



Kadale Consultants

**FY 16 Food for
Progress Malawi
Strengthening
Inclusive Markets for
Agriculture
Land O'Lakes**

Baseline Report

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Team Leader and Senior Consultant

Acronyms and Abbreviations

AICC	African Institute for Corporate Citizenship
CSA	Climate Smart Agriculture
DADO	District Agricultural Development Officer
DC	District Commissioner
EPA	Extension Planning Area
FBO	Farmer Based Organization
FGD	Focus Group Discussion
GAP	Good Agricultural Practices
GoM	Government of Malawi
HPH	Harvest and Post-Harvest Handling
KII	Key Informant Interviews
LOL	Land O' Lakes
MEL	Monitoring, Evaluation and Learning
MFI	Microfinance Institution
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoIT	Ministry of Industry and Trade
MSIKA	Malawi Strengthening Inclusive Markets for Agriculture
MTE	Mid-Term Evaluation
HPH	Harvest and Post-Harvest (Storage) and Handling
PMM	Performance Measurement and Management
PMP	Performance Management Plan
PPI	Progress out of Poverty Index
PPS	Proportional to Population Sample
SACCO	Savings and Credit Co-operative
S&C	Savings and Credit (Group)
SoW	Scope of Work
T&T	Techniques and Technologies
USDA	United States Department of Agriculture

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Executive Summary

This document provides the baseline for Land O'Lakes Malawi Strengthening Inclusive Markets for Agriculture (MSIKA) project. The baseline consisted of a survey of 658 households growing the target crops of tomato, onion, Irish potato and mango, across five Districts, being Dedza, Mangochi, Mchinji, Ntcheu and Salima, farmer focus group discussions and stakeholder key informant interviews was conducted in January 2017.

The methodology is presented in section 2.

The findings are presented in section 3, covering farmer profiles, inputs, farming and post-harvest practices, gender, yields, sales, farm management, employment, information, financial services and processing.

The baseline study provides information for the calculation of baseline indicators, which are set out in annex 6.

Strategies for Land O'Lakes to consider in response to baseline findings are set out in section 5. Key considerations are the low levels of education and high level of poverty of the target group. The limited amount of processing by farming households and businesses is also an issue that requires MSIKA to consider adjusting its approach.

The following **program-related recommendations** are made in section 6:

1. That LOL adopts the minimum land sizes for tomato and Irish potato of 0.2 ha, but reduces the land size for onions to 0.1 ha based on indications that onions are grown on relatively smaller plots;
2. That LOL adopts a higher threshold number of mango trees for inclusion of beneficiaries, as the minimum of four in the baseline was too low, such that many respondents were merely harvesting what they had rather than taking mango farming as a business. The exact number is open to further review, but should be closer to the mean average of eight trees;
3. That due to the low levels of educational attainment, LOL should ensure its training and communication materials are suitable for farmers with low literacy and delivered in a way that is accessible and appropriate to those with low education, such as a high emphasis on oral and visual presentation over written material;
4. That due to the high poverty levels found, LOL should focus on promoting inputs and techniques and technologies that are no or low cost to enable higher uptake;
5. That LOL leverage the existing network of agro-dealer shops and vendors to enable access to good quality, affordable inputs where there are identified supply gaps, such as for violet potatoes in Mchinji. Agro-dealers could also play a role in farming information provision and supplying less well known inputs like lime;
6. That LOL use existing community-based knowledge and community based mechanisms, such as lead farmers and demo plots, as these are highly valued sources of farming and HPH techniques and technologies ;
7. That due to higher adoption of harvesting T&T, that LOL focuses more on addressing storage and handling T&T;
8. That a more detailed gender analysis is conducted to help determine the specific gender roles in production and selling in each crop for each locality, and provide a more detailed analysis of how decisions are made ;
9. That LOL reviews the GoM KII data on high production EPAs to confirm that these match the target EPAs and that LOL builds good relations with the GoM District teams to ensure collaborative implementation and engagement;

10. That LOL conducts a more detailed assessment of farmer's actual knowledge and application of farm management practices as opposed to the reported data that a baseline can collect, so as to enable the definition of an appropriate curriculum for training;

11. LOL should adjust its program for processors to reflect their scarcity, such as targeting new processing investment, considering interventions that help small processors to expand, setting low targets around processing and focusing more on aggregation and quality related activities that feed into processing; and

12. That LOL focus on promoting Savings and Credit groups as an accepted financial service mechanism in rural areas as a means for targeted farming households to save and access small amounts of money for investment in fruit and vegetable production.

In addition, the following **monitoring and evaluation recommendations** were made:

1. That LOL reviews the list of inputs for each crop and removes those that are current practices that are not clearly Good Agricultural Practices (GAP), such as the use of recycled seed, with the intention of reducing the proportion of respondents that already use two or more of these inputs;

2. That LOL reviews the list of farming techniques and technologies for each crop and removes those that are commonly applied GAP, such as ridging, composting and manuring, with the intention of reducing the proportion of respondents that already apply two or more of these inputs. This should not discourage LOL from promoting these techniques; rather it recognizes that these are already commonly adopted and so should not be part of the scoring;

3. That LOL increases the number of inputs, farming techniques and technologies and harvest & post-harvest handling techniques and technologies that farmers should be measured as adopting from the remaining lists from at least two to at least three;

