shelling	US$/ha	900	0.14	122.73	900	0.14	122.73
Machine shelling	US$/ha	900	0.07	61.36	900	0.07	61.36
Labour							
Hand shell	Person-days	150		371.84	150		371.84
Machines shell	Person-days	135		310.48	135		310.48
Hand shelling							
Total Variable Costs				507.24			507.24
Gross Margin/ha				518.76			595.26
Breakeven Yield/ha				397.84			368.90
Breakeven Price/kg				0.56			0.56
Gross Return Labour				5.94			6.45
Machine Shelling							
Total variable costs				445.88			445.88
Gross Margin/ha				499.12			566.62
Breakeven Yield/ha				349.71			324.27
Breakeven Price/kg				0.50			0.50
Gross Return Labour (US$/person day)				6.00			6.50

Therefore, to increase levels of adoption for the mechanical shellers, it necessary to help smallholder farmers reduce levels of breakage. This can be done by providing tailor made training in the calibration and use of the mechanical shellers. Smallholder farmers should also be helped to sell the grade-outs as this will minimise the losses by the producers and assemblers. Currently, groundnut breakage due to poor use of mechanical shellers varies between 5 to 15%. This can be reduced to at least 5% or below if farmers are trained on the right moisture content when shelling, choosing the right sieve and how to calibrate the machines. Planting certified quality seed will also improve pod filling and groundnut grain uniformity in terms of size, which also ease selection of the sieves.

Table 7.4: Sensitivity analysis on machine shelling savings (based on ICRISAT)

	Hand shelling	**Machine shelling with varying % breakage**		
		15%	**10%**	**5%**
Gross Margins/ha	518.76	499.12	539.62	580.12
Returns to Labour	5.94	6.00	6.30	6.60
Gross margin change from 1% reduction in breakage		US$ 8.1 (2% increase)		

Gross margin analysis was also conducted for estate production to assess the impact of using modern agricultural technology on profitability e.g., quality seed at recommended rate and good agricultural practices (including use of fertiliser, lime and gypsum). Large-scale producers attain high groundnut yields (three times that achieved by smallholder seed producers) due to use of modern technologies. The results demonstrate that increased productivity due to use of modern technologies has high influence on returns to land (gross margins) and labour (Table 7.5). Gross margin for estate seed producers is over 60% that of smallholder seed producers based on the same price. The difference in profitability is mainly due to differences in levels of output productivity. Despite some productivity gains made by smallholder seed producers due to use of quality seed and other quality measures, large-scale producers have gone a step further by adding some lime to reduce acidity of the soils, gypsum to promote pod filling and also use fertiliser. Unlike estate groundnut producers, smallholder farmers in Malawi do not apply fertiliser, lime and gypsum for groundnut production. Hence limit their productivity.

Table 7.5: Large scale-groundnut gross margins (based on machine shell)

Description	Groundnut Variety						
	CG7 (ICRISAT)				CG7 nuts (Seed companies)		
	Unit	Quantity	Unit Cost	Value	Quantity	Cost	Value
Product	Kg	3000			3000		
Product	Kg	2100	1.28	2677.50	2100	1.40	2887.50
Grade outs	Kg	900	0.38	337.50	225	0.38	337.50
Total Revenue	US$/ha			3015.00			3225.00
VARIABLE COSTS							
Seed	Kg/ha	120	1.63	195.00	120	1.63	195.00
LABOUR							
Land preparation	US$/ha	2		62.50	2		62.50
Planting	US$/ha	1		50.00	1		50.00
Weeding	US$/ha	2	46.25	92.50	2	46.25	92.50
Harvesting	US$/ha	1		45.00	1		45.00
Shelling	US$/ha	3000	0.07	143.18	3000	0.07	143.18
Grading	US$/ha	60	1.25	75.00	60	1.25	75.00
Liming	US$/ha	0.5 ton		325.00	0.5 ton		325.00
Gypsum	US$/ha	5x50kgs		250.00	5x50kgs		250.00
Packaging material	US$/ha	60	0.30	18.00	60	0.30	18.00
Stripping	US$/ha	3000	0.07	204.55	3000	0.07	204.55
Total Variable Cost				**1584.59**			**1584.59**
Labour (equivalent)	Person-days	180		796.59	180		796.59
Total Variable Costs				1584.59			1584.59
Gross Margin/ha				1430.41			1640.41
Breakeven Yield/ha				1242.82			1152.43
Breakeven Price/kg				0.53			0.53
Gross Return Labour				12.37			13.54

7.3 Assessment of Marketing Efficiency for the Different Channels Being Used for Groundnut Sales

In addition to the profitability analysis, performance of the groundnut market was assessed using Market Efficiency Index (MEI) based on the price spread method. MEI was used as a measure of efficiency in groundnut market by type of channel used. In general market efficiency relates to extent to which actual market prices reflect the true production costs and benefits received from output (Formosa, 2008). Based on the price spread method, market is efficient if the MEI is greater than one. Market efficiency is conducive to the optimum allocation of resources (Woodford, 2002) and it is also thought to optimise welfare (Cordina, 2008). Producer share being a percentage of the farm-gate price in the consumer price were also computed and results are presented in Table 7.6. Box 7.1 below presents a summary of main market channels used for groundnut grain and seed.

Box 7.1: Summary of market channels used for groundnut grain (C1 to C6) and seed C7 and C8

C1: Smallholder producer –> Local market ->consumer;

C2: Smallholder producer –> Small trader (Assembler) -> Wholesaler->Consumer;

C3: Smallholder producer –> Small trader -> Wholesalers>Retailers>Consumers

C4: Smallholder producer –> Small trader -> Wholesalers -> Processors-> Retailers-> Consumers

C5: Smallholder producer –> Small trader ->Wholesalers -> Exporters;

C6: Smallholder producer -> Small trader -> Processors -> Exports (formal and informal)

C7: Producer (smallholder/estate)→contractors → consumers (seed market)

C8 Producers (smallholder/estate)→ contractors→Seed company→consumer

Three types of channels exist in the groundnut industry in Malawi. Market channels C1 to C4 are mostly domestic and less strict on enforcement of quality and standards and less structured. C5 and C6 involve exports and to certain extent may become more structured depending on type of external market targeted. Low-end external markets are not strict on quality and standards compared to the high-end export markets. Low-end markets are mostly dominated by informal exporters and confined within the Southern and Eastern

African Region. Most formal exporters target high-end markets in South Africa and Europe, which are more structured and quality sensitive. These markets have strict quality and standard rules which have to be adhered to by exporters. Channels C7 and C8 are for the local seed market. Though domestic, the market for the certified seed is well structured based on contract farming arrangement. This is a quality sensitive market, which offers premium prices to promote quality and standards amongst smallholder producers.

The results indicate that producers' share in the consumer price is higher the shorter the value chain, i.e., 76% in groundnut grain channel 1 when smallholder producers are selling direct to consumers (Table 7.6). Caution need to be taken here because a higher percentage of producer's share does not mean higher returns to the farmers. Unless the market offers a premium price as is the case in the seed industry (channels 7 and 8). However, with more players involved in the value chain, the producers' share shrinks (C4 to C6). But one should not be tempted to conclude that the best way to increase producer's share is therefore to shorten the value chain by eliminating other players (middlemen). Producer's share is just a percentage but farmers are more interested in the actual dollar value accruing to them. It is possible for a producer share to be lower because it is a percentage of a large consumer price. Therefore, a lower farmer's share of a consumer's dollar does not necessarily mean lower farm prices or returns.

Table 7.6: Marketing efficiency of the different market channels being used by smallholder groundnut farmers

Type of Market		Producer Share %	Total Marketing Margin	Market Efficiency Index (MEI)
Local Market	[C1]	76.67	23.33	6.6
Assembler(vendor)	[C2]	65.71	28.57	8.6
Wholesalers	[C3]	51.11	33.33	9.8
Retailers	[C4]	41.82	27.27	10.4
Regional Export	[C5]	35.58	38.46	5.1
International Export	[C6]	33.82	41.18	4.3
Seed Companies	[C7]*	61.54	38.46	4.0
CGIAR/research	[C8]*	56.41	43.59	4.2

*Contracted groundnut seed only

All groundnut marketing channels have a market efficiency index (MEI) greater than one (Table 7.6). This means that all groundnut market channels considered in this study are efficient in price. Market efficiency is also a sign that there is some fair level of competition in the groundnut industry in Malawi. Price efficiency suggests that welfare of various players in the groundnut value chain for the different channels is somehow being optimised.

Total marketing costs were also disaggregated. Table 7.7 presents main components making up the total marketing costs. Many studies do not compute separately the cost of product losses i.e. post-harvest handling and marketing losses. This study has demonstrated that cost of product losses amount to about 50% of the total market costs. Where these losses have not been properly tracked, separately computed and added as part of the marketing costs, they have been added as part of profits for the market middlemen, thereby inflating the profits of traders. This approach, therefore, unduly over-state profit margins for market middlemen.

Table 7.7: Disaggregation of components of groundnut marketing costs (%)

Marketing activity	**Cost as % of TMC**					
	Local market	**Mobile trader (vendor)**	**Wholesaler**	**Retailer**	**Regional export market**	**International export market**
Cost of product losses (Post-harvest and marketing loss)	52.04	57.47	50.85	52.02	42.83	51.99
Grading cost	13.57	11.49	10.17	9.36	7.49	7.80
Packaging cost	10.86	9.20	8.14	6.24	2.57	2.08
Storage cost	5.43	4.60	5.42	8.32	4.28	3.47
Transport cost	18.10	17.24	25.42	24.06	42.83	34.66
Total	100	100	100	100	100	100

Cost of product losses (post-harvest and marketing losses) in groundnuts marketing include grade-outs/spoilage due to defects /poor calibration of mechanical shellers, spoilage due to poor moisture management in the warehouses. This study demonstrates

that the cost of product losses is huge and limits efficiency in the groundnut industry and therefore an important area that requires urgent intervention. In addition to cost of product losses, other areas reducing market efficiency include transport and cost of grading.

7.4 Discussion

The study has demonstrated that key players in the groundnut value chain are producers, mobile small traders or vendors, wholesalers, retailers, processors and exporters. Each one of these plays a distinctive function in the value-chain. The more players involved, the longer the value chain and vice versa.

The study results revealed that some of the mobile traders operate as middlemen working on small profit margins and maximising their profits through quick turnover. Despite some level of mistrust by smallholder farmers, small mobile traders play an important role of assembling the produce from usually small pockets of otherwise geographically scattered production zones. This role cannot be easily played by big traders as it could attract huge transaction costs. Vendors incur relatively low costs in bulking their commodity by using cheap modes of transport such as bicycles or hire old cheap cars, which sometimes operate in rural areas without proper registration papers.

Smallholder groundnut farmers do not have enough options where to sell their nuts at harvesting time. Mobile traders take the risk of buying groundnuts while moisture content is still high but offer low prices to cushion against this risk. Farmers revealed that they are persuaded to sell part of their harvest early because they are pressed with immediate household cash needs after a long period of waiting. Agriculture is the main source of income for majority of smallholder farmers. Similar observations have also been reported by Sitko and Jayne (2014). The study findings reveal that smallholder farmers spread their sale over a period of time as part of insurance waiting for better prices and also managing income as most of them do not have a bank account.

The study results have demonstrated that smallholder farmers operating under a structured market, such as contract farming for groundnut seed, are able to invest in productivity and quality management. In addition to a guaranteed market, contract farming provided premium price for groundnut seed. Therefore, the market and price incentive provided

under the contract farming arrangement persuaded the smallholder farmers to invest in certified seed and quality management such as post-harvest handling practices. The study findings also demonstrate that application of fertiliser, gypsum and lime, in addition to use of quality seed as done by large-scale farmers, further boosts productivity, and therefore maximises profitability. Fertiliser and lime are important to improve soil pH and fertility, while gypsum facilitates pod filling. Average large-scale yields are 3000kg/ha compared to 900kg/ha achieved by smallholder seed farmers that are also using certified seed but are not applying fertiliser, lime and gypsum.

It is evident that smallholder farmers would enhance profitability in groundnut production if they invested more in modern technologies that boost productivity. Despite fetching slightly lower price than confectionary Chalimbana, CG7 which is a high yielding variety achieved higher gross margins and returns to labour. Increasing agricultural productivity through modern technologies and offering farmers the price and market incentives will positively impact on the value of the scarce labour.

Gross margins per hectare for smallholder groundnut grain farmers ranged from US$71 to US$127. Gross margins for groundnut seed were higher than groundnut grain ranging from US$499 to US$1640 for smallholder and large commercial producers, respectively. Gross margins for groundnut seed compare very well or even exceed that of tobacco, which is the main export crop for Malawi. Agriculture Research and Extension and Training (ARET) estimate that smallholder farmer average cost to produce a kilogram of tobacco is US1.70, with a mark-up of between 15% and 30%. Average yield for burley tobacco is about 1800kg/ha (MoAFS, 2012). This gives gross margin for smallholder tobacco of between US$460 and US$1000 per hectare.

With computed returns to labour of more than US$2 per person-day, compared to official minimum wage rate of US$1.2, it can be inferred that scarce labour would fetch a higher price (or higher labour value) in groundnut grain production than if it were allocated to a day wage labourer earning a minimum wage rate. The returns to labour increased further with increased productivity and premium price as demonstrated in the groundnut seed industry. High returns to labour for groundnut seed imply that the crop is competitive in value and therefore smallholder farmers would prioritise labour allocation to this crop than other less profitable crops at peak labour demand periods.

Rising productivity in the legume seed industry in Malawi has been influenced by steady market provided by the Farm Input Subsidy Programme (FISP). FISP has also offered competitive price for legume seed. Contract farming in legume seed being promoted by the seed companies in Malawi has been premised on assured market and premium price offered by the FISP. The structured legume seed market in Malawi, under contract farming arrangement, has so far been anchored around the FISP. This arrangement ensured that producers and contractors have adequate information regarding quality of seed required, volume demanded by the programme and the commercial quality requirements and prices offered. Providing market and price incentives consistently for a sustained period has been important in changing farmers' attitudes and expectations in the legume seed industry in Malawi.

The study also found that stringent quality requirement for seeds imposes a high production cost on seed producers. However, the premium prices offered under contract farming are high enough to off-set the post-harvest and market losses incurred by farmers to satisfy and maintain the high quality and standards as demanded by this type of market (legume seed industry). The availability or lack of incentives contributed to the differences in household behaviour on managing quality and standards when selling to different markets.

In terms of price efficiency, the results have shown that all groundnut marketing channels have an MEI greater than one. Since price efficiency is usually based on the assumption that markets are efficient (FAO 2014), it can therefore be inferred in this case that all groundnut market channels considered in this study are efficient. Price efficiency here may be evidence that groundnut market could somehow be achieving some level of efficient resource allocation and maximum economic output due to fair competition. This result suggests that welfare (or utility) for the various players (producers, traders, processors, wholesalers, retailers, consumers and society as a whole) in the value chain is being optimised, i.e., at least all the players are benefitting.

This study has also demonstrated that cost of product losses (value of post-harvest and marketing losses) amount to about 50% of the total market costs. Usually these losses have not been properly tracked, separately computed and added as part of the marketing costs.

Instead they have been added as part of profits for the market middlemen and therefore, unduly over-stated profit margins for market middlemen. The study results found no evidence to support usual claims that middlemen over-exploit smallholder farmers in the groundnut market. In other words, the study found no evidence that middlemen have supernormal profits and therefore over exploit the smallholder farmers.

Small mobile traders (vendors) are often accused of exploiting smallholder farmers in Malawi (Simtowe *et al*., 2009; Sangole *et al*., 2010; Munthali and Murayama, 2013). On the contrary, the study results show that the small mobile traders play a crucial role of assembling the produce from small plots that are geographically scattered. Big traders cannot assume this role without inflating the transactions costs including transport and therefore further limiting competitiveness. It has also been demonstrated in this study that small mobile traders (vendors) do not make supernormal profits as often suspected. This is consistent with findings by Sitko and Jayne (2014); CYE Consult (2009). Sitko and Jayne (2014) found that assembly traders offered competitive markets and that they performed a crucial role considering the low volumes often produced by smallholder farmers. Smallholder farmers still complain about small traders due to their unreliable weighing scales used. This was also observed by Sitko and Jayne (2014). However, various risks that are taken by such small traders are often not taken into account. These risks range from personal security, lack of insurance, lack of information, time delays and transport risks. Bearing in mind that the bulk of groundnut (more than 90%) in Malawi is produced by smallholder farmers in small geographically scattered plots, small mobile traders play a crucial role of bulking the crop. Unlike big traders, mobile assemblers are able to operate in these hard to reach areas at minimum costs. Most of the mobile traders do not deal with one specific crop and will switch to any other crop that looks profitable at that particular time. With such opportunistic behaviour by the mobile traders, these traders are highly unlikely that they can develop or cultivate any long-term relationship with the smallholder producers.

The study results demonstrate that producers' share in the consumer price is higher the shorter the chain, 76% when producers are selling direct to consumers. Producers' share decreases the longer the value chain. Similarly, Onumah *et al*. (2007) also reported that long supply chains squeeze producer margins. Smallholder farmers' welfare can be maximised by ensuring that they get a fair share of the consumer price. To facilitate this,

smallholder farmers need to step-up to become credible players by seriously getting involved in value-adding activities along the chain. The previous chapter established that smallholder farmers that belonged to a farmer association had better access to certified groundnut seed and important services such as extension, training and credit. However, in terms of marketing so far, the results indicate that even the famers that belonged to a farmer organisation do not engage in collective marketing and take advantage of economies of scale to reduce transaction costs and consolidate their bargaining position by bulking their produce. .

Results of the qualitative value chain analysis indicate that only 14% of members and 2% of non-members sold their groundnuts as groups. As such, it is not easy for smallholder farmers to consolidate their share in the consumer price if they are not organised to strengthen their price bargaining position. Markelova *et al*. (2009); Markelova and Mwangi (2010) found that not all farmer organisations have been successful in collective marketing action and suggested that types of markets, products, characteristics of farmers and their institution and margins obtained all influenced the success of collective action. The need to address immediate household needs was given as the main factor that influenced smallholder farmers' decision on when and how much to sell. A lot of smallholder farmers indicated they sell their crop produce including groundnuts soon after harvest in order to get income to address immediate household needs. In the absence of innovative financial solutions, such as warehouse receipt systems, to cushion the smallholder farmers during this period, mobilising smallholder farmers into group marketing may still be remote.

This might also suggest the need for the farmer organisation to perform different service functions. These service functions include crop production and bulking, finance (such as village loans and savings) and marketing with proper coordination mechanisms in place.

Marketing-oriented component would be responsible for assembling and warehousing of smallholder produce and also tasked with the responsibility of searching for reliable markets and linkages. By cutting off the middlemen and getting involved in groundnut assembly, the marketing groups will also strengthen their position in bargaining for better price and consolidate the smallholder farmers' share in the consumer price. However, market search takes time and the long waiting period could tempt some smallholder

farmers into side-selling. Financial service provision such as the village loans and savings-VSLs and the warehouse receipt systems would be used to address immediate farmer needs while allowing them to hold their produce and sell when prices have improved on the market. Payment would be made to the smallholder farmers against their produce stored in the warehouse as collateral. Such localised and well coordinated marketing and financing system in which farmers are well integrated might be strategic interventions for enhancing collective marketing and strengthening bargaining position.

Drawing from the lessons from groundnut seed production, smallholder farmers can also increase their share in the consumer price and improve their welfare if they get involved in structured groundnut marketing. The results have demonstrated that players such as ICRISAT preferred to engage smallholder farmers that belong to reliable and functional farmer organisations. The ICRISAT model, which utilises organised farmers, has mutual advantage in that the contractor transfers some of the transaction costs to the group and reduces default rate. If one member defaults the whole group defaults and therefore the group is forced to put peer pressure on their members to pay. Premium prices paid for seed proved to be enough incentive for the group to protect this reliable market. This was also confirmed in the focus group discussions. This demonstrates that farmers are willing to invest in quality if they are provided with good incentive such as premium price.

