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The Production of Ready-to-Use Therapeutic Food in Malawi: Smallholder farmers' experience with groundnut production Results from a six year livelihoods analysis in Malawi's Central Region



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List of Acronyms

ADMARC	Agricultural Development and Marketing Corporation Malawi
CSO	Civil Society Organisation
EAA	ExAgris Africa
EPA	Extension Planning Area
FANTA	Food and Nutrition Technical Assistance, USAID
FAO	Food and Agricultural Organisation of the United Nations
FEG	Food Economy Group
FGD	Focus Group Discussion
FHH	Female Headed Household
FISP	Farm Input Subsidy Programme
GDP	Gross Domestic Product
HEA	Household Economy Approach
HFIAS	Household Food Insecurity Access Scale
KCSG	Kasekese Cooperative Society Group
MAL	Minimum Allowable Levels
MHH	Male Headed Household
MoAFS	Ministry of Agricultural and Food Security (Malawi)
MVAC	Malawi Vulnerability Assessment Committee
MWK	Malawian Kwacha
NASFAM	National Smallholder Farmers' Association of Malawi
NGO	Non-Governmental Organisation
NIS	Nuts in Shell (refers to unshelled groundnuts)
OECD	Organisation for Economic Co-operation and Development
PRA	Participatory Rural Appraisal
RLEEP	Rural Livelihood Economic Enhancement Programme

RUTF	Ready-to-Use Therapeutic Food
SD	Standard Deviation
SLF	Sustainable Livelihoods Framework
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
VSLA	Village Savings and Loan Associations
VN	Valid Nutrition

Glossary

<i>Chewa</i>	The predominant language of Malawi, spoke by approximately 90% of the population
<i>Chikodola</i>	Newcastle Disease, common in poultry
<i>Dimba</i>	Dry-Season cultivation
<i>Ganyu</i>	Casual Labour usually of an agricultural nature, which may be paid in cash or food.
<i>Likuni Phala</i>	Maize/soya porridge
<i>Nsima</i>	Maize porridge

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Executive Summary

This report provides a comprehensive analysis of the impact on farming household livelihoods of a specific market-led intervention – a guaranteed groundnut purchasing scheme for smallholder farmers. This intervention is part of an overall aim to develop a locally-based value chain to produce Ready-to-Use Therapeutic Foods (RUTF).

Between 2010 and 2016 the same 200 (\pm) farmers were surveyed annually to collect information about their groundnut production and livelihoods. Most of the farmers involved in the research received agricultural extension services provided through their local associations facilitated by one of the research partners. A control group did not receive such support.

The Sustainable Livelihoods Framework was used as a conceptual tool to investigate various household assets that fall under the human, social, physical, financial and natural capital categories. Given the context, food security was looked at through a number of established indicators. For each of the food security indicators there was always a significant proportion of the sample that fell into categories that would class them as being food insecure, be it through limited access or quality of food.

Households' access to finance decreased considerably over the study period due to the decline of promotion and support of Village Savings and Loans (VSLA) groups. Lack of access to credit has had a negative impact on the livelihoods of smallholder farmers as it correlates with reduced access to farm inputs, thus limiting agricultural production.

In terms of livelihood strategies results show how households continue to rely on crop production, livestock and casual labour for their livelihoods. However, significant changes occurred in relation to which crops farmers are choosing to cultivate. Tobacco cultivation has declined but there have been considerable increases in the production of groundnuts and soya beans. Increases in production are typified by increased yields of groundnuts. The increase of yields throughout bad weather periods illustrates the resilience of groundnut as a cash crop.

Disaggregation by association membership shows that those who participate in training and receive extension visits have significantly higher yields and sell more produce to the market. However, the majority of crop sales over the study period were at farm gate, where prices are at their lowest. This shows the immaturity of the output markets.

A key barrier to local production of RUTF is aflatoxin contamination, largely caused by post-harvest handling; the studied intervention has a strong focus on building the capacity of farmers to be able to produce export quality groundnuts suitable for RUTF manufacture. This was complemented with attempts to develop the high value groundnut markets in the study areas through a number of Nut in Shell (NIS) markets, whereby groundnuts were bought sorted and in their shell. The presence of this

market created a more diversified market place for groundnuts. Previously the main option for farmers was traditional informal buyers whereby nuts are typically bought shelled and at the farm gate. The NIS market saw farmers gaining premium prices, a reduction in labour required for post-harvest handling (i.e. families no longer have to shell groundnuts) and reduced health risks from aflatoxin contamination.

The emergence of cooperatives and willingness to form cooperatives is significant, both in terms of potential commercial farming and improvement of livelihoods. The potential benefit on livelihoods of a cooperative leading to better market access is significant. The development of a cooperative was an unintended positive outcome.

Cumulatively, the key findings show that despite significant improvements in overall production (yields, quantity) of the focus cash crop, groundnuts, the livelihoods status of households in terms of capital assets (e.g. human, social, financial, natural, and physical) appears to have only slightly increased overall. This highlights the need for integrated policy and large-scale interventions to address gaps that are limiting positive returns from projects such as the studied market-led intervention. A prime example of this would be to address the absence of a functioning and appropriate financial market for smallholder farmers. Other promising interventions include addressing long term deficiencies in input/output market development, the provision of extension services, investment in road infrastructure, and the support of associations/cooperatives.

Section 1: Introduction

This report is the result of the fifth round of an ongoing research project conducted by University College Cork on behalf of Valid Nutrition from 2010 to 2016. The purpose of the study was to provide a broad analysis of the impact on smallholder farming household livelihoods of a specific supply chain intervention, designed to guarantee groundnut purchasing for smallholder farmers¹, as part of a larger aim to produce Ready-to-Use Therapeutic Foods (RUTF) through a locally-centred value chain. The study and the guaranteed groundnut purchasing scheme was performed in association with ExAgris Africa (EAA).²

The groundnut purchasing scheme was established to facilitate the transformation of small holder farmers into reliable suppliers of groundnut, through providing access to new agricultural technologies and enhancing the quality of groundnut yields to comply with export standards. The intervention was designed with an overall objective to reduce poverty and increase food security levels in rural economies in areas throughout the Central Region of Malawi participating in the groundnut value chain.

This report explores the changes in the livelihood status of a longitudinal study sample of rural smallholder farming households between 2013 and 2016 cropping seasons, while referring to the baseline data collected in 2010. The sample has been categorised by a treatment group and a control group. Farmers who fall under the treatment category are participants in the supply chain intervention and thus have received agricultural extension services through local associations. Those who make up the control group have not received such services. This report attempts to factor in national and local external factors that may impact the effectiveness of the intervention on the participant households.

The objectives of this research are outlined below:

1. Identify the food security and livelihood status of the sample households, exploring agricultural production, food consumption, physical assets, and social assets.
2. Explore the pattern of preference between cultivation of cash and food crops.
3. Identify the current constraining factors on the efforts to improve livelihoods, including recent changes in climate and the impacts of droughts and flooding on household livelihoods.
4. Ascertain the household's responses and coping strategies to shocks and constraining factors.

¹ A small holder farmer from herein will refer to a farming household that own small plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour (Agriculture, Forestry & Fisheries, 2012).

² ExAgris Africa is a private company that engages with commercial farming and rural development.

Report Structure

The structure of the report is based around the Sustainable Livelihoods Framework and uses some of its main elements. Sections 1 to 4 describe the overall livelihoods status; Section 5 examines the welfare of households in terms of food security, human, financial, natural and social capital; in addition, the wealth ranking of households is also identified. The main livelihood strategy of crop production is analysed in Section 6, where the main crops cultivated by households are presented. Unforeseen shocks and household responses are discussed in Section 7. Finally, conclusions are drawn in Section 8, where the progress in social capital is measured and two main challenges are discussed: the continuing vulnerability of households due to lack of access to credit and inputs and, more positively, the emerging potential of the intervention and of households' participation in the RUTF value chain development. A number of possible measures at micro and macro level are proposed which could help overcome key constraints to livelihood improvements.

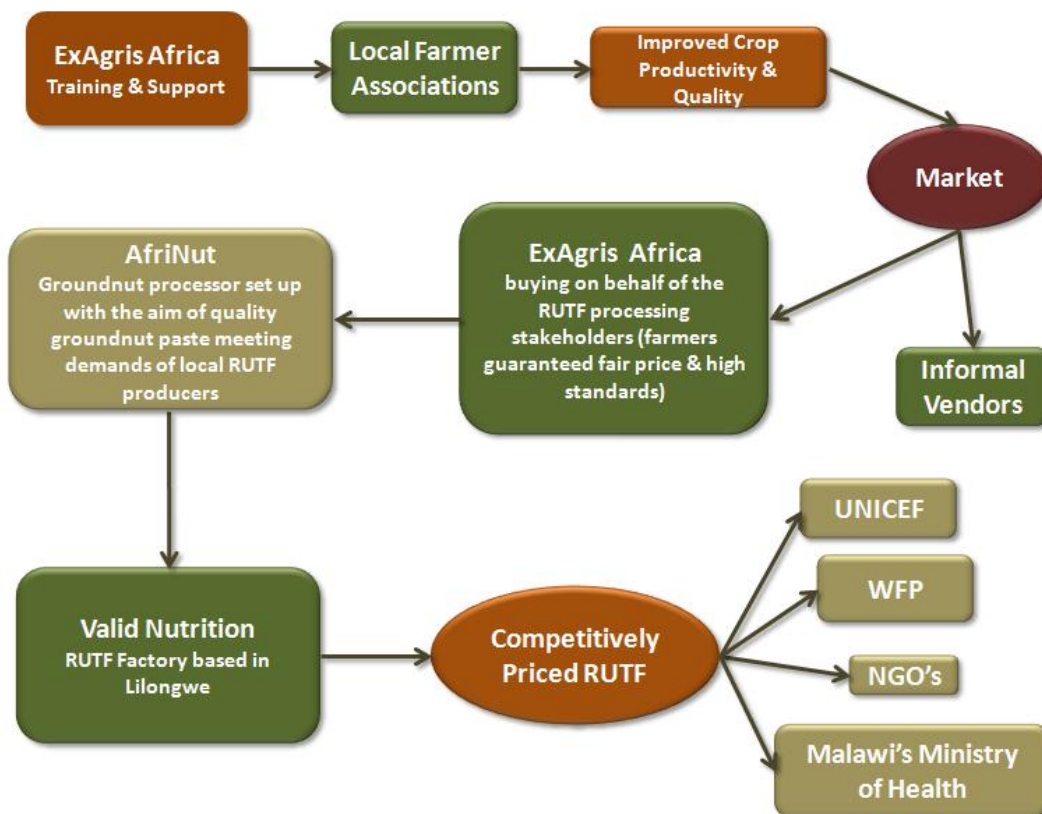
The Intervention

Farmers involved in the research were either participants of the mentioned market-led intervention for the duration of the investigation, entailing agricultural extension services provided to local agricultural associations, or did not receive such support for its duration. It was intended that that the targeted smallholder farmers would sell their groundnuts graded and in their shell to ExAgris. At the buying station, these groundnuts would be bulked, further graded and packaged before being sold to AfriNut³. AfriNut would then process the nuts into peanut paste and supply to Valid Nutrition to process into RUTF⁴, thus, in the broadest sense, creating a sustainable value chain. (Figure 1)

³ AfriNut is a 'pro-poor peanut processor', whose shareholders include: Twin, NASFAM, ExAgris Africa Ltd., Coraid and the Waterloo Foundation.

⁴ Ready-to-Use Therapeutic Food (RUTF) is a highly nutritional groundnut based paste that is used in the treatment of Severe Acute Malnutrition in young children.

Figure 1: RUTF Value Chain



Although the baseline survey for the research project was conducted in 2010, prior to any specific intervention activities, the process of guaranteed groundnut purchasing did not begin until 2013, the final year of data collection was conducted in 2016. The intervention is part of a wider out-growers programme that ExAgris Africa is implementing in 8 districts⁵. This intervention is partially funded by Malawi's Ministry of Local Government and Rural Development's, Rural Livelihood Economic Enhancement Programme (RLEEP). ExAgris outlined the main objectives of the intervention in the 2013 'Growing with Groundnuts' annual report:

- Increase the average yield of groundnuts produced by the target group.
- Increase the average price per kg of groundnuts produced by the target group.
- Reduce per unit processing, handling and marketing costs for both commercial and smallholder groundnut farmers.
- Identify the key determinants of yield and price in various farming scenarios.
- Increase availability of and access to quality certified seed of a number of appropriate groundnut varieties.

⁵ Mchinji, Dedza, Lilongwe, Salima, Rumphi, Mzimba, Dowa, and Mangochi

Through the provision of agricultural extension services good progress has been made towards these objectives. Farmer associations and groups are supported by the extension advisors in the set-up of sustainable seed systems. The advisors train farmers in agronomic practices through the use of demonstration plots, field visits and other activities. There are several agronomic practices that ExAgris is promoting through the groundnut out-growers scheme. These include: early planting, use of improved seed, increased plant population, scouting for pests and disease control where economically viable for the small holder, fertilizer application and improved harvesting and drying. Associations and groups are also trained in the calculation of gross margins to enable them to estimate financial benefits of additional costs, and to enable them to make comparisons between crops with the aim of them being able to make more informed planting decisions in the future (Valid Nutrition, 2015). However, between 2013-2016 there have been slight modifications to the exact extension services provided, this is mainly due to change of management on ExAgris farms throughout the different locations, but the fundamental objectives continue to be implemented.

Country Context

Malawi has an agrarian-based economy with agriculture accounting for nearly 80% of employment and one third of the GDP. More than 80% of Malawi's exports are agricultural commodities (FAO, 2015). Rural employment is mainly made up of smallholder farmers cultivating plots of an average of 1.4 hectares (National Statistical Office, 2012)⁶. Development of Malawi's agricultural sector has been one of the country's main priorities since independence in 1964, yet the country still faces annual national food deficits. Agricultural development is seen to be the solution for food insecurity, rural poverty, vulnerability, and stagnant GDP growth.

Since independence in 1964 the government, multilateral organisations, non-governmental organisations, and the estate sector, have predominantly led agricultural development policy and initiatives in Malawi. However, the private sector is now playing an increasing role in the implementation of agricultural development initiatives in the country. Out-grower schemes, contract farming and provision of off-farm employment on plantations/estates are a few examples of such initiatives. However, at household level, many farmers still employ cultivation practices and cropping strategies that prioritise food security over income. Through the 'commercialisation' of smallholder farmers it is thought that increased incomes will enable households to meet basic needs, build up productive assets, and reduce their own vulnerability. However, commercialisation in the form of market integration is argued to increase uncertainty and risk because subsistence is replaced with the insecurity of unstable markets and volatile prices (Ellis, F. et al., 2003).

⁶ 2012 is the most recent year of statistical data available on area of cultivation, from the National Statistical Office Malawi.

Malawi was ranked the 13th highest producer of groundnut (in shell) in the world in 2012 (FAO, 2012). According to the National Statistics Office of Malawi, in 2015 it was ranked 15th, comprising of 0.5% of the global export market. This is significant for a small landlocked country whose mainly agrarian economy has limited resources and is over reliant on rainfed production which is increasingly vulnerable to droughts and floods (World Atlas, 2017). Second to the staple crop of maize, groundnut is a key crop grown in Malawi. In 2014, 373,925 hectares of land was used for groundnut cultivation (FAOSTAT, 2014).

Groundnut is an important legume crop for smallholder agriculture in Malawi, providing approximately 25% of the agricultural income. Smallholders produce 93% of total groundnuts cultivated in Malawi. However, yields are low at an average of 1 metric tonne/ha against its potential of 1.5 to 2.5 metric tonne/ha. (MOST, 2017). In Malawi groundnuts were once a popular export crop with 64% of the total produce being exported in the 1980s; this declined to 0.2 percent in the 1990s (Diaz Rois, et al., 2013). The decline is attributed to several factors: structural adjustment programmes and liberalisation of the agricultural sector; deterioration of prices; a falloff in the use of improved seed; land pressure; changes in international demand; and the introduction of stringent maximum allowable levels (MALs) for aflatoxin contamination by importers, particularly the EU (Diaz Rois, et al., 2013).

Following the sudden reduction in production in the 1990s, groundnuts have made a significant comeback with production growing at an average annual rate of 8% since 2000, this growth coming largely from the smallholder sector (Diaz Rois, et al., 2013). For smallholder farmers, groundnuts are seen as an increasingly attractive crop to grow, as there is improved awareness around the nutritional benefits for producing households and the nitrogen fixing properties for farmers' soil. With regard to the economic benefits, farmers see groundnuts as having relatively good gross margins, especially since prices for the traditional cash crop tobacco have become unpredictable and vulnerable to anti-tobacco campaigns and increased cost of inputs (FAO, 2012). Despite the increase in demand of the export market, Malawi has only been successful in exporting an annual average of 26,000 metric tonnes or 8%-15% of its total production since 2008 (ITC Trade Map, 2015). This is less than 2% of the world export market share, but an improvement from the average of 1,700 metric tonnes exported between 1990-2005.