4. That LOL adopts a standardized set of weights for different types of containers that are used for harvested and marketed produce, such that comparisons with the baseline, and across Districts can be made without resorting to costly, time consuming and impractical weighing of produce in the field. LOL could adopt the weights used by Kadale, or it could conduct a weight standardization exercise across all known container types and apply these retrospectively to the baseline;

5. That LOL establishes its protocols, drawing on the baseline, as to how it will collect data reliable production data, based on the challenges that existing, including the lack of actual weighing and recording of harvest, losses and sales;

6. That Indicator 25, FFPr 2.3 "Average number of days required to move selected agricultural products from purchase of initial inputs to final product (ready for sale)" be dropped as there are good reasons both for making the time shorter (e.g. faster turnaround of capital), but also for making it longer (e.g. buying inputs early while cash is available, preserving the product to reduce perishing, selling when there is not a glut);

7. That there is more focus on hiring for short term, than on full-time equivalent employment, based on low levels of employment found in the baseline due to the small size of the farms, and that employment is often shorter term and more part-time than the current qualifying period of four weeks full-time; and

8. That where any of the recommendations makes future comparisons more difficult, that there is use of retrospective questions in relations to those issues in the mid-term and endline evaluations.

1 Background

This report sets out the baseline for the Malawi Strengthening Inclusive Markets for Agriculture (MSIKA) Program that is to be implemented by Land O'Lakes (LOL) for the United States Department for Agriculture (USDA). It provides the findings of a household survey, Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) conducted by Kadale Consultants Ltd, Malawi. From these findings, Kadale extracts the data for the baseline calculations. The approach adopted is set out in the proposal made by Kadale, the inception discussion held on Thursday 1st December 2016 and in subsequent email exchanges.

From the Scope of Work (SoW):

“MSIKA is a five-year value chain development project that will reach 42,000 smallholder farmers, 210 farmer-based organizations (FBOs), and 24 processors in south central Malawi in the fruit and vegetable value chains. MSIKA will catalyze increased value addition and income for value chain actors by facilitating improved processing, increased crop productivity, improved post-harvest handling (PHH) and storage, expanded market linkages between farmers and processors, more efficient domestic trade, and increased potential exports of processed products in the long term. MSIKA interventions and market linkages will target generating a \$69.7 million increase in value of sales by project participants, and leveraging \$675,000 in new public or private investment by 2021.”

The MSIKA program focuses on achieving the following Objectives:

- *“Increase agricultural productivity in the fruit and vegetable sector by increasing the availability of improved inputs, improving infrastructure to support on-farm production, facilitating access to finance, and training farmers on improved agricultural techniques and technologies, as well as farm management.*
- *Expand trade of agricultural products in the fruit and vegetable sector by improving quality of post-production agricultural products, training producers and processors on improved post-production processes, facilitating improved linkages between buyers and sellers, improving market and trade infrastructure, and facilitating improved management of buyer/seller groups.”*

The full SoW is set out in Annex 1.

Kadale prepared an inception report (final version 30th December 2016) set out our understanding of the programme and our methodology. Kadale reviewed documents provided by LOL.

The main documents provided were as follows:

1. MSIKA Project Introduction and Strategic Analysis, Original (submitted to USDA)
2. MSIKA Organization Chart
3. MSIKA performance Indicator Table
4. MSIKA Evaluation Plan, Approved 15 Sep 2016
5. MSIKA Results Framework
6. MSIKA Final targets
7. MSIKA Performance Management Plan (PMP)
8. MSIKA SPV Overview, Absolute Options, Aug 2016 (PowerPoint)
9. Value-Chain Analysis of Traditional Vegetables, Malawi and Mozambique, IFAMA, Vol 17, Issue 4, 2014
10. MSIKA Market Research and Analysis Summary, Absolute Options, June 2016
11. Project workplan, Annual Plan, Year 1, November 2016
12. Ag-Pro Manual, Second Edition, 2014
13. Report on Fruit and Vegetable Value-Chains, February 2017.

In addition, the consultants made particular reference to an additional source:

1. Agribusiness SMEs in Malawi – Assessment of SMEs in the Agriculture Sector and Improved Access to Finance, Kadale, 2014 for USAID, LEO Report #5 (LEO 2014).

The main change from the program outline in the original SoW for the evaluation was addition of a potential fifth implementation District, being Salima. Implementation will be considered in five Districts, namely: Mchinji, Dedza, Ntcheu, Salima and Mangochi. This is covered in more detail in the section on sampling in the methodology section.

LOL confirmed that it would work with four value-chains initially, being tomatoes, onions, Irish potatoes and mangoes

From the year one annual workplan (November 2016), MSIKA plans to implement activities in eight areas:

Activity 1: Training: Improved agricultural production techniques

Activity 2: Infrastructure: Post-harvest handling and storage

Activity 3: Training: Post-Harvest Processing

Activity 4: Capacity Building: Producer Groups and Cooperatives

Activity 5: Market Access: Facilitate buyer-seller relationships

Activity 6: Financial Services: Facilitate agricultural lending

Activity 7: Financial Services: Provide SME finance

Activity 8: Government Capacity Building: Improve Enabling Environment

The draft workplan provided Kadale with a broad picture of the activities planned. The instruments and sample frame are based on the above sets of activities.

Section 2 sets out an overview of the Methodology and the Implementation of the baseline study. Section 3 presents the findings, following the structure of the household questionnaire for ease of reference. Section 4 addresses the baseline indicators. Section 5 presents a summary and recommendations.