It has been demonstrated in this study that belonging to a farmer organisation is necessary but not sufficient condition for smallholder farmers to engage in collective action. While farmers that belong to farmer associations had better access to extension services, modern technologies like certified seed, they still sold their produce as individuals just like those farmers that do not belong to any farmer organisation. These farmers only engaged in bulking and collective marketing when they were offered premium price under a contract farming arrangement. Farmers belonging to farmer associations were also able to invest and meet quality and standards requirement as demanded by the contractors which was not possible when the same farmers were selling groundnut grain under less structured and quality insensitive market. It can therefore be concluded that farmers will invest in new technologies and also engage in collective marketing if the expected benefits more than off-set the cost of their investment. The price which the farmers will get after bulking and waiting to sell as a group later in the season should be attractive enough to justify such a

long wait. However, lack of a regulatory system for contract farming in Malawi limits the implementation of this production and marketing arrangement.

This study has demonstrated that cost of product losses amount to about 50% of the total market costs. Cost of product losses are through the post-harvest and marketing losses. Post-harvest and marketing losses comprise grade-outs as a result of breakage, rotten nuts due to moulds and Aflatoxin contamination as a result of poor moisture management, and skin peeling off during transportation. Peeling off of groundnut skin and breakage are particularly discouraged in the seed industry where nuts have to be whole in order to maintain viability. Cost of product losses are rarely tracked and factored out when calculating profits usually leading to over-exaggerating traders' profits. Results also show that cost of transport from the farm to the market is another huge component of the marketing cost. Transport cost is quite substantial for the export market, over 35%, which may negatively affect competitiveness of the Malawian nuts. Sitko and Jayne (2014); Derlagen and Phiri (2012); Tchale and Keyser (2010); Fafchamps and Gabre-Madhin (2001) also observed that transport costs incurred by traders are high.

Reducing post-harvest and marketing losses would be effective intervention points to improve competitiveness of the groundnut industry. Mechanical shellers have been introduced as one way of addressing post-harvest losses related to shelling. However, high percentage of breakage associated with mechanical shellers still limits use. Emmott 2012 made similar observations as regards use of mechanical shellers among smallholder farmers. This might require adequate training of smallholder farmers and traders on proper drying and groundnut conditioning prior to use of mechanical shellers. Issues of calibration, standardisation of groundnuts prior to shelling, and proper adjustment of the sieves will need to be addressed. Promotion of alternative uses for grade outs might also encourage farmers to use mechanical shellers as they will not totally lose on the grade-outs. Moisture testing at the point of buying would also ensure that only groundnuts that are well dried are bought to reduce Aflatoxin contamination.

Reducing costs of transportation is another important intervention point. Well functioning marketing-oriented farmer groups might get involved in bulking of their crop and sell as a group if proper incentives such as premium price are offered. This would reduce transaction costs from the farm-stead to the retail market. Reducing these losses and costs

could significantly increase competitiveness and promote efficient allocation of resources in the groundnut value chain.

7.5 Conclusion

In summary, the study results have demonstrated that profitability of groundnuts is influenced by productivity, which is also affected by a number of factors including variety/and type of groundnut grown and market price. Smallholder farmers that belong to well functioning farmer organisation have better access to modern technologies such as certified seed and extension services. However, it requires demonstration of benefits that outweigh the cost of investment for these farmers, though they belong to farmer organisation, to invest in quality management and also get involved in collective marketing. But bulking their crop and selling as a group will help these farmers increase their share of the consumer price. Smallholder farmers may need to step-up to become credible players in the value chain by graduating into cooperatives.

Marketing cooperatives can play such functions like aggregating or assembling, market search and other value adding activities. However, smallholder farmers are impatient to aggregate produce and wait to sell as a group when prices are not good. Therefore, there is need to support such initiative with workable innovative financial solutions to cushion the smallholder farmers during this waiting period. An agricultural commodity exchange platform linked to warehouse receipt system could be tried and perfected over time. Since smallholder land cannot be used in Malawi as collateral, commercial banks could use the produce instead. Other approaches such as contract farming are working though without any supporting legal framework. This needs to be put in place to ensure that both the contractor and the producers are protected.

The marketing efficiency index for all groundnut marketing channels considered in this study were greater than one meaning that these market channels are efficient in price. This suggests that there is some fair level of competition in the smallholder groundnut industry in Malawi. This support findings by Sitko and Jayne (2014) who found that village groundnut grain markets in southern and eastern Africa (including Malawi) have a reasonable degree of fair competition. Marketing efficiency may also suggest that welfare of various groundnut players in the value chain for the different channels is to certain

extent being optimised. Traders' surplus were also assessed and concluded that that groundnut traders in Malawi are not making supernormal profits.

Smallholder farmers' welfare can be maximised by ensuring that they get a fair share of the consumer price. The study found that producers' share in the consumer price is higher the shorter the chain. Smallholder farmers can increase their share in the consumer price and improve their welfare if they directly engage with buyers as is the case under seed contract farming arrangement. This could also be facilitated by farmer organisation. However, lack of a regulatory system for contract farming in Malawi limits its successful implementation.

The study has found that post-harvest/marketing losses and high transportation costs are major components influencing total market costs and influence efficiency of the marketing channels. Therefore, strategically intervening to reduce these costs would help to improve competitiveness of the groundnut industry in Malawi. Mechanical shellers could be promoted as one way of addressing post-harvest losses due to Aflatoxin contamination. Also, teaching smallholder farmers how to calibrate the shellers well in order to reduce breakage and finding alternative uses for grade outs, will ensure that smallholder farmers and traders are able to minimise losses.

CHAPTER 8

FACTORS INFLUENCING SMALLHOLDER FARMERS INVESTMENT IN GROUNDNUT QUALITY MANAGEMENT

8.0 Introduction

Groundnut quality is one of the factors that influence access to reliable markets at domestic, regional as well as international level (Babu *et al*., 1994; Diop *et al*., 2004). Though quality in groundnuts encompasses various aspects, specific attention is laid on Aflatoxin due to its hepatotoxic, carcinogenic, immunosuppressive and anti-nutritional capacity on both humans and animals (Gong *et al*., 2002; Williams *et al*., 2004; Liu and Wu, 2010; Khlangwiset *et al*., 2011; Leroy, 2013). The risk of causing cancer, effects on nutrition which is linked to stunting in children through interference with protein metabolism and multiple micronutrients, suppression of immunity and modulation of infectious diseases such as HIV have been reported. Exposure to Aflatoxin and its effects on immunity and nutrition negatively affect health factors that account for more than 40% of the burden of disease in developing countries. As one of the risk factors in human health and development, controlling Aflatoxin in food and feeds is critical.

Groundnut exports ranked second to tobacco as the country's foreign exchange earner before export volume significantly declined in the late 1980s due to several reasons including high incidences of Aflatoxin which did not meet the stringent EU requirements (Babu *et al*., 1994; Monyo *et al*., 2010; Delargen and Phiri, 2012). Sustained groundnut exports to markets with stringent Aflatoxin regulations is still hampered by Aflatoxin contamination (Diop *et al*., 2004; WHO, 2006). Hence any efforts to restore access to such reliable markets need to consider factors that led to the loss of this market and how access might be restored. Importantly, the effects of Aflatoxin on health and nutrition on producers and domestic, regional as well as international consumers cannot be ignored.

In this chapter, groundnut quality is largely discussed at farmer and briefly at subsequent levels with focus on Aflatoxin contamination. The household survey and focus group

discussions captured information regarding farmers' perceptions, awareness, knowledge and practices in relation to groundnut quality, particularly Aflatoxin contamination. Traders' views on quality and standards and how these affect market demand were assessed to establish the gaps in knowledge and practices. At the producer level, descriptive statistics and a Selective Tobit model as described in chapter 4 were used to assess key factors that influence farmer decisions to adopt and decide on intensity of use of the technologies on groundnut quality management.

Section one of this chapter presents the perceptions of quality at smallholder producer and trader level, section two presents results on awareness of Aflatoxin contamination among smallholder groundnut farmers in Malawi and section three focuses on pre- and post-harvest practices to control Aflatoxin contamination and sources of information. Section four looks at traders practices to control Aflatoxin contamination. Section five focuses on grading in groundnuts while Section six presents the results of the Selective Tobit model for assessing factors that influence smallholder farmers when adopting and deciding on the extent of investment in groundnut quality management. Section seven discusses the key results and finally section seven concludes the chapter.

8.1 Perception of Groundnut Quality by Farmers, Traders and Processors

8.1.1 Perception of groundnut quality by smallholder farmers

Smallholder farmer perceptions on what groundnut quality refers to were analysed. In a multiple response question, over 90% of both members and non-members interviewed associate groundnut quality to plumpness of the kernel (how well pod filled). The analysis was further conducted for male and female-headed households and shown in Table 8.1.

Table 8.1: Smallholder farmers' perception of groundnut quality (%)

Smallholder farmers' perception of groundnut quality	% of respondents		% of respondents		% of respondents	
	Male Member (n=131)	Male Non-member(n =114)	Female Member (n=27)	Female Non-member (n=25)	All Members (n=158)	All Non-members (n=139)
Well filled pods/ plumpness	92	89	92	96	92	90
Uniform variety	89	78	78	80	87	78
Properly dried nuts	44	45	30	24	42	41
Clean nuts	24	11	30	12	25	12

In addition to plumpness, farmers also relate groundnut quality to uniformity in size of kernel and colour and the moisture content of the groundnuts. These perceptions were similar among male and female headed households in both categories of farmers.

The study also assessed farmers' perceptions on what traders view as key aspects of good quality groundnut. Figure 8.1 shows that 50% of both member and non-member farmers think that traders just buy whatever is brought to them without strictly specifying quality required. Another 43% of members and 38% of non-members said other traders emphasise more on moisture content (how dry the nuts are). Other farmers said some traders also consider uniformity of the varieties (especially based on colour) and wholeness of the nuts.

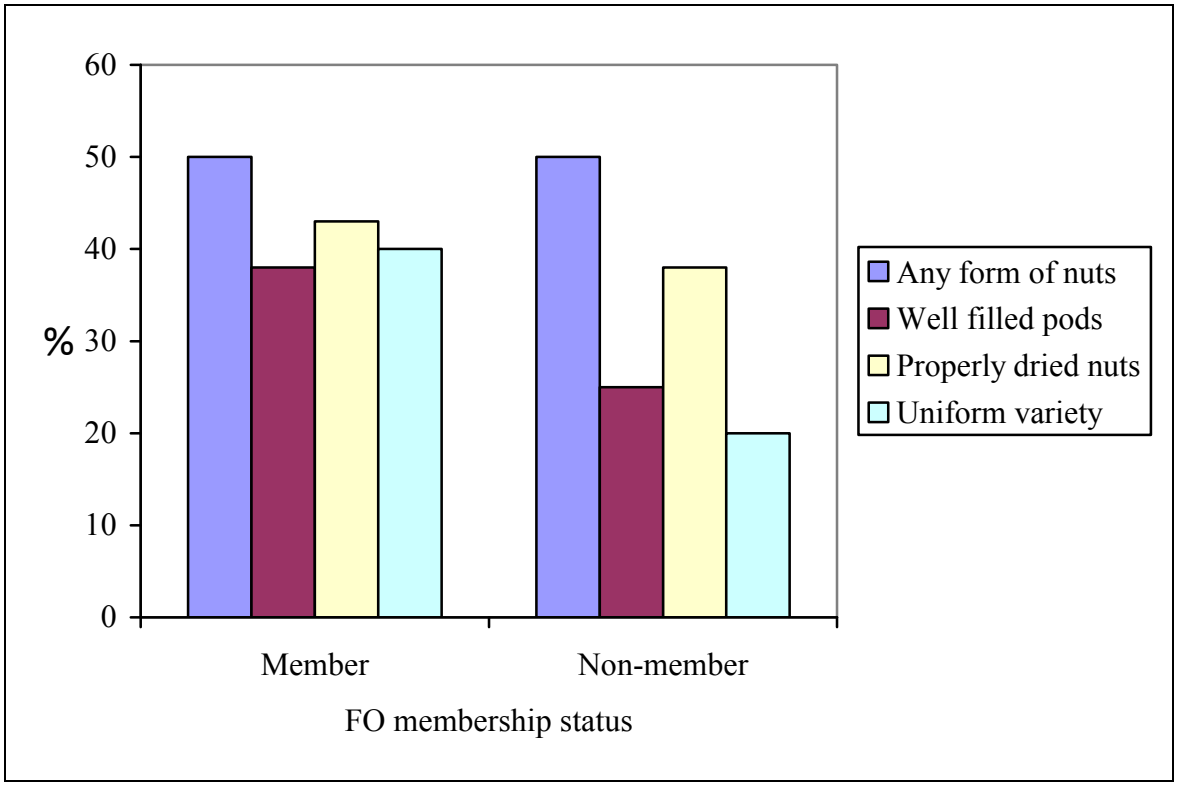


Table 8.1: Farmer perceptions on what quality of groundnuts traders demand (%)

Further assessment was made on whether there are differences between prices offered by traders that demanded quality and those that were not strict with quality as shown in Figure 8.2.

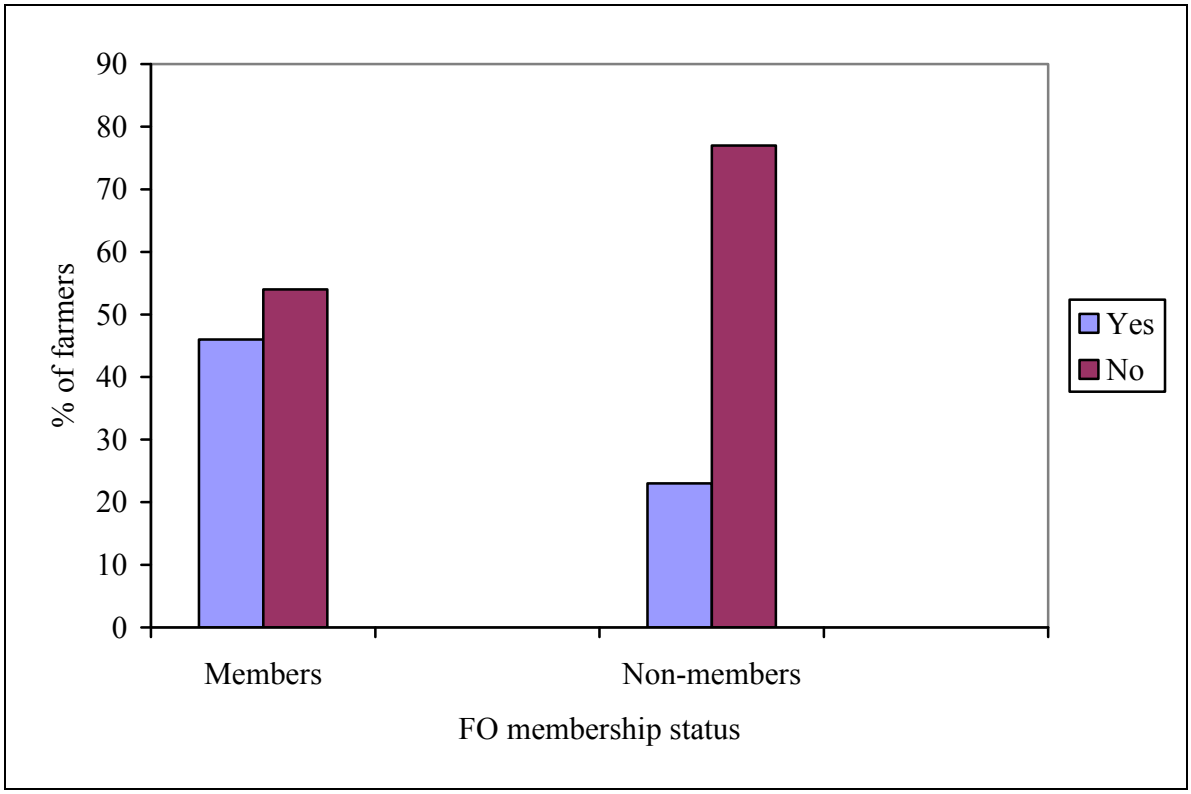


Figure 8.2: Whether traders that are more concerned with quality offered better prices for their demand than other traders (%)

From Figure 8.2, 54% of members and 77% of non-members stated that buyers that demand quality do not offer better prices to match their demand. As such, a lot of smallholder farmers do not take grading and other quality issues seriously. However, it was learnt from the focus group discussions that FO members received slightly higher price for groundnuts sold under fair-trade arrangements. Fair-trade has not been as successful because the bonuses do not go to the farmer involved in production but rather are ploughed back in form of community development to benefit everybody including those that are not groundnut producers.

8.1.2 Perceptions of groundnut quality by traders and processors

Perceptions of groundnut quality were also captured at trader and processor level. Majority of small traders mentioned that they were more concerned with volume than quality. However, some consider moisture content (feel texture to see how dry the nuts are), uniformity of the varieties (based on colour) and wholeness of the nuts. Traders and processors emphasized on different quality aspects depending on the intended use of the

nuts. For example, peanut butter processors consider oil content and colour of the skin. Beyond physical quality aspects, processors for nutritional supplements and the suppliers for peanut paste are also more concerned with Aflatoxin content. These processors stipulate and adhere to strict maximum allowable levels of 10ppb on peanut paste. The finished product must not exceed 5ppb according to international standards (Valid Nutrition, 2010). Foreign traders targeting low-end market in East Africa, mainly for roasting, prefer light coloured Chalimbana groundnuts and CG7 variety. The study found that CG7 is particularly preferred by processors roasting groundnuts in skin.

Apart from processors involved in nutritional supplements, it was observed that most traders were not strict with quality when buying from farmers and other secondary suppliers along the value chain. Except for processors in therapeutic feeds such as Valid Nutrition and Project Peanut Butter that purchases peanut paste within the maximum allowable Aflatoxin levels from reputable suppliers, none of the buyers bought groundnuts based on set grades and standards.

As a result of limited flow of information in the groundnut value chain, various actors had different views on groundnut quality. This also contributes to the challenges faced in the overall management of quality in groundnuts.

8.2 Smallholder Farmers' Awareness of Aflatoxin Contamination in Groundnuts and Sources of Information

In addition to general knowledge about groundnut quality, farmers were also asked about their knowledge of Aflatoxin in groundnuts. Figure 8.3 presents the proportions of respondents that have heard about Aflatoxin.