85% of Malawi's groundnut production is consumed locally and mostly traded informally. About 25% of total production is processed and sold through formal channels, this includes export channels (MOST, 2017). Poor access to the groundnut export market often results from the inability to meet quality requirements. Malawi's agricultural markets tend to be inefficient, lacking adequate infrastructure and institutions. A culture of non-compliance to grades and standards throughout supply chain systems limits opportunities for farmers by creating barriers to high value agro-processing and export markets. 95% of the country's groundnut exports are to regional markets with no aflatoxin limitations (MOST, 2017). This was not always the case: prior to the liberalisation of agricultural markets the monopoly parastatal ADMARC (Agricultural Development and Marketing Corporation) enforced strict

grades and standards for groundnuts. These established grades and standards still exist today. However, since liberalisation weak enforcement mechanisms have led to the development of the current low-value, low quality groundnut sector.

This culture of non-compliance to established grades and standards is changing. Recent developments in the private sector, such as the intervention being studied here, have created increased local demand for high value aflatoxin-free groundnuts. There are six significant groundnut processing facilities in Malawi; four produce roasted nuts and one produces peanut butter. Two among the six only make RUTF, these are Valid Nutrition and Project Peanut Butter. It is hoped that such demand from the private sector will have wider socio-economic impacts on the improvement of livelihoods for smallholder groundnut farmers and consumers in Malawi.

Context in 2016: Drought

The 2016 data collection round differs from previous rounds as it illustrates the impact of drought on the livelihoods of households. During the rainy season between October 2015 to March 2016, Malawi experienced extreme drought, which devastated many rain-fed crop harvests. Due to the high levels of reliance on agricultural production in Malawi, changes in climate have resulted in the livelihoods of small holder farmers coming under added stress. This round of the study was conducted after the depleted rainy season of 2015-2016, therefore the data collected reflects the livelihood status of households post-drought.

The Malawi Vulnerability Assessment Committee (MVAC) estimates that 6.5 million people, (39% of the total population) were at risk of food insecurity in 24 out of the 28 districts resulting in a 129% increase since early 2015. The 24 affected districts have food deficits ranging from three to nine months (MVAC, 2016). The study data also reflects this; in 2013 10.26% of households felt stress accessing food for more than three months of the year, compared to 20.9% of households in 2016, i.e. the proportion of households experiencing stress accessing food in 2016 was double the proportion in 2013. This correlates with the national maize production deficit that the UNOCHA (2016) estimates at 700,000 tonnes. At a national level, there was a 39.5% increase in severe acute malnutrition and a 73.9% increase in moderate acute malnutrition admissions throughout the first half of 2016 compared with the same period in 2015 (UNOCHA, 2016).

The data in this report reflects the impact of drought on food consumption and crop cultivation. The FAO has noted that there are staggering gaps in seed availability in Malawi, and this is also reflected in the data collected. The combination of lack of farming inputs and poor farming conditions is having severe impacts on the livelihoods of smallholder farmers.

Section 2: Methodology

The intervention targets approximately 3,000 smallholder-farming households in three districts across the Central Region of Malawi: Lilongwe, Mchinji and Salima. The long-term study gathered data from the 2008-2009 cropping season through to the 2015-2016 cropping season (excluding 2014-2015). A mixed method approach was taken for each year of the study combining both qualitative and quantitative approaches.

The study adopted approaches derived from the Sustainable Livelihoods Framework (SLF) and the Household Economy Approach (HEA) to provide a conceptual and methodological framework.

Sustainable Livelihoods Framework

The SLF is a common tool used to analyse the causes of poverty, people’s access to resources and their diverse livelihoods activities, and relationship between relevant factors at micro, intermediate and macro levels (Adato, M et al. 2012). Figure 2 illustrates the various elements of the framework.

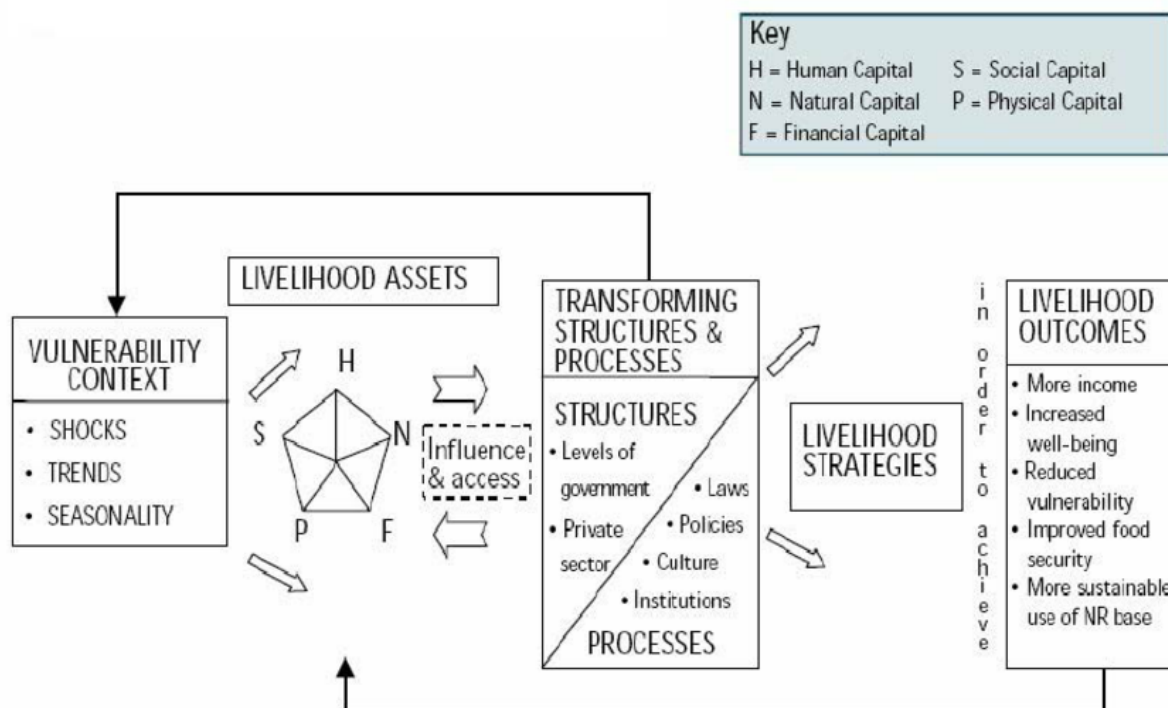


Figure 2: Sustainable Livelihoods Framework (Sife, A. et al., 2010)

Household Economy Approach (HEA)

Paired with the SLF, the Household Economy Approach (HEA) was applied to structure information on livelihoods and key findings. The HEA is a livelihood-based framework for

examining methods of access used by households to obtain the necessary essentials to survive and prosper (Seaman et al., 2000). The HEA is based on the principle that an understanding of how people make ends meet is crucial for assessing how livelihoods are impacted by wider economic or ecological change and for planning interventions that will support rather than undermine, their current survival strategies (FEG, 2008).

The HEA therefore includes analysis of the relationships between different groups and different areas, providing a view of how assets are distributed within a community (FEG, 2008). To implement this approach spatial, social, and methodological triangulation was used in the annual analysis (Gosling, 2003; Brock, 1999; Vanclay, 2012).

A mixed method approach was employed for the study. Mixed methods were applied to attempt to override inherent biases that come from using single methods. Using both qualitative and quantitative methods allowed for the strengths and weaknesses of both to be compensated by each other. By using mixed methods there is a higher degree of accuracy and a larger picture of the context in which the intervention is being implemented can be formed. Data collection methods included annual household questionnaires, focus group discussions (FGD), semi-structured interviews, market visits, key informant interviews and direct observation.

Household Questionnaire

The baseline household questionnaire was launched in the three study areas during the first quarter of 2010 capturing data for the 2008/2009 cropping season. 238 farming households were originally selected for the questionnaire through stratified random sampling. 37 of these original houses either relocated, or were unavailable for interview during the 2016 round of study.

The questionnaire consisted of both closed and open questions to explore key household characteristics and livelihood influences, including:

- Household assets (i.e. human, natural, financial, physical and social)
- Household income and expenditure
- Shocks and supports
- Annual food balance (i.e. consumption and access)
- Crop production and sales.

During the 2010 baseline the researcher initially validated the questionnaire with key stakeholders and a local translator. A two-day pre-testing was carried out with randomly selected households; any anomalies or issues that arose were corrected. Four enumerators were then trained over three days. Data collection lasted approximately 5 weeks. This was carried out using the traditional paper based data collection approach. Data was then entered into Excel and imported into SPSS for further analysis.

The 2011, 2012, 2013 and 2016 household questionnaires largely replicated the 2010 baseline. The time of data collection changed to June/July, as opposed to March to mid-May. The 2016 study round was conducted from November to early December. The change in time periods meant that data collection reflected different times of the harvesting seasons capturing a wider view of changes throughout the year. However, the timing of data collection also meant that data collected on food security status and consumption levels varied between favourable and less favourable reflections of food security situations i.e. lean seasons or post-harvest seasons. This seasonal effect must be kept in mind when considering the survey results. Interviews were conducted using android electronic tablets that allowed for automatic data entry, which increased validity, and reduced data-collection and data processing times.⁷ Each year, four enumerators were employed. Training and piloting of the digital survey took approximately 5 days each year.

Focus Group Discussions

Each year focus group discussions (FGDs) were conducted to provide a more in-depth contextual picture of the communities that the sample households lived in. Groups were made up of 6 to 12 members in all three study areas. Group discussions were held with different sub-groups depending on the topic for discussion. Participatory rural appraisal exercises (PRA) including wealth ranking, seasonal calendars, income and expenditure matrixes were conducted in specific FGDs. These gave insight into village and individual perceptions of what strengths, weakness, opportunities and threats households face in terms of achieving a sustainable livelihood and what impacts each of these.

Semi-Structured Interviews

Household representatives and key informants were interviewed with the objective of getting individuals' thoughts and experiences. Households targeted were association members who were considered as case studies with one female and one male farmer interviewed in each study area. Key informant interviews were conducted with agricultural extension advisors, government officials at national level, NGO and CSO representatives and other key stakeholders in the groundnut supply chain and the RUTF value chain.

Market Visits and Trader Interviews

Each year the researchers visited trading centres for food and other commodities in the three areas. Both the nearest small markets and medium to large markets were visited. Observations of the markets and prices were made as well as interviews with agricultural commodity traders.

⁷ KoboCollect part of Kobotoolbox data collection software was used to deploy the questionnaires.

Direct Observation

The researchers recorded events, structures, processes, institutions, behaviour, relationships, social differences, and enumerators' notes and personal observations from household interviews. This was done to inform the survey data collection processes and to triangulate the other methods employed.

Study Ethics

For all the data collection activities, oral consent was obtained from all participants. For the household questionnaire, a standardised introduction was read out by the enumerator, this introduction gave a background to the intervention, the purpose of the study, how the information would be used and how all information would be treated confidentially. This was also done in FGDs and semi-structured interviews. Participants were also informed that they were entitled to ask any question, and if at any time, they wanted to terminate the interview they could do so, or could refuse to participate. Participants were given payment for their participation, calculated to represent potential earnings lost during the time given to complete the survey.

Statistical Analysis

Results from the household questionnaires were combined into one dataset and analysed using SPSS version 23. The 2016 data was merged with the past four datasets. Qualitative data was also compared. Basic exploratory analysis was conducted. Data was disaggregated into different categories; wealth groups, membership periods and gender of respondents, to compare and track changes in both wealth status and livelihood improvements. The data was used to identify trends in planting, harvesting and total outputs of certain crops. To ensure validity of the data a number of statistical significance tests were conducted.

Section 3: Study Sample

The initial 2010 baseline study interviewed a total sample of 238 households, chosen through stratified random sampling. Since 2010 the baseline sample figures have fluctuated due to households moving away, separating or not being available for interview. The 2016 sample totalled 201 participants, all of whom have been interviewed over the previous four rounds of data collection. The sample has a confidence level of 95% and a margin of error of 7%.⁸

The sample consists of members of the associations connected with the ExAgris groundnut out-growers extension programmes that commenced in 2010, and a control group of non-members. The sample of members has been categorised by length of association membership: since the last round of the study was completed in 2013 the membership categories have been modified to allow for longer periods of membership.

Table 1 displays membership status of the households since 2010, the distribution of households across the study areas and the sex of the household heads during the 2016 study.

	n	%
<i>Total Sample</i>	201	100
<i>Association Membership 2010-2016</i>		
Association Member <4yrs	17	8.5
Association Member 4yrs	59	29.4
Association Member >4yrs	80	39.8
Not a Member	45	22.4
<i>District</i>		
Lilongwe	70	34.8
Mchinji	71	35.3
Salima	60	29.9
<i>Gender of respondent</i>		
Male	136	67.7
Female	65	32.3

⁸ The confidence level of 95% is commonly used to calculate the margin of error for a given sample. It relates to the sample size and the size of the general population. Using a 95% confidence level, a sample size n=201, and the population of Malawi in 2016 of 17,749,826 (Worldometers, 2017) the margin of error is calculated at 7%.

Section 4: Study Areas

The study areas were selected based on the criteria that they were areas where the partner organisation ExAgris Africa Ltd., which is implementing the intervention being investigated, is operational. Figure 3 shows the location of the study sites.

Lilongwe

Villages surrounding the ExAgris Lisungwi Farm were selected. The Lisungwi farm (estate) is approximately 100km south of the capital city Lilongwe and 20km from Mitundu trading centre, one of the largest trading centres for the Lilongwe district. The selected villages fall under the Mitundu EPA.⁹ Households were selected from 28 different villages.

Mchinji

Villages nearby to the ExAgris Mchaisi Estate were selected. This estate is approximately 50km east of Mchinji town, and 5km from the Kapiri trading centre. The selected villages fall under the Chioshya and Kalulu EPAs. A total of 6 villages were represented in the sample.

Salima

Villages neighbouring the ExAgris Mpatsanjoka farm were selected. The farm is approximately 5km outside Salima town. The selected villages fall under the Tembwe EPA. Households were drawn from 12 different villages.



Figure 3: Map of Malawi

⁹ Extension Planning Area is the lowest government planning level in Malawi.

Section 5: Livelihood Status of Households

This section applies the Sustainable Livelihoods Framework as a tool to analyse the findings. As mentioned above the SLF highlights five factors that affect the livelihoods of poor people. This section will draw upon four of these factors:

- physical capital, such as the structure of dwellings and housing
- natural capital, land ownership and livestock ownership
- financial capital, livestock, and commercial farming
- social capital, particularly formation of cooperative association.

The study sample is classified and disaggregated into wealth rankings. Numerous intermediary indicators were applied to measure food security status. Food security affects many elements of livelihood analysis and is interlinked into all capitals addressed within the SLF, including human capital, which is not discussed in this section as it does not feature in the wealth ranking process. However, it should be noted that food security relates directly to health which is a main component of human capital. Financial capital addressed both savings and credit access; as livestock is directly linked to financial capital for many households it has also been used as an indicator for natural capital also. The following sections display each category in detail.

Wealth Groups

Ownership of assets varies amongst households; these variations indicate differences in wealth status and give an indication of how a household may achieve its livelihood needs. Data on specific assets was collected in each round of surveying, this data was then used to categorise the households into different wealth groups.

The wealth group variable is a composite index of household wealth. Table 2 below displays the results of a stratification method undertaken for all households over the five rounds of surveys, which was in line with Participatory Rural Appraisal (PRA) and the Household Economy Approach (HEA) methodologies.

The wealth groups used were defined during the initial data collection in 2010. Key-informant interviews were conducted in all three districts as a foundation of the various groups and how to differentiate each group. Characterisations of the main defining factors and resources of the poorest households in the village were described. The same was done for the middle and wealthiest groups in the area. Once the characterisations were determined the communities were divided into the wealth groups: low, middle, and high. This information was triangulated with focus group discussions conducted within each community. These steps were followed for each of the rounds of data collections in 2011, 2012, 2013 and 2016.

For comparative purposes, the wealth group descriptions seen in Table 2 were used during the 2016 round analysis; however due to the three-year gap in data collection between 2013

and 2016 the methods of formulating the limits of each wealth group were replicated in 2016 to identify if a change in the characterisation of wealth status had occurred. Table 3 represents the wealth group categorisation described by participants during the 2016 research. The changes evident are: the area of land required to be categorised into the middle or high group has increased, and the number of chickens required to meet the middle categorisation has decreased, suggesting the prices of chicken and their value has increased between 2013 and 2016. All other characteristics remained unchanged.