There are annexes covering the Scope of Work (Annex 1), the Methodology (Annex 2), the household questionnaire in English (Annex 3), the FGD topic guide (Annex 4), KII guide (Annex 5) and Baseline indicators (Annex 6).

2 Methodology and Implementation of the Baseline

This section sets out an overview of the planned and actual methodology (section 2.1) and challenges faced (section 2.2). The full methodology is set out in the inception report and in Annex 2.

2.1 Methodology Planned and Actual

This section sets out the overall approach, key considerations, sampling, FGDs, KIIs, instruments and quality control.

2.1.1 Overall Approach

The evaluation adopted a mixed method approach to determine simple differences using quantitative and qualitative methods. A cross-sectional household survey of qualifying households that grow at least one of the target fruit or vegetables was used to collect baseline data on the output and outcome indicators for the program. FGDs and KIIs were conducted to complement the quantitative data.

2.1.2 Key Considerations in the Methodology Design

Kadale noted some key considerations in designing the baseline:

1. **Range of crops** – The four crops are different in terms of the inputs used/needed, Good Agricultural Practices (GAP) in farming the crops and Post-Harvest Handling

(PHH) techniques and technologies to be applied. There are also differences in the way these are sold. At the request of LOL, all four crops were to be treated as a single population, which is a necessary simplification to avoid an overly large and costly sample. However, one implication is that while generalizations are valid based on the whole sample, generalizations based on sub-sets of the sample are more difficult to generalize from in a statistically valid manner.

2. **Units of measurement** – All four crops are more commonly sold by volume than by weight, mainly in bags, baskets and pails. These volume-related ‘units’ vary by locations, though there is some commonality; this makes it more complex to estimate weights where these have not been accurately determined by respondents. In response, the research team established an average weight per unit type, which was applied throughout the baseline. The standard weights need to be either adopted based on Kadale’s work, or extended/verified by LOL so that it can adopt an agreed common set of weights for the containers in use in the target Districts. It would be advisable to photograph, weigh a sample of containers and then standardize these weights for LOL staff to use in their data gathering and reporting. These standardized units should also be applied at impact baseline and the mid-term and endline evaluation.

3. **Timing** – The timing of the harvest for the four crops differs. In addition, tomatoes and onions can be harvested more than once, if the farmer has access to water/irrigation. This means there are different possible periods for a baseline to cover. The consultants, in consultation with LOL, decided that the baseline should be for calendar year 2016.

4. **Practices, techniques and technologies** – These terms are used in the indicator descriptions. The consultants take ‘practices’ to be ‘technique’; that is the ways farmers prepare land, grow the crop and harvest it. ‘Technologies’ involve money spent on an asset or farm input (seed, fertilizer) either by the farmer or some other party that provided it to the farmer (like a NGO/Project). The planned techniques and technologies (T&T) detailed in the instrument were based on considerable consultation with LOL. However, it was difficult to fully anticipate all the T&T that will be promoted, as they vary for each crop (see point 1 above), and have not yet been finalized.

2.1.3 Survey/Household Sampling

Kadale visited each District in advance of the fieldwork to meet the appropriate Government of Malawi (GoM) personnel and gather additional information on the Extension Planning Areas (EPAs) to enable the sampling to be finalized. These were the District Agricultural Development Officers (DADO) and the Crop Specialists/Horticulture Specialists. The Kadale team also met the Ministry of Industry and Trade (MoIT) Trade/Marketing Officers where these were available.

LOL provided details of the target Extension Planning Areas (EPAs) where fruit and vegetables are most commonly grown; these are in bold and underlined in the table below. These were verified via the District GoM KIs.

Table 1: List of EPAs and Target EPAs

District	Extension Planning Areas (<u>LOL’s target EPAs</u>)
Dedza	<u>Lobi</u> , Kabwazi, Mayani, <u>Bembeke</u> , <u>Golomoti</u> , Mtakataka, <u>Kanyama</u> , Chafumbwa, Linthipe, Kaphuka.
Mchinji	<u>Mlonyeni</u> , <u>Mkanda</u> , <u>Mikundi</u> , <u>Chiotcha</u> , <u>Zulu</u> , Situ, Kalulu
Mangochi	<u>Maiwa</u> , <u>Lungwena</u> , Mpiripiri, Masuku, <u>Nasenga</u> , <u>M’bwazulu</u> , Chiripa, Nankumba, <u>Katuli</u> , Mthiramanja
Ntcheu	<u>Tsangano</u> , <u>Njolomole</u> , Nsipe, <u>Manjawira</u>
Salima	<u>Tembwe</u> , <u>Chiluwa</u> , Chipoka, Matenje, Chinguluwe, Katerera, Makande

LOL will target more commercially-oriented farming households, however in Malawi, the relatively small average land areas per household suggests that a land area of half an acre/0.2 hectares allocated to vegetables is a reasonable minimum for inclusion. That size is more than adequate to provide vegetables for the household and should be sufficient for households to have a surplus they can sell.