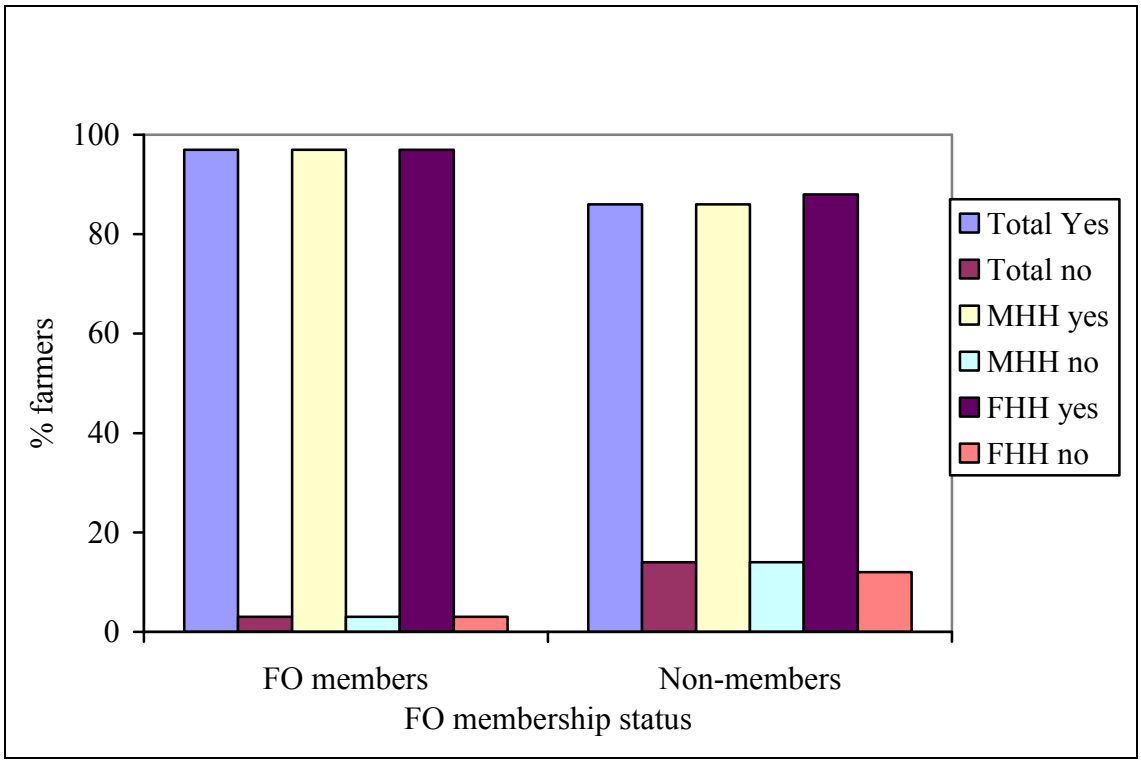


Figure 8.3: Proportion of smallholder farmers that have heard about Aflatoxin in groundnut (%)

From Figure 8.3, 97% of members and 86% of non-members reported that they have heard or know something about Aflatoxin which they locally referred to as '*chuku*'. The chi square tests for significance show that the difference between members and non-members in terms of awareness of Aflatoxin contamination is significant at 1%. More members are aware of Aflatoxin contamination in groundnuts than non-members.

Based on gender of the household-head, over 90% of both male and female headed member households and over 80% of male and female-headed non-member households have heard about Aflatoxin in groundnuts. Chi square tests show that the difference between male-headed households for members and non-members that have heard about Aflatoxin is significant at 1%. However, the difference between female-headed member and non-member households that have heard about Aflatoxin is not significant.

Analysis was also performed on what farmers relate Aflatoxin in groundnut to. Figure 8.4 shows what farmers that knew about Aflatoxin related Aflatoxin with the following:

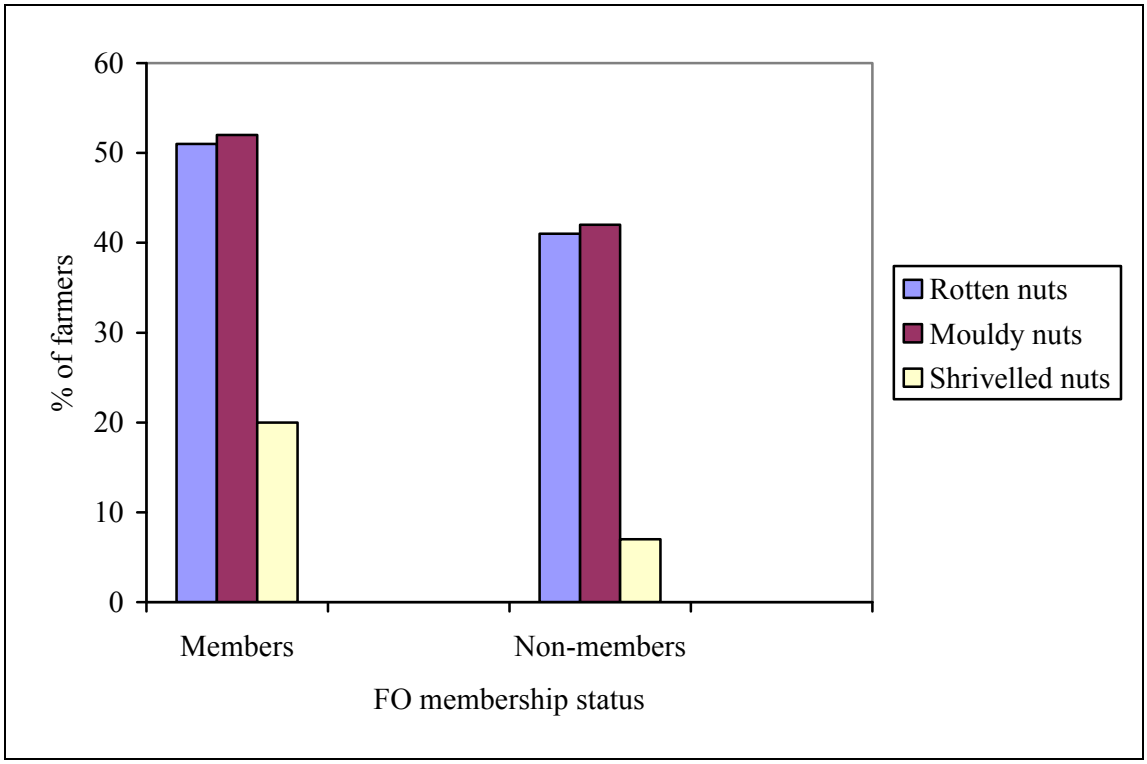


Figure 8.4: Farmers explanation about Aflatoxin in groundnuts (%)

Aflatoxin was largely related to rotten or mouldy nuts due to poor moisture management after harvest. Only 20% of members and 7% for non- members associated shrivelled nuts with potential for Aflatoxin. Yet most of the shrivelled nuts have high potential for Aflatoxin contamination.

Farmers were also asked about knowledge of impact of Aflatoxin on human health. Knowledge about contamination and the negative impacts of Aflatoxin on human health to trigger any behavioural change is still limited as shown in Figure 8.5.

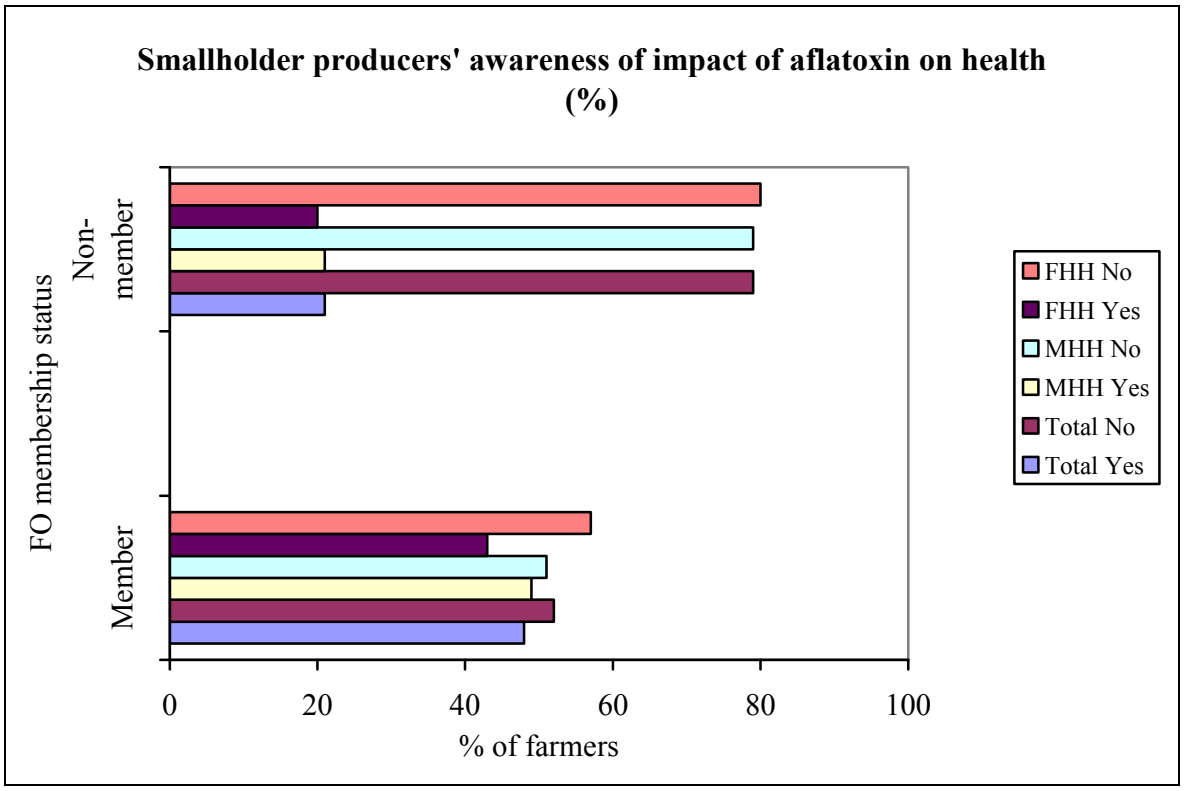


Figure 8.5: Smallholder producers' awareness of impact of Aflatoxin on health (%)

Only 48% of members and 21% of non-members are aware of the negative impacts of Aflatoxin contamination on human health. The chi square test for significance shows that the difference between members and non-members that are aware of the negative impact of Aflatoxin on human health is significant at 1%.

More male-headed households among both members and non-members were aware of impact of Aflatoxin on human health than female-headed households. Chi square tests show that the difference between male-headed member and non-member households is significant at 1%. Among female headed households, similar trend was observed but the difference is not significant.

Among the farmers that are aware of the impact of Aflatoxin on human health, 96% of members and all non-members said they have heard that in some cases Aflatoxin causes diseases such as cancer. Among members, 4% said Aflatoxin contamination is also one of the factors that contribute to stunted growth as it reduces the quality of food made out of the contaminated groundnuts.

Awareness of the negative impacts of Aflatoxin contamination on human health is low amongst domestic consumers. Rarely would domestic consumers demand for Aflatoxin tested nuts on the market. This is worsened by inability by the Malawi Bureau of Standards to reinforce quality and standards on Aflatoxin contamination levels.

Smallholder farmers have multiple sources of information on Aflatoxin presented in Table 8.2.

Table 8.2: Main sources of information on Aflatoxin in groundnuts for smallholder farmers (%)

Main source of information on Aflatoxin for smallholder farmers	% of respondents	
	Members (%) (n=149)	Non-members (%) (n=92)
Farmer organisation	81	19
ICRISAT	26	21
Fellow smallholder farmers	23	38
Other NGOs	18	22
Government extension	3	4

Farmer organisation and ICRISAT constituted the main sources of information on Aflatoxin for members. Fellow farmers/friends (some of whom are FO members) are the main source of information for non-members followed by ICRISAT and NGOs.

8.3 Smallholders' Pre and Post-harvest Practices to Control Aflatoxin Contamination in Groundnuts

At the production level, Aflatoxin contamination occurs at both pre and post-harvest stages making its management at all stages necessary. The results in Figure 8.6 show that smallholder farmers have little knowledge about pre-harvest contamination. Only 8% of members and 7% of non-members said they follow field practices that reduce water stress such as construction of box ridges and early harvesting when the soil is still moist to avoid Aflatoxin contamination.

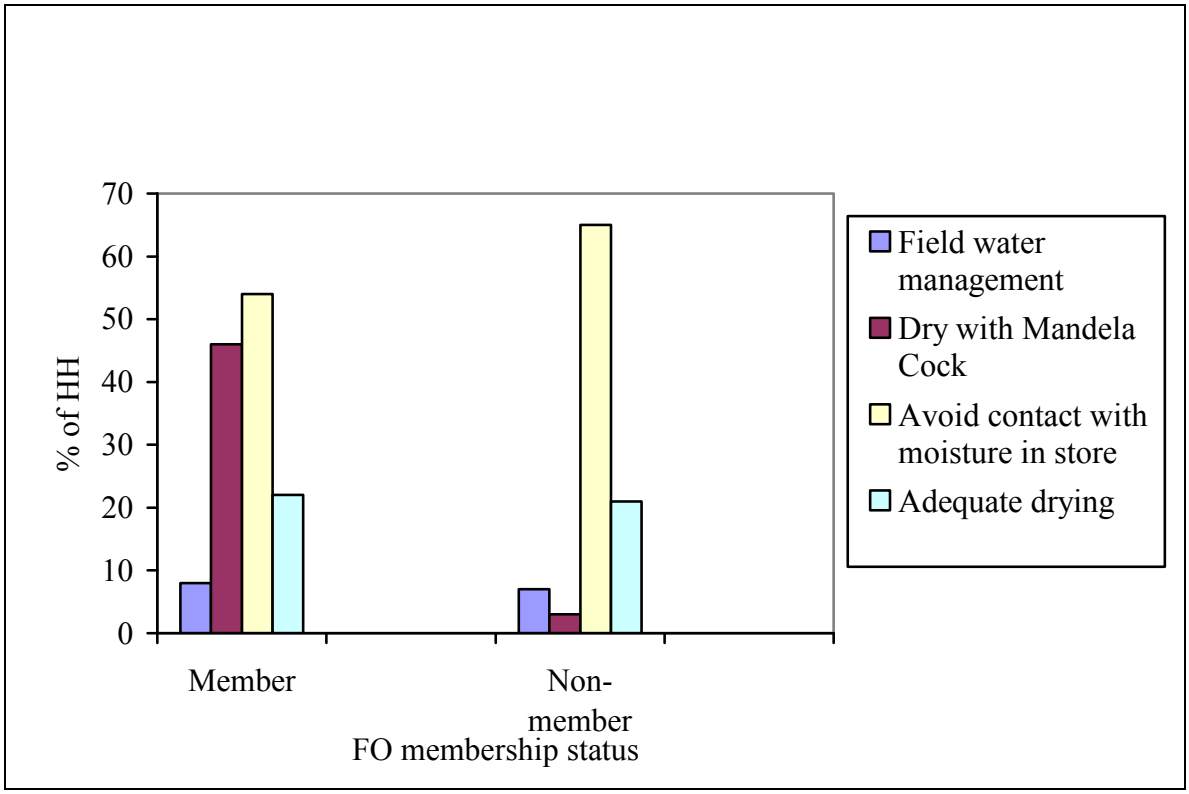


Figure 8.6: Smallholder practices to avoid Aflatoxin contamination in groundnuts (%)

The above shows that post-harvest drying technique known as 'Mandela Cock' (Figure 8.7B) is used by 43% of farmers that belong to farmer associations and only 4% of non-members. Mandela Cock is a slow-drying method that relies on adequate air circulation currently promoted by ICRISAT as one of the most reliable drying methods to reduce Aflatoxin contamination in groundnuts. Figure 8.7A shows groundnut drying using traditional methods.

Figure 8.7: Groundnut drying using traditional round heaps (A) and Mandela Cock method (B)

Another 54% of members and 65% of non-members said they avoid contact of the groundnuts with moisture in store to control Aflatoxin contamination. Smallholder farmers use polypropylene sacks for storing groundnuts in the house. However, to facilitate hand-shelling, 60% of both members and non-members interviewed revealed that they soak groundnut pods in water before shelling to soften the shell. Soaking the already dried nuts re-introduces moisture which promotes fungal growth and therefore promoting Aflatoxin contamination.

8.4 Traders' Practices to Control Aflatoxin Contamination in Groundnuts

Traders were also asked on practices that they do to avoid Aflatoxin contamination. During the market survey it was observed that the procurement systems for most of the traders buying groundnuts are not quality conscious. None of the 33 small traders interviewed used equipment such as moisture meters which provide an easy and accurate method of determining moisture content. Buyers use 'hand feeling' and visual inspection to determine if the groundnuts are well dried or not. Only few traders such as NASFAM used moisture meters when receiving groundnuts from commissioned agents and other suppliers at the warehouse. Before groundnuts are re-bagged and put in the warehouses it is recommended to first aerate and further dry them to ensure they attain the required moisture levels of between 7% and 10%.

At least 17% of small traders bought unshelled nuts and either hired labourers to hand-shell or mechanical shellers. Mechanical shellers have recently been introduced in an effort to help reduce Aflatoxin contamination in groundnuts. However, some of the only few smallholder farmers and vendors that currently use mechanical shellers, still soak the nuts before shelling. They claim soaking softens the shell and reduces breakage and dust (Figure 8.8A and 8.8B). Although hand shelling is time consuming and costly in terms of labour, it is still preferred amongst smallholder farmers, especially those selling to low-end roasting market and those targeting the seed industry. Some smallholder farmers experience high rate of breakage due to poor skills in using the mechanical shellers. Breakage is as high as 15% for some smallholder farmers. This needs to be reduced to below 5% in order to further strengthen value for money for this investment according to the cost-benefit calculations in profitability chapter.

After shelling, traders recruit people to winnow the nuts and do 'light touch' grading before packaging in polypropylene sacks ready for storage or onward sale to other actors in the value chain. Usually these nuts are properly off-loaded at the big trader stage. Some big traders offload the groundnuts from the sacks to re-dry, grade (depending on buyer requirements) and repackage in standardized weights. Groundnuts which were packed while inadequately dried risk fungal growth while in transit and in store as shown in Figure 8.8C and 8.8D of mouldy nuts found in off-loaded sacks.

Figure 8.8: These previously dried nuts are soaked before mechanical shelling (A and B) which results in mouldy groundnuts later in storage (C and D)

8.5 Grading and Associated Weight Losses

8.5.1 Groundnut grading, time of grading and criteria for grading

Sorting or physical separation of contaminated nuts from clean ones is recommended to reduce post-harvest Aflatoxin contamination. Key informant interviews with the Malawi Bureau of Standards (MBS) indicated that Malawi has a range of maximum allowable level for total Aflatoxin which is 15-20ppb. However the actual Aflatoxin levels stated in the standard for groundnuts (MBS213:1990) whose specifications are shown in Table 8.3 below:

Table 8.3: MBS specifications for groundnuts under MBS213:1990

Characteristics	In-shell	Kernels
Extraneous matter content % (m/m) max	2	0.1
Damaged pods/kernels % (m/m) max	0.5	1
Shrivelled pods/kernels % (m/m) max	3	0.5
Broken and split kernels % (m/m) max	-	0.5
Empty pods % (m/m) max	-	9
Admixtures of other varieties % (m/m) max	2	0
Aflatoxin content ppb max	10	3
Moisture content % (m/m) max	9	7

Source: MBS: 213:1990 Malawi Standard: Groundnut Specification, Malawi Standards Board ICS 67.060

However this standard is not known by most actors in the groundnut value chain mostly due to failure by MBS to reinforce this on all players, whether dealing with domestic or export markets.

Such processes as winnowing and thorough grading are important processes for reducing Aflatoxin contamination. Results from a market survey indicated that more smallholder farmers only perform light touch grading, 91% and 83% of male and female-headed households under functioning farmer organisation, respectively; and 71% and 76% of male and female headed households that do not belong to any farmer organisation. These groundnut grain farmers reported that they do not do serious grading for fear of reducing weight due to grade-outs. Smallholder farmers also claimed that there is no need to get involved in serious grading as there is high demand for groundnuts and traders buy whatever is offered to them for sale. Figures 8.9A and 8.9B show ungraded nuts that were

bought by traders. This also showed that indeed most traders are not strict on the quality of groundnuts they buy.

Figure 8.9: Sample of ungraded groundnuts bought by a small trader (A). These two sorted samples (B) are from same sample (A).

However, the same smallholder farmers claimed they do serious grading when selling groundnuts which they have produced as seed. They indicated they grade out rotten, moulded, and shrivelled nuts when selling to quality-demanding buyers that pay them a premium price for quality. ICRISAT and other seed companies prefer contracting smallholder farmers that belong to well functioning groundnut associations to produce seed under agreed specified agronomical practices and quality requirements. In addition to other specified pre and post-harvest handling techniques required to be followed by contracted seed farmers, it was reported that ICRISAT also checks, using moisture meters, that the nuts have the right moisture content at the point of sale. The smallholder farmers also reported serious grading happens when selling groundnut grain to big traders or processors that are involved in formal exports. These traders are sometimes willing to compensate quality by good price. But other traders indicated they buy anything farmers offer for sale irrespective of quality and invest more in grading by the company itself. This is an important area for further research to conduct a cost benefit analysis of the two approaches. Paying premium price is an incentive for farmers to invest more in production and quality management.