	Low	Middle	High
Livestock Owned	0-8 chickens only	Chickens, 1-3 goats, and/or 1-3 pigs	Any cattle/oxen. Or chickens. 3+goats, & 3+pigs
Land Owned	0-0.61 hectares	0.61-1.68 hectares	1.68 hectares and above
House Structure	Mud bricks (unfired/compacted) & grass roof	Burnt bricks & grass roof	Burnt bricks & iron sheet roof

	Low	Middle	High
Livestock Owned	0-3 chickens only	Chickens, 1-3 goats, and/or 1-3 pigs	Any cattle/oxen. Or chickens. 3+goats, & 3+pigs
Land Owned	0-0.76 hectares	0.76-1.61 hectares	1.61 hectares and above
House Structure	Mud bricks (unfired/compacted) & grass roof	Burnt bricks & grass roof	Burnt bricks & iron sheet roof

Table 4 displays the results of the wealth ranking activity. It appears that the percentage of households within the low wealth ranking bracket has decreased slightly since 2013; the middle ranking category has also decreased and has the lowest figure of all five rounds. Between 2010 and 2012 the percentage of households considered to be in the high wealth category had been increasing until 2013 where a sharp decrease occurred; however, the 2016 data indicates that there has been a 4.6% increase in households within the high wealth group

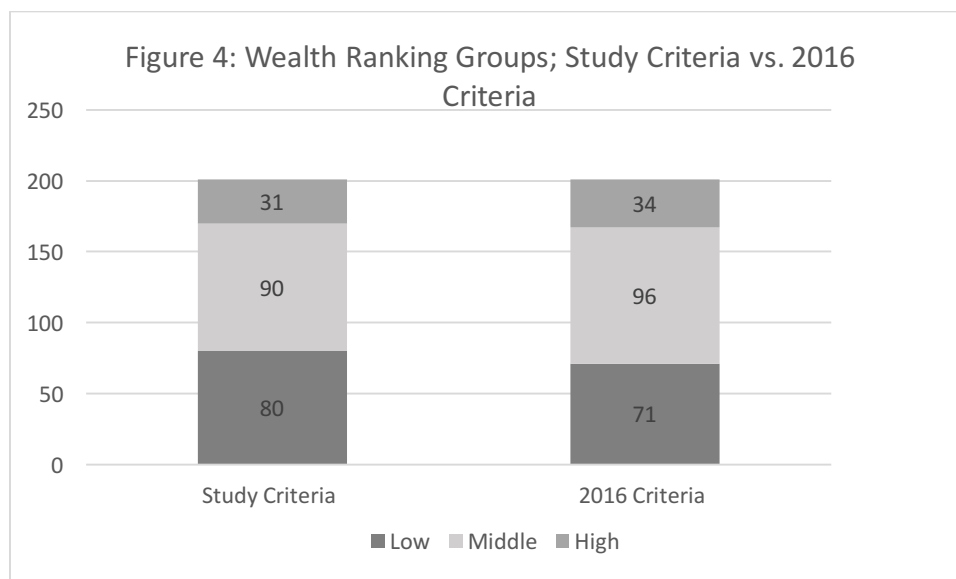
since 2013. The difference in the proportion of households in each wealth group between the 2013 and 2016 sample is statistically significant at the 5% level (see appendix for statistical tables).¹⁰

Table 4: Distribution of Households by Wealth Ranking

	2010		2011		2012		2013		2016	
	n	%	n	%	n	%	n	%	n	%
Low	83	42.6	74	37.9	71	36.4	79	40.5	80	39.8
Middle	95	48.7	96	49.2	96	49.2	95	48.7	90	44.8
High	17	8.7	25	12.8	28	14.4	21	10.8	31	15.4

When wealth groups were categorised using the 2016 wealth ranking criteria (see table 3) the results differed from the study criteria 2013 rankings. Figure 4 displays that when the 2016 criteria are applied there is an increase in the number of households within the high wealth grouping. This is due to the reduction of area of land owned required to meet the high wealth category. Looking at 2016 criteria 47.76% of households fall within the middle wealth group, the transfer from low to middle relates to the decrease in livestock (number of chickens owned) required to be included in the middle wealth group. Both the number of households in the middle and high wealth groups increase. This would indicate that relative to the newly triangulated criteria the percentage increase in the high wealth group is more.

¹⁰ It should also be noted that the increase in the number of households falling under the high wealth group could also be due to development interventions in the areas. For example, if a household received materials to improve their dwellings it would have an impact on their wealth ranking.



Food Security

Food security is a concept that has been developed over many years, it has been defined as the secure access to available food supplies to ensure “that all people at all times have both physical and economic access to the basic food that they need”, (FAO, 1983), to live an active and healthy life (World Bank, 1986).

The staple food of Malawi is maize, therefore when measuring household levels of food security maize consumption is used. Maize is grown by the majority of households in Malawi, many households use it both as a food and cash crop, however in recent years’ household production has not been meeting the consumption needs of families. Focus groups estimated that only 30-35% of households produce enough maize to adequately feed a household for that season. The recent decrease in maize production can be directly linked to the impacts of floods and droughts on harvests, severe droughts following devastating floods have reduced the amount of maize and other crops harvested.

In May 2016 the Malawi Vulnerability Assessment Committee (MVAC) carried out a food security assessment to predict the number of people who will be food insecure during the 2016/2017 consumption period. The results of the assessment show that 39% of the country’s projected population will not meet their annual food requirements during the 2016/17 consumption period. This is an increase of 129% in just one year. The government predicts that to ensure food security without disrupting the socio-economic livelihoods of the most vulnerable in Malawi there is a need of 493,000 metric tonnes of maize in the form of humanitarian assistance. (MVAC , 2016)

Many households that do produce maize face the challenge of appropriate storage capacity. Successful methods of storage ensure that the crop remains dry, clean, and pest/rodent free and that can also be secured against theft. The most popular method of storage mentioned by farmers is the use of metal silos. Metal silos are available in different sizes, holding up 0.4

to 10 tonnes of maize. Food wastage has been highlighted as one of the issues facing villages in all three districts; due to lack of storage facilities maize is lost to damp and pest infestations. The study has followed the pattern of maize consumption from household production between 2010-2016. Results of these patterns are displayed in table 5 below, which shows annual per capita maize consumption from own production overall and by wealth rankings. The Kruskal-Wallis test for significant differences between wealth groups was conducted in 2013 and 2016, and in both years it was found that there are statistically significant differences between wealth groups.

Table 5: Maize Consumption from own production (kg/per capita)

	Overall	Low	Middle	High	p.value
2013	109	86	164	150	0.000
2016	107	69	114	157	0.000

The overall sample shows a small decrease in per capita maize consumption from own production, however there were significant changes in consumption between groups, with noticeable decreases in both the low and middle groups and an increase in the high wealth group.

To further explore the food security situation additional measurements of food security were applied. The Household Food Insecurity Access Scale (HFIAS), the Household Diet Diversity Score (HDDS) and the Hunger Gap are explained below. The 2016 round was conducted throughout the beginning of the rainy season (November-early December), when households had just begun to plant their maize seeds for next harvest; the last harvest was completed in June and therefore households were beginning to feel the stress of accessing food. However, the previous rounds of studies were conducted during different seasons, this needs to be kept in mind when seeking to compare the results between years.

Household Food Insecurity Access Scale (HFIAS)

The HFIAS is a popular tool used to measure food security, developed by FANTA. Nine generic questions regarding the food security of each household over the past four weeks were asked. Each of the nine questions were followed by a standard sub-question to identify the frequency of occurrence. The generic occurring questions, grouped by three domains can be seen in Box.1.

Box 1: Household Food Insecurity Access Scale Indicator Guide (Cotes, J.S. 2007)

1. Anxiety and uncertainty about the household food supply:

- Did you worry that your household would not have enough food?

2. Insufficient Quality (includes variety and preferences of the type of food):

- Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
- Did you or any household member have to eat a limited variety of foods due to a lack of resources?
- Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

3. Insufficient food intake and its physical consequences:

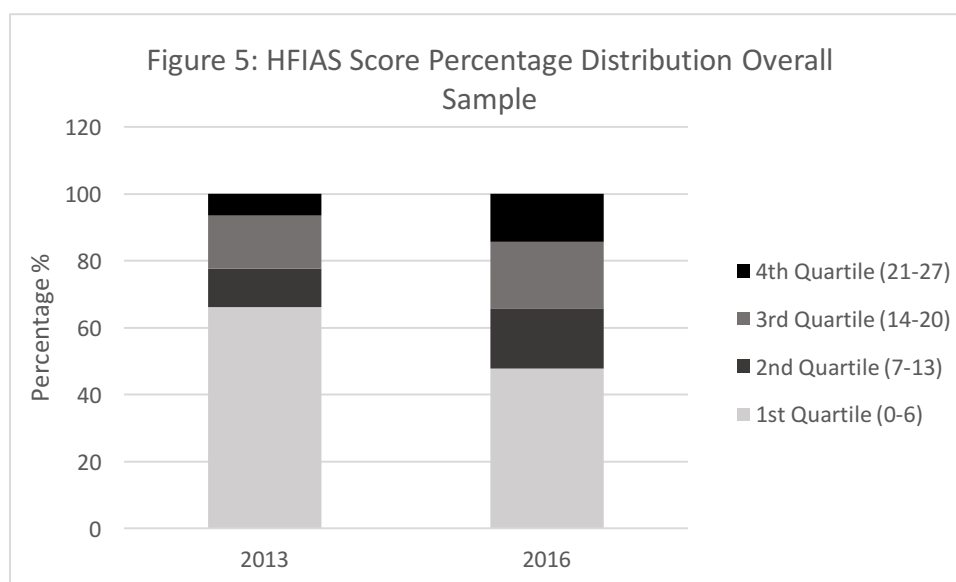
- Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
- Did you or any household member have to eat fewer meals in a day because there was not enough food?
- Was there ever no food to eat of any kind in your household because of a lack of resources to get food?
- Did you or any household member go to sleep at night hungry because there was not enough food?
- Did you or any household member go a whole day and night without eating anything because there was not enough food?

Box 2: Scoring weights of responses to HFIAS questions

Answer	Score
Did Not Occur	0
Rarely Occurred (once or twice in the past four weeks)	1
Sometimes (three to ten times in the past four weeks)	2
Often (more than ten times in the past four weeks)	3

Using the total of these weighted responses the HFIAS score can range between 0 and 27. The higher the score, the more food insecure the household.

The mean HFIAS score was 10.42 (5.74 SD) in 2010, and 5.94 (7.2 SD) in 2013. The 2016 mean of 9.15 (9.34 SD) has increased significantly since 2013, but has not reached 2010 levels. The difference in mean HFIAS may be due to the difference in data collection periods, which highlights the instability of food security in Malawi due to seasonality. The HFIAS scores were categorised into four quartiles. Figure 5 represents the percentage distribution of households across the four quartiles.

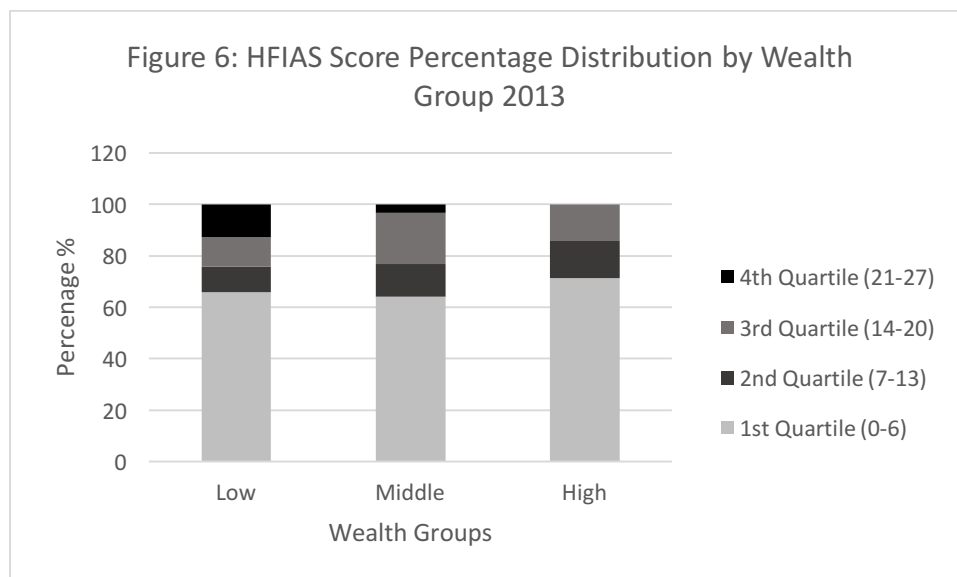


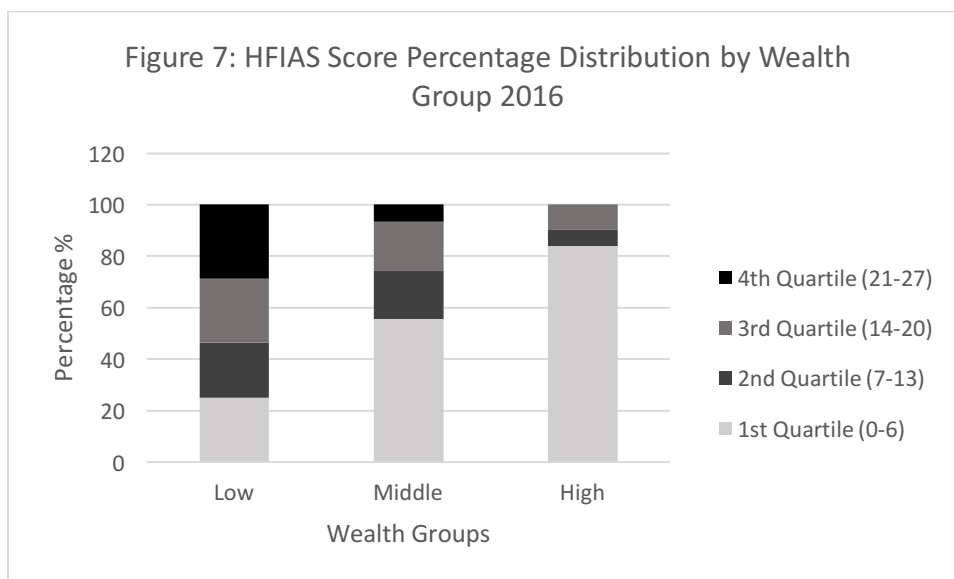
The results of the 2013 study round show that majority (66.2%) of the sample population to be relatively food secure, as they fall into the 1st quartile of the HFIAS score. However, the 2016 results show an increase in food insecurity as the percentage of the sample population in the 1st quartile decreased by 18.4%. It must be noted that both rounds of study occurred

during different seasons and the decrease may be due to the fact that the 2013 round was conducted post-harvest when, access to food is likely to have been easier. However, when considering the decrease in annual maize consumption (refer to table 5 above) between 2013 and 2016, it can be concluded that general food insecurity has increased in the sample households over the last three years.

Figures 6 & 7 below represent HFIAS scores disaggregated by wealth rankings, both for 2013 and 2016. It can be seen that the low wealth group HFIAS scores have changed significantly: the percentage of the low wealth group in the 1st quartile has decreased by 40.8% between 2013 and 2016. Both 2013 and 2016 results show none of the sample in the high wealth groups were in the 4th quartile. 2016 shows that there has been an increase (12.5%) in the high wealth group of households within the 1st quartile. Referring to annual maize consumption (table 5 above) it can be seen that low and middle wealth groups consumed less in 2016 than in 2013 but the high wealth group consumed more. These findings suggest that poor households have become more food insecure while those in the high wealth group have become less food insecure.

However, not all food accessed is captured within these measures: children who attend school receive meals during their school hours. Key informant interviews revealed that children enrolled in school have higher access to food than the rest of the household. Children are given roasted maize, cassava, mangos, bananas and nsima once during the school day.





Household Diet Diversity Score (HDDS)

The Household Diet Diversity Score (HDDS) is a measure of dietary diversity: the higher the score the higher the diet diversity of the household. A good quality of dietary diversity correlates with a healthier level of nutrition amongst household members. The HDDS applied in this study was the modified indicator used by the National Integrated Household Survey III (HIS III 2007) where the participant is asked about their consumption of 113 food items over the period of the last 7 days. It is derived from the question “In the past 7 days, have you or any household member eaten...” The following set of 12 food groups is used to calculate the HDDS: Cereals, Roots and tubers, vegetables, fruits, meat, eggs, fish, pulses, milk and milk products, oils/fats, sugar and miscellaneous (Swindale, 2006). Each food group is given a score, so the total combination of the scores (HDDS) can range between 0-12.

The 2016 study results show the mean score for the total population was 6.5 (2.6 SD): this is substantially lower than the 2013 mean, 8.29 (2.14 SD), indicating that dietary diversity has decreased. This may be partly due to the impact of weather events on food availability, and may also be influenced by seasonality. During the later months in the year households often experience extra financial stress with the result that dietary quality and quantity are adversely affected. Many households mentioned they have attempted to cultivate during these months, but due to the change in weather have not had success in increased crop output. This directly impacts the nutritional status of households as cash flow is low and other costs take priority over food purchases, e.g., school fees which fall due every four months.