Mangoes are not commonly planted as an orchard crop in Malawi, but typically they are scattered across the household's land at random. Informed by interviews with the Government staff, Kadale used a minimum of four trees that produce fruit, as the qualifying point for a household to be included in the baseline. A Crops Officer said that most farmers consider mangoes as "extraction" from the natural environment, rather than as something to farm, however he also said: *"some (farmers) have ventured into commercialization by setting up orchards of hybrid mango trees"*

Because the sample was randomized, the baseline provides LOL with data on growers of the four crops with at least 0.2ha and/or 4 or more mango trees, but not those below the qualifying levels.¹ Therefore, the baseline is not for the whole population of growers of these crops, but for the middle to upper end of growers.

At the time of the baseline implementation, the value chain assessment was not available, nor was there information on the actual/estimated numbers of households that grow the target crops. Therefore, the consultants used a Proportional to Population Sample (PPS) method based on the whole District population, as there was insufficient information to do this by the fruit and vegetable farmer sub-population.

The MSIKA program aims to benefit 42,000 smallholder households. Kadale made a working assumption that no more than 20% of households within the targeted Districts would be growers of fruit and vegetables at or above these thresholds. This assumption was based on the Kadale team's knowledge of rural households and was discussed and agreed with LOL. Kadale also discussed this assumption with Ministry Officers, who agreed that it was a realistic level, given that there are thresholds for qualifying.

The total population of the five Districts was estimated at 1,372,775 based on the 2016 Census Projection (see table 2 below). Using 20% as the maximum proportion that grow fruit and vegetables on at least 0.2 ha or with four or more mango trees, the estimated population of growers is up to 274,555.

The DCED calculator was used with the following assumptions:

1. Confidence: 95%
2. Precision (e): 5%
3. Degree of Variability: 0.5
4. N is the population target, 274,555

This gave an estimated minimum sample size of 604, to which was added an oversample by around 3% to account for any unusable instruments, giving a planned minimum sample of 622 farming households.²

The population for each district was calculated to calculate the proportional allocation of the total sample, for example, Dedza's target population was calculated to be 61,068 (20% of its total population), which is 22.4% of the total sampling frame (274,555). Proportions for the five Districts were calculated on this basis and used to calculate the minimum sample sizes for each District. For example, the minimum sample size for

¹ These threshold levels were discussed and agreed with LOL. This provides LOL with a profile and data on farmers at or above this threshold. LOL may wish to raise the threshold for actual implementation, though that has implications for using the baseline data.

² The calculation is set out in Annex 8.

Dedza, was calculated to be 138 i.e. 22.24% or 622. The planned sampling split by District was therefore:

Table 2: Planned sample split by District

Sample based on 20% of the total population (aged 19-64)				
District	Population	N (20% of Total)	Proportion (%)	PPS sample
Dedza	305,341	61,068	22.24	138
Mangochi	416,743	83,349	30.36	189
Mchinji	245,103	49,021	17.85	11
Ntcheu	234,729	46,946	17.10	106
Salima	170,859	34,172	12.45	77
Total	1,372,775	247,555	100.00	622

The field researchers interviewed either the household head and/or person most responsible for growing one or more of these crops in 660 households. Two questionnaires were discarded as they were incomplete, resulting in 658 usable questionnaires, well over the minimum required.

Table 3: Actual sample split by sex and District

Respondent by District						
District	Male	%	Female	%	Total	%
Dedza	58	15.6	75	26.2	133	20.2
Mangochi	88	23.7	90	31.5	178	27.1
Mchinji	125	33.6	74	25.9	199	30.2
Ntcheu	71	19.1	21	7.3	92	14.0
Salima	30	8.1	26	9.1	56	8.5
Total	372	100	286	100	658	100

For the analysis that follows, the actual number of respondents per question is stated as the 'base', as there were some questions that not all respondents answered, for example, not all respondents grew all the crops, so the base is smaller for each crop. There were a few missing responses on some questions, which also reduces the base, but relatively few for a study of this size and nature.

2.1.4 Actual and Planned FGDs

The consultants planned 16 FGDs split across the four crops and the five Districts. Kadale was guided by the DADO on locations where it would be appropriate to do FGDs, specifically where there were concentrations of target crop growing households that could be readily identified. The aim was to find farmers with the minimum land size/trees through to larger growers, so that a range of views can be obtained. Groups were selected to be male only, female only and mixed according to the split agreed with LOL.

Kadale was able to conduct 16 FGDs, split as planned by crop, sex and District:

Table 4: FGDs conducted, split by sex, crop and District

District	Crop	Male	Female	Mixed	FGDs per crop	Total FGDs per District
Dedza	Irish Potatoes	1	1	0	2	4
	Tomatoes	1	1	0	2	
Mangochi	Mangoes	1	1	0	2	4
	Tomatoes	1	1	0	2	
Mchinji	Irish Potatoes	0	0	1	1	3
	Onions	0	0	1	1	
	Tomatoes	0	0	1	1	
Ntcheu	Irish Potatoes	0	2	0	2	3
	Tomatoes	1	0	0	1	
Salima	Mangoes	1	0	0	1	2
	Tomatoes	0	0	1	1	
Overall		6	6	4	16	16

2.1.5 Actual and Planned Kills

The initial round of KIs in December, targeted Government of Malawi Officers and Specialists at the District level. Those interviewed are important for their knowledge of the District, but also for protocol reasons. Three interviews per District would result in 15 KIs.

These GoM KIs helped to identify other interviews to be conducted with processors, farmer based organization (FBOs) and non-governmental organizations (NGOs) /projects working in similar or related fields. The consultants were able to meet GoM staff in each District, though fell one short of the planned target due to the absence of the Officer. In addition, Kadale met 10 FBOs, five NGOs and seven processors.