8.5.2 Rejection of groundnut in the domestic markets due to contamination with moulds and disposal of contaminated nuts

Smallholder farmers were asked whether they had experienced any rejections of groundnuts at the market. Despite most of them stating that their nuts had signs of moulds or being wet at the time of sale, only 9% of members and 25% of non-members have had their groundnuts rejected at the market (Fig. 8.10).

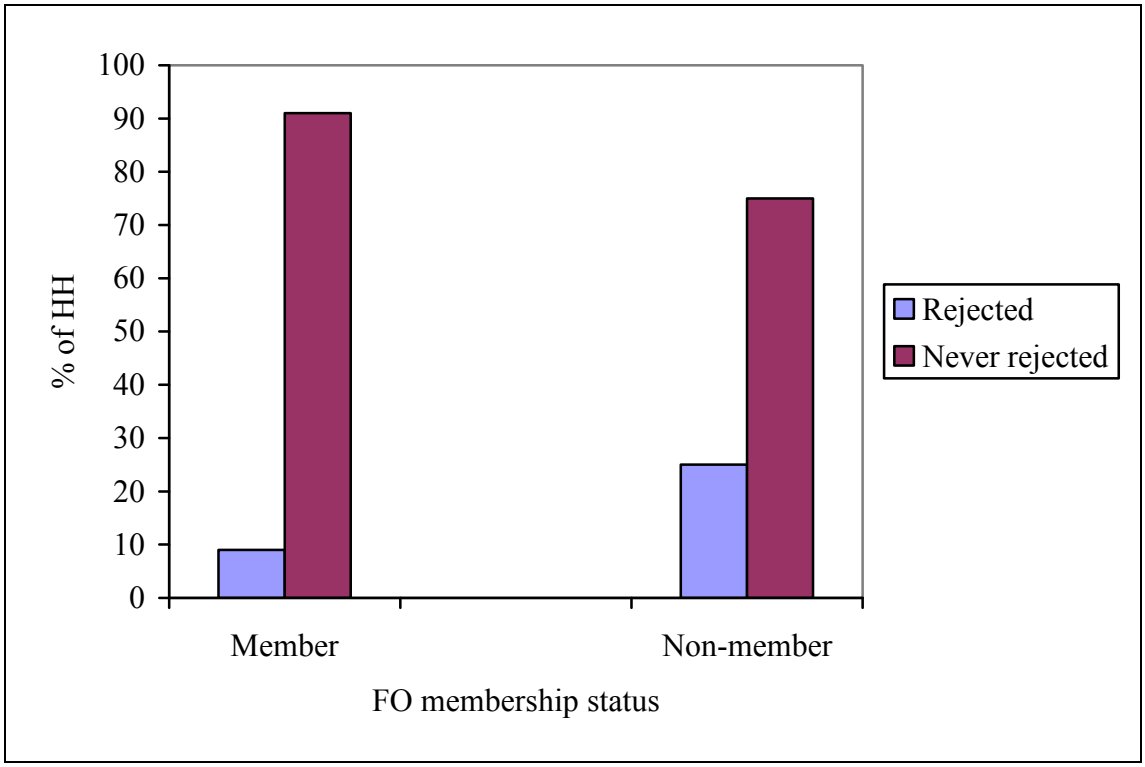


Figure 8.10: Proportion of farmers that have experienced rejection of groundnuts at the local market (%)

Chi square tests for significance show that the difference between members and non-members in terms of rejections is significant at 1%. More non-members have experienced rejections than members. These usually do not have any source of information regarding quality demanded at the market.

Smallholder farmers' responses on disposal of rejected groundnuts are presented in Figure 8.11.

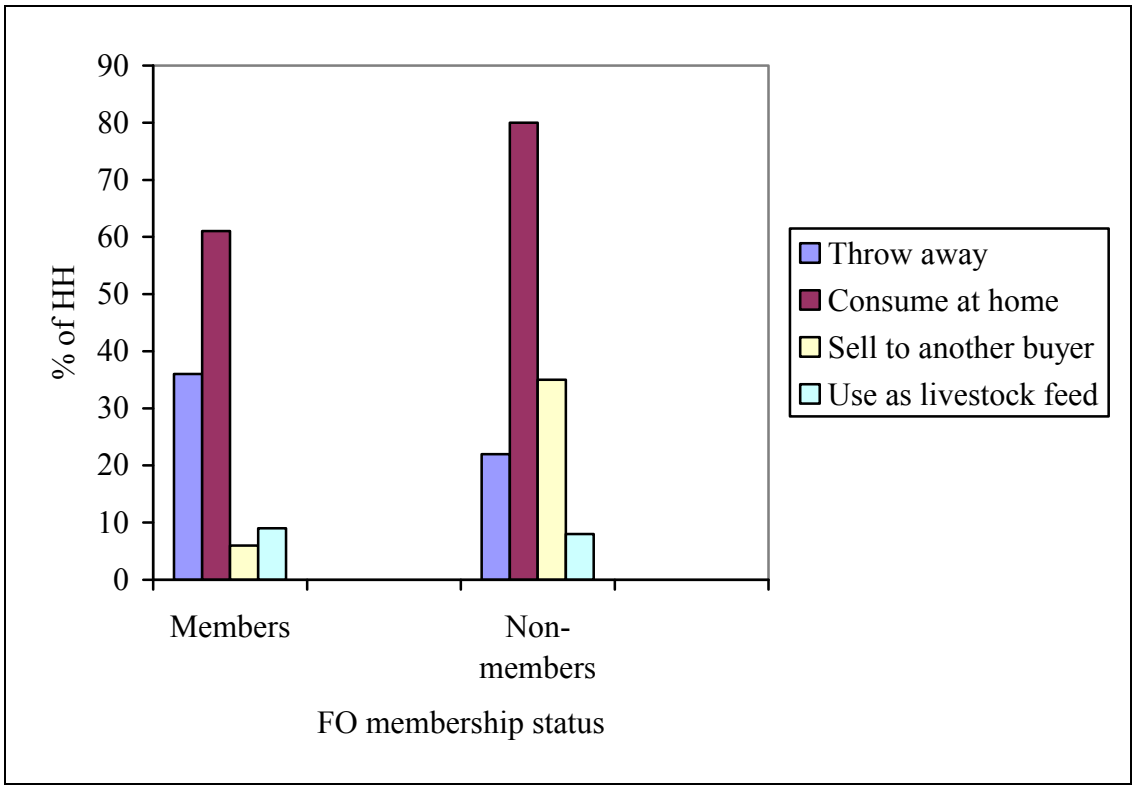


Figure 8.11: Disposal of rejected groundnuts by smallholder farmers (%)

Groundnuts rejected from the market are mostly used for home consumption by both members and non-members. Another 6% of members and 35% of non-members said mouldy nuts are further dried to get rid of the moulds, mixed with good nuts then consumed at home or sold to another buyer. More non-members consume groundnut rejected from the market because they have inadequate knowledge of the negative impacts due to Aflatoxin contamination.

Discussions with local traders revealed that they manage to sell most of their assembled nuts to their buyers. Traders who supply to processors indicated that they rarely have their nuts rejected. At this level rejection rate is below 10%. At the international export level according to SGS, a quality surveillance company, rejections of up to 30-40% were experienced in 2010 in European markets, (Personal Communication, SGS, Blantyre, Malawi, 2012). These high rejections are another cost that exporters have to shoulder.

High rejection rate at international markets or high-end regional markets would be reduced if more emphasis on quality is put at the domestic level. But this requires strong regulation, reinforcement and monitoring. However, the most important would be putting right market and price incentives for producers.

Figure 8.12 shows the average reported free on board (FOB) prices for groundnuts for 2008-2011

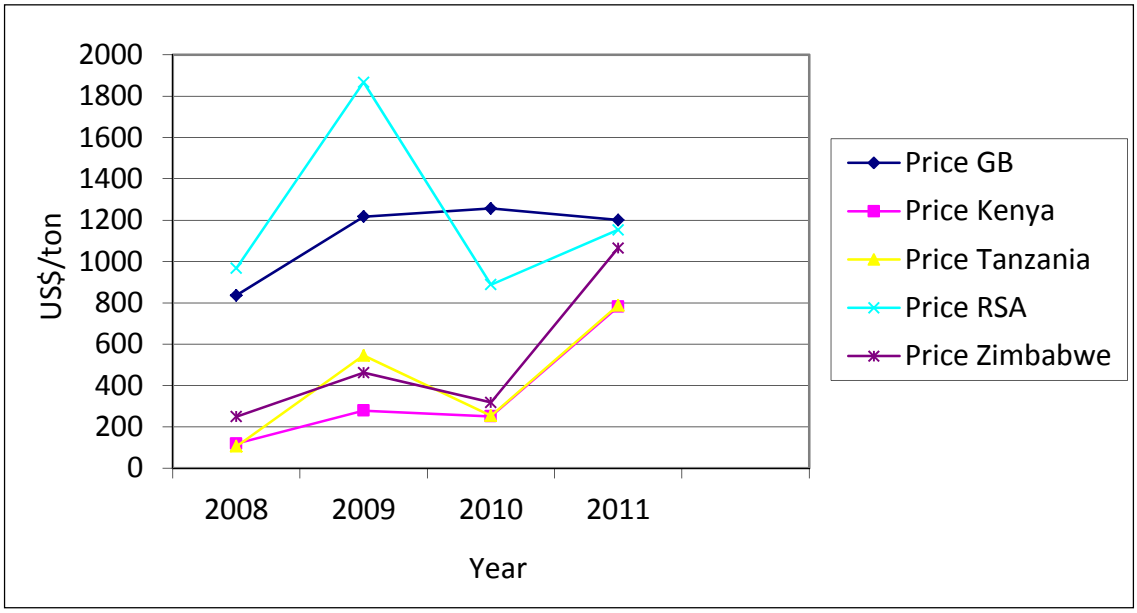


Figure 8.12: Average FOB Groundnut price by importing countries
Source: Based on official Malawi Government (customs) export data for groundnuts, (May 2012)

With an average price of US$1,200/tonne at a specific EU buyer (Figure 8.12), Aflatoxin testing costs represent 13% of the 2011 FOB price. Since 2011, regional and EU groundnut prices seem to be converging. Regional groundnut market has been growing. In terms of volume, more groundnuts were exported within the region between 2008 and 2011 as shown in Table 8.4.

Table 8.4: Formal groundnut export volumes (MT) to different destinations (include proportions)

Country	Year			
	2008	**2009**	**2010**	**2011**
UK	441	108	18	22
Kenya	3576	3949	6697	9021
Tanzania	7732	10515	11509	15995
Republic of South Africa	1362	3777	748	6038
Zambia	1269	363	173	1294
Zimbabwe	295	1319	2599	857
China	-	-	-	380
Total	**14675**	**20031**	**21744**	**33607**

Source: Based on official Malawi Government (customs) export data for groundnut (2008-2011)

While exports to the UK have on average been falling by 45% annually, regional average annual increase has been 33% between 2008 and 2011. Exports to UK (and EU) have been declining due to stringent quality requirements, which local traders in Malawi struggle to satisfy. Exports to the regional market, especially East African markets (Tanzania and Kenya) grew steadily over the same period as local exporters mainly target low-end markets which are less sensitive to quality. But as demonstrated above the prices for the quality sensitive European markets and low-end less quality sensitive regional markets have been converging. Without any significant price incentive, Malawian exporters have no reason to target European markets.

The expanding regional markets offer more opportunity for Malawi to expand its groundnut export volume. Since groundnut prices for the regional and EU markets are converging, Malawi needs to focus more on the regional markets considering its current low skills base and low technology being used. Heavy investment required to manage quality demanded for the EU markets may not be justifiable for the time being when the regional markets are offering equally competitive prices for low quality. Currently Malawi does not satisfy the desired volume by the domestic and regional markets.

8.6 Factors Influencing Adoption and Extent of Investment in Quality Management Practices by Smallholder Farmers

Selective Tobit model was used to assess the factors that influence smallholder farmers' decision to adopt and decide on extent of investment in available quality management technologies and practices. The study results in Table 8.5 based on the probit model indicate that demographic and social factors such as age of household head, farmers' awareness and knowledge of Aflatoxin contamination, and education level of the household-head, positively influence household's decision to adopt practices to improve quality and reduce Aflatoxin levels. However, except for age of household head, most of these social factors were not statistically significant, implying they are not important to influence changes in the dependent variable.

The probit model results further show that level of production (commercial production), quality sensitive markets and price, all positively influence and increase probability of the smallholder groundnut producers to adopt practices that enhance quality and reduce Aflatoxin contamination. All these factors were positive and significant at 5% level and less. Groundnut market/or buyer that demand quality (such as the seed market and high-end export market for groundnut grain), land area allocated to groundnut production, price offered for groundnuts positively influence producers decision to invest in quality management of groundnut. However, the most important factors increasing probability of smallholder farmers' to adopt or invest in quality management include increased production levels, if more land is allocated to groundnut production, (which might also be linked to commercialization of groundnut production) if the market /or buyer demands quality groundnuts and also, the age of the household head. All these factors are significant at 5% level of significance.

Table 8.5: Selective Tobit model results on factors influencing adoption and extent of investment in quality management practices

PROBIT MODEL			
Variable	**Coefficient**	**Std Error**	**P[Z/>z]**
Constant	-2.87	0.78	0.0002
Dummy Sex	-0.277	0.2326	0.2340
House head education	0.007	0.0275	0.7903
Labor availability	0.038	0.0660	0.5647
Dummy Aflatoxin Health Impact	0.287	0.1917	0.1343
Dummy Aflatoxin knowledge	0.096	0.3998	0.8051
Age of household age **	0.018	0.008	0.029
Dum market demanding quality ***	1.24	0.299	0.000
Groundnut area	0.227	0.153	0.1367
Level of production**	0.001	0.0003	0.0411
Groundnut price***	0.756	0.270	0.0051
Log likelihood function	-134		
SELECTIVE TOBIT MODEL			
Constant	-4011	610.23	0.000
Dum market demanding quality***	1893	220	0.000
Dum sex of household head	94.05	237.09	0.6916
Education household head	6.38	27.26	0.8150
Age household head	2.30	3.60	0.5228
Labor availability **	140.67	62.06	0.0234
Dum CF **	535.40	238.92	0.0250
Groundnut area ***	513.46	152.91	0.0008
Level of production levels**	0.749	0.346	0.0303
Groundnut price ***	7.18	2.80	0.0104
Log likelihood function	-953		

**Significant at 5%; ***Significant at 1%

The probit model results indicate that a mix of social and profit related variables such as age of household head, supplying to market that demand quality, level of production and price will increase chances of adoption of quality management in groundnut by a household. The selective Tobit model results in part two of Table 8.8 show that mostly the profitability related factors are important and quite influential when farmers take the next step deciding on the extent of involvement in the quality enhancing practices/technology. Producers will invest more in groundnut quality enhancing technologies if the key markets

are quite sensitive to quality and standards, availability of labour as quality management would demand more labour investment, more land area is allocated for groundnut production, high production and if the market offers premium price such as under the contract farming arrangement. All these factors may influence profitability of groundnuts farming in one way or the other. Smallholder producers are more concerned with profit maximisation when considering intensifying their investment in groundnut quality management. This agrees with the earlier findings in this study on the qualitative value chain analysis in chapter six. Also, there is evidence in literature suggesting that smallholder farmers will invest in any technology as long as it demonstrates good returns to investment (Pagiola 1993, Barrett 2008). Increased volume mainly due to increased land allocation to groundnuts may imply that the household is mainly producing the crop for commercial purpose and not for subsistence. Markets that were quality sensitive, and well-structured such as seed market under contract market arrangement, were also associated with offering both price and market incentives that attracted farmers to invest more in quality management as they were assured of positive returns to their investments.

8.7 Discussion

From the results in this study, farmers associate groundnut quality mostly with physical characteristics such as plumpness, moisture content and uniformity based on colour or size. Similarly, most traders focus on the same factors. But the significance of quality factors varies depending on the intended use for the nuts. For example, skin colour and oil content is particularly important when the groundnuts are to be used for making peanut butter. Low oil content varieties are preferred for longer shelf life for peanut butter while varieties with high oil content are preferred for crushing for groundnut oil. Groundnut quality is defined by physical (colour, plumpness), chemical (oil content) and other factors (Misra, 2004). However, currently under groundnut quality management programmes the other aspects of quality are dwarfed by the presence of Aflatoxin because of the risk it poses to both human and animal health (Williams *et al*., 2004; WHO, 2006).

Household survey results showed that a considerable proportion of farmers, especially those under a functioning farmer organisation, have heard about Aflatoxin. These figures are higher than findings from Monyo *et al*. (2012). Farmer organisations provide easy platform and reduces transaction costs for extension services providers such as CGIAR

like ICRISAT, which are quite involved with Aflatoxin management among smallholder farmers. However, despite high knowledge about Aflatoxin, there is still low awareness of its impact on human health, only 4 % were aware of its impact on stunted growth in children and cancer.

The survey results show that most farmers associate Aflatoxin contamination with poor post-harvest handling. Most of the smallholder farmers have inadequate knowledge about the pre-harvest contamination. It is unsurprising that little effort is made to reduce or control pre-harvest contamination. Results show low proportions of farmers (less than 10% of both FO members and non-members) are working on soil water management (including irrigation and box ridges) to avoid field water stress, a critical pre-harvest pathway for Aflatoxin contamination. Similar results were reported by Monyo *et al*. (2010) (published in 2012). Monyo *et al*. (2012) found a positive correlation between AFB_1 contamination in groundnuts and the level of the fungus in the soil. Pre-harvest control largely entails dealing with critical factors that predispose crops to mycotoxin contamination including poor quality seed and end of season drought.

Key post-harvest handling practices for groundnut include drying, storage, shelling and grading. Mandela cock, a slow-drying method that relies on adequate air circulation, is being promoted among smallholder farmers that are linked to farmer organisations such as NASFAM by ICRISAT. This is one of the most reliable drying methods to reduce post-harvest Aflatoxin contamination. ICRISAT has demonstrated that slow drying relying on air circulation is a better method that helps to reduce incidences of Aflatoxin contamination (Monyo et al 2012). With this method, groundnuts take about 14 to 21 days to dry. Unlike with the traditional round heaps, with the Mandela Cock nuts can stay for 30 to 60 days without deteriorating. This method is suitable for smallholder farmers as the slightly longer drying period helps them to manage their competing labour demands with other high value crops such as tobacco or staple food crops, such as maize during harvest time. However, results of this study have shown that very few farmers have adopted this drying method. Among adopters more are farmers that belong to farmer organizations than non-members. Farmer organisations facilitate technology adoption as also observed by Tchale (2009), Markelova *et al*. (2009) and Madola (2011).

It is recommended that once dried, groundnuts should be stored in a well-conditioned and dry place to avoid over-drying and Aflatoxin contamination. The results show that smallholder farmers as well as traders use polypropylene sacks for groundnut storage or traditional granaries. Similar findings are reported by Emmott (2012); Mofya-Mukuka and Shipekesa (2013). Polypropylene sacks tend to trap moisture in the sacks due to local condensation and lead to Aflatoxin build-up. Natural jute bags are recommended to allow air flow in store. Besides, these dwelling houses are usually not adequately ventilated and do not have the right equipment, e.g. pallets to avoid contact with moisture as is required of a good commodity warehouse. In addition, the mud floors are susceptible to seepage creating conducive environment for Aflatoxin build-up. Monyo *et al*. (2012) report the percentages of stored groundnut samples from different sources with AFB1 above the acceptable levels of between 4 and 20 parts per billion. Results showed that more than 40% of samples from farm houses, local markets, shops, supermarkets and warehouses had AFB1 levels ≥4ppb while more than 15% of the samples had AFB1 levels ≥20ppb. At the farm house stage, AFB1 levels ranged between 0 and 2197ppb.