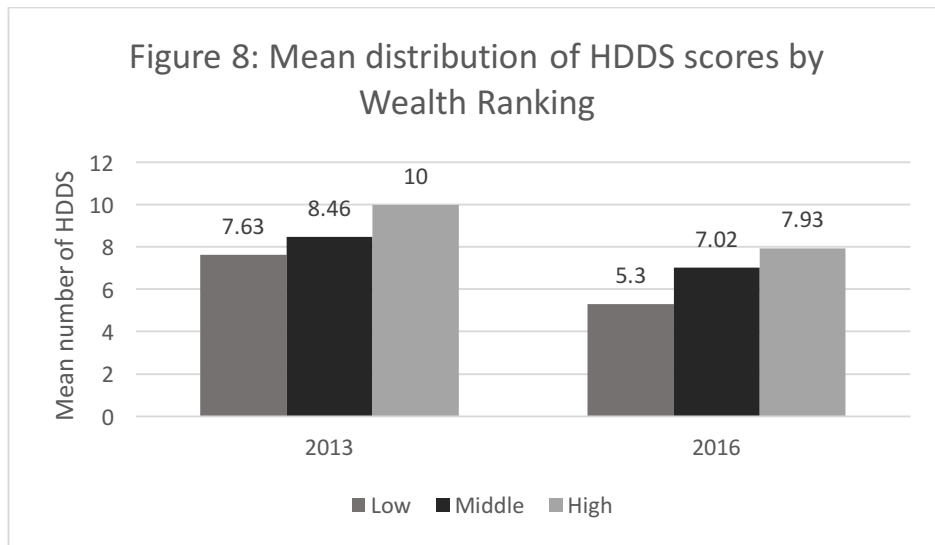


Figure 8 displays the mean distribution of HHDS scores disaggregated by wealth ranking for 2013 and 2016. The results from 2016 show a decrease in the mean for all wealth groups. Diet diversity increased with wealth status in both years. A comparative means test (ANOVA) was performed to determine the relationship between wealth groups and HDDS, and there was a statistically significant difference at the $p < .05$ level in HDDS for all wealth groups. ($F(2,905) = 13.95, p = 0.000$).

Hunger Gap

The hunger gap is the third indicator applied to measure the food security status of households. In each round households have been asked which months they found most difficult to access food. The households identified November through March as the hardest months. This reflects the FEWSNET seasonal calendar, Figure 9, which also identifies the most difficult season as November-March.

Figure 9: Seasonal Calendar (FEWSNET, 2016)

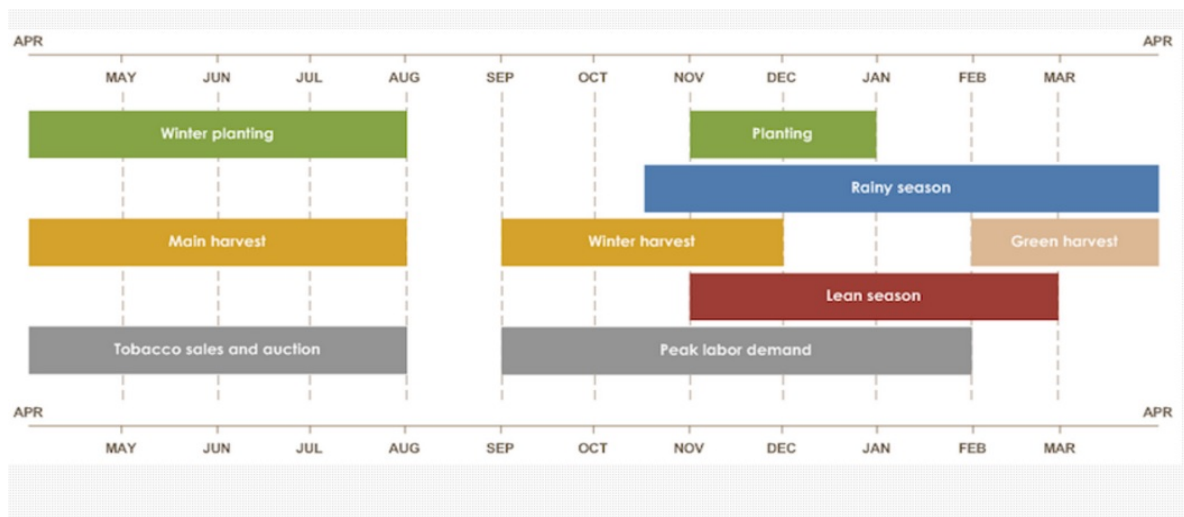


Table 6 shows the percentage of the sample responding that they had difficulties accessing sufficient food for more than 3 months has increased by 9.84% since 2013; conversely the percentage of households experiencing restricted access over 3 months or less has decreased. This correlates with national levels of food insecurity and the impact of floods and droughts. It also reflects the lean season which as shown in figure 9 covers 5 months (November-March).

Table 6: Percentage Distribution of Household Hunger Gap

Months	2013	2016
	%	%
0-3	89.74	79.1
>3	10.26	20.9

Financial Capital: Access to Saving & Credit

The 2013 research showed that there was a significant increase in the number of households saving since the baseline study of 2010. The 2016 results show that since 2013 there has been a decrease in household saving, although the number remains higher than the 2010 figure of 22 households. Regarding credit the number of households who have borrowed or taken out loans is significantly lower in 2016 than both 2010 and 2013. Table 7 shows the number and percentage of the sample with access to financial services for the 2010, 2013 and 2016 study rounds.

Table 7: Households Accessing Financial Services 2010-2016

	Savings		Credit	
	N	%	n	%
2010	22	11.28	64	32.82
2013	99	50.77	82	42.05
2016	51	25.4	36	17.9

The decrease in household savings may be partly due to the unforeseen impacts of bad weather and the increase in prices of farm inputs. Drawing on FGD data collected in all three districts in 2016, the main reasons for not saving are the immediate needs that households have; the decrease in crop production output has put many households under stress and their income is often spent on ensuring that the household has enough food, has enough seed for the next planting season and can pay school fees for children.

The issue of lack of seeds on the market is also driving the prices up, causing households to spend more on inputs and seeds than in previous years. The reason for the decline in households accessing credit has been highlighted as the reluctance of creditors to give loans and the rate of repayment in the current economic climate is extremely low. Referring to a key informant interview conducted in Salima, there is now a fear of accessing credit from non-

official creditors since if they cannot repay their loan on time, households may lose their land or livestock. In terms of official loans from financial institutions the number of households obtaining loans is extremely low.

During the 2013 round, it was highlighted that the reason for such an increase in savings compared with 2010 was the ‘Village Savings and Loans’ clubs that were established between 2012 and 2013. These clubs were targeted at women to promote local savings and loan groups but they have not been sustained since the changing of government. Table 8 displays the change in the locations of savings and illustrates the decrease of such clubs.

Table 8: Location of Household Savings (2013-2016)

	2013	2016
	n	n
Bank (commercial)	20	16
Club Village Savings & Loans	60	19
Home	10	14
Women’s Group	8	1
Other	1	1
Total	99	51

In relation to sources of credit the data in Table 9 reflects the impact of the ‘Village Savings and Loans’ clubs on access to credit. With the absence of such clubs’ households who do still gain credit often turn to non-official credit sources such as relatives or neighbours. The main reason for the discontinuation of the promotion of Village Savings and Loans clubs (VSLA) by the government is that they believe the concept of the VSLA does not achieve equitable access to credit or savings. There was concern that VSLAs were dominated by wealthier community members and were simply shifting the ways in which people borrow rather than providing financial access to new populations (Karlan, D. et al. 2012). The government has also stated that they will not support a concept that they see as one that pushed women further into poverty. During women only FGDs in Lilongwe, discussions around access to credit highlighted the frustrations of local women. They understand why the government withdrew support and discussed cases of mismanagement of local savings clubs but feel that the government should offer an alternative system. It was mentioned that the lack of access to saving institutions makes it increasingly difficult for women to partake in the decision making of how the household money should be spent. Government officials in certain areas have asked NGOs to stop advocating the concept. They feel that it was poorly implemented and has led to many households selling land in order to repay debts. The concept would be backed if NGOs could liaise with community district offices on how to best implement VSLAs. Any money that was saved with a VSLA was refunded to the member and loans were repaid through the selling of assets before closure (Khamula, O. 2015).

Table 9: Source of Household Credit 2013-2016

	2013	2016
	n	n
Bank (commercial)	3	3
Club Village Savings & Loans	19	0
CUMO	1	0
CUUM	1	0
Employer	2	0
FITSE	1	0
Home Bank	10	0
Money Lender	20	5
MRFC	1	0
Neighbour	8	8
NGO	1	2
Relative	12	13
SACCO	1	1
Women's Club	2	0
Other	0	4
Total	82	36

The reasons for households obtaining credit during the 2016 round are displayed in table 10. Seventeen of the households accessing credit responded with 'other'; table 11 explores what was included in the 'other' category. The two main reasons for obtaining credit are farm inputs and to meet food needs: this reflects the overall situation in these areas as each FGD and key informant interview noted that these are the two major issues constraining the immediate improvement of livelihoods. When the 'other' category is broken down it shows the third reason for obtaining credit is to pay for hospital bills; the price of medical care has increased and access to local health centres has become increasingly difficult due to lack of transport. Section 7 below further explores the shock of illness on households.

Table 10: Reasons for sourcing credit 2016

	2016
	n
To purchase inputs for crop production	8
To meet food needs	11
Other	17
Total	36

Table 11: Break down of 'other' category (reasons for sourcing credit) 2016

	2016
	N
To pay hospital bills	7
House improvements	5
School fees	3
Transport costs	2
Total	17

Natural Capital: Livestock Ownership

Livestock ownership is a measure of wealth status in Malawi, the number of livestock a household has is often an indicator of livelihood status. Livestock are also perceived as a liquid asset in periods of difficulty. Households sell or kill livestock in response to low cash flow or to meet food needs. The livestock market is subject to seasonality which means supply and demand fluctuate in a similar manner to agricultural commodities.

Table 12 shows the mean number of livestock per household for 2013 and 2016. The only notable change is the increase in the mean number of pigs and cattle/oxen, this reflects an increase in households in the high wealth ranking (see table 4), as the ownership of such animals is an indicator of high wealth status. The increase in the number of pigs, oxen or cattle during this round of data collection may be partly due to the season it was conducted in. Referring to Table 13 the best time of year for the sale of pigs, cattle or oxen is between May and August, therefore the number of livestock households have would likely be increased as they wait for better market prices. Livestock such as chickens and goats would be sold throughout the year; since their value is lower they are sold to bridge income gaps, while larger livestock are kept until the best price can be obtained.

Seasonal calendars were used in three Village Head FGDs to identify timelines in agricultural production and livestock sales and purchases. The data showed that households tend to purchase livestock at the beginning of the low season, late September-early October. The main livestock purchased during these times are pig and cattle/oxen. It was reported that many households recognise that during the low season some people are forced to sell large livestock for immediate income and livestock can be purchased at prices lower than market value. In such cases, households often are willing to travel further to buy livestock as they suspect that the price will be low. During the dry season people bring their livestock to the nearest river bed or Dimba areas, livestock are grazed near these damp areas until the rainy season arrives. In some areas, natural pasturing on Dimba areas is supplemented with crop residue saved during rainy season as livestock fodder.

Data collected through FGDs showed the prevalence of Chikodola (Newcastle Disease) in poultry has decreased in 2016. The participants were asked to rank the three most common

hazards in the production of crops and livestock over the last three years, both the 2nd and 3rd hazards referred to livestock. The 1st referred to bad weather conditions. During 2014 and 2015 Chikodola was ranked 2nd and goat diarrhoea was ranked 3rd. For 2016 goat diarrhoea was ranked higher than Chikodola.

Table 12: Mean Number of Livestock Owned by Households 2013-2016

	2013	2016
	n	n
Chicken	7.56	7.86
Goat	4.09	3.76
Pig	2.71	4.48
Cattle/Oxen	2.55	3.48

The livestock market is not a stable market and as mentioned prices fluctuate between seasons. Table 13 illustrates the results of combined FGDs on the high and low prices households would receive if they sold their livestock, depending on the time of year.

Table: 13 Market Prices of Livestock between seasons 2016

	Purchaser	Low Price (MWK)	Season	High Price (MWK)	Season
Chicken	Local Trader	500-750	Oct-April	1500-2000	May-Aug
Goat	Local Trader	11,000-12,000	Oct-April	15,000-17000	May-Aug
Pig	Local Trader	20,000	Oct-April	35000-40000	May-Aug
Cattle/Oxen	Local Trader	100,000	Oct-April	250,000-280,000	May-Aug

Respondents were asked what amount they received for the sale of their livestock over the last 12 months. When the mean values of each livestock class were calculated, and compared against the average prices of high and low seasons (see table 13) it showed that chickens were the only livestock that they received high season prices for. For all other livestock, the mean values fell within the low season price category. Suggesting that a high portion of households sold their livestock during the low season.

Households usually sell both livestock and crop production to local traders. Local traders are travelling traders, they buy directly from the households at the farm gate. Households usually receive low prices for their goods since there is little negotiation with local traders, and much of the time households are distress selling and have little access to transport to sell at larger markets. The issue of local traders buying at low prices during the lean season was an occurring theme throughout the entire data collection process.

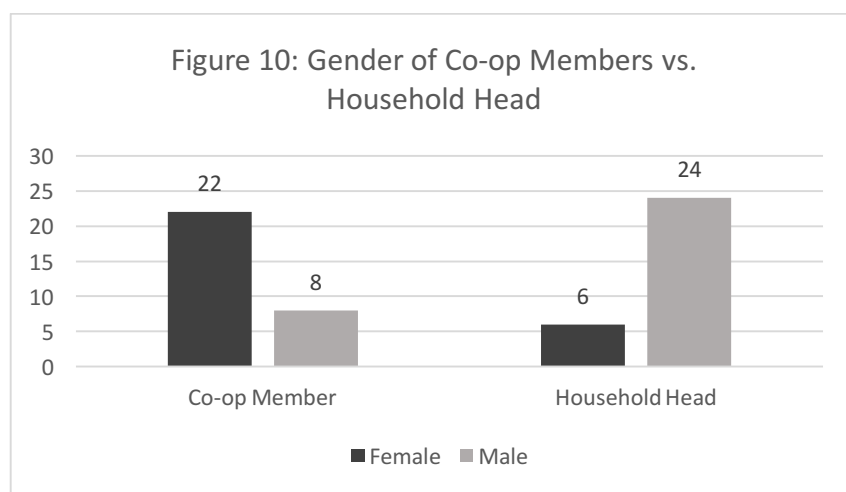
Social Capital

Social capital is one of the factors identified in the SLF that impacts on the livelihoods of households and communities. The OECD defines social capital as “networks together with shared norms, values and understandings that facilitate co-operation within or among groups”. (Keely, B. 2007) To fully encapsulate the livelihood status of a household a wider examination of external influencing factors within a community is crucial.

Mchinji Cooperative

Cooperatives have the potential to facilitate the mobilisation of local resources into a community-orientated business structure (Zeuli, K. & Radel, J. 2005). In late 2015 such mobilisation occurred when the Kasekese Cooperative Society Group (KCSG) was established by local farmers in the Mchinji area. The KCSG practice commercial farming and the processing of groundnut into peanut butter for sale. As of November 2016, 30 of the 71 sample households in Mchinji were members of the co-op, and 73% of membership was female. The KCSG focus their activities around improving three main issues in the Mchinji area: gender equity, food security and coping with climate change. The KCSG was set up to achieve better access to the groundnut market. They chose to cultivate groundnut as opposed to other cash crops as the cost of cultivation is considerably lower. The local community created the co-op, it stemmed from the aim to receive better and fairer prices for groundnut, while utilising the technologies and techniques learned through agricultural training and demonstrations on ExAgris farms. They also recognised the potential of adding value in a simple manner to groundnut by processing it to peanut butter: this simply involves adding salt to the groundnuts which are then passed through a machine to be made into peanut butter. This allows the co-op to now produce a valuable commodity to be sold at larger markets.

Although the 73% of the membership is female, only 20% of the females are household heads. Figure 10 illustrates the disaggregation of gender between co-op members and the gender of households within the co-op sample.



The cooperative was set up independently from the (Mchaisi) ExAgris farm located in Mchinji. However, the KCSG does not work in isolation from ExAgris, since its set up ExAgris has bought 31 tonnes of un-shelled groundnut from the co-op. ExAgris have also allotted 5 hectares of land to be used by the co-op for the cultivation of groundnut. The co-op was founded with the purpose of using the new methods and technologies learnt at ExAgris agricultural demonstrations to create a community oriented business, and since inception the co-op has not only cultivated large amount of groundnut, they have invested in adding value to the raw good. Since September, 2016 they have used a peanut butter machine to produce local peanut butter. They have been applying aflatoxin prevention methods throughout each stage of groundnut cultivation and processing, ensuring a high quality of nut. Currently the co-op awaits the quality approval stamp from the Malawi Bureau of Standards to gain access to larger markets, as their custom to date has been local markets.