Table 5: Planned and actual KIs

Type of Organization	KIs Planned	Actual KIs
GoM District Staff	15	14
Farmer Based Organizations	10	10
NGOs/Projects	5	5
Processors	10	7
Overall	40	36

In practice, the most difficult category of key informants to find were processors. Kadale asked GoM staff, but they reported that there were few processing organizations in their Districts, particularly for onions and potato. An Officer in Mchinji said that processing in the District was *"limited to frying Irish potatoes in the streets or road sides."* The GoM staff in Salima and Mangochi said there was a lot of mango achar³ produced around the Bomas by small scale processors, but not much else. According to an Officer in Dedza, onion was rarely processed, except as an ingredient in piri-*piri*⁴ sauces.

³ Achar is the Indo-Aryan name for a pickled product.

⁴ Piri-*piri* is hot sauce made from African Birds-Eye Chillies.

2.1.6 Instruments and Data Set

The consultants developed a single household (HH) questionnaire with optional sections according to which of the four crops were grown. Each crop has different inputs, GAP, PHH and markets, which required technical input from LOL alongside the consultant's own knowledge. The questionnaire went through many iterations and was shared with LOL's program staff, Monitoring, Evaluation and Learning (MEL) staff and the technical experts for input at all the key stages. It was translated into Chichewa, piloted and revised.

Four teams of four researchers were trained and undertook live practice with farmers. From this field testing, the HH questionnaire was finalized. See Annex 3 for the final English questionnaire.

The data was entered into the Statistical Package for Social Sciences and the final data set will be available for LOL to review and to run further analysis on, as desired. Each question was tabulated in Excel; however, not all questions are included in this baseline report following guidance from LOL. The final Excel file will be sent to LOL.

The FGDs used a topic guide with a list of topics, some being mandatory, and optional to be asked at the facilitator's discretion as it was too demanding for each group to discuss every topic. FGDs were recorded using digital recorders to assist in recall of quotes and key points. The topic guide is included in Annex 4.

Four KII topic guides were prepared according to the nature of the organizations. These contain variants of the topics asked related to the type of organization, be they governmental, FBO, NGOs/projects or processors. Not all topics/questions could be asked of all interviews. An example of one instrument (for NGOs/Projects) is included in Annex 5.

To facilitate improved co-ordination, Kadale also shared the draft instruments with TANGO, who will be implementing the impact baseline later in 2017. Kadale received and incorporated useful feedback and adapted a qualitative analysis template that TANGO uses for KIIs and FGDs. This will improve co-ordination and enhance the value of the data gathered for this program baseline. The completed template, summarizing the interviews will be shared with LOL.

2.1.7 Quality Control

Kadale adopted comprehensive quality control procedures to ensure data quality that should help project implementers make informed decisions based on quality evidence. Data quality was assured across the instrument design, piloting, training, incentives, data collection supervision and data entry protocols. Kadale ran logic checks to check and clean the data, overseen by the Kadale Team Leader.

The outcome of these quality control measures is that we are confident that the analysis is based on robust data.

2.2 Challenges

As with most survey processed, there were challenges to be addressed:

1. **Interpretations of survey questions** – There was confusion among some enumerators and respondents on a few questions, notable the question on the number of days from harvesting to selling of all crops and on the interpretation and determination of employment. These were addressed by the Research Manager and Supervisors as they arose. Part of the problem relates to the difficulty of applying these in Malawi, with more said about this in the relevant sections of the baseline report and the recommendations. Overall, this has not had a substantial effect on data quality.

2. ***Finding KII respondents*** - there was a shortfall of four KIIs (out of 40) mainly due to finding very few processors in the Districts. The KIIs are conducted primarily to get a range of qualitative views, so the shortfall is less important. However, it does present a challenge to LOL in its plans to work with small and medium processors. These appear to be very few in number and those that exist are operating at a very small-scale.
3. ***Varying FGD participant numbers*** – The consultants found it difficult to control the number of participants for FGDs, as once a group was convened other farmers came out of interest and probably in the hope of getting food or allowances. Once it was clear that these were not on offer, the numbers reduced, but in some cases it was difficult to exclude people, so some groups had relatively high numbers of participants, which can inhibit development of the discussion. Although not desired, the consultants do not think this substantively affected the quality of the information that we were able to get.
4. ***Determining who is the best respondent for the household*** - When households were approached for an interview, the researcher asked for the person most involved in growing one or more of the four target crops. However, it was not possible to only interview this person in all cases, e.g. if the (male) HH head insisted on being the respondent. The compromise was for both the HH head and the person most responsible to be present, which was possible in most cases. Overall, researchers managed to identify the sex of the person that is more involved in production of the target crops. The matter is further complicated by there being more than one crop in most HHs and because responsibility for growing and selling is usually shared. This is discussed in more depth in the gender section and recommendations are made relating to it.

The above represent areas to learn from for the forthcoming impact baseline, and the mid-term and endline evaluations. Otherwise, these were relatively minor challenges that did not substantively affect the outcome of the study.

3 Survey Findings

This section sets out the quantitative findings of the HH questionnaire and is structured around the question sequence in the instrument. Additional qualitative information is provided from the KIIs and FGDs where this adds insights. The heading within each table gives the question numbers, which can be referred to in the questionnaire that is included in Annex 3.