Normally most farmers prefer to sell shelled nuts and will therefore shell only when they are ready to sell. Smallholder farmers in Malawi usually stagger their groundnuts sales and mostly keep their nuts in unshelled form as insurance for the household. Nuts are also kept unshelled to deter or reduce rodent attacks and also, retain viability of the seed. Therefore the practice of keeping groundnut in-shell cannot solely be attributed to post-harvest control of Aflatoxin contamination.

The results showed that smallholder farmers mainly hand-shell their groundnuts before selling. To facilitate hand-shelling the study has shown that over 60% of farmers soak the previously dried nuts to soften the pods. This has also been observed by Emmott (2012). This practice re-introduces moisture to the kernels and creates a favourable environment for fungal growth (Okello *et al*., 2010; Monyo *et al*., 2010). Similarly, traders who buy unshelled nuts soak the nuts before mechanical or hand-shelling. Mechanical shellers have been introduced as a way of reducing Aflatoxin contamination at this stage. However, despite hand-shelling being expensive compared to mechanical shelling, adoption of mechanical shelling at the smallholder level remains very low. With the reduction in other farm activities at the time of shelling, opportunity cost for own labour is low (has less alternatives). Despite being cheaper than hand shelling among other reasons, high

percentage of breakage has been given as the main reason for not using mechanical shellers. Similar reasons have been reported for low adoption of mechanical shellers among smallholder groundnut farmers in Zambia (Mofya-Mukuka and Shipekesa, 2013). Farmers mentioned that most buyers prefer unbroken nuts. High breakage is mostly attributed to improper calibration of the shellers, poor drying and conditioning of the groundnuts in store. High use of recycled seed amongst smallholder farmers coupled with poor soil fertility and compromised field management practices leads to poor pod formation and irregular sizes and shapes making calibration of the shellers a challenge. Failure to grade the nuts to similar sizes and shapes prior to shelling further exacerbates the calibration challenge.

Aflatoxin contamination is not only a threat to the economy as it limits exports, but also a threat to domestic population as bulk of the groundnut is sold and consumed locally. Consumption of groundnuts per head in Malawi was estimated at 4.7kg/annum in 2007 making control of Aflatoxin at domestic level important (Derlagen and Phiri (2012).

Despite knowing that soaking groundnuts to facilitate shelling exposes the nuts to Aflatoxin contamination, smallholder farmers and traders still continue with the practice. This shows that they are more worried with losses due to breakage than the problem of Aflatoxin contamination. Most buyers want unbroken nuts and this put more pressure to the farmers/traders when they experience high rate of breakage. As such, traditional hand shelling is still popular. In this case, introduction of mechanical shellers is an important but not sufficient intervention to help reduce Aflatoxin contamination during shelling stage. It was observed that training might be needed among operators of the shellers and other players in the value chain, including traders. Use of quality seed would contribute to homogeneity of the pods which would make calibration of mechanical shellers easier. In addition to exploring how to reduce rate of breakage with mechanical shelling, development of alternative uses for grade-outs (including splits and peeled skin groundnuts) would provide a market for such nuts and reduce losses for the farmers.

Despite knowledge that groundnuts need to be kept dry, farmers also want to maintain a certain level of moisture content to maximize on weight when selling. Farmers stated that traders cheat them with their weighing scales and that they look for ways to also cheat the traders. In addition to information obtained from the focus group discussions, soaking was

also observed during marketing season. In some instances, water was added to the already shelled nuts just before taking to the market. Wet nuts are put in the middle of the bag, with dry nuts on top. This suggests that in addition to knowledge of the importance of proper drying, there is more action needed to influence behaviour change. These results suggest the importance of relationship, trust and transparency among different players in the chain. Since producers cannot trust the vendors' scales which are tampered with, they wet the nuts to ensure that they gain on weight, an act which increases risk of Aflatoxin contamination later in the chain.

Sorting or physical separation of contaminated nuts from clean ones has been identified as another reliable method of reducing post-harvest Aflatoxin contamination. Even though a high proportion of farmers mentioned that they grade their nuts, in practice this referred to simple winnowing or a light touch grading as observed in the quality of the nuts during the market survey. This is consistent with findings by Monyo *et al*. (2010). Due to the high domestic demand, buyers are engaged in serious competition resulting in buying everything that is offered on the market. Traders said that they fear that they would not be able to get the required volumes if they insisted on graded nuts from the suppliers. Most of the small traders only do 'light touch' removal of visibly rotten nuts before bagging and selling as seen in the quality of groundnuts on the market. Despite the poor quality, almost all groundnuts brought for sale are usually cleared at the market due to the high domestic and regional demand. This is exacerbated by lack of information on levels of production and low productivity as seen earlier on.

Farmers expressed that some of the buyers that demand quality nuts do not offer competitive price. As a result, farmers usually have no incentive to invest in quality management. Offering premium price for well graded nuts would be an incentive to farmers to seriously consider investing in quality. Farmers mentioned that light touch grading is done especially when their nuts are sold to small traders. It has also been revealed in this study that smallholder farmers and small traders do not trust each other. Low emphasis on quality on the domestic and regional markets is limiting investments in quality at all levels. The results also indicate that the traders scramble for groundnuts due to low supply against ever growing demand, both domestically and regionally. As such, it is difficult to enforce quality and standards in the domestic and low-end regional markets.

If domestic and regional markets became sensitive to quality and standards, it would help prepare the domestic producers and traders for the high-end regional and EU markets.

There will be slow progress in dealing with Aflatoxin problem if emphasis is mostly put at production level when very little is done at the marketing and processing and consumer level. Stringent quality demands leading to rejection of poor quality nuts would send strong signals to producers and traders alike on the needs for quality nuts. From the study of the groundnut marketing process, there is poor regulation and enforcement of quality and standards on the domestic market. Similar observations were made by UNIDO (2010); Monyo *et al*. (2010); Emmott (2012). Similarly in their study in Ghana, Jolly *et al*. (2009) found that lack of strong regulatory framework and weak institutions to enforce quality and standards in the domestic and export markets are the likely causes of non-conformity to quality and standards for the export market. If processors and processed products were exposed to stiff Aflatoxin requirements and standards, processors would be forced to demand quality nuts from producers and other traders.

Unlike import quality monitoring, export quality monitoring for groundnuts is not mandatory and is mainly done based on buyer and supplier agreement (Personal Communication, Malawi Bureau of Standards (MBS), 2012). Results have shown that lack of an in-country accredited laboratory for Aflatoxin testing further makes compliance difficult and expensive as external laboratories in South Africa or Kenya have to be used. It is very difficult to achieve required quality and standards for the export market when the domestic market, which absorbs the largest share of groundnuts produced in the country, is less sensitive to quality and standards. Currently, domestic buyers that are quality demanding include manufacturers of ready to use therapeutic foods (RTUTF) and those involved in exports to quality sensitive markets, e.g., UK and South Africa such as NASFAM. In order to access these markets such players incur high costs for testing in both national and external accredited laboratories to minimise risk of rejection. Diop *et al*. (2004) and Diaz Rios and Jaffee (2008) also found that lack of accredited laboratories make Aflatoxin testing expensive and further limits progress in Africa.

Domestic consumption accounts for about 60% of all groundnuts produced locally, of which the bulk is taken up by the domestic processing industry. However, the domestic processing industry lacks strong regulation and enforcement of quality and standards. This

was also observed by Monyo *et al*. (2010); UNIDO (2010). These weaknesses have encouraged supply of poor quality groundnuts at various stages in the chain as most traders do not seem to emphasize on quality. Failure to stipulate different prices for different grades has limited adherence to this criteria. Strong regulation and strict enforcement of penalties for non-compliance on quality and standards would ensure that the domestic processing industry retrospectively demand and promote quality and standards from its local suppliers.

Health considerations are currently not prioritized by smallholder farmers and traders in Malawi. As such, a majority of farmers indicated that they use the shrivelled and broken nuts for home consumption. Some even further process the mouldy nuts to get rid of the moulds and mix them with good nuts. Even though most farmers said they had heard about Aflatoxin, this suggests limited knowledge about Aflatoxin and the hazardous effects on human health. Similarly, Monyo *et al*. (2010) noted that where trade occurs, good nuts are targeted for the export markets leaving the poor quality nuts for own consumption by producers or sold to domestic consumers increasing the risk of exposure to Aflatoxin.

Some health impacts of Aflatoxin take long to manifest and therefore negative externalities of Aflatoxin on population health may not be easily appreciated in the short term. Due to high levels of poverty, majority of poor smallholder farmers have high preference of time, i.e., smallholder farmers are more concerned with their survival now than to invest in their future well-being. This in line with observations by WHO (2006) that current food security needs tend to overshadow other considerations such as food safety, whose negative effects maybe long-term. To trigger change in behaviour the current awareness campaigns on Aflatoxin's health impacts on human and being promoted on the supply side should also be seriously conducted on the demand side targeting the buyers, processors and consumers. Knowledge alone of Aflatoxin's negative impacts on human health (stunted growth in children, cancer and immune disorders as reported in Gong, et al., 2004; Williams, et al., 2004; WHO 2006; Jolly et al., 2009; Wu et al., 2011) may not be enough to influence immediate change in behaviour as farmers are more concerned with short-term benefits. As such, it is important to ensure that health concerns which are long-terms strategies pig-back short-term strategies that trigger immediate responses and behaviour change, such as price and market incentives.

Results based on the probit model indicate that demographic and social factors such as age of household head, farmers' awareness and knowledge of Aflatoxin's contamination, and education level of the household-head, positively influence a household's decision to adopt practices that improve quality and reduce Aflatoxin levels. However, except for age of the household head, most of these social factors were not statistically significant, implying they are not significant in explaining changes in the dependent variable. In previous studies, age, education, extension contact, labour was found to significantly influence household's decisions to adopt a technology (Boahene *et al*., 1999; Chirwa, 2005; Abdulai, *et al*., 2011). Chirwa (2005) found that higher levels of education positively influenced adoption of fertiliser and hybrid maize seed in Malawi while Abdulai *et al*. (2011) found that education, extension contact and membership to a farmer organisation influenced adoption of irrigation technologies in Kumasi, Ghana.

The probit model results further show that the level of production, quality sensitive markets and price, all positively and significantly influence and increase probability of the groundnut producers to adopt practices that enhance quality and reduce Aflatoxin contamination. In other studies, expected net benefits positively influenced the decision to participate in farmer organisations. It is clear from these results that market and price incentives, and production for commercial purposes, influences the smallholder farmers to take action to invest in quality management. But markets can only influence this positive change if they are able to offer an attractive tangible benefit, such as a premium price to compensate farmers' additional costs incurred on the quality management. In other words farmers want to be convinced of return to investment first before they can take a serious step to invest in any technology, especially that which adds extra costs.

From the results it is evident that farmers know that some buyers demand quality while others do not. Under the structured groundnut seed market, the market demanded quality and paid a premium price to producers as an incentive. These farmers were engaged in commercial seed production under a structured market with a quality enforcement system and stipulated prices in place. Structured market system with the right incentives in place (premium price) influenced farmer behaviour. Gadzikwa *et al*. (2006) and Shiferaw *et al*. (2006) also observed that smallholder farmer adoption of technologies was linked to market incentives. The same farmers that failed to invest in quality management when growing groundnut grain were able to invest in quality management when contracted to

grow groundnut seed under contract farming arrangement. Thorough quality management in groundnuts entail more costs on labour and time, and loss in groundnut weight after discarding the rotten, shrivelled and broken nuts. A lot of smallholder farmers are usually risk averse and therefore want assurances that there are good returns to their investments before they can spend more on the new technology. Seed production under the contract farming arrangement provided certainty in price and volumes, therefore proving assurances at the beginning of the growing season before the farmer could invest. This certainty was lacking in the groundnut grain market, especially the domestic market.

This result demonstrate the strong and positive influence key institutions can play to ensure that smallholder farmers take positive action to invest in quality management and reduction of Aflatoxin. But these institutions only manage this positive influence if they are able to offer an attractive visible economical benefit such as premium prices for the quality demanded or link farmers to markets that pay a premium price. Further, the domestic market should be strengthened by a regulatory framework which is effectively enforced by the Malawi Bureau of Standards (MBS), which eventually influences behavioral change amongst value chain players. If the domestic market becomes quality sensitive, it becomes easier to replicate this on the export market as both producers and traders learn and are already accustomed to quality and standard issues.

The selective Tobit model results show that mostly the profitability related factors are influential when farmers want to take another step to decide on the extent of involvement in the quality enhancing practices/technology use. Producers will invest more in groundnut quality enhancing technologies if the key markets are quite sensitive to quality, labour is available, more land area is allocated for groundnut production and, if the market offers premium price such as the case for seed under structured market arrangement. The FISP has not only provided an assured market for seed, but also has driven the high price for certified seed. Seed companies are able to contract out seed and offer good price in advance on the premise of availability of the FISP market. All these factors have a bearing on profitability of groundnut farming. Increased land allocated to groundnut, increased scale of production and engagement in contract farming arrangements all indicate that producers are engaged in groundnut production as a commercial enterprise, and not for subsistence. Similarly, in their case study on dairy technologies in Kenya, Batz, *et al*. (1999) observed that high relative profitability of a technology accelerates speed of

adoption and contributed to a high ceiling of adoption. Such factors as area allocated to groundnut linked to increased groundnut production and, price being offered, influence farmers' expectation on profits. Therefore, level of investment in quality and other efforts to reduce Aflatoxin contamination in groundnuts is decided by the smallholder farmer with due consideration of perceived/expected costs and benefits out of such investments. These results agree with the profitability analysis (gross margin analysis) and reveal that producers are more influenced by profitability factors such as prices and production levels when deciding on the extent of investment in the reduction of Aflatoxin or quality issues.

Although information on long-term impact of Aflatoxin on human health is important and slowly gaining ground, such health awareness efforts should only piggyback on the more effective price incentives. It is the more immediate visible benefits that attract the farmers to really change their attitude or behaviour and begin to invest more on quality management. Aflatoxin's health impacts on humans are long-term in nature, yet poor farmers usually want to maximize short-term benefits and sometimes at the expense of future wellbeing. Although farmers can be told about the health impact as a result of consuming Aflatoxin contaminated nuts, the long-term nature of the problem is not a strong deterrent for poor farmers who want to maximize present benefits as opposed to invest for the future wellbeing. Aflatoxin control is a public food safety, health and quality management issue. Government need to play its role as a regulator and ensure enforcement and monitoring of standards. In the long-term consumers may start demanding quality after gaining enough knowledge of the negative impact of Aflatoxin.

The domestic and key regional markets for Malawi (East and Southern Africa, except for South Africa) are less sensitive to Aflatoxin contamination in groundnuts. This is compounded by poor regulatory framework and enforcement of quality and standards on the domestic market. Unless domestic and regional buyers/markets are stringent on quality, it will be difficult to persuade smallholder farmers in Malawi to invest in quality and reduce Aflatoxin contamination. It has been demonstrated in this study that farmers will respond positively to profit signals and address quality demands stipulated by buyers. This is only if buyers also provide satisfactory incentives in form of premium price that cover farmers' costs and increase farmers' margins as the results show. In addition health messages on the negative impact of Aflatoxin on human health should accompany the efforts on reducing Aflatoxin.

The study results have also shown that under the current scenario, regional export markets are more attractive for Malawian exporters and therefore will be prioritized. Regional and the EU market groundnut prices have been converging and yet EU have stringent requirement for Aflatoxin and other quality and standard requirements, which imply that local traders targeting the EU will have to spend more on quality management for almost the same price offered by regional markets but for lower quality nuts. This is triggered by low supply against growing domestic and regional market demands. However, this does not mean Malawian producers and traders should not consider seriously invest in quality. China and India which are among the largest producers of groundnut are currently faced with growing domestic demand (Maftei, 1999). The gap created by China and India is another opportunity for African exporters to exploit hence the need for Malawi to seriously consider groundnut quality matters if groundnut is to feature as one of the crops in its export diversification strategy. Besides economic gains, investing in quality would bring in human health gains.

8.8 Conclusions

This Chapter has demonstrated that farmers mostly associate Aflatoxin to poor post-harvest handling hence limited effort is put to address pre-harvest contamination. A considerable proportion of smallholder farmers have heard about Aflatoxin but there is still limited understanding of Aflatoxin's critical contamination points, its impacts on the economy and human health. Hence interventions by most value chain players are being targeted at post-harvest level, mainly involving drying, storage techniques, shelling and grading at farmer level with less effort targeting other stages in the value chain. Despite knowledge of some post-harvest management practices to reduce Aflatoxin contamination, implementation of such practices is still limited among smallholder farmers' especially in the case of groundnut grain due to lack of incentives.

Profitability related factors are influential when farmers want to take a second decision regarding the extent of involvement in quality management. Presence of markets that demand quality, availability of household labour, land area allocated for groundnut production and, premium price offered such as under contract marketing influence household's decision on extent of involvement in quality management. Farmers' decision

to invest in technologies that would improve groundnut quality, such as technologies that reduce Aflatoxin contamination in groundnuts, is to a greater extent influenced by smallholder farmers' expectation or perceived benefits out of such investments. Market and price-based incentives would easily motivate and attract more farmers to invest in groundnut quality management including reducing Aflatoxin contamination.

Despite improvement in farmers' knowledge on Aflatoxin there is still limited understanding on the causes, manifestation and impact of Aflatoxin contamination on human health. As such farmers are not persuaded to invest in reduction of Aflatoxin contamination on human health reasons. Aflatoxin's health impacts on humans are long-term in nature, yet poor farmers usually want to maximize short-term benefits and sometimes at the expense of future wellbeing. Although smallholder farmers may be aware of the long-term health impact as a result of consuming Aflatoxin contaminated nuts, the long-term nature of the problem is not a strong deterrent for these poor farmers who also have high time preference i.e., they want to maximize present benefits as opposed to invest for the future wellbeing. Long-term health benefits should be promoted a long side more immediate economic incentives in order to attract smallholder farmers who want to maximize short term benefits. As household income status improves with time, they become more aware and cautious of health concern and start to take action.

CHAPTER 9

GENERAL DISCUSSION OF KEY RESULTS

There is evidence in literature that the agricultural sector in small agro-based economies like Malawi provides the main pathway towards economic growth that delivers broad based poverty reduction because of its strong links and influence on the rural economy where most of the population lives (Gollin, Parente and Rogerson, 2002; Diao *et al*., 2007; Christiansen, Demery and Kuhn, 2010; de Janvry and Sadoulet, 2010). Achieving structural transformation through agricultural productivity and diversifying the economic base is central to sustainable development in these economies including Malawi as a case study, whose 85% of the population lives in the rural areas, of which 85% are engaged in agriculture as their main source of livelihoods and 60% of the export earnings depend on one crop, tobacco.

The thesis focused on groundnut, a high value crop mostly grown by smallholder farmers including women in predominantly tobacco producing areas. With tobacco experiencing less than buoyant demand prospects on the global markets due to strong anti-smoking campaigns by the World Health Organisation (WHO), groundnuts is one of the available options for diversification alongside tobacco. But it is acknowledged in this study of the need to first understand the problems that have hampered groundnut exports from Malawi, a crop that was once a second export crop to tobacco until the late 1980s. The need to diversify the narrow export base and increase agricultural productivity is also supported by Ellis (2013) who encourages the adoption of modern technologies and ensure that increasing yields are sustained over time; promote diversification and substituting lower for higher value crops; correct market failures and promote market access.