The advantages of co-op membership are numerous. Drawing from the qualitative data gathered through FGDs with members of the KCSG, it can be concluded that access to markets has been greatly improved since the start-up of the co-op. A major issue regarding market access in each area of data collection is the role of local traders who distort the market: individual farmers sell their produce at low rates and have little or no power to negotiate, whereas the co-op has noted that they have more power to negotiate as they offer a higher quality and quantity of groundnut. They also have the option to sell directly to ExAgris. As a collective they have decided to produce groundnut as the cost from land acquisition to harvest, including aflatoxin prevention of cultivating groundnut is lower and requires fewer inputs than most other dual crops. There is also the benefit of collective credit: as a co-op access to credit is higher and it enhances power over decisions made regarding crops grown since the pressure to sell early is reduced. When seeking financial assistance from formal institutions there is increased access when applying as an established group. The amount of overall finance available is higher as it is borrowed/saved on a collective basis.

The aspirations of the co-op are to increase membership, to gain access to larger markets; both in the sale of nuts in shell and peanut butter. Once they have positive results from current projects, they plan to enter seed production.

The total number of households sampled in Mchinji was 71 (35.32% of total sample), of which 30 were members of the KCSG. The sample was divided into members and non-members and compared in terms of wealth ranking. Figure 11 shows the percentages of households within each wealth ranking by membership/non-membership of the co-op. A Chi-square test was performed to determine that the sample size was appropriate for analysis, the result was the expected cell frequency of 20.5, therefore the sample satisfies this test.

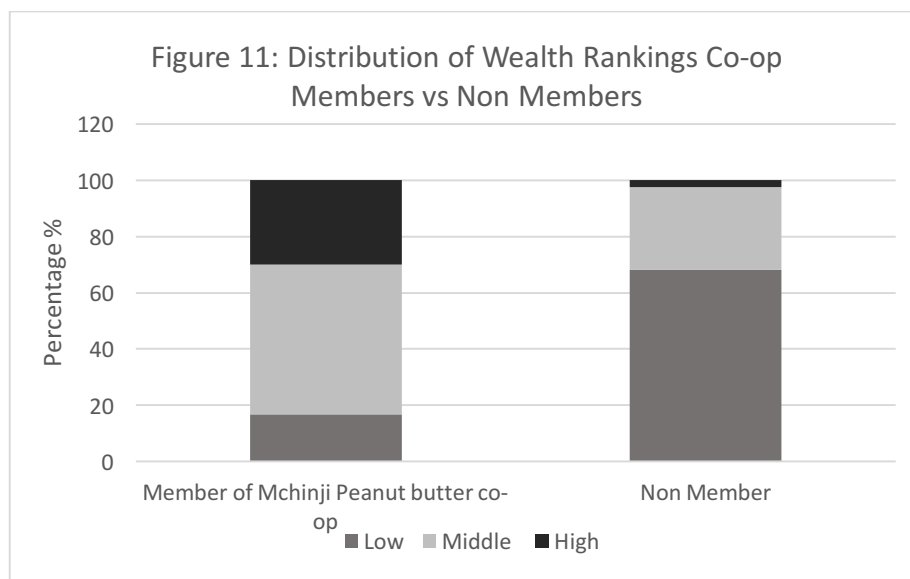


Figure 11 shows that there is a significant difference between wealth groups in relation to membership of the co-op. There are a higher proportion of people in the middle and high wealth groups within the members' sample compared to the non-members sample where the majority (84.8%) are in the low wealth group. There are two possible reasons for this increase with the high and middle wealth groups. It could be suggested that being a member of the KCSG is having a positive impact on livelihoods and plays a role in the increasing of households' livelihood status, shifting the sample households from low-middle. This could be due to the increase of income generated by the co-op from sales of peanut butter and direct sales of groundnut to ExAgris. Alternatively, it may be a result of the original wealth status of households that were involved in the setup of the co-op. It may be a case of households that have increased wealth had opportunity and resources to form the co-op. The data presents us with a question that needs further exploration: has the co-op led to increased wealth or has increased wealth led to the co-op?

The cooperative not only results in positive physical and financial outcomes but also demonstrates the growth of social capital. Drawing upon qualitative data gathered through FGDs there is a clear trend appearing in the willingness to take on business ventures as a community; both in Mchinji and Salima respondents expressed positive attitudes towards the set up and continuation of cooperatives. In Salima a women's group was observed packing bricks of manure: when questioned about their activities and what they hoped to achieve they spoke of forming a cooperative to sell manure. There was also interest from a mixed FGD in Salima to establish a co-op based around the communal purchase and use of farm equipment. In both Mchinji and Salima there were discussions on the potential of a financial credit co-op; the main conclusion was that they lack knowledge on how to achieve such goals. This is a significant change in trends towards community initiative and directly links to the wellbeing of communities. It should also be noted that on numerous occasions through FGDs, key informant interviews and general observation the role of ExAgris in developing social

responsibility was recognised. This specific supply chain intervention has proven to impact not just the income of individuals, but also the social environment.

Section 6: Crop Production as a Livelihood Strategy

Each year the respondents were asked a series of questions regarding crop production and sales. It is important to note that the 2016 data on crop production refers to the selling season 2015-2016 and the production season of 2016. The data from the 2013 round refers to the selling season of 2011-2012 and production season of 2012-2013.

The data relating to prices in 2016 reflect the inflation rate that has increased by 20.8% since 2013 (World Bank, 2016). Therefore, it should be kept in mind that although households are receiving more for their yield the price of inputs, land and other commodities have also increased. In order to assess the overall impact of price changes on farm income the gross margins for each crop have been calculated.

The data on crop production is positively skewed, so the median is used as a measure of central tendency together with the minimum and maximum values to display the range of values. Where the data is normally distributed the mean and standard deviation are used.

Land Ownership and Cultivation

The mean land ownership in 2016 was 1.05 hectares, there has been no significant change of mean land ownership since the initial baseline in 2010. However, Table 14 shows that the mean has levelled between districts in 2016 compared to 2013. The area of land owned by female headed households has marginally decreased, while the mean has increased slightly for male headed households. The high wealth group of 2013 had 0.48ha higher mean land ownership than the high wealth group in 2016. This could be due to decreasing of plot sizes due to population growth and the system of dividing land between family members. However, it is important to note that the reason for such a decrease in land ownership is not clear and allows scope for further exploration.

Table 14: Land Ownership 2013 & 2016 (ha)

	2013		2016	
	Mean	SD	Mean	SD
Total Sample	1.06	0.75	1.05	0.75
<i>District</i>				
Lilongwe	0.83	0.53	0.75	0.43
Mchinji	1.28	0.78	1.3	0.88
Salima	1.06	0.86	1.11	0.77
<i>Household Head Sex</i>				
Male HH	1.17	0.77	1.18	0.84
Female HH	0.9	0.7	0.78	0.44
<i>Wealth Groups</i>				
High	2.28	0.82	1.8	0.4
Middle	1.18	0.59	1.1	0.77
Low	0.6	0.44	0.7	0.82

The mean of land cultivated is 1.16 hectares, the mean of male headed household land cultivation is 1.31 ha compared to female headed households with a mean of 0.82 ha. This suggests that female headed households are disadvantaged in terms of both land ownership and cultivation.

Since the baseline study in 2010 there has been a steady decline in households renting out land. This may be due to the low total output in recent years and the fact that households are using more land but producing less, hence preferring to use land for dual crops, for example, maize, groundnut, or soya rather than cash crops only.¹¹ Only 12 households from the total sample had left land uncultivated, of these 12 many said they had given land to other family members to use for cultivation or other reasons. Table 15 shows households renting out land in 2013 and 2016.

Table 15: Land Rented Out by Households (2013-2016)

	Units	2013	2016
Rented out	No. of HH	13	10
Mean hectares rented out	ha per HH	0.68	0.76
Total rented out	ha	8.84	7.60
Mean rental cost	MWK per ha		22,225

By contrast, land rented in for cultivation use has increased significantly since 2013. The 2016 figures (Table 16) are closer to those in 2010, where 59 households rented in and the mean

¹¹ Dual crops are crops that can be used as a source of income (cash crops) or consumed by the household (food crop).

area of land rented was 0.69ha. It is important to note that the high number of households that reported renting in land may be referring to land they use on ExAgris estates and therefore may not be accurately representative of actual land rented in. However, the trend remains relevant as it underlines that there is a need for increased plot sizes for cultivation to contribute to an adequate livelihood.

The difference between the cost of renting out and the cost of renting in land relates to data collection. Households that have responded to either renting in/out land spread across all three districts, therefore the cost of renting relates to the households' location. It should also be noted that land ownership systems differ between areas, in more rural areas village chiefs distribute the land rather than governmental agencies. Land ownership and land acquisition policies can affect the cost of land rental differently between districts. The quality of land also impacts the cost of rent.

Table 16: Land Rented In by households (2013-2016)

	Units	2013	2016
Rented in	No. of HH	26	65
Mean hectares rented in	ha per HH	0.48	0.59
Total rented in	ha	12.48	38.35
Mean cost of land rented in	MWK per ha		25,885

Rainfed Cultivation

The sample households in this study, similarly to most households in Malawi, rely on rainfed crop production as their main source of food and income. This harvest, illustrated in Figure 9 (above) begins during the planting period after the first rains in October/November. The harvesting of the crops usually takes place between April-August. The crop production discussed below refers to rainfed crops. For the purpose of this analysis the median is used in some cases rather than the mean as the data is positively skewed.¹²

Maize Cultivation

This section examines household maize production. Maize production has been disaggregated between local and improved varieties. This allows for the tracking of trends/attitudes towards each variety. Local maize seeds can be saved and reused by farmers and are usually cheaper to purchase at markets and are seen to be more resilient to stress. Improved maize seeds (also known as hybrid maize) cannot be stored and reused and therefore require to be purchased each season, however they normally produce better yields.

¹² The median allows for a more accurate measurement of data as outliers/skewed data do not distort it. It is commonly used to analyse agricultural production and yields Manikandan, S. (2011). The median indicates the centrally placed value between the minimum and maximum values.

Table 17: Household Maize Production by Variety and Wealth groups 2012-2013 & 2015-2016

Season	HHs Cultivating n	Area cultivated ha	Median quantity harvested kg	Harvest Min-Max kg	Median yield kg/ha	Yield Min-Max kg/ha
<i>Local Maize</i>						
<i>2012-2013</i>						
Low	24	0.33	237	50-1,000	101	247-2,023
Middle	18	0.47	375	100-1,000	323	250-4,127
High	5	0.57	1,250	500-2,100	1,214	250-1,853
Total	47	0.4	275	50-2,100	824	247-1,853
<i>2015-2016</i>						
Low	26	0.41	225	3-1,100	300	140-900
Middle	17	0.62	600	200-1,500	494	100-1,600
High	6	0.61	1,400	500-2,000	741	329-1,235
Total	49	0.53	400	3-2,000	1,111	100-1,600
<i>Improved Maize</i>						
<i>2012-2013</i>						
Low	56	0.43	350	1-25,00	400	62-1,600
Middle	83	0.24	700	25-3,000	500	80-1,500
High	21	0.34	1,350	100-7,750	737	100-3,954
Total	160	0.4	500	1-7,750	1,235	62-3,954
<i>2015-2016</i>						
Low	61	0.6	300	20-1,250	850	0-3,088
Middle	74	0.59	675	100-3,000	1,214	0-3,053
High	30	0.95	1,675	600-9,000	1,976	123-3,506
Total	165	0.66	650	20-9,000	1,173	0-3,506

Table 17 shows that there has been little change in the number of households using local or improved maize, however there is an increase in the area cultivated. This is due to the increase in land rented in by households (Table 16). The reported reasons for such an increase is due to low total output caused by drought. Therefore, households must plant more seeds, use more land, and expect no real increase in total output. Interestingly the area of land used for the cultivation of improved maize has increased by 0.26 ha in 2016, yet the median quantity harvested has marginally increased and the median yield has marginally decreased. Regarding local maize both harvest and total output has increased compared to the previous levels of 2011-2012. The increase in the harvest of local maize may be thought to indicate increased use of inputs however it must be noted that this is not the case. When the cost of the production is calculated the price of purchased seed and fertilizer has increased and the number of days and costs of hired labour has decreased. However out of the sample

households 3 used hired labour for local maize and 15 used fertilizer, this shows that there is fewer households using inputs on local maize. The significant decline in households receiving FISP coupons has had a major impact on access to seeds. Secondly, the use of new agricultural techniques has increased, qualitative data shows the increase of knowledge and application of planting techniques. The use of crop rotation and inter cropping seems to be commonly applied, the use of natural compost from tree and plant foliage is also popular.

Table 17 shows the production of local and improved maize by each wealth group. Interesting the middle wealth group cultivating improved maize has a slightly lower median of hectares cultivated than the low wealth group yet the median quantity harvested and yield is higher for 2015-2016. This can be explained when the inputs of the wealth groups are broken down. The middle group has significantly higher percentage of households using fertilizer on improved maize than the low wealth group. 77.7% of the middle wealth group that cultivates improved maize uses fertilizer on their crops, compared to 62.5% of the lower wealth group. Unsurprisingly of the high wealth group 96% use fertilizer, this coupled with more area results higher harvests and total output. It should be noted that the quantities of fertilizer used by the low wealth group is less the other wealth groups. The median quantity of fertilizer used in the low wealth group is 20kg compared to 50kg and 75kg for middle and high wealth groups respectively. This pattern is also found with regards to local maize.

Accurately estimating the financial profit made from maize production can be difficult as market prices fluctuate considerably due to seasonality. The majority of maize produced by households is kept for consumption, this further reduces the accuracy of measuring exact financial benefits.

Table 18: Maize Sales by Household

	Proportion Selling	Quantity Sold (kg)		Income (MWK)	
	%	Median	Min-Max	Median	Min-Max
<i>Local Maize</i>					
2011-2012	13.16	145	50-550	10,500	2,000-33,000
2015-2016	6	125	50-500	18,000	4,000-75,000
<i>Improved Maize</i>					
2011-2012	45.38	250	50-2,700	12,000	300-80,000
2015-2016	31.2	275	25-3,500	20,000	500-90,000

Table 18 shows that the proportion of households selling both varieties has decreased. The quantity of local maize sold has decreased and the quantity of improved maize has increased. The income from sales has increased for both varieties, although the presence of overall price inflation must also be taken into consideration.

Households that did sell maize in 2016 sold to local traders at farm gate or at local markets. Those who sold at local markets are all from the Lilongwe district, and the average distance

travelled was 5km; these households were also the households that received the best prices for their maize. The remaining selling households sold to local traders (farm gate sales) who buy directly from the household and therefore there is no need for sellers to arrange transport. Lack of transport has recurred in every aspect of data collection, households feel that if they had access to better transport they would not sell to traders, and do so solely for convenience. Drawing on a key informant interview from the Salima district, which has the worst accessibility to markets, although the unwillingness of local traders to negotiate is a challenge for farmers selling maize, local traders are aware that fewer households are willing to sell maize and only do so if in need of emergency or immediate cash. Due to decreased maize sales from households, traders give fairer prices than before: the lack of supply creates better prices. However, this normally only applies to maize sales and is reversed regarding cash crop sales.

Table 19: Improved Maize Gross Margins

	Production Scenario 2011-2012		Production Scenario 2015-2016	
	units/ha	MK/ha	units/ha	MK/ha
<i>Gross revenue</i>				
Average Yield (kg/ha)	1,483		1,173	
Average price (MK/kg)	60		72	
Total Revenue		88,980		84,456
<i>Variable costs</i>				
Purchased seed (kg)	19	2,596	10	3,550
Fertilisers (kg)	211	12,272	100	7,000
Hired Labour days	86	21,412	50	21,947
Total Costs		36,280		32,497
Gross Margin		52,700		51,959
% Gross Margin		59%		61%

Table 19 illustrates that the quantity of inputs used has decreased since 2011-2012 yet the cost of overall inputs has not. This depicts the general situation in Malawi, where households are accessing fewer inputs and the prices of such inputs have increased. This may be in part due to the reduction of FISP subsidy programme. The average yield of improved maize has decreased but the price that it is being sold at is higher, as shown in Table 18. When the gross margin is calculated excluding the cost of land renting it shows an increase of 2%. However, there has been a significant increase in households renting land in to cultivate maize. The actual gross margin will be much lower when the cost of renting-in land is considered. Table 18 shows that households received higher income for maize sold, (both varieties) in 2015-2016, but that the proportion of households selling maize from their production is decreasing. Hence, the prices received for maize are higher yet the number of households benefiting are lower. The reason for decreased levels of sales is due to food insecurity, households are

consuming most of their total output as access to other sources of food is increasingly difficult.