The findings cover:

- Section 3.1 Demographic, farming and poverty data.
- Section 3.2 Input, farming & post-harvest handling practices for target crops,
- Section 3.3 Storage Facilities;
- Section 3.4 addresses Gender;
- Section 3.5 Production Levels (2016);
- Section 3.6 Sales;
- Section 3.7 Farm Management;
- Section 3.8 Employment
- Section 3.9 Market Information;
- Section 3.10 Financial Services; and
- Section 3.11 Processors

The analysis is split by crop where that is possible. It is important to bear in mind that many farmers grew more than one of the four crops.

Where there is a significant difference in the findings based on the sex of the respondent, this is explicitly stated. Otherwise, the differences are not significant.

Results are not reported by location, as the sample was not large enough to disaggregate it to this level. A summary is given below:

Table 6: Qualifying growers by crop and by District

A.1.3.a Qualifying growers by crop and by district								
District	Tomatoes	%	Onions	%	Irish Potatoes	%	Mangoes	%
Dedza	33	8.5	-	-	83	43	43	22.9
Mangochi	120	31.1	50	42.7	3	1.6	60	31.9
Mchinji	150	38.9	47	40.2	76	39.4	40	21.3
Ntcheu	57	14.8	17	14.5	31	16.1	14	7.4
Salima	26	6.7	3	2.6	-	-	31	16.5
Base	386	100	117	100	193	100	188	100

The table highlights that the highest proportion of the sample for:

- Tomato growers - Mchinji (38.9%) and Mangochi (31.1%);
- Onion growers - Mangochi (42.7%) and Mchinji (40.2%);
- Irish potatoes - Dedza (43.0%) and Mchinji (39.4%); and
- Mangoes - Mangochi (31.9%), Dedza (22.9%) and Mchinji (21.3%).

It should be noted that there were different numbers of respondents in each District due to the PPS method used, so direct comparisons between Districts are not possible.

Table 7: Key crops by District

Commonality based on qualifying respondents		
District	Relatively Common	Relatively Uncommon
Dedza	Irish Potatoes, Mangoes & Tomatoes	Onions
Mangochi	Tomatoes, Mangoes & Onions	Irish Potatoes
Mchinji	Tomatoes & Irish Potatoes	Onions & Mangoes
Ntcheu	Tomatoes & Irish Potatoes	Onions & Mangoes
Salima	Mangoes & Tomatoes	Onions and Potatoes

The table above gives an overview of how commonly the crops were found, based on the number of respondents per District. The team was initially surprised by not having respondents in Dedza for onions. This appears to be because onions were being grown on small areas of land of less than 0.2 ha, so did not qualify for the survey. It may also be a function of the selected target EPAs, which could have lower numbers of growers of that crop. LOL should undertake further scoping in Dedza to ensure important onion growing areas have not been excluded.

3.1 Profile of the Sample

In total, there were 658 usable questionnaires. The demographic profile of respondents is set out in 3.1.1, the farming profile in 3.1.2 and the poverty profile in 3.1.3.

3.1.1 Sample Profile - Demographics

This section sets out the demographic profile of the sample respondents:

Table 8: Sex of the sample respondents

A.1.1.b Sex of Respondent		
	Count	%
Male	672	56.6
Female	286	43.5
Base	658	100

There were more male (56.5%) than female (43.5%) respondents in the sample. In the section on gender (see 3.4), the evidence is that men are generally more involved in these crops (other than mango) than women, hence a higher proportion of male respondents is not surprising. This also came through in the FGDs and KIIs, which highlighted that both men and women are involved in these crops. As referred to in section 3.4, a more detailed gender analysis of roles would guide LOL on how it should respond to this overall finding.

The age range of respondents varied from 18 to 82, with a mean of 41 and a median of 38.

The mean size of the households was 5.7 people, including the respondents and all adults and children.

The majority of the respondents (86.5%) were married. Of the remaining 13.5%, 5.9% were widowed and 5.5% divorced or separated. The implication is that households were mainly 'unitary', consisting of a husband and wife.

Of the married women, only 8.9% said their husband was working and staying away from home for more than six months. Most households (77.6%) consisted of a husband and wife for the majority of the year.

For the youth, 10.6% of respondents were aged 18-25 and 26.9% were 26-34, giving a total of 37.5% for all youth.

From the sample, 98.4% of male respondents were head of household compared to 25.9% of the female counterparts. As a whole, 66.9% of the respondents were head of their households. As noted earlier, the researchers asked for the person who was most involved in the target crops, though the interviews were often joint if there was a husband and wife.

Of those who were not the household head, 93.6% were the spouse.

Respondents were asked to give their highest level of education reached:

Table 9: Level of education

A.1.1.j What is the highest level of education you reached?						
Level	Male	%	Female	%	Total	%
Standard 1-8	267	72.8	206	73.3	473	73
Form 1-4	67	18.3	25	8.9	92	14.2
Tertiary	1	0.3	-	-	1	0.2
None	32	8.7	50	17.8	82	12.7
Base	367	100	281	100	648	100

The majority of the respondents (73.0%) had only attended primary school ('Standard 1-8'). Only 14.2% had gone to secondary school (Form 1-4) and 12.7% reported no education at all ('none'). Of those that had at most attended primary education, only 22.9% had reached the highest level of Standard 8.