Bulk of the groundnut in Malawi is produced by smallholder farmers on their small plots. The study results showed that male-headed households owned, cultivated and allocated more land to groundnut than female-headed households. However, in terms of proportions, the allocation to groundnut production was similar. Male-headed households, on average, had more labour and higher incomes than female-headed households. It is not surprising therefore, that male-headed households were able to allocate more land to groundnuts,

which is labour intensive, as they are able to allocate or hire extra labour to manage the field and post-harvest activities.

Contrary to common perceptions and findings (Ngulube *et al*., 2001; Minde *et al*., 2008) that groundnut is a woman's crop; this study found that a lot of men are also involved in groundnut production, post-harvest activities and marketing. Since legumes were incorporated as part of the government's farm input subsidy programme (FISP), prices of legumes such as groundnuts have been steadily growing (Chirwa and Dorward 2013), unlike tobacco which has experienced volatile and fluctuating prices over the same period. In addition to benefiting from the FISP, good price for groundnut is also due to the opening up of regional markets (Table 8.6), which are less sensitive to quality and standards. Increased demand coupled with steady price could explain the reason why more men are being attracted to this crop. Increased men involvement in the growing and marketing of this crop means more labour availability at critical periods to manage other labour demanding activities such as harvesting, stripping and grading.

Use of modern technologies by smallholder farmers in Malawi

For the poorly resourced farmers, land, labour and seed are the major inputs in smallholder groundnut production. Despite the huge investment in the past seven years to promote use of quality seed through FISP, the study results indicate that a lot of smallholder farmers still use recycled seed which continue to be a major hindrance to increasing smallholder productivity. This result is consistent with Simtowe *et al*. (2009), who also found high use of recycled seed amongst the smallholder farmers in Malawi. Disaggregating between farmers that belong to a functioning farmer organisation and those that do not, this study found that more farmers that do not belong to any farmer organisation, over 90% compared to 70% of the members use recycled seed. The study found that farmers that belonged to a functioning farmer organisation have better access to improved groundnut seed, extension services, training, and credit facilities compared to farmers who do not belong to any farmer organisation. This is consistent with observations made by Chirwa (2005), Shiferaw *et al*. (2006), Tchale (2009) and Madola (2011). Although more farmers that belong to farmer organisations access and use modern technologies, use of these technologies is still quite low due to high cost of these inputs (including certified seed).

Further, focus group discussions revealed that smallholder farmers do not apply any fertiliser in groundnut. This is a misunderstanding from extension messages that emphasise on rotating crops such as maize with legumes because of their ability to fix nitrogen and therefore replenishes and enhances soil fertility. The need for other nutrients in the soil such as fertiliser, gypsum and lime should therefore be emphasised.

The farm input subsidy programme has, however, been the major source of the available certified seed since its inception in 2006. The steady demand for certified seed by the FISP has persuaded other small to medium sized Malawian investors to venture into legume seed production (Chirwa and Dorward, 2013). Since introduction of the FISP, about ten local companies have been registered to produce and trade in legume seed. About 80% of the seed for the private seed companies is channelled into FISP through agro-dealers. This demonstrates that FISP has become the anchor for development of the seed industry in Malawi, especially legume seed which has a very thin commercial market. At the same time, over reliance on FISP whose long term future is always uncertain due to its huge cost, is a great risk to the long-term development of the legume seed industry in Malawi. The FISP accounts for about 50% of the agricultural budget in Malawi (Chirwa and Dorward, 2013) and may not be sustainable in the long-run. Reluctance of big multinational seed companies such as Monsanto and Seed Co to invest in the legume seed industry casts more doubt on the future of the legume (including groundnut) industry. Legumes such as groundnuts have limited demand because smallholder can easily recycle the seed due its open pollinated nature. Similar observations were made by Simtowe *et al*. (2009). Multinational seed companies are more interested and continue to mostly invest in hybrid maize. All the local seed companies that have been registered recently all rely on the continued existence of the FISP.

Use of recycled seed by smallholder farmers is not the only reason for the low yields in legumes. There is a huge yield gap between smallholder groundnut seed farmers (less than one metric ton per hectare) and large-scale groundnut producers (three metric tons per hectare) despite both types of farmers using certified seed (CG7). In addition to planting certified seed, large-scale groundnut seed producers also apply fertiliser, pesticides and gypsum based on soil conditions. Diseases also limit productivity and hence the use of herbicides. Applying some limited amount of fertiliser and use of gypsum is important to enhance pod filling. This has also been demonstrated by China which doubled its

groundnut production when it adopted modern input technologies (Diop *et al*., 2004; Talawar, 2004; Knorzei *et al*., 2010). Therefore, all areas that limit groundnut productivity among smallholder farmers need to be given adequate attention.

The study also focused on whether or not belonging to an organised farmer organisation upgrades the role of the smallholder farmers in the value chain. Bienabe and Sautier (2005) argued that current changes in the global marketing systems are a commercial reality and that smallholder farmers should therefore be organised in order to forge direct relationships in the new markets. Diop *et al.* (2004) indicate that local producers seeking inclusion in a competitive value chain have to upgrade in order to produce for global markets. Against this background, it was assumed in this study that smallholder farmers can therefore become more competitive and influential along the value chain if they are more organised, and are able to utilise their numbers to operate at economies of scale and use collective marketing to strengthen their bargaining position in the value chain. In addition to effectively consolidating their price bargaining position, farmers that belong to a farmer organisation can also reduce their transaction costs if they are able to operate at economies of scale (Markelova *et al*., 2009; Narrod *et al*., 2009; Kaganzi *et al*., 2009).

Benefits of belonging to a functioning farmer organisation

However, this study found that the majority of smallholder groundnut farmers belonging to a functioning farmer organisation were able to access modern inputs such as certified seed and extension service. But just like those that were not members of any farmer organisation, the majority of farmers that belonged to farmer organisation were not involved in collective marketing to take advantage of their collective numbers to operate at economies of scale through bulking and selling their crop as a group. Therefore, it should not be assumed that belonging to a farmer organisation always leads to smallholder farmers maximising economies of scale and get involved in collective marketing.

In addition to other services that they may get by belonging to a farmer organisation, ultimately smallholder farmers are also looking for ways to maximise economic opportunities. For example, the study findings demonstrated that smallholder farmers are mindful of costs and respond to market and price incentives. Despite belonging to a farmer organisation, smallholder farmers supplying to small mobile traders (vendors) and other

buyers that did not reward quality with good prices, did not invest in quality and also could not bulk their crop to sell as a group. In other words, belonging to a farmer organisation did not necessarily influence positive change on quality management or motivate these farmers to bulk their produce in order to sell as a group.

However, the same smallholder farmers responded differently when they were engaged to produce seed under contract farming and were offered a premium price. Farmers were able to invest in quality management and sell their seed collectively. Smallholder farmers responded positively to economic incentives in form of premium price. Contractors such as ICRISAT and private seed companies preferred to work with farmers that belonged to farmer organisations. This is consistent with findings by Berdegue *et al*. (2008) and Markelova *et al*. (2009) that private companies prefer to work with organised farmers rather than individuals in order to reduce transaction costs. It is also cheaper to train and provide extension services to an organised group of farmers rather than individuals.

This positive behavioural change confirms that smallholder farmers respond to economic incentives. It also agrees with Eaton and Shepherd (2001) and FAO (2008) who reported that businesses have used structured markets, especially contract farming to successfully link smallholder farmers belonging to farmer organisations to modern markets where capital, technology and market access constitute limiting factors.

In order to protect this reliable market, leadership at the local level was able to discipline members who were not adhering to rules. This contract farming arrangement operated on the principle that 'if one member fails, then all have'. This has also demonstrated that group cohesion is achieved when farmers have something to lose, which they cannot get outside the group. The economic incentives guaranteed loyalty from the members of these farmer groups. The group shouldered all transaction costs associated with managing the members to ensure they conform to quality and standards requirements and also that there is no side-selling to meet the volumes.

Smallholder farmers can also step-up their involvement in the value chain and claim more of the consumer price if they through their farmer organisations are able to bulk their produce and are able to trade on the commodity exchange to access other reliable markets even across the borders. However, this should be linked to a warehouse receipt system to

help farmers easily access credit from finance houses (Onumah, 2010). Their produce under the warehouse receipt could be used as collateral to get a loan from commercial banks if needed. This will help smallholder farmers ease pressure for immediate cash needs. It was revealed through key informant interview that this loan could be as high as 70% of total tonnage deposited and based on last traded price. However, this requires a lot of training and awareness to avoid undue losses as a result of over-holding. The farmer will accumulate interest on the loan from the bank and also cost of storage in the warehouse. Therefore over-delaying sale of the commodity in search of very high prices could also be risky, especially in countries like Malawi where policy reversals and export bans which lead to price volatility are quite common.

Governance of the groundnuts value chain

This study also assessed the governance of the groundnut value chain focusing on the three value chains and these are groundnut grain sold locally, groundnut grain for exports and the seed value chain. First, farmers that belong to farmer organisation exhibited strong vertical integration to access production related services such as extension, seed for planting and market information. Non- members do not have this privilege.

However, groundnut grain associations are failing to strengthen and maximise horizontal integration to take advantage of economies of scale. Just like non-members, they still sell as individuals instead of bulking their produce to sell as a group at a high price. Collective marketing would also reduce transaction costs for the farmers as they take advantage of economies of scale. Members are less interested to bulk and market collectively especially when selling either to mobile vendors or other big traders which are less sensitive to quality issues and not willing to pay a premium price. Members, just like non-members face the same dilemma of low prices and therefore see no need to incur extra costs to manage quality and even bulk their commodity waiting to sell as a group when prices rise on the market, when in fact prices never rises high enough to enable them offset the extra storage costs.

There is weak or no reliable long-term relationship between smallholder producers and the buyers of the groundnut grain. Smallholder farmers are price takers and do not influence or participate in any serious price negotiations with buyers. Most of the mobile buyers do not

specialise in one crop but will switch to any crop fetching good price on the market at particular time. As such, they are not interested to invest in production or quality. The lack of long-term relationship and lack of transparency between smallholder producers and buyers were also found to be some of the main factors contributing to mistrust leading to cheating by both sides. Farmers indicated that some of the buyers manipulate their weighing scales to cheat on weight while buyers also countered accusing the smallholder farmers of cheating as well by soaking their nuts. Soaking nuts leads to Aflatoxin contamination.

There is not much difference in terms of price incentives when smallholder farmers are selling to small and big traders, some of whom intend to export their commodity. However, levels of trust are a bit better with big traders because they do not tamper with the weighing scales. Just like vendors, most of the big traders do not have a long-term relationship with the smallholder producers. The big buyers including processors are not interested to invest in production or quality at the farmer level. Key informant interviews revealed that processors though interested in long-term productivity and production of the groundnuts expressed dissatisfaction with smallholder farmers' behaviour of side selling. But as has been demonstrated in contract farming in seed, this could be easily sorted out if contractors are willing to pay a premium price to ascertain farmers' loyalty. Key informant interviews also revealed that processors and exporters are spending more money on grading at factory level, especially when involved in formal exports, than passing on that money to producers as premium price in exchange for good quality. Since smallholder farmers also respond to economic incentives, one way of increasing productivity is for big buyers and processors to offer good prices so that farmers can value agriculture as a profitable business they can invest in. Increased productivity, improved quality and standards, entail assured and consistent supply of raw material to support a vibrant agro-processing industry. As such it should be in the best interest of the legume processors in Malawi to seriously strategise and invest in the long-term productivity of groundnuts and other legumes. Contract farming arrangement is one way to ensure that farmers have access to modern technologies such as quality seed and herbicides. But processors should be willing to offer premium prices to ensure that farmers do not sell the contracted groundnut grain on the parallel market.

The seed value chain operates under a well-structured contract farming arrangement with set standards which are enforced and regulated. As argued by Berdegue *et al*. (2008); Kaganzi *et al*., 2009 Markelova *et al*. (2009) that private companies prefer to work with organised farmers rather than individuals, it was observed in this study that contractors (seed companies and ICRISAT) were only interested to engage smallholder farmers that belong to a well-functioning farmer organisation in contract seed production. The contractors provided certified seed on loan and also invested in extension services focusing on quality management from pre-to post-harvest handling. The contractor also guarantees the market and a premium price. Smallholder farmers responded positively to the economic incentives by strengthening their horizontal integration to take advantage of economies of scale through bulking their harvested seed and engaging in collective marketing with the seed contractors.

By engaging in collective seed marketing, the associations were able to reduce their transaction costs and also ensured all members adhere to agreed quality and standards as stipulated in the contract. It is also cheaper and effective for the contractor to provide extension services to a group galvanised by the same objective. This is consistent with observations by Alene *et al*., 2008; Kaganzi *et al*., 2009. Under this value chain, there is a display of long-term relationships as both the producers and the contractors want to protect their vested interests. The members of the groups are interested in maintaining a long-term (assured) reliable market, while the contractors are interested in maintaining a group of farmers which they have already invested in trainings such as quality training and already familiar with requirements for quality. It is cheaper and assuring to maintain a group of organised smallholder farmers that have already proven themselves.

According to the findings of this study, producers and traders either do not have real time market information or is not adequate to guide informed decision at production and marketing. Information asymmetry means that both producers and traders do not have right information to help them make informed decisions. For example, rarely do farmers know what volumes are required, what quality and at what price. Traders are less aware of prices and volumes demanded for the various markets. This limits opportunities for arbitrage. If some of this information is available, then it comes too late to make timely decisions. Because buyers are not aware of volumes available, they usually scramble for groundnuts and care less for quality. This finding agrees with Markelova *et al*., 2009; Narrod *et al*.,

2009; and Poulton *et al*., 2010 who found that participation of smallholder farmers in the markets is constrained by limited market information (including price), credit, limited accessibility to modern technologies, and distortions in input and output markets.

The private sector has not invested enough in the market information system mainly due to its public good nature. But this is an important area that cannot be left to government alone, especially if the information generated is to be real time.

This study established that the bulk of smallholder groundnut in Malawi is sold through small to medium-scale buyers or mobile assemblers. Various marketing channels exist in the marketing of groundnut but all with positive gross margins though with different profitability levels. This agrees with previous studies, Simtowe *et al*. (2009); Sangole *et al*. (2010); Kapopo and Maganga (2012). Gross margins increased with productivity gains due to use of certified quality groundnut seed.

Profitability analysis for groundnut smallholder producers

Profitability was assessed for smallholder groundnut grain, smallholder groundnut seed production, which is a more structured market and estate groundnut seed production. Profitability for smallholder groundnut grain producers varied between US$71 and US$127. Profitability was limited if smallholder farmers were selling to vendors or using hand shelling which is labour intensive and costly. When calculating profitability for channel for vendors, weight loss due to weighing scale manipulation was factored in. However, the overall study results have demonstrated that allocating scarce labour to groundnut grain production is more rewarding than being employed as a wage earner at the Government instituted minimum daily wage rate of US$1.20 per person day. Returns to labour for smallholder groundnut grain farmers ranged from US$2.51 to US$3.20. Comparatively, value of labour is even higher and more rewarding if allocated to growing of high yielding CG7 than low yielding Chalimbana though the difference is marginal at current productivity levels. This would widen further if farmers improved their field management and adopt use of modern technologies including use of quality seed. CG7 has high yield potential which is not yet being maximised by smallholder farmers. This study found that majority of smallholder farmers (over 70%) are using recycled groundnut seed.

Similarly, Simtowe *et al*. (2009) and Sangole *et al*. (2010) found that use of recycled seeds limit smallholder productivity and therefore, profits for smallholder groundnut producers.

Producing seed under a structured market, such as contract farming arrangements, was more profitable with a higher return to labour than growing for groundnut grain. Increased profitability for seed was mainly due to premium price offered for groundnut seed under contract farming and also increased productivity due to use of certified seed as demonstrated by yield levels of 900 kg/ha compared to 650kg/ha for groundnut grain. Smallholder groundnut seed farmers responded to the economic incentives and were able to invest in quality certified seed (though given as a loan) and also quality management as demanded by the contractors. Gross margins for smallholder seed producers ranged from US$499 to US$595 per hectare and were higher than smallholder groundnut grain producers.

Returns to labour for seed producers were also high implying that increased productivity and high crop prices increase the value of scarce labour. The groundnut seed industry has demonstrated that smallholder farmers are able to respond positively to economic incentives as long as it produces positive returns to their investment. When they were offered a premium price, smallholder farmers responded by investing in quality seed and quality management. However, smallholder farmer participation in markets is limited due to several factors as discussed earlier in this chapter.

Gross margin analysis was also conducted for estate production to assess the impact on profitability of using modern agricultural technology such as quality seed at recommended rate, use of fertiliser, lime, gypsum and good agricultural practices. Estates CG7 groundnut seed yields are three times higher than those of smallholder farmers although both use certified seed. In addition to quality certified seed, large estates producers also apply fertiliser, gypsum, lime and herbicides. The results demonstrate that increased productivity due to use of modern technologies has high influence on profitability and returns to labour. Gross margin for estate seed producers is over 60% that of smallholder seed producers based on the same price. The difference in profitability is mainly due to differences in levels of productivity.

As demonstrated by estate producers, in addition to emphasising on use of quality certified groundnut seed, smallholder farmers should also be encouraged to apply some small amount of inorganic fertiliser to boost nutrient availability, lime depending on soil type to reduce acidity, gypsum to boost pod filling and herbicides to control pests and diseases, which also currently inhibit groundnut productivity. Smallholder farmers' perception that it is not necessary to apply inorganic fertiliser in groundnuts is a misconception that needs to be changed. Even though groundnut fixes nitrogen in the soil, due to continuous land use the soil nutrient base has been eroded. As such, application of other deficient soil nutrients is necessary for optimum yields. There is evidence that countries with the highest levels of groundnut yields use inorganic fertiliser based on soil conditions (Talawar, 2004; Knorzei *et al.,* 2010).

Impact of type of shelling methods on profitability

The study also assessed the impact of using hand shelling versus mechanical shelling on smallholder groundnut profitability. Hand shelling of groundnuts is labour intensive and becomes quite expensive (increases marketing costs), especially where rural labour wage is high. Despite the fact that mechanical shelling is cheaper and labour saving, adoption by smallholder farmers is still low mainly because of high breakage rate. High breakage above 15% makes it difficult for smallholder farmers, especially those targeting other sensitive markets that demand whole nuts such as seed and roasting markets, to appreciate the benefits of mechanical shelling. In fact, for these markets very high breakage rates can even reduce profits for the smallholder farmers and therefore discourage adoption. Barrett (2008) argues that markets, which in this case would mean return to investment, influence technology adoption patterns. It should be noted also that labour saving becomes important if the smallholder farmers concerned have other valuable use for that saved labour. Focus group discussions revealed that some smallholder farmers prefer hand-shelling as it gives them opportunity to socialise with friends who come to assist with shelling for free.

In order to achieve reduced breakage rate smallholder farmers should be trained on how to calibrate the mechanical shellers. Groundnut should also be properly dried, stored and shelled at the right moisture content and using the right sieve size to reduce levels of breakage. Also, use of quality seeds and modern technologies that help achieve uniform

pod size (Monyo *et al.*, 2010) would make calibration of mechanical shellers much easier for smallholder farmers.

In addition to stepping-up productivity, smallholder farmers can also maximise their profits by taking up some roles being performed by other players in the value chain such as bulking. However, this would depend on whether farmers more than off-set the cost of bulking-up to have a net profit. By consolidating their numbers to operate at economies of scale, smallholder farmers can collectively sell through the commodity exchange platform linked to warehouse receipt system as already explained earlier in this chapter.

Alternatively, to facilitate access to key production inputs, access steady markets and good prices, smallholder groundnut farmers can also be linked to structured market arrangements such as contract farming as is the case with the groundnut seed industry. Quality in groundnuts can also be promoted if the domestic market is quality conscious and supported by strong monitoring and enforcing mechanisms. More investment to strengthen human capacity in terms of technical skills and other resources to facilitate operations of the Malawi Bureau of Standards is also required. It will be easy to meet strict quality requirements for groundnuts on the quality sensitive export markets, such as the EU and South Africa, if the domestic market is already demanding and enforcing high standards for quality.