Improved maize is producing slightly higher yields, however when the gross margin of local maize is calculated for the production scenario 2015-2016 there is a significant difference between varieties. The costs involved with the cultivation of local maize are much lower than improved maize. The price of seed is lower as many households recycle seed, the use of purchased fertilizer is lower and the number of hired labour is significantly lower. There is an opportunity cost of using local maize seeds regarding the quality of seed. Local maize seeds tend to be of a lesser quality. The calculated gross margin for local maize is 95.6%. There is need for further exploration around why households continue to cultivate improved maize as it could be suggested that local maize is more viable option for households.

Groundnut Cultivation

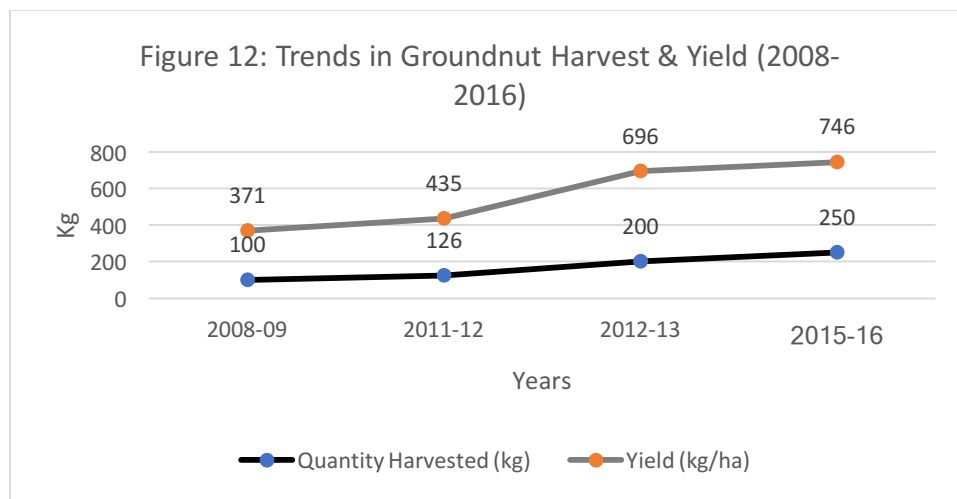
There has been no change in the total number of households cultivating groundnuts since 2013 but there has been an increase in land cultivated for groundnut production. Table 20 shows the increase in area cultivated in each category. This increase in land cultivation is reflected throughout this report. It is a combination of land rented in and the use of ExAgris plots given to farmers to cultivate groundnuts.

Interestingly the area of land households not involved in the association used for cultivating groundnut has increased. This is a positive shift as it shows the intervention is impacting a wider target than intended. Table 20 coupled with FDG data shows that there has sharing of knowledge. Many farmers spoke of how if one family member is part of the association it benefits the whole family as knowledge and techniques are shared.

Table 20: Groundnut Cultivation by Household & Area Cultivated

	Number of HHs Cultivating (n)		Area Cultivated (ha)	
	2012- 2013	2015-2016	2012-2013	2015-2016
Overall	156	156	0.36	0.48
<i>Membership</i>				
Association Member <4 yrs	52	14	0.35	0.64
Association Member 4 yrs	67	43	0.42	0.5
Association Member >4 yrs	n/a	60	n/a	0.41
Not a Member	37	39	0.31	0.52
<i>Wealth Ranking</i>				
Low	54	52	0.2	0.5
Middle	82	77	0.4	0.45
High	20	27	0.4	0.54

The mean yield for the overall sample in 2016 was 746kg/ha, this is an increase from the 2013 mean of 696kg/ha (for this analysis unless otherwise stated the groundnut quantities reported refer to nuts in shell ((NIS)). The data for quantities harvested is positively skewed, therefore the median and range will be used for analysis. There is a pattern of increasing quantities harvested since the baseline of 2010 (see Figure 12). The increase in groundnut total output highlights the resilience of groundnut as a crop even through years of bad weather it has continued to produce higher outputs and yields.



Despite this increase in production over the study period, there is a persistent challenge in acquiring good quality groundnut seeds. This was noted in the 2013 round and remains an issue. Access to seed is difficult for households, resulting in the use of recycled seeds and low yielding types of seeds. However, the overall percentage of households using improved seed has significantly increased (46%). Only 8.8% of the households purchased seeds last year, a decrease from other years; the main source of seeds was to buy from local traders.

Although there is a positive increase in the yield of groundnut the levels remain significantly lower than the potential yield of 2000-2500kg/ha. National yields average around 1000kg/ha. Showing that this is a nationwide challenge which requires national policy reform regarding access to farm inputs and credit (Cuddeford, V. 2014).

The growth in groundnut production can be attributed to its potential as a dual crop. Farmers receive better market prices for groundnuts than other dual crops and it requires fewer inputs. Farmers in Malawi do not usually use fertiliser when cultivating groundnut and this reduces the overall cost significantly, especially during a period when input costs are high. However, the total output could be increased significantly more if fertiliser was applied.

Groundnut cultivation is labour intensive and much of the labour is performed by the women and children of the households. Attitudes towards groundnut as a woman's crop is decreasing over time due to its commercial potential. This does not change the distribution of labour however; in each district women were responsible for the post-harvest activities associated with groundnut, such as harvesting, drying and shelling. Both men, women and children carry out land preparation, weeding and earthing up. The 2013 study showed that during the

weeding and planting season households employed ganyu labourers on their land. In 2016, remarkably there were no respondents that had employed labour from outside the family: the mean number of days that family labour was used for groundnut cultivation was 49 (SD 41.1). This has reduced the cost of cultivation significantly. It should be noted that the area of land cultivated with groundnuts is less than that with maize, hence there is less need for hired labour. Also, the trend towards selling NIS further reduces the need for external labour.

When questioned about decisions made in relation to the planting, consumption and sale of the crop, respondents answered that although the women are responsible for the labour the men usually make the decisions. Men decide in 54% of the households, women in 20% and joint decisions are made in 26%. The percentage of women making decisions in relation to the crop has increased by 13% since the 2013 study. However, the decision-making gender varies between the consumption and sale of the crop. In terms of decisions made regarding the consumption of groundnut 34.5% is male, 26.1% female and 37.8% are based on family discussions. In relation to sale of groundnut 34.5% male, 9.6% female and 55.9% family discussions. The data correlates with results from the women only FGDs; females have a greater decision power regarding consumption than the sale of the crop and increasingly decisions are made jointly.

Table 21: Groundnut Cultivation Gross Margins

	Production Scenario 2011-2012		Production Scenario 2015-2016	
	Units	MWK/ha	Units	MWK/ha
<i>Gross revenue</i>				
Average Yield (kg/ha)	435		746	
Average price (MWK/kg)	117		130	
Total Revenue		50,895		96,980
<i>Variable costs</i>				
Purchased seed (kg)	10	1,800	10	3,500
Pesticides (kg)	7	1,100	1	750
Hired Labour days	27	4,500	n/a	n/a
Total Costs		7,400		4,220
Gross Margin		43,495		92,760
% Gross Margin		85.46		95.45

Table 21 shows the gross profit margin of cultivating groundnut. Due to not using fertilisers the variable costs of cultivation are relatively low, pesticides are used but are not generally popular. According to responses of FGDs pesticides are normally used on groundnut if it is inter-cropped with crops that are prone to pests or disease. During the 2015-2016 season 11% of groundnut producing households inter-cropped with maize. The low levels of input

required to cultivate means that the gross profit margin remains high. Due to the absence of hired labour in 2016 the average gross margin was 95.45%.

Households consume part of their production; however, groundnut is generally seen as a cash crop first and a food crop when necessary. Although the average amount of seed purchased has reduced since 2013 the price of seeds has increased. Output prices are increasing but the cost of inputs, food from traders or markets, school fees and health care are also increasing; although they are receiving higher income, expenditures are also higher. The reduction in use of inputs again highlights the issue of limited access to credit.

Table 22: Groundnut Cultivation Gross Margins Between Wealth Groups (2016)

	Low		Middle		High	
	Units	MWK/ha	Units	MWK/ha	Units	MWK/ha
<i>Gross revenue</i>						
Average Yield (kg/ha)		447		771		1,219
Average price (MWK/kg)		152		147		285
Total Revenue		67,944		113,337		347,415
<i>Variable costs</i>						
Purchased seed (kg)	10	2,100	12	5,000	7.5	3,200
Pesticides (kg)	n/a	n/a	1	750	1.5	1,500
Total Costs		2,100		5,750		4,700
Gross Margin		65,844		107,587		342,715
% Gross Margin		96.90%		94.90%		98.60%

Table 22 disaggregates groundnut production gross margins between wealth groups. Interestingly the middle wealth group spends more on inputs, therefore decreasing the gross margin, but still do not produce better yields than the high wealth group. The low wealth group has a gross margin of 96.9% but inputs use is low. When use of inputs are disaggregated into wealth groups the results offer an explanation to the difference in yields. 52.5% of the low wealth group use recycled seed from previous harvests. The mean amount of recycled seed used by households within the low wealth group is 31kg. Low quality seed would have an impact on low yield. A much lower percentage of the higher wealth group use recycled seed. Purchasing seed is also more common within the middle and high groups. Within the middle wealth group not only do more households purchase seed, they purchase larger quantities of seed. The mean amount of seed purchased within the wealth groups are 6kg, 12kg and 9kg for low, middle, and high respectively. The difference in seed price may also be due to differing varieties of seed. The most popular seed purchased by the middle wealth group is Nambwindi, the low and high tend to buy Nsinjiro seed. Nambwindi seed is more expensive than Nsinjiro.

It could be hypothesised that the lower a household's income the less inputs used, the higher the income, the higher the input use. However, Table 22 shows that the middle wealth group used more purchased inputs than the higher wealth group but generated lower income, suggesting other factors are also involved in determining yields. One such factor may be adoption of improved techniques.

FGDs revealed that the increase in total output seen in recent years is influenced greatly by the advanced technologies communities are exposed to. Many farmers now practice the mandela cock technique and double row planting. Such techniques allow households to produce better quality groundnuts and save and store the harvest for longer. Farmers now also try to always sell nuts in shell as it is less labour intensive and sells better at markets, although the price for NIS is lower. Total yield is a major contributor to the increase in gross margin, this shows an agronomic influence which stems from the rise in knowledge of farming practices received in training and demonstrations. This is a direct positive effect of the supply chain intervention.

The difference between wealth groups may be partly due to access to inputs and access to selling markets: i.e. where households source their inputs and where they sell their product. Association membership may be a contributing factor to the difference in the price received for the sale of groundnuts. 87% of the high wealth group are members of the association. Being a member of the Mchinji peanut butter co-op and falling within the high wealth group may also account for the higher price received for groundnut sales.

The median quantity of groundnut being produced is higher than in 2013. Due to the lack of data between 2013 and 2016 questions relating to production in 2015 were also included. As one year recall is not an accurate method of estimation respondents were asked if they had produced more this year than last: 39% had produced more groundnuts while 61% produced less. The impact of groundnut income on the household was then discussed. Households that produced and sold more described the increase in income as small but having a significant impact on the day to day items they could now purchase. Items such as soap, salt and fabric are usually cut from expenditure when income is low, however in recent years it is noticeable that households have bought such items. Gaining insight from a semi-structured interview in the Lilongwe district, over the past 5 years there has been a slow but definite increase in livelihood improvement due to the cultivation of groundnut: seeing children in new clothes, the use of soap, housing improvements.

“It is not the big things that change, we are still poor, but the little things, like soap, like salt, some medicines, these things make a difference”

On a larger scale, households reported that if they can sell their groundnuts for a fair price they can pay for school fees and health bills, without their groundnut harvest they could not.

The percentage of households that sold groundnut from their own yields mirrors 2013 at 79%. Eighty-one per cent of those who sold chose to sell NIS and 19% sold shelled groundnuts. The

mean quantity sold in 2016 was 336.9kg (NIS) and 227.9kg (shelled). The median income received for sales was 24,000 MWK and 26,625 MWK for NIS and shelled respectively.

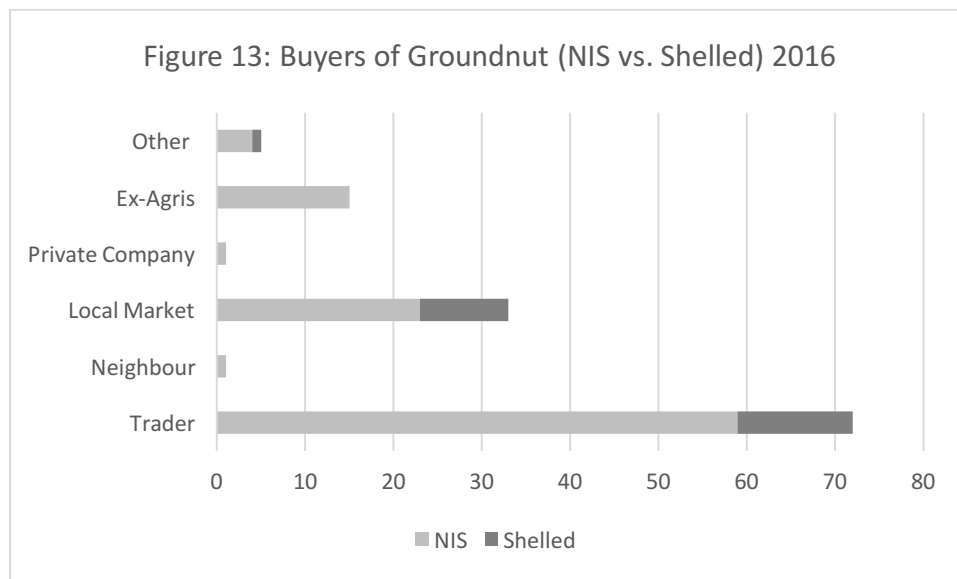


Figure 13 shows the buyers of household groundnut (2016) both NIS and shelled, most households sell early to meet immediate needs and their only option is to sell to local traders. ExAgris buys from households later in the season and the households cannot wait. The main reason for selling to local traders is the proximity and the time of sale. Many of the groundnut sales are distress sales to attempt to bridge an income gap. In Figure 13 'local market' refers to the nearest trading centre or smaller market area where farmers can sell directly to merchants, or in some cases sell directly to customers. 'Traders' refers to local traders who go to the household to buy direct from their villages.

Aflatoxin

Aflatoxins are naturally occurring, highly toxic substances caused by fungi that are produced on crops such as maize, paprika and groundnuts. Contamination can happen as a result of poor harvest practices, such as improper drying and storage. Poor quality kernels, that are either physically damaged or from a damaged plant, are extremely prone to contamination by aflatoxin.

ExAgris have been facilitating training and sensitisation around aflatoxin and its impact on health and crop production to members of the intervention associations since 2010. Results from the household surveys show that since 2010 the number of households aware of aflatoxin in the production of groundnuts has been increasing. The highest percentage of households, since the baseline, that were aware of aflatoxin was in 2013, 2016 showed 75.1% are aware. Table 23 shows that association membership has a positive impact on awareness of aflatoxin as the lowest percentage of awareness is amongst the non-member category.

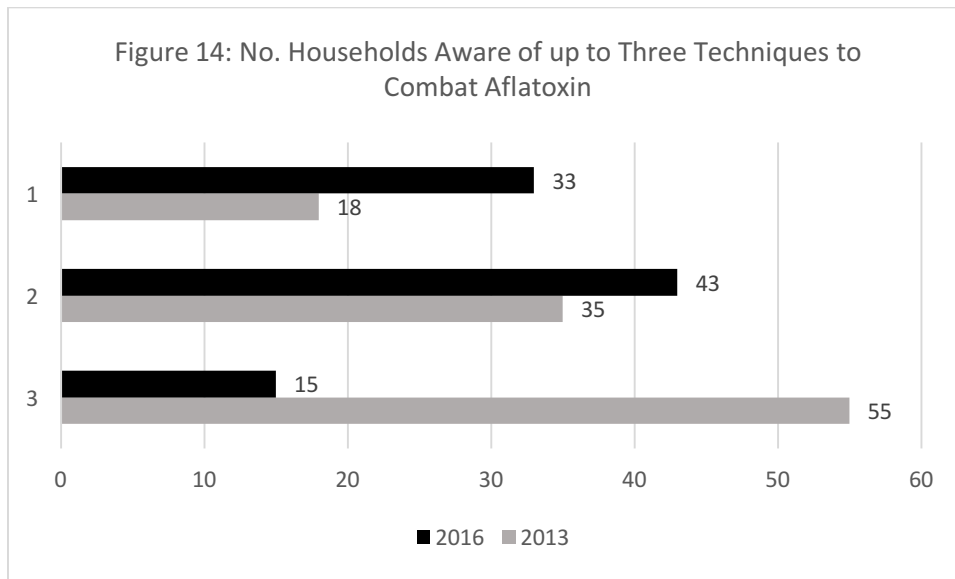
Table 23: Percentage Distribution of Respondents Reporting Awareness of Aflatoxin

	2010	2013	2016
	%	%	%
Overall	12.31	79.49	75.1
Association Membership <4yrs	13.48	70.79	82.4
Association Membership 4yrs	16.67	93.33	79.7
Association Membership >4yrs	n/a	n/a	76.3
Not a Member	4.35	78.26	64.4

Respondents were asked about the health implications of aflatoxin. There has been an increase from 53.33% (2013) to 55.7% in household awareness of the effects of aflatoxin on human health. Households responded that they are aware that aflatoxin causes cancer but many did not know what cancer was.