As might be expected, LOL will be working with people that have limited educational attainment affecting their literacy, numeracy and capacity to learn and act on information and approaches that the project promotes. LOL will need to make sure that its communication and training materials are appropriately geared to this low level of education. Some suggested strategies are included in Section 5.0.

3.1.2 Farming

This section provides a profile of respondents in relation to their farming activities.

Of the 650 respondents that answered this question, 96.8% said that farming was their main source of income. This does not preclude other sources, but highlights the importance of farming in their livelihood mix. Just 21 respondents had something else as their main source of income. This does not mean that farming is not part of their livelihood mix; rather that they have a more important source of income, alongside their farming activity. Those that had other means were mainly split among employment, operating a business and skilled labor as their main source of income.

Respondents were asked for their total land area farmed in 2016:

Table 10: Total land area farmed in 2016

A.1.2.c.i What is the total land (ha) your household farmed in 2016?					
Sex of Respondent	Base	Mean	Median	Maximum	Minimum
Male	372	1.40	1.20	7.00	0.20
Female	286	1.16	1.00	4.00	0.20
Base	658	1.29	1.00	7.00	0.20

In 2016, the mean average land size for respondents was 1.29 ha and ranged from 0.2 ha to 7.0 ha. The median land areas were lower, with the overall median being 1.0 ha. Land areas for smallholders are typically low in Malawi, and all five target Districts are relatively densely populated.

In Mangochi, participants in the FGDs explained that land is customary, so cannot be held forever. In Dedza, the issue of security of land tenure also came up in the FGDs, as these crops are grown on community land, so tenure depends on the Chiefs. These

groups also highlighted that land is being sub-divided as it is passed down, resulting in small plots. This creates both a pressure for high returns from smaller land areas and an opportunity, as farmers are forced to intensify.

One way for more commercially minded farmers to increase production is to rent land. Most respondents (79.0%) did not rent land. For the 21.0% of respondents that had some rented land, the mean average rented land was 0.72 ha. The area of rented land ranged from 0.1 to 3.2 ha in 2016.

Farmers that want to rent more land face problems. For example, in Salima, one farmer said: *"I once was duped by a land owner who received money from other two farmers as land renting fee."* Others in the FGDs said how rents were increasing rapidly due to pressure on land. The practice of paying after selling the crop that is grown on rented land, is being replaced by payment in advance, which makes it more difficult to rent unless the person renting has money they can use.

Land is typically rented for a cropping season, so this might be a few months, if the land has water in the dry season and so can support one harvest, e.g. of tomatoes and onions. As a result of short, insecure tenure, farmers that rent would not likely invest in irrigation, but could invest in inputs and techniques and technologies that have an immediate effect on the particular crop. LOL may wish to focus on encouraging investment that has an immediate return where the farmers have rented land.

Table 11: Crops grown in 2016

A.1.3.i Crops grown in 2016 (unprompted)			
Crop	Male (%)	Female (%)	Total (%)
Maize	93.0	94.1	93.5
Tomatoes	74.2	62.9	69.3
Irish Potatoes	38.7	32.9	36.2
Mangoes	29.0	43.0	35.1
Onions	32.0	22.0	27.7
Other vegetables	37.2	27.6	27.4
Soybean	24.2	27.6	25.7
Groundnuts	21.0	19.9	20.5
Beans	13.2	13.3	13.2
Sweet Potatoes	11.3	14.7	12.8
Crops<10% not listed			
Base	372	286	658

The range of crops reportedly grown in 2016 was very wide. Unsurprisingly 93.5% of respondents grew maize, being Malawi's most popular staple food. As this was a sample of farmers growing fruit and vegetable on a minimum of 0.2ha, by definition a high inclusion of the four target crops was expected. 69.3% of the respondents grew tomatoes as the second most common crop after maize, followed by Irish potatoes grown by 36.2%, mangoes grown by 35.1% and onions grown by 27.7% in 2016. Tobacco was among the crops grown by less than 10% of respondents. This partly reflects that tobacco is not grown in low lying dry areas, but also that the respondents may have found these other crops more profitable and better suited to their land. Tobacco production has also been reduce in Malawi due to demand factors.

The attraction of tomatoes appears to be the relatively high income. Both male and female FGDs in Mangochi stressed the high profits from tomatoes. The women quantified this by saying that a piece of land that could yield an income of MK 20,000 from maize, it would yield MK 200,000 for tomatoes. The high profitability of tomato growing was echoed by the Mchinji and Dedza groups as well. The Salima mixed tomato group also felt it was attractive as it was less labour intensive than the main alternatives, such as cotton production. Access to water for tomato growing is important.

Growing Irish potatoes was attractive in Dedza and Ntcheu Districts in particular due to the suitable climate and that this crop can do well on slopes, which dominate the landscape. The Ntcheu women's FGD added that the husbandry is simple and it requires few (cash) inputs. Having a low cash requirement is important for poorer households, and for women more generally, who tend to be poorer overall and with less access to finance.

Onions were seen as a good income crop, as long as there is access to water (or rain) (FGD mixed, Mchinji). It should however be noted that there is limited access to irrigation overall. Most farmers rely on watering cans for manual watering.

Mango was seen as a good crop because it required minimal effort. However, while mango is seen as a minimal effort crop, the downside is that it is seen as a crop that does not require investment or effort. In partial contrast to this minimal effort message, the Salima male FGD felt it was increasingly in demand and becoming commercial, which they attributed to the presence of a mango processor.