Assessing market efficiency based on the Market Efficiency Index (MEI)

It has been demonstrated in this study that smallholder farmers in Malawi sell their groundnuts through multiple channels. In slight contrast to findings by Fafchamps and Gabre-Madhin (2001), the results show that all groundnut marketing channels that were assessed in this study are efficient in price. The computed Market Efficiency Index (MEI) for all the market channels was greater than one. This suggests that there is some level of competition in the smallholder groundnut industry in Malawi. Limited supply amidst strong domestic and regional demand may be driving this level of competition for the commodity. This suggests that the welfare of the various players in the value chain for the different channels is being optimised, i.e., at least all the players are benefitting. But as already alluded to in earlier sections, profit margins for producers are higher when the

value chain is shorter. Profitability is higher for smallholders when involved in value chain of a well-structured market such as contract farming.

MEI as a measure of market efficiency was supported by computed results on traders' surplus as percentage of total marketing costs, which ranged between 19% and 36%. This range further supports the MEI findings that marketing channels are efficient and confirms that traders are not making supernormal profits as usually suspected by smallholder producers.

Cost of transport was also found to contribute highly towards the marketing costs and this is one of the intervention points in order to further improve efficiency of the marketing channels. Similar results are reported by Fafchamps and Gabre-Madhin (2001); Tchale and Keyser (2010); Sitko and Jayne (2014) who found that transport and search costs comprised the largest trader transaction cost.

Small groundnut traders are often accused of being exploitative (Simtowe *et al*., 2009; Sangole *et al*., 2010). However, the study results show that these small traders do not make supernormal profits. Sitko and Jayne (2014) and CYE Consult (2009) have also argued that various risks taken by small traders are often not taken into account when assessing profitability and therefore exaggerate their profit margins. These risks range from personal security, lack of insurance, lack of information, time delays and transport related risks. This study found this argument plausible and quite applicable for Malawi where more than 90% of groundnut is produced by smallholder farmers in geographically scattered small plots that make assembly quite expensive. Unlike big traders, mobile assemblers are able to operate in these hard to reach areas and therefore become important players in the value chain under the current scenario where not all smallholder farmers are organised to bulk their commodity and supply to big traders directly.

Assessing factors that influence adoption and extent of adoption of groundnut quality management techniques

A probit model was used to assess factors that influence adoption of quality management in groundnuts. Results from this analysis indicated that demographic and social factors such as age of household head, farmers' awareness and knowledge of Aflatoxin

contamination, and education level of the household-head, positively influence household's decision to adopt practices to improve quality and reduce Aflatoxin levels. However, except for age of household head, most of these social factors were not statistically significant, implying that they are not important to influence changes in the dependent variable.

The probit model results further show that level of production (proxy for whether one is commercially oriented or not), dummy for quality sensitive markets and price, all positively influence and increase probability of the groundnut producers to adopt practices that enhance quality and reduce Aflatoxin contamination. Volume of production and land allocated to groundnut production are closely linked and are proxy for whether or not a smallholder farmer is commercially oriented or not. The positive sign means that being commercially oriented increases farmers probability to adopt quality management practices unlike producing for subsistence. Quality sensitive market and structured market like seed contract farming were associated with offering premium price for groundnuts. Therefore one can argue that providing economic incentives increases farmers' probability to adopt quality management technologies in groundnuts. All these factors were positive and significant at 5% level and less.

Further, the Selective Tobit Model results demonstrated that mostly the profitability related factors are influential when farmers decide whether or not to increase level of involvement in the quality enhancing practices or use of quality enhancing technologies. The results of the selective Tobit model agreed with the profitability analysis based on the gross margin analysis, which indicate that smallholder producers and traders invested more in quality management in reliable market channels such as export markets and contract farming under seed production. The Selective Tobit analysis indicate that producers will invest more in groundnut quality enhancing technologies if the key markets are quite sensitive to quality, labour is available, more land area is allocated for groundnut production and, if the market offers premium price. All these factors have a bearing on profitability of groundnuts farming. Increased land allocated to groundnut, increased scale of production, premium price and quality sensitive market all point to commercial agriculture as opposed to subsistence farming which dominate the smallholder subsector. Therefore, level of investment in quality management and other efforts to reduce Aflatoxin contamination in groundnuts is decided by the smallholder farmer and buyers after

carefully weighing and being convinced of positive returns to such investment. Similar observations were made by Pagiola 1993, Boahene 1999, Chirwa, 2005 and Abdulai *et al*., 2011.

These results are also supported by the study findings from the focus group discussions which demonstrated that smallholder farmers make rational decisions when investing in technologies. The same smallholder farmers displayed contrasting behaviours when dealing with two types of markets, one which does not reward quality and another which rewarded quality by offering a premium price. Smallholder farmers that belonged to farmer organisations and therefore were well informed of the dangers of soaking groundnuts as it introduces Aflatoxin, disregarded this information and continued to soak their groundnuts when selling to vendors. They claimed soaking adds weight to the groundnut. Soaking groundnuts is more of an induced behavior as the smallholder farmers cheat in reaction to cheating by some small traders (some small mobile traders (vendors) who manipulate their weighing scale to underpay the farmers by cheating on weight). However, when offered a premium price for quality seed under a structured contract farming arrangement, the same farmers quickly galvanized their groups and invested in quality management. This demonstrates that smallholder farmers make rational decisions and are able to respond to economic incentives. Their behavior is influenced more by profit maximisation objective.

Impact of health concerns in influencing investments to reduce Aflatoxin contamination

The study results demonstrate that despite increasing awareness of Aflatoxin contamination and its negative impacts on market access, there is still little understanding of the critical contamination points and impacts of Aflatoxin on human health among smallholder farmers and traders, including exporters targeting regional markets. This study found that a dummy variable for assessing importance of health concerns on influencing farmers' decisions to invest in groundnut quality management was not significant. This implies that this was not an important variable in the model. In their study, Jolly *et al*. (2009) concluded that perception of significant economic and health benefits to be obtained from reducing the levels of Aflatoxin in groundnuts was important to inform their activities. They found a positive relationship between awareness of economic and health

benefits and action taken to control Aflatoxin. However, while this study got similar results that economic benefits influences farmers decisions to adopt and invest in quality management of groundnuts, there is no evidence to support the argument that awareness of the health benefits influences positive action from smallholder groundnut farmers in Malawi. Although information on long-term impact of Aflatoxin on human health is important and slowly gaining ground in Malawi, such awareness efforts need to ride on more short-term economic incentives such as offering a premium price to reward farmers' investment in quality management.

Aflatoxin's health impacts on humans are long-term in nature, yet poor farmers usually want to maximize short-term economic benefits and sometimes at the expense of future wellbeing. Farmers may be aware of the negative health impact of consuming Aflatoxin contaminated nuts, but the long-term nature of the problem does not provide that much urgency among most of the poor smallholder farmers who usually want to maximize present economic benefits now as opposed to investing in the future wellbeing. Similar findings have been reported by Nakhumwa and Hassan (2003) working on soil conservation in Malawi. Using an inter-temporal model the authors found that smallholder farmers were aware of the negative impact of soil degradation on future productivity of their fields but yet continued to use production practices that were eroding the soils but seemed profitable in the short-term.

CHAPTER 10

CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The thesis set to assess the performance of the smallholder groundnuts value chain, using Malawi as a case study. The overall objective was to assess the smallholder groundnut farmers and traders' access to markets through quality improvement and also, determine the socio-economic factors that influence groundnut farmers when deciding to adopt quality management techniques and the extent/or level of involvement. Specifically the research focused on issues affecting market access, trading relations, market incentives with respect to product quality, perceived benefits of farmer organisation membership, contract farming mechanisms, and factors affecting adoption of quality management practices.

Several data collection methods were used and include household and traders' surveys, focus group discussions and key informant interviews. Secondary data was also used to strengthen the analyses. Both qualitative and quantitative value chain analyses were used to inform areas in the value chains that required intervention to reduce inefficiencies and step-up performance of players, especially smallholder farmers, along the value chain. Quantitative value chain used a price spread method to determine market efficiency in price for the various marketing channels used. Gross margin analysis was conducted at farm level to assess profitability of smallholder and estate groundnut farmers. Qualitative value chain analysis was done on the governance of the value chain in order to understand power relationships along the chain. Qualitative analysis also involved assessing how smallholder farmers' access production inputs, production and market information, and how various players interact and influence each other along the value chain. A Selective Tobit Model was used to simulate the step-wise decision making process of smallholder farmers when adopting and deciding on the extent of adoption of quality management practices especially for Aflatoxin control.

The study results showed that smallholder farmers that belonged to functioning farmer organization (vertically integrated) have better access to improved groundnut seed, training

and extension services compared to farmers that do not belong to any farmer organization. However, despite the huge public investment in the past seven years to promote use of quality certified seed through the farm input subsidy programme (FISP), the study results indicate that use of recycled seed continue to dominate and hinder smallholder productivity. The open pollinated nature of groundnut means that smallholder farmers are persuaded to recycle the seed several times therefore limiting demand for certified seed. As such, big multinational seed companies have not been attracted to invest in legume seed due to limited demand for certified seed.

Belonging to a functioning farmer organisation does not guarantee that farmers are able to step-up and maximise economies of scale, such as bulking to collectively market their commodity. This study found that the smallholder groundnut farmers that belong to a functioning farmer organisation were still unable, just like non-members, to bulk their crop and market collectively as a group. The study found that belonging to functioning farmer association was a necessary step but not sufficient to ensure these farmers are bulking their crop and take advantage of economies of scale in marketing as a group. They only got involved in collective marketing when economic incentives such as premium price was higher than the price they could get for their crop if they sold as individuals. They needed a premium price that could off-set the extra costs incurred on quality management, storage and cost of waiting longer. Most of the farmers want to sell soon after harvest to meet their immediate household needs. In other words, farmers will only venture in collective marketing if it has good returns to investment.

It was found that a more structured market such as a contract farming arrangement if well managed would build long-term close relationship between contactors (buyers) and smallholder producers. Smallholder farmers and contractors agreed in advance on the expected economic incentives such as guaranteed market, volume required and premium price to be paid for the top grade. These incentives were enough to change farmer behaviour, raised levels of trust and loyalty from the smallholder farmers to the contractor. Farmers' high expectations on benefits resulted in their commitment and significantly reduced levels of cheating, for example, farmers did not soak their contracted seed and did not side-sell this seed, which is common practice when farmers feel they are offered low price. Contractors preferred to engage farmers belonging to an organised farmer association because it is cost effective to deliver extension to a group of farmers and also

reduced their transaction costs as these groups operated using their own agreed rules and ensured adherence to meet the agreed quality and standards stipulated in the contracts.

Therefore, beyond forming the farmer organisations stemming from vertical integration, it is important to also build their institutional and human capacities so that they are able to step-up their involvement in the value-chain by taking advantage and effectively utilizing their strength in numbers to get more influence. Bulking enables the farmer organizations to step-up their bargaining position and also be regarded as credible partners in the value-chain. If smallholder farmers were able to consolidate enough volumes, it would give them access to other big markets they cannot easily access as individuals. To access modern technologies such as inputs, reliable market and possibly good price, contract farming arrangements are another option for smallholder farmers that are vertically integrated to exploit. Contract farming will help boost productivity for smallholder agriculture. However, contract farming needs to be supported by a proper legal framework and policy to ensure both parties (contractors and smallholder farmers) are protected and can mutually benefit.

The study also found that producers and traders suffer from information asymmetry. Where information is available, it is usually not timely. Information asymmetry coupled with a lack of real-time information entails that smallholder producers and traders are sometimes forced to make uninformed decisions regarding production and marketing. Lack of real-time information has also limited chances for arbitrage and therefore reducing levels of market competition. Because buyers do not have adequate information regarding volume of production, they usually scramble for groundnuts and take whatever is brought on the market irrespective of quality. Speculative buying has usually undermined efforts to insist on quality on the domestic market, which is also a necessary preparatory step for domestic producers and traders to take if they are to satisfy quality demands for the international quality sensitive markets.

Results from the probit model showed that level of production and land allocation to groundnuts (both being proxy for whether one is a commercial farmer or not), dummy variable for quality sensitive markets and price, all positively influence and increase probability of the groundnut producers to adopt practices that enhance quality and reduce Aflatoxin contamination. The positive sign means that being commercially oriented

increases farmers probability to adopt quality management practices unlike producing for subsistence. Quality sensitive markets and structured markets such as seed contract farming were associated with offering premium price for groundnuts. Therefore, one can argue that providing economic incentives increases farmers' probability to adopt quality management technologies in groundnuts.

Further, the Selective Tobit Model results demonstrated that factors related to profitability are the most influential when farmers are considering whether or not to increase level of involvement in the quality enhancing practices or use of quality enhancing technologies. The results of the selective Tobit model agreed with the profitability analysis based on the gross margin analysis, which indicate that smallholder producers and traders invested more in quality management in reliable market channels such as groundnut grain destined for the export markets and seed production under contract farming. The Selective Tobit analysis indicates that producers will invest more in groundnut quality enhancing technologies if the key markets are quite sensitive to quality, labour is available, more land area is allocated for groundnut production and, if the market offers premium price. All these factors have a bearing on profitability of groundnut farming. Increased land allocated to groundnut, increased scale of production, premium price and quality sensitive market all point to commercial agriculture as opposed to subsistence farming which currently dominates the smallholder subsector. Therefore, levels of investment in quality management and other efforts to reduce Aflatoxin contamination in groundnuts is decided by the smallholder farmer and buyers after carefully assessing and being convinced of positive net returns from such investment.

These results are also supported by the study findings from the focus group discussions which demonstrated that smallholder farmers make rational decisions when investing in technologies. When prices offered are low and not off-setting the extra cost incurred for investing in quality management, smallholder farmers did not invest in quality management of groundnuts. This was evidenced by cheating practices by the smallholder farmers such as soaking the nuts purportedly to easy shelling, and direct adding of water to shelled nuts to increase weight. Yet these practices introduce Aflatoxin contamination in groundnuts. The study found that soaking groundnuts is more of an induced behavior as the smallholder farmers want to compensate on the weight loss due to vendors manipulating their weighing scale.

However, the same farmers quickly switched to good quality management practices when they were offered a premium price to compensate for their extra costs in quality management. The smallholder farmers indicated they do not soak groundnut seed and strictly adhere to quality requirements in order to protect the contract market which offers premium price. This demonstrates that smallholder farmers make rational decisions and are able to respond to economic incentives. Their behavior is influenced more by a profit maximisation objective.

Aflatoxin contamination happens at different stages in groundnut production and marketing making management at all stages critical. The findings of this study show that smallholder farmers' understanding and some limited interventions that are taken are mostly targeted at post-harvest handling level. Smallholder farmers and groundnut grain traders in Malawi associate Aflatoxin contaminations with mainly high moisture content in the nuts. Due to this poor understanding of Aflatoxin's critical contamination points, its impacts on the economy and human health, interventions by most value chain players are being targeted at post-harvest level. These interventions mainly involve drying, storage techniques, shelling and grading. But pre-harvest Aflatoxin contamination, currently not being prioritised forms the inoculums for the post-harvest contamination. This study also found that producers and traders alike associate groundnut quality mainly to physical attributes such as plumpness, skin colour, and moisture content. Although shrivelled nuts have high risk of Aflatoxin contamination, this was not regarded as a serious quality issue amongst the smallholder producers and buyers, including those informally exporting to the low-end regional markets.

Improved quality management is one of the most important steps to increase market access to reliable markets and achieve high incomes for the farming households, which is key to the poverty reduction. Bearing in mind that more than 80% of Malawians live in rural areas and are involved in agriculture, increasing agricultural productivity and diversifying into high valued crops such as legumes (including groundnuts) provide some of the reliable pathways to poverty reduction for the small agro-based economies like Malawi. But this can be done cost-effectively when smallholder farmers are not only organised into farmer organisations (vertical integration) but are also organised and empowered to take advantage of economies of scale by participating in collective marketing through

commodity exchange platforms linked to warehouse receipts. Promoting contract farming arrangements will not only offer steady market but also enhances smallholder farmers' chances of accessing modern technologies to increase their labour and land productivity. Strong farmer participation in these markets depends on provision of tangible economic incentives.

Despite improvement in farmers' knowledge of the causes and impact of Aflatoxin contamination on human health, results of the focus group discussions, and confirmed by the regression analyses, showed that farmers are not persuaded to invest in reduction of Aflatoxin contamination on human health reasons. Aflatoxin's health impacts on humans are long-term in nature, yet poor farmers usually want to maximize short-term benefits. This demonstrates that although smallholder farmers may be aware of the long-term health impact as a result of consuming Aflatoxin contaminated nuts, the long-term nature of the problem does not build a strong case to persuade these poor farmers, who also have high time preference, to invest in quality management. High time preference in this case means that although farmers are aware of the negative health impact of Aflatoxin, they are more inclined to maximizing the current benefits as opposed to investing for the future wellbeing of society. As such, the case for long-term health benefits should supplement the immediate economic incentives in order to attract smallholder farmers who want to maximize short term benefits. It has been demonstrated in this study, through contract farming in seed, that market and price-based incentives easily motivate and attract poor smallholder farmers to invest in groundnut quality management including the reduction of Aflatoxin contamination.

The domestic groundnut market, which takes up about 60% of the entire local production and the low-end regional markets for Malawi (East and Southern Africa—except for South Africa) commonly targeted by Malawian informal and formal exporters, are both less sensitive to quality including Aflatoxin contamination. This problem is compounded by poor regulatory framework and enforcement of quality and standards on the domestic market. Unless both the domestic and regional markets are stringent on quality, it will be difficult to achieve sustained headway in quality management in Malawi. The Malawi Bureau of Standards should deliberately target the processing industry in Malawi to ensure strict adherence to quality and standards (particularly Aflatoxin level) on the domestic and regional markets for the processed groundnut related products such as peanut butter.

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11 Appendix

Questionnaire for Groundnut Producers

Household Identification

Name of Respondent	
Name of Household Head (if different from above)	
Association	
Chapter	
Name of Enumerator	
Date of Interview	
Checked by	

SECTION 1: HOUSEHOLD SOCIO-ECONOMIC CHARACTERISTICS

1. Head of household, marital status, number of members and education level of HH head

Sex of household head	**Marital status of household head**	**Education level of household head**	**Age of HH head**	**Number of HH members per category**
(01)Male (02)Female (03)Child	(01)Single (02)Monogamist (03)Polygamist (04)Widowed (05)Divorced (06)Separated (07)Other	(01)None (02)Adult literacy (03)Std 1-4 (04)Std 5-8 (05)Form 1-2 (06)Form 3-4 (07)Tertiary	(01)<15years (02)15-64years (03)>64 years	( )<15years ( )15-64years ( )>64 years How many of the above participate in farming activities?