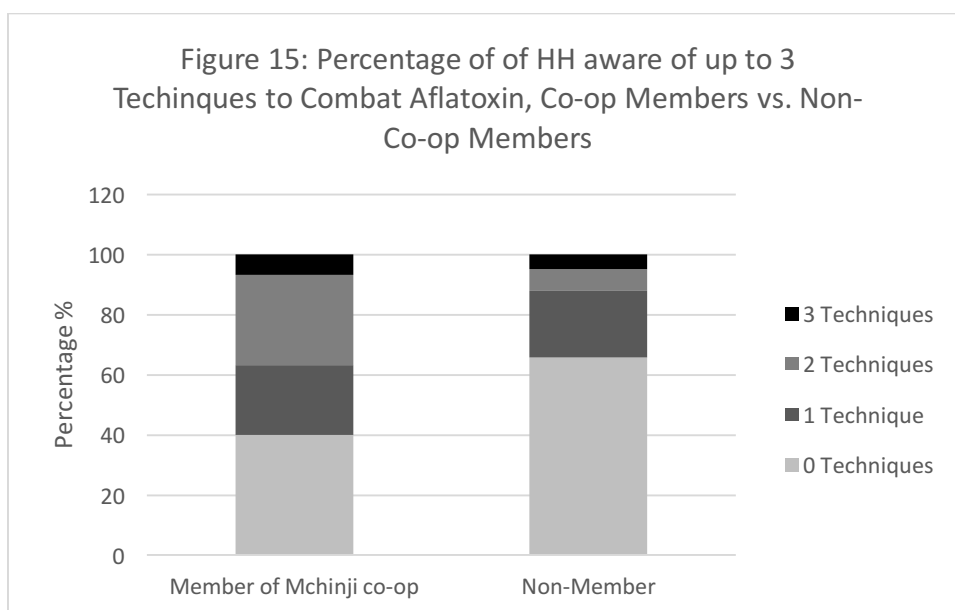
When asked what households do with groundnuts infected with aflatoxin 40% responded that they consumed them. The affected groundnuts were consumed in various forms, ground into flour or charred then eaten whole. The reasons are varied; households do not weigh the risk of cancer above the food security of their households, in some cases it is the only food crop they have and if they cannot sell it would be a waste not to eat. Another reason is linked to the fact that they do not have much knowledge of cancer. Village Heads in Salima explained that the word cancer has many translations in Chichewa and the causes for the disease are so many that aflatoxin is not seen to be posing a high enough risk to not eat the groundnuts. Aflatoxin awareness is taken seriously as it affects the households' access to markets and buyers, however this awareness does not translate into their own homes. Others responded that they sold the affected nuts on the black market. 60% of households say they dispose of affected groundnuts.

Each year participants were asked to name three techniques to prevent aflatoxin contamination. 2016 results differ significantly from 2013, suggesting at first glance that there has been a decrease in awareness. Figure 14 shows the number of techniques households were aware of, it can be seen that there has been an increase in households with knowledge of 1 or 2 techniques however there is a significant reduction in the number of households aware of three techniques to combat aflatoxin. The overall number of households with no knowledge of techniques is also larger in 2016 than 2013. Drawing on insights from a key informant interviewee whose position was as trainer and demonstrator for ExAgris association members, the reasons for farmers not applying learnt techniques on their own plots of land may be due to lack of interest or fear of jeopardising their normal output by trying something different. During the last round of demonstrations conducted in the Lilongwe area 90 farmers attended: when asked how many practiced learnt techniques at home the answer was 45.



The decrease in the number of households aware of three techniques to combat aflatoxin may however not be due to lack of knowledge but rather that farmers have tried out techniques and identified those which are successful, therefore one or two are now implemented as the norm. Positively the number of households who reported having groundnuts rejected by buyers has increased from 6 to 25. This shows that there has been a general increase in awareness of aflatoxin and that buyers are beginning to notice the economic difference between 'good' and 'bad' nuts.

The Mchinji cooperative has had a positive influence on aflatoxin awareness: due to strict regulations on the selling of groundnuts at the public market the co-op have invested in prevention of aflatoxin to ensure a high-quality product that will past export standards. In doing so the members of the co-op have been exposed to methods of prevention. Figure 15 shows that households involved in the co-op have higher awareness of combating techniques.



Soya Bean Cultivation

Soya bean has been heavily promoted in agricultural and nutritional development programmes by governmental departments and NGO actors in recent years. It has also been promoted by ExAgris which is now involved in producing soya bean based products. Table 24 shows the increase in the number of households cultivating soya bean between 2013 and 2016. The number of households cultivating is at its highest since the baseline study with an overall increase of 36% since 2010. The increase may be attributed to the promotion of soya bean through the association and the availability of improved seed. The overall mean area planted to soya bean has increased.

Table 24: No. of HHs Cultivating Soya Bean & Area Cultivated

	2013	2016	2013	2016
	n	n	Ha	Ha
Overall	50	72	0.22	0.35
Association Member <4yrs	22	7	0.25	0.41
Association Member 4yrs	20	21	0.15	0.4
Association Member > 4yrs	n/a	27	n/a	0.3
Not a Member	8	17	0.27	0.43

The national production of soya bean over the past ten years has been growing at about 4.6% annually. (Kananji, G. et al. 2013) The national demand was 11,000 metric tonnes which caused the farmers to increase their production areas, this national increase is reflected in Table 24. However, soybean yields remain low as farmers at a national level obtain an average yield of 800 kg/ha against the potential yield of 2000-2500 kg/ha. It is clear from Table 25 that the sample households, though increasing production area, have lower yields, lower than the 2013 study round and lower than national averages. The 2016 yield is likely to have been influenced by droughts and unpredicted rain fall. It follows the pattern occurring for many crops, where the area and amount of seed used is increasing but the yield is not: households are planting more in an attempt to combat low yields. There is also the challenge of increasing prices of fertiliser and pesticides, this affects households' access to inputs and greatly impacts on yields and total production. Nonetheless the popularity of soybean as a dual crop is increasing.¹³

¹³ Valid Nutrition Malawi have commenced the development of a recipe for soya based RUTF.

Table 25: Quantity of Soya Bean Harvested (kg) & Yield (kg/ha)

	Quantity Harvested (kg)		Yield (kg/ha)	
	2013	2016	2013	2016
Overall	70	172	494	251
Association Member <4yrs	60	215	351	258
Association Member 4yrs	83	144	741	230
Association Member > 4yrs	n/a	190	n/a	302
Not a Member	120	162	432	190

Table 26 shows the rise in costs associated with soybean cultivation and shows a decrease in overall percentage gross margin, although the gross margin is higher in absolute terms. Similar to groundnut production, as the price of inputs increase the selling price also increases: soya beans are more sensitive to drought, but there is a price increase when supply shortages occur. Hired labour was again not used due to lack of disposable income.

Table 26: Soya Bean Cultivation Gross Margins

	Production Scenario 2012- 2013		Production Scenario 2015- 2016	
	Units	MK/ha	Units	MK/ha
<i>Gross revenue</i>				
Average Yield (kg/ha)	494		251	
Average price (MK/kg)	137		308	
Total Revenue		67,678		77,308
<i>Variable costs</i>				
Purchased seed (kg)	3	489	10	3,500
Fertiliser (kg)	6	3,040	15	6,580
Pesticides (kg)	7	1,850	-	-
Total Costs		5,379		10,080
Gross Margin		62,299		67,228
% Gross Margin		92.1%		86.9%

In recent years, due to the national demand for soybean as a cash crop used to feed the poultry industry and the role of grain traders the soybean market has stabilised somewhat. The government has introduced more regulated export policies. Table 27 illustrates the rise in soybean sales and prices since 2011-2012.

Table 27: Soya Bean Sales per Household

	n	Quantity Sold (kg)	Price Received (MWK)	Price per kg (MWK/kg)
2011-2012	48	52	8,500	137
2015-2016	68	126	27,594	308

The main buyers of soybean are local traders. ExAgris are becoming the second most prominent buyer of soybean from households. When selling to the association households are guaranteed a stable price.

Soya bean production has increased in popularity as is fast becoming one of Malawi's most produced crops. For the sample households, there has been a larger increase in households cultivating soybean than any other crop. Figure 16 illustrates that between 2013 and 2016 there has been an increase of 29 households producing soybean.

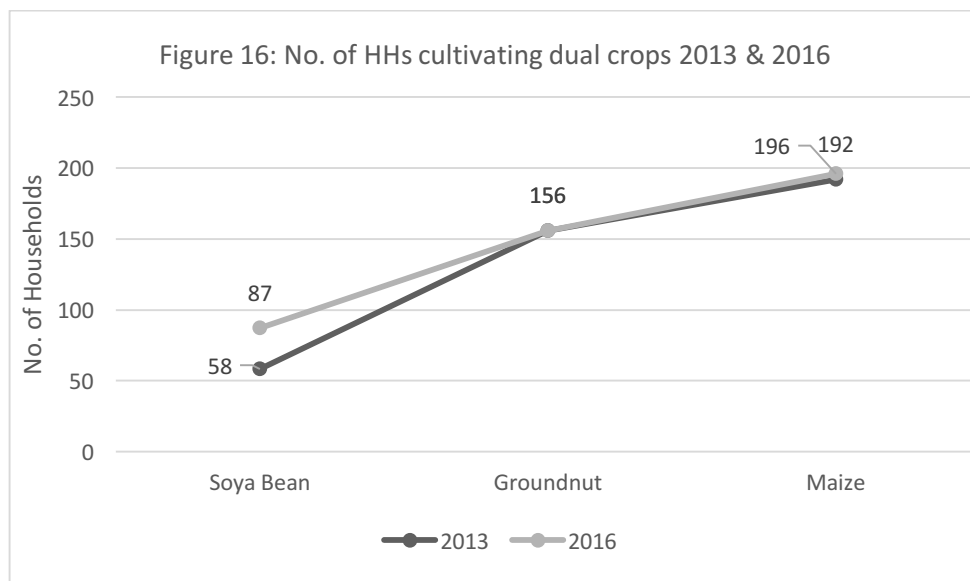
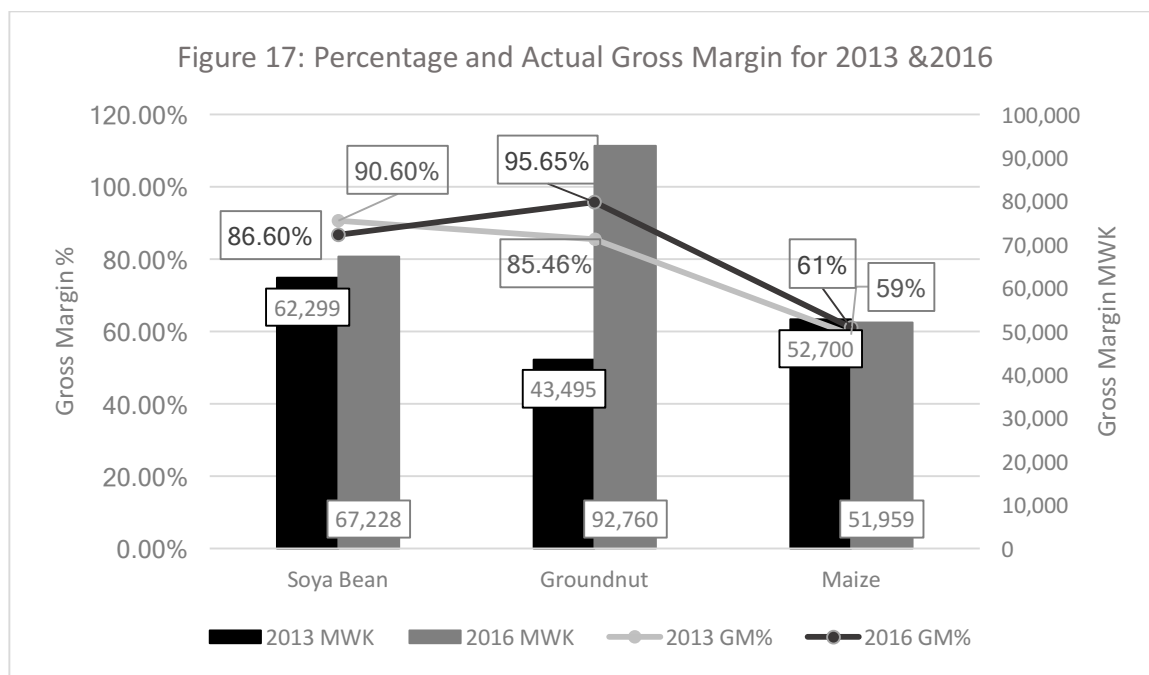


Figure 17 illustrates the changes in percentage gross margin in producing soya bean, groundnut, and maize between 2013 and 2016 alongside the actual gross margins for each crop between 2013 and 2016. There has been an increase in both maize and groundnut gross margin percentages, and a decrease in soya bean. It also shows that groundnut is the most viable cash crop to cultivate at the present time: the fact that farmers do not use fertiliser, can recycle seeds, and only use family labour, reduced the costs of production significantly. If the market prices stabilise groundnut will continue to be a popular and successful cash crop, directly improving livelihoods.



Investing in fertiliser would benefit many households: the challenge facing farmers is not the lack of fertiliser or the price, it is the lack of access to credit to be able to purchase fertiliser. There is ample evidence to show production and income would increase with better access to credit. This needs to be addressed through policy reforms.

Although maize cultivation is not as profitable as other crops farmers continue to cultivate to meet household food needs: if farmers did not produce and relied on purchasing maize for household consumption the price of maize would increase significantly and their access would be at risk. By maintaining a steady supply, market demand is lower, hence prices remain low.

Tobacco and Cotton Production

The study sample shows an increase in tobacco cultivation; the majority of tobacco grown was burley which was grown mainly in the Salima area. There has been a shift in attitudes towards the production of cash crops that are not dual crops. Due to the instability of food security in recent years, households are much more prone to invest in cultivating crops like groundnuts or soy that can be consumed in times of food shortage. This shift is apparent in regard to cotton cultivation, where there is a sharp decline in the number of households that have planted or harvested cotton during 2015-2016.

The increase in area planted to tobacco cultivation is in line with national levels of area increasing even though the number of households cultivating is declining. The selling prices of both crops are subject to fluctuation as they are sold in a more structured format than dual crops: the crops are sold at auction and the farmer is completely powerless in negotiation.

The selling prices are however high as there is a lack of supply presently. Table 28 illustrates the change in cultivation of both tobacco and cotton between 2013 and 2016.

Table 28: Cash Crops Tobacco & Cotton Descriptive 2013 & 2016

	Tobacco		Cotton	
	2013	2016	2013	2016
No. of HH Cultivating (n)	21	26	25	10
Mean Area Cultivated (ha)	0.41	1.2	0.33	0.33
Quantity Harvested (kg)	400	451	86	202
Yield (kg/ha)	988	772	494	682
Quantity Sold (kg)	300	424	200	202
Price Received (MWK)	120,000	142,005	27,350	19,753
Price per kg (MWK/kg)	448	625	137	181

The place of cash crops such as tobacco and cotton is fading in smallholder farming. The attraction of dual crops is too acute in times of uncertain harvests and climate change. The emerging markets for groundnut and soybean have enabled change in the choice of crops.

Household were asked their preferences on which crop to produce. 74.6% chose groundnut, 25.4% chose soybean. When households that do not currently produce groundnut or soybean were asked if would they like to in the future , 98% responded 'yes'.

Table 29: Household Crop Combination by Season

	2012-2013	2015-2016
<i>1 Cash Crop produced</i>		
Cotton	6	2
Groundnut	88	66
Soybean	3	13
Tobacco	0	4
	97	85
<i>2 Cash Crops produced</i>		
Cotton & Groundnut	13	4
Cotton & Tobacco	1	0
Groundnut & Soybean	31	53
Groundnut & Tobacco	9	12
Soybean & Tobacco	1	2
Soybean & Cotton	0	1
	55	72
<i>3 Cash Crops produced</i>		
Cotton & Groundnut & Soya	5	2
Groundnut & Soybean & Tobacco	10	16
	15	18
<i>No Cash Crop</i>	28	26

Table 29 presents the pattern of multiple cropping of cash crops. The move from households cultivating one crop to two is highlighted. The slight decrease since 2013 in households single cropping reflects the increase in households cultivating 2 or more cash crops. Groundnut remains the most popular cash crop to cultivate and for those cultivating 2 cash crops, groundnut and soya are preferred. Those who do cultivate tobacco mostly cultivate it in conjunction with either groundnut or soya, or both. Table 29 further illustrates the decline in cotton cultivation.