LAND OWNERSHIP

2. How much land do you currently own or have rights to cultivate?

Land	**Land size (acres)**	**Value for land rented in and/or out**
(01)Total owned		
(02)Total cultivated		
(03)Rented in		
(04)Rented out		
(05)Under Fallow		

3. How did you acquire the land which you own?

(01) Allocated by village head
(02) Bought
(03) Inherited from family
(04) Through marriage
(05) Other (specify)_____

SECTION 2: MAJOR CROPS GROWN BY THE HOUSEHOLD

4. Indicate up to 4 main crops grown by the household

Crops Grown	**Land allocation per crop (acres)**	**Cropping system (Code 1)**
(01)Groundnuts		
(02)Tobacco		
(03)Maize		
(99) Other (specify)		

Code 1 Cropping system

(01) Sole/mono cropping
(02) Intercropping
(03) Crop rotation
(04) Relay cropping
(05) Mixed cropping
(99) Other (specify)_____

5. Main cash crops grown by the household

From the above, which crop(s) do you grow for cash? (Tick appropriately)	**Rank based on income**	**Main reasons for choice of crop (multiple answer)** (01) Main source of household income (02) Good price for the crop (03) Guaranteed market (04) Easy to market/sell (05) Less labor demand (06) Disease/pest resistance (07) Agro-ecological consideration (08) Past experience in growing the crop (09) Also used as a food crop (10) Household nutrition needs (99) Other (specify)				
(01) Groundnut						
(02)Tobacco						
(03) Maize						
(99) Other (specify)						

6. Main Food crops grown by the household

Which crop(s) do you grow for food? (Tick appropriately)	**Rank**	**Main reasons for choice (multiple answer)** (01) Main staple food crop (02) Household nutrition reasons (03) Can easily sell surplus (99) Other (specify)				
(01)Groundnut						
(02)Maize						
(99)Other (Specify)						

SECTION 3: GROUNDNUT PRODUCTION (seed and other inputs; yields)

7. How long have you been growing groundnuts? _____Years

8. Source of groundnut seed, seed financing and crop harvesting (use codes provided)

Variety grown (code 1)	**How long variety grown for?**	**Area grown (acres)**	**Seed type (code 2)**	**Amt of seed used (kgs)**	**Source of seed (code 3)**	**Distance to source of seed (km)**	**Cost of seed (MK)**	**Mode of payment (01)Cash (02)In kind (specify)**	**Source of seed finance (code 4)**

Code 1 Variety
(01)Chalimbana
(02)CG7
(03)Nsinjiro
(04) Chitala
(05) JL24 (Kakoma)
(06) Other (specify)

Code 2 seed type
(01) Certified seed
(02) Recycled seed

Code 3 Source of seed
(01) ADD/RDP/EPA
(02) ICRISAT
(03) Ordinary retail shop
(04) Previous own harvest
(05) Farmers association (specify)
(06) Govt. subsidy program
(07)Seed multiplication programme
(08) Relatives/neighbors
(09) Local market
(10) ADMARC
(11) Private company (specify)
(12) NGO (specify
(99) Others (specify)

Code 4 Source of finance
(01) Own agricultural sales
(02) Formal employment
(03) Casual labor sales
(04) Remittances
(05) Contractor/contract farming
(06) Lending institutions (specify)
(99) Other (specify)

9. If recycled seed was used for some varieties above, how many times has it been recycled? (Use variety codes provided)_____

10. What factors influence the choice of groundnut varieties that you grow? (rank them)
(01) High yielding
(02) Time to maturity
(03) Pest and disease resistance
(04) Demand from buyers
(05) Fetch high price
(06) Taste of the nuts
(07) Size of the nuts
(08) Number of uses
(09) Suitability to the agro-ecological zone
(99) Other (specify)

11. Which members of the family influenced the choice of variety to grow?
01 Wife
02 Husband
03 Both
04 Children
05 Others (specify)

12. If more than one groundnut variety is grown, state the reasons?

01 hedging against production risk
02 hedging against demand and price risk
03 to match variety of use/needs (food and for sale)
04 determined by level of seed available
05 Others (specify)

13. What varieties of groundnuts do farmers grow in this area specifically for sale?
01 CG7
02 traditional chalimbana
03 Nsinjilo (Chalimbana 2000/05)
04 Kakoma
05 Chitala
06 Others (specify)

14. Which of these varieties do you grow? (Use code above)_____

15. Groundnut yields

Variety grown		**Crop Harvested in 2009/10**		
Use codes provided above	**Area grown in 2009/10**	**Crop eaten green or sold before harvest (kg)**	**Harvested (Kg)**	**Amount sold (kg)**

16. What trend have you observed in your groundnut yields?
(01) Increasing yields
(02) Constant yields
(03) Decreasing yields
(04) Others (specify)

17. Reasons for the trend observed in groundnut yields?
(01) Erratic and low rainfall
(02) Lack of inputs
(03) Inadequate inputs
(04) Heavy pest and disease incidences
(05) Poor quality of seed used
(06) Reduction in land allocated
(07) Use of new high yielding varieties
(08) Allocation of more land
(09) Increasing demand for groundnuts
(10) Improved crop husbandry practices (specify)
(11) Other (specify)

18. Cost of groundnut production (farmers should be encouraged to remember/estimate)

Land preparation	**Seed**	**Planting**	**1st Weeding**	**2nd weeding**	**Harvesting**	**Transport from farm to homestead**

19. In your opinion, which components contribute the highest towards your cost of groundnut production?
(01) Labour (land preparation, weeding and harvesting)
(02) Seed
(03) Labour (shelling and grading)
(04) Other (specify)

20. Which factors hinder production expansion for groundnut? (Top 4)

Production problem	**Rank**
(01) Lack of quality seed	
(02) Poor yields	
(03) Inadequate credit	
(04) Inadequate land	
(05) Inadequate post harvest handling knowledge	
(06) Poor extension services	
(07) High pest and disease incidences	
(08) Short-shelf life (poor storability)	
(09) Competition with other enterprises for resources e.g., labour	
(10) Late delivery of inputs e.g., seed	
(11)Lack of steady and guaranteed markets	
(12)Poor farm gate prices (no incentive)	
(99) Others (specify)	

SECTION 4: GROUNDNUT POST-HARVEST HANDLING

21. How do you dry your g/nuts? (01) Using Mandela Cock (02) Traditional round heaps (03) On roof tops (99)Other (specify)

22. How long do you dry your groundnut crop?_____

23. Groundnut storage

Variety grown	**Stored in what form? (code 1)**	**Where and how do you store your g/nuts? (code 2)**	**Cost of packaging materials used**	**Cost of storage facility if separate**	**Storage chemicals used**	**Quantity of loss in store**	**Major cause of crop loss (code 3)**

Code 1
(01) Shelled
(02) Unshelled

Code 2
(01) Bags in the house
(02) Heaped in the house
(03)Traditional granary (Nkhokwe)
(04)Improved granary (tin)
(05) Plastic buckets

Code 3
(01) Spillage
(02) Rodents
(03) Stolen
(04) Rotten
(99)Other (specify)

24. What other costs do you incur in the storage of your groundnuts? MK_____

25. Groundnut shelling

Variety grown	When do you shell? (code 1)	How do you shell? (code 2)	Maximum kgs/day with manual shelling	Max kgs /day with machine shelling	Quantity of loss in shelling (kgs)	Cost of shelling (MK)

Code 1
(01)Soon after drying before storage
(02)Just before selling

Code 2
(01) Manually
(02) Using a machine
(03)Both manual and machine shelling

28. Groundnut grading

Variety grown	Do you grade your g/nuts? (01)Yes (02)No	How do you grade your g/nuts? (01)Sort by variety (02)Sort by color (03)Sort by size (04)Based on pod filling (pops and lights) (05)Winnowing (99)Other (specify)	When is grading done? (01)Before shelling (02)Soon after shelling before storage (03)Before selling	Cost of grading	Quantity of loss due to grading	What do you do with the grade outs? (multiple response) (01)Eat them (02)Throw them away (03)Use as livestock feed (04) Use as organic manure (05) Use for oil extraction (99)Other (specify)

SECTION 5: GROUNDNUT MARKETING

29. GROUNDNUT MARKETING Quantity of groundnuts produced and sold by the household

Amount harvested (kg) per variety grown	Form in which g/nuts are sold (01)Shelled (02)unshelled (03)Both	Quantity intended for sale (kg)	Quantity actually sold (kg) (If none sold, put zero)	Buyer **(Code 1)**	Unit price	Total value earned (estimate in kind payments)	Reasons for choice of buyers (**Code 2**)	When do you sell your g/nuts? **(Code 3)**	Quantity rejected/ damaged (kgs)	Reason for rejection (**Code 4**)	Specify reason for not selling other than rejection (**Code 5**)	Transport cost to the market

Codes

Code 1: Buyers	**Code 2: Reasons for choice of buyer**	**Code 3: Time of selling**
(01) Local vendors	(01)Pay cash	(01)0-2 months after harvest
(02) Foreign private traders	(02)Offers good price	(02)3-6 months after harvest
(03) Big traders	(03)Reward quality with good price	(03)>6months after harvest
(04) Local market	(04)Not strict on quality	
(05) ADMARC	(05)Offer guaranteed market	**Code 4: Reason for rejection**
(06) NASFAM	(06)Reliable weighing scale used	(01)Mixed color
(07) Private Produce Company (specify)	(07)Buy large quantities	(02)Uneven size
(08) by road-side	(08)Offer market information	(03)Broken
(99) Other (specify)	(09)Always sell to this buyer	(04)Rotten
	(10)Nearest buyer	(05)Wet
	(11)Buyer also offer loan and other services to farmers	**Code 5: Other reasons for not selling**
	(12)Starts buying early	(01)Withheld due to poor prices
	(99)Other (specify)	(02)Buyers run out of money
		(03)Rejected by the buyers (specify reasons)
		(04)Low g/nut demand
		(05)Early closure of the market
		(06)Withheld for future sale
		(99)Others (specify

30. How is the selling price determined?
(01) Determined by the buyer
(02) Bargained based on quality of the nuts
(03) Based on the variety
(04) Based on the number of buyers available
(05) Bargained based on volume supplied
(99)Other (specify)_____

31. Were you able to negotiate and influence the price at which the nuts were sold?
(01) Yes (02) No

32. What factors would you like groundnut buyers to consider when determining prices at which to buy groundnuts?
01 consider quality
02 consider volume to be supplied
03 consider variety/type of nuts
99 others (specify)

33. What factors do you consider before accepting or rejecting a price?
(01) Cost of production
(02) Household income needs
(03) Level of supply
(04) Level of demand
(99) Other (specify)

34. Did you sell your groundnuts as an individual or a group? (explain your answer)
(01)Individual
(02) Group marketing
(99) Others (Specify)

35. How do you engage with your buyers?
(01) Directly
(02) Through intermediaries
(99) Others (specify)

36. Who makes the decision on how much of the harvested groundnuts to sell in a particular year?
(01) Husband (02)Wife (03) Both (99) Others (specify)

37. What factors do you consider when deciding how much to sell?
(01) Predetermined quantity
(02) Prevailing market price
(03) Household income needs
(04) Amount harvested
(99) Other (specify)_____

38. How many times did you sell your groundnuts? _____

39. What factors determine your time of selling?
01 Prevailing market price
02 Volume harvested
03 Household needs
04 Risks associated with long storage period
05 Expected gain in selling prices
99 Others (specify)

40. Were your expectations from the marketing of your groundnuts met in terms of the following? (circle appropriately and explain your answer in the boxes given)

Quantity sold	**Quality required**	**Price/kg**	**Time taken to sell**	**Number of willing buyers**
(01)Yes (02)No	(01)Yes (02)No	(01)Yes (02)No	(01)Yes (02)No	(01)Yes (02)No

SECTION 6: CONTRACT MARKETING

41. What is the nature of your relationship with your buyer(s)?
(01) Formal contract
(02) Buyer dictates terms
(03) You can easily find another buyer
(99) Other (specify)

42. Are you involved in groundnut contract marketing? (01) Yes (02) No

43. If no, would you be interested to be involved in contract marketing?
(01)Yes (02) No

44. What would be your expectation for participating in CM?
(01)Have a guaranteed market
(02)Get good prices
(03)Benefit from extension
(04)Access to improved technologies

45. If yes, specify name of the contractor
_____

46. How long have you been involved in contract marketing? _____

47. Do you sign any written contract? (01) Yes (02) No

48. Was the contract legally binding? (01) Yes (02) No

49. What inputs and other services do you get from the contractor?
(01) Seed specify amount
_____
(02) Extension services
(05) Others

50. How much do you pay back? _____
51. How do you pay back the loan? Specify
_____

52. After how long do you pay back the loan?
_____

53. If groundnut selling price increased tremendously within the year are you allowed to renegotiate terms of the contract? (01) Yes (02) No

54. In general, are you satisfied with the conditions and the way the contract is executed?
(01) Yes (02) No

55. Explain your answer

_____
_____
_____

56. Do you sometimes divert part of your groundnut crop to parallel markets even when contracted to someone?
(01) Yes (02) No

57. If yes, what are the reasons for diverting contracted crop?
(01) Immediate cash needs
(02) Parallel markets offer better price than contractor
(03) To conceal true output
(04) Others (specify)

58. Contract farming helps farmers get the necessary inputs and provide ready markets. Have you realised any of the following since venturing into contract farming?
(01) Increased productivity
(02) Increased income from crop sales
(03) Steady income flow
(04) No positive change in my farming activities

59. Most contractors now prefer contract marketing to contract farming (enumerator should clearly explain the differences between the two to the respondent).

60. Which one of the two is most preferred by the producers and why?_____
_____
_____
_____
_____

61. Four major marketing problems faced by producers (circle and rank)

Four major marketing problem faced	**Rank**
(01) Inadequate markets	
(02) Low farm-gate prices	
(03) High standards required	
(04) Quality not rewarded in price	
(05) Low demand	
(06) Low competition in the market (few traders available)	
(07) Smallholder farmers unorganized and fail to influence price	
(08) Late entry into marketing by traders	
(09) Early closure of the market	
(98) Others (specify)	

62. In your opinion, which areas should be prioritized to ensure that groundnut marketing is improved?
_____
_____
_____

SECTION 7: GROUNDNUT QUALITY ISSUES

63. What is your understanding of groundnut quality?
(01) Well filled nuts
(02) Well graded nuts (uniform variety)
(03) Properly dried nuts
(04) Clean nuts
(05) Free of pests and diseases
(06) Attractive color
(07) Whole nuts (less breakage)
(99) Other (specify)

64. What quality of groundnuts are traders looking for?

_____
_____
_____

65. Are some traders more concerned about quality than others? (Explain your answer)
(01) Yes
(02) No

_____
_____

66. Do the traders that are more concerned with quality offer better price for their demand?
(01) Yes
(02) No

67. Are you aware of Aflatoxin in groundnuts?
(01) Yes (explain) (02) No

_____
_____
_____

68. If yes, how do you manage your groundnuts to ensure that they are not contaminated with Aflatoxin?
01 Field water management (box ridges, irrigation, site selection)
02 Well dried through Mandela cock method
03 Avoid contact with moisture

69. Where did you learn the techniques to control Aflatoxin?
01 Farmer organization extension
02 Govt extension
03 ICRISAT
99 Others (specify)

70. What are the benefits of controlling/reducing levels of Aflatoxin in your groundnuts?
01 Get better quality
02 Get better price
03 Groundnuts are safe for human consumption
99 Others (specify)

71. Are you aware of the impact of Aflatoxin on human health? 01 Yes 02 No

72. If yes, how does affect human health?
01 Causes cancer
02 Reduces the quality of food made out of contaminated nuts
03 Others (specify)

73. Have you had any of your groundnuts rejected due to Aflatoxin contamination?
01 Yes (02) No

74. What do you do with the groundnuts that have been rejected due to Aflatoxin contamination?
01 Consume it at home
02 Through it away (destroy it)
03 Resale at lower price
04 Use it for animal feeds
99 Others (specify)

SECTION 8: INSTITUTIONAL SUPPORT SERVICES ((Extension, training and finances)

75. Do you have access to the following services on groundnut?

Production related extension 01 Yes 02 No
Marketing related extension 01 Yes 02 No

76. Extension service providers and service provision

Extension service provider	**Area of focus (select all that apply)**	**How do you rate the service provided**	**Frequency of service provision**
(01) Govt./public extension service (02) Farmer organizations in the area (specify) (03) NGOs (04) Private traders (05) Private extension service providers (99) Others (specify)	(01) Crop husbandry (02) Disease/pest control (03) Post-harvest handling (04) Profit/loss accounts (05) Record keeping (06) Value-adding activities (07) Market research (99) Others (specify)	01 Very poor 02 Poor 03 Excellent 04 Good 05 Fair	

77. Do you pay to access the services above?
01 Yes 02 No

82. What type of market information regarding groundnuts do you receive?

Market information accessed	**Other market information desired**
(01) Available market	(01) Available market
(02) Price information	(02) Price information
(03) Volume demanded for the crop before production	(03) Volume demanded for the crop before production
(04) Quality standards	(04) Quality standards
(05) None	(05)None
(99) Others (specify)	(99) Others (specify)

78. Is this information readily available?
(01) Yes (02) No

79. Indicate source of this information?

Current source of information	**Preferred source of information**
(01) Buyers/traders	(01) Buyers/traders
(02) Contractors	(02) Contractors
(03) Friends	(03) Friends
(04) Farmer organizations e.g., associations	(04) Farmer organizations e.g., associations
(05) Government market agencies	(05) Government market agencies
(06) Private market support service providers	(06) Private market support service providers
(07) Print media	(07) Print media
(08) Farmer radio programmes	(08) Farmer radio programmes
(99) Others (specify)	(99) Others (specify)

80. Is this information timely and informative enough for your decision making?

Production related information
Timely (01) Yes (02) No
Informative enough (01) Yes (02) No

Marketing related information
Timely (01) Yes (02) No
Informative enough (01) Yes (02) No

81. Do you have any groundnut demonstration fields in this area?
(01) Yes
(02) No

82. What benefits have you experienced from participating in demonstration plot activities?
_____
_____

83. Have you attended any training in groundnut production and marketing in the past two years?
(01) Yes (02)No (go to Q)

Organization	**Type of training received**	**Frequency of training**	**Rating of training** **01 Poor** **02 Good** **03 Very good** **04 Excellent**

84. What impact did these trainings have on your groundnut enterprise?
(01) Contributed to high yields
(02) Improved production technologies
(03) Improved groundnut quality
(04) No impact observed
(99) Other (specify)

85. Do you have access to any credit? (01) Yes (02) No

86. If yes,

Source of credit	**Type of loan (01)Cash (02) Seed**	**Amount accessed**	**Is the amount enough? (01)Yes (02)No**	**Repayment method (01)Cash (02)In kind**	**Repayment period**

87. If doesn't access credit, why not?
(01) No collateral
(02) No credit institutions
(03) Not aware of such facility
(04) No need for credit
(05) Prefer grants
(06) Segregated because of gender

SECTION 9: FARMER ORGANISATION

88. Are you a member of a farmer organisation?
(01) Yes (02)No

89. If not a member, are you intending to join?
(01) Yes (02) No

90. If yes, state the reasons for joining the farmer organisation?
(01) To access produce markets
(02) To access training
(03) To access inputs
(99) Other (specify)

91. Do you pay any fees to be a member of the group?
(01) Yes (02) No

92. If yes, how much do you pay per year?
_____

93. Are there any special services which you receive from the group in terms of groundnut production and marketing?
(01) Yes
(02) No

94. If yes, specify the type of services received

Production related services	**Rank**	**Marketing related services**	**Rank**	**Other service providers other than the FO**
(01)Crop husbandry		(01)Market information		(01)Govt./public extension services
(02)Disease/pest control		(02)Profit/loss accounts		(02)Farmer organizations in the area (specify)
(03)Post-harvest handling		(03)Record keeping		(03)NGOs
(04)Seed access		(04)Value adding activities		(04)Private traders
		(05)Market search and linkage		(05)Private extension service providers
		(06)Quality control		(99) Others (specify)
		(99)Others (specify)		

95. What else can a farmer organization do to facilitate production and marketing of groundnuts?
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_____
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96. Sources of household income

Main source of income	**Annual amount**	**Main expenditure**	**Annual amount**
(01) Formal employment		(01)Food purchases	
(02) Agric crop sale		(02)Transport	
(03) Livestock sales		(03)Housing	
(04) Remittances		(04)Land rents	
(05) Pension		(05)School fees	
(06) Income generating activities		(06)Clothes	
(07) Casual labour (‘ganyu’)		(07)Medical bills	
(99) Other (specify)		(08) Agric. Inputs	
		(99) Other (specify)	