Section 7: Shocks and Responses

This section will explore the shocks, the causes, the time period, and the responses to such shocks at both household and national levels. Households were asked to list shocks they experienced during the last year in order of significance. The results show that the main shock was bad harvests, then illness/death of a household member and theft respectively. This section will explore the shocks, the causes, the time period, and the responses to such shocks at both household and national levels. The following discussion illustrates the impact of unforeseen shocks and how environmental and economic shocks can leave households vulnerable to food insecurity, relating to the vulnerability context illustrated in the SLF (figure 2).

Shock 1: Bad Harvests

Households are struggling to produce sufficient levels of output. There is a higher occurrence of poor harvests and even poorer total output. Yields of improved maize and soybean have decreased even though the area of land given to production has increased. World Bank (2016) estimates a 12.4% decline in maize production for the 2015/2016 growing season nationally.

They are two main causes of the low production rates of 2015/2016: lack of inputs and unpredictable and bad weather. Throughout both quantitative and qualitative data collection households repeated that these two factors were continuous constraints on livelihood improvements. Households are to some extent in a vicious cycle: the ability to respond to shocks is determined by the livelihood outcomes achieved. The lower the livelihood outcomes the more vulnerable households are.

Lack of inputs

Lack of inputs has been an issue since the 2010 baseline, farmers are not accessing the required farm inputs to substantially increase output. The recycling of seeds and lack of appropriate fertiliser is damaging outputs, sales, soils, and food security. When asked what is done in response to lack of inputs households responded that in most cases they try to find extra income to buy seeds or fertiliser. However, over the last 2 years, households have been using most of their disposable income on purchasing food commodities and therefore have not spent much of their income on farming inputs.

In the last decade, the importance of transforming structures and processes and how these influence access to the five livelihood capitals (i.e. human, natural, financial, social and physical), has become apparent. Yet social protection programmes in Malawi have decreased. With the stark decline in number of households benefiting from FISP the access to fertiliser is low. Providing coupons for farming inputs to households is one of the government's main responses to lack of inputs.

30.7% of households have received coupons from the government targeted inputs programmes. 31.1% of those households received fertilizer coupons, 26.9% purchased fertiliser with these coupons, and the mean estimated market value of the coupons was 9,131 MWK. The additional cash amount spent by the households sourcing fertiliser with coupons was 3,864 MWK: this figure refers to the amount of the household's money used to access fertiliser with the coupon, for example, transport costs.

26.4% of households received seed coupons and 21.4% purchased seed with the coupons. The mean estimated market value of this seed was 2,568 MWK. The mean amount spent on sourcing seeds with the coupon was 1,028 MWK.

3.4% households benefited in the last 12 months from inputs-for-work. The estimated market value was 9,312 MWK. The decrease in households benefiting from this programme would have a significant impact on the amount of inputs a household would receive: often one or more household member would participate in inputs-for-work and use it on the family plot.

20.6% of households benefited from cash-for-work programmes. The mean cash received was 19,969 MWK. 8% benefited from food-for-work.

The decline of FISP has affected access to inputs significantly. Although the programme was flawed it did ensure that a portion of households received better access to inputs. The reduction of FISP recipients and the shocking lack of access to credit over the three years have damaged agricultural production. The use of inputs has a direct impact on household production and the lack of such inputs is only furthering the vulnerability of households particularly during times of bad weather. The gross margin calculated for the cultivation of groundnut (Table 21) and soya (Table 26) show that there is potential for a high return on inputs and the probable solution to the issue is access to credit.

Bad Weather

During the rainy season between October 2015 to March 2016, Malawi experienced extreme drought, which devastated many rainfed crop harvests. The result was low output, poor quality harvests and extreme shortages of food. Food security declined rapidly and levels of malnutrition rose. Households reported that after 2016 few families have savings as they spent them to fill the hunger gap. The government and development organisations distributed free food/maize in response to food insecurity, 14.3% of the sample households benefited from this. The households' response to bad weather and low output was winter cultivation. The government propose an increase of conservation agriculture in response to bad weather. The adoption of conservation agriculture could aid in households increasing protection against weather shocks.

Winter cultivation is also known as wetland (Dimba) cultivation. It is commonly practiced during the dry season to help alleviate the hunger gap. Households normally cultivate vegetables and small amounts of maize. Yields are generally higher in Dimba soil as the soil has retained nutrients. During the droughts, lack of irrigation for Dimba cultivation proved

difficult. During FGDs and key informant interviews it was clear people's attitudes towards Dimba cultivation were becoming frustrated. Households are investing in small areas of land and trying to irrigate extremely dry soil and the total output is extremely low. 60% of households that reported climate change as one of the most significant shocks last year have said their Dimba crops have failed.

" We are tired, we put more time, more money and labour into vegetables and there is no result at the end."

Participants reported that the worst time of the year was not during harvest, when they realise their total output is low but it occurs almost like a ripple effect throughout the year. The most stressful months of the year were reported as January, February, and June.

Shock 2: Illness

The prevalence of illness has increased since the drought season. FGDs explored the reasons behind this. The worst time of year for illness and deaths is during the lean season, November-March.

Households feel the lack of access to clean water is adversely affecting them. In Salima during a FGD it was reported that there had been a development intervention in some of the villages to provide wells and safe drinking water, however, respondents mentioned that the wells were almost 10-15km away and only 5 villages out of the 32 villages surrounding the area have access to them. What water is available is shared by people and animals. The number of fatal malaria cases have increased.

The lack of access to clean water and food insecurity is also leading to a rise in HIV related deaths. In 2015 27,000 Malawians died from HIV-related illnesses. (Avert, 2017) Without proper food and water the treatment for HIV does not have its full effect. 54.2% of households reported that a family or household member had died in 2016.

Households respond to illness by seeking immediate cash flow to pay for medical bills and transport to hospital. This is done; by premature sale of livestock or crops, the sale of household food crops, or using school fees for medical bills.

Shock 3: Theft

Theft was the third most significant shock reported. FGDs spoke of how it is a desperate time in Malawi and people need to survive, with this comes crime and theft. Farmers can understand why someone could steal but the impact of losing livestock, stored seeds, stored maize etc. is devastating to the general income and livelihood of a household.

Interestingly in Salima theft has brought the community closer. Since ExAgris has begun farming in Salima the local villages look over the association land to make sure there is no theft. This has now transferred to household plots also. In Salima each village has a "security

guard” to keep an eye on crops, theft has happened to many people over the last year and the village are considering communally buying a bicycle for the patrolling of crops and villages.

Section 8: Conclusion

This report has analysed the results of the research in terms of households and their livelihoods while specifically focusing on farmers as groundnut producers. In terms of the overall livelihood and food security situation of the households, the results show that there are fewer households in low and middle wealth rankings and a 4.6% increase in households in the high wealth ranking.

The results show that those who are within the high wealth group are experiencing livelihood improvements but this is not the case for other households. Maize consumption from own production has decreased for all wealth groups except the high wealth group. The HFIAS score has increased significantly since 2013 illustrating that food insecurity is growing. HDDS also indicates the food insecurity situation is getting worse. The hunger gap is also increasing: in 2013 10.26% of households felt stress accessing food for more than three months of the year, compared to 20.9% of households in 2016, almost double the number. This is reflected in the national maize production deficit that the UNOCHA (2016) estimates at 700,000 tonnes. At a national level there has been a 39.5% increase in severe acute malnutrition and a 73.9% increase in moderate acute malnutrition admissions throughout the first half of 2016 compared to the same period in 2015. (UNOCHA, 2016) The impact of flooding and drought on food security is clear.

The previous report based on 2013 data identified constraints and potential remedies to livelihood improvement, as shown in Table 30. The following discussion compares the current situation with that discussed in 2013 to assess changes and continued challenges.

Table 30: Economic constraints and remedies (2013) ¹⁴

Factors affecting decisions about cash cropping and marketing	Options for changes in production and trading	Resulting changes in economic terms	Main Current Constraints	Main enabling policy shifts and implementation changes needed
Vulnerability - Economic - Environmental Assets - Human - Social - Natural resources - Physical infrastructure - Financial Policies, Institutions and processes	Scale of production	More groundnuts for sale	Land ownership, No cash for advance rent, Low maize yields	Land ownership, Credit promotion
	Input management	Lower costs, better yields	Lack of inputs, lack of money	FISP rethink Credit promotion, Comms infrastructure
	New techniques	Better yields, less post harvest loss	Seed/ drying and shelling	Better seed availability Improved extension Conservation Ag?
	Marketing channels	Better prices	Distress sales info gaps, farmer disorganisation	Credit promotion Information comms. Farmer organisations
	Aflatoxin control	Better prices Lower crop losses	Harvesting/ storage and marketing methods	Health standards enforcement, Sell nuts in shells No waste processing
	All of the above	Better gross income, Better margins		

The left-hand column sets out the three main components of a livelihoods framework i.e. Vulnerability, Assets and Policies Institutions and Processes. These factors influence farmers' decision making in relation to crop production. The second column lists all the options open to farmers for improvements in production and trading while the next column shows the benefits to be gained from each change. For each production and trading option the main current constraints are set out in the fourth column with the main remedy in the final column.

Table 30 shows that the main suggestions from the 2013 analysis were to move away from widespread subsidy of maize fertiliser and enable farmers to access affordable credit so that they could make decisions regarding farm diversification and purchase inputs which would create meaningful returns for households across a wide range of parameters such as labour demand and food security. It was suggested that an affordable credit system could be facilitated using electronic telecommunications infrastructure which would bring benefits to the national agricultural input and output marketing systems. However, from the analysis of 2016 data it can be concluded that there has been little progress in developing a method of increased access to credit or savings institutions. If anything, access to credit has reduced

¹⁴ Table 29 developed by H. Dalzell from concepts in Chou Panith 2011

since the decline in VLSAs. The significant barriers to credit are having a direct negative effect on access to inputs and on overall agricultural production, thus challenging the improvement of livelihoods. Access to credit must be addressed as a national priority and adequate policy reforms should be implemented at a government level.

The phasing out of FISP was mentioned as an avenue to promote alternative ways of farming, Table 30 suggests that the downward investment in FISP would release funds for the promotion of many of the policy changes and implementation required. Although the government has almost ceased FISP it has not been replaced with a more sustainable and efficient programme. The government has announced, on numerous occasions, the promotion of a shift towards conservation agriculture, however the implementations and planning of such actions have fallen short. Prices of fertiliser and seeds have increased, cost of labour has increased and this is all at a time when the weather is unfavourable to crop growth. The responses to these challenges are not sustainable and currently do not provide many households with financial relief and support. There is a need for the Malawian government to invest both time and funding in ensuring better access to inputs. As reflected throughout the entire report lack of inputs is diminishing the agricultural sector's ability to reach potential outputs. An increase in the sector's outputs would have a major positive impact on livelihood improvements.

In 2013 it was concluded that the overall market process is inadequate and would benefit hugely from the stimulation of small farmer organisations to allow farmers to gain more influence in the value chain and to be able to access market information more easily. Results from 2016 show a positive move towards the setup of cooperatives. The setup of the Mchinji co-op demonstrates how farmer mobilisation can positively influence the value chain. The results surrounding farmers' interest in community based initiatives such as community approaches to farming, cooperative banking and commercial farming and community orientated enterprises, display positive progress. This relates to the social capital aspect of the SLF and could result in a decrease of the vulnerability of households. It also shows that some of the barriers to markets have been recognised and action is being taken to overcome them. There was a significant difference in the proportion of co-op members in the middle and high wealth ranking than among non-co-op members. The co-op also address gender issues, the majority of its members are female and facilitates an increase in decision making for women.

Some of the remedies suggested in Table 30 occur several times, as they affect more than one production and/or trading option. The positive change and promotion regarding cooperatives can also remedy more than one challenge. Cooperative farming increases access to financial institutions, thus increasing the purchasing power for inputs; it allows for higher leverage when negotiating prices, hence market knowledge improves. The adding of value to crops also demonstrates market knowledge. The awareness surrounding aflatoxin has also increased: this is an important development, since to be a sustainable seller of groundnuts and peanut butter the Mchinji co-op must meet regulations and standards for high quality

groundnut production. The co-op has used grading and other techniques to ensure their products are not rejected at market.

The continued production of groundnuts has shown positive outcomes in terms of total output and better use of new techniques. Areas that remain problematic are unrealised potential yields, the selling to local traders (market access) and lack of inputs.

It is noticeable that in terms of livestock ownership valuable livestock (Pig/Cattle/Oxen) have increased and holdings of less valuable livestock (chickens/goats) have either remained the same or decreased. A pattern can be seen throughout the findings, low and middle wealth groups are remaining stagnant and the high wealth group is seeing improvements in livelihoods. It can be concluded that the low and middle wealth households are getting poorer and the high wealth households are getting wealthier. Although the number of sample households in the high wealth category has increased somewhat, a substantial majority of households fall within other wealth categories, so this dynamic is a cause for concern.

There is no real change in land ownership but higher areas of land are being cultivated. The rise in the number of households renting in land to attempt to increase output is a direct response to the bad harvests induced by droughts during the harvest season of 2014-2015.

Maize production remains the largest agricultural activity performed by the households, however the percentage of households selling maize has decreased. The sale prices of maize have increased but due to food insecurity fewer households are benefiting as consumption has increased to fill the hunger gap. Interestingly the yield from improved maize seeds has decreased and local maize yields have increased since 2013. This shows that the resilience to bad weather of local maize is higher than improved maize, suggesting that more households may be inclined to cultivate local maize particularly as input costs increase.

Another challenge prevailing for both rounds of the study is the widespread occurrence of aflatoxin. The promotion of nuts in shell trading by smallholders was a remedy mentioned in Table 30. This promotion has been successful and the results of 2016 illustrate this. Results for groundnut production and the sale of groundnuts show positive outcomes at household level: both harvests and yields have increased since the baseline year.

There are more households selling NIS than ever before: however there has been a slight reduction in awareness levels surrounding aflatoxin, particularly amongst households who were not members of the association. There is a need for an improved and more in-depth awareness programmes. Including households outside the intervention supply chain. It does not suffice to only raise awareness amongst farmers, if traders and processors begin to introduce quality standards and grading of groundnuts, which appears to be the case, it would also ensure that the effort in combating aflatoxin would increase.

Positively the adoption of techniques to combat aflatoxin has increased. There is a significant increase in farmers adopting one or two aflatoxin techniques, and the reduction in farmers using three techniques may denote a positive change, if the farmers are now using techniques

learned from agricultural demonstrations as the norm. There is no need to apply all techniques known as they now cultivate using practices that work for their crops. The number of farmers whose groundnuts were rejected at market level due to contamination has increased, positively suggesting a broader awareness of the issue.

For the intervention to provide real and sustainable change there must be an increase in groundnuts purchased by ExAgris to provide access to a stable and fair market. This suggests that ExAgris need to consider making earlier purchases or developing equivalent arrangements that ameliorate farmers' needs to sell early to local traders to fund immediate cash needs, such as potential credit lines which mature after the distress selling period.

Soybean production is also increasing in popularity and predicted trends show it playing a significant role within the agricultural industry: however, droughts have caused output levels to decrease. There is no doubt that there has been a significant shift from cash crops to dual crops over recent years. Food insecurity has pushed the move and according to households the change is here to stay.

In conclusion, the results show that the short to medium objectives of the RUTF value chain intervention are being progressively met year on year. There has been a significant increase in RUTF production in late 2016 and strong orders in 2017 for VN Malawi, which will increase demand for groundnuts, and hence could influence the value chain significantly in 2017. The move towards cooperative initiatives gives a positive indicator of potential growth. However, there remain significant challenges facing the households and although the intervention has had a positive impact more must be achieved to continue to transform livelihoods.

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Appendix:

Test Statistics

	MHS16Wealth Ranking	MHS13Wealth Ranking
Chi-Square	29.761 ^a	46.646 ^b
Df	2	2
Asymp. Sig.	.000	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 67.0.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 65.0.

Member of Mchinji Peanut butter co-op

	Observed N	Expected N	Residual
Yes	30	20.5	-5.5
No	41	20.5	5.5
Total	71		

Test Statistics

	Member of Mchinji Peanut butter co-op
Chi-Square	1.704 ^a
Df	1
Asymp. Sig.	.192

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 20.5.

Test Statistics^{a,b}

	RAINFED HYBRID MAIZE: Total quantity consumed from own production (KG)?
Chi-Square	47.355
Df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: MHS16Wealth

Ranking

ANOVA

HDD Scores abs Difference

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	81053.875	2	40526.938	13.949	.000
Within Groups	575267.981	198	2905.394		
Total	656321.856	200			