Table 12: Land area, by crop

A.1.3a.ii What land area (ha) did you grow the following crops?					
Crop	Base	Base (%)	Mean	Maximum	Minimum
Maize	613	93.2	0.61	3.60	0.10
Soybean	171	26.0	.050	4.00	0.04
Tobacco	25	3.8	0.49	2.40	0.20
Groundnuts	135	20.5	0.46	2.80	0.04
Rice	44	6.7	0.46	4.00	0.10
Millet	6	0.9	0.37	0.80	0.10
Irish Potatoes	238	36.2	0.34	2.00	0.01
Beans	87	13.2	0.34	1.80	0.04
Pigeon Peas	24	3.6	0.31	1.00	0.10
Tomatoes	456	69.3	0.27	2.00	0.01
Cassava	31	4.7	0.26	0.80	0.10
Onions	181	27.5	0.22	2.00	0.04
Vegetables	166	25.2	0.22	1.60	0.02
Sweet Potatoes	84	12.8	0.22	0.80	0.10

In terms of land area in hectares (ha) for crops that respondents were growing, maize had the highest mean average at 0.61 ha, followed by soybean at 0.5 ha. Irish potatoes mean average was 0.34 ha, with tomatoes at 0.27 ha and onions at 0.22 ha. The maximum area for farming of these three target crops was 2.0 ha.

For the 231 respondents that had four or more mango trees, the mean average was 8.5 trees with a median of 6 and a range up to 70. 36 respondents grew bananas (mean 8.0 trees) and 15 grew papaya (mean 2.9 trees). Mango was clearly the most popular fruit among respondents, though it should be noted that there is a selection bias in favor of mango growers due to the thresholds for the sample.

Livestock types and numbers were collected, as livestock is an indicator of relative wealth and often a store of surplus money as a form of savings. Livestock is also a source of manure which can be useful for the target crops.

Of the sample, 57.4% had at least one type of livestock. For those that had at least one type of livestock, chickens (72.7%) and goats (57.7%) were the most common type that was kept. In terms of the number of livestock of each type that was kept, the highest mean average for number kept, was chicken at nine. The maximum number of chickens was up to 63.

3.1.3 Progress out of Poverty Index

This section provides an indication of the levels of poverty of the respondents, using the Progress out of Poverty Index (PPI). This is a recognized international tool with questions tailored to each country to enable users to assess how many of their target beneficiaries can be classed as poor. The Kadale team used the version that is designed for Malawi. Respondents were asked about asset ownership, housing material and livestock ownership among others, as proxy questions to assess their level of poverty (see the final section of the questionnaire in Annex 3).

Table 13: Progress out of Poverty score

Progress out of Poverty Total Score in 2016			
	Mean	Maximum	Minimum
Male	54	95	9
Female	50	95	11
Total	52	95	9

The overall group had a mean score of 52, which means there was a 92.2% likelihood that they live on less than \$ 2.50 per day in 2016 and a 72.3% likelihood that they live on less than \$2.00 per day.⁵ There was not significant difference between male and female respondents.

The PPI data suggests that most of the respondents are poor, which is a likely key characteristic of the target group that LOL wants to address through MSIKA. Therefore, LOL needs to bear in mind that targeted farmers have limited ability to invest in any farming inputs, farming techniques and technologies (T&T) and harvest and post-harvest handling (HPH) T&T that require additional cash expenditure. This mirrors previous learning in LOL's USDA-funded FY12 FFPr project where adoption rates were high for T&T that were low cost and lower for technologies that involved moderate or high expenditure.

3.2 Farming and Harvest/Post-Harvest Practices

This section sets out the current farming practices used by respondent households for each of the crops. This is split into three sections on inputs, farming T&T and harvest and post-harvest handling (HPH) T&T for each of the four target crops.

3.2.1 Inputs

This section sets out the type of inputs used, actors in the supply of inputs, ease of access and the input costs for each of the four crops.

Inputs are important to productivity. An Officer, Mangochi, said: *"With climate change, there has been an eruption of new pests that attacked various crops and need immediate address."* This highlights that there may be additional pressures related to the variability in the weather that is promoting additional pest and disease problems.

3.2.1.1 Type and Extent of Inputs Used

The overall number of respondents ('base') growing tomatoes was 386, which was the highest number of growers of the four crops. Respondents were asked what inputs they used, with responses split between 'all crop', 'some crop' and 'none (of the crop)':

⁵ It is possible to use other poverty thresholds to allow the profile calculation to fit the poverty level used by particular organizations. In this case, the consultant selected \$2.50. At a different threshold, then a higher or lower proportion of the population would be assessed to be poor.

Table 14: Inputs used for tomatoes

B1.i Which of the following inputs did you use for growing tomatoes in 2016?			
Input	On all crop (%)	On some crop (%)	None used (%)
Recycled seed (own crop)	12.4	4.1	83.4
Recycled seed (other source)	13.5	2.8	83.7
Certified seed	65.5	4.	29.8
Seedlings (another source)	3.1	2.1	94.8
Insecticides	81.1	2.1	16.8
Fungicides	6.8	4.7	29.8
Foliar feed/fertilizer (inorganic)	78.2	4.4	17.4
Sprayer	55.4	2.8	41.7
Compost/manure (organic)	52.3	4.1	43.5
Water for watering can	52.1	2.3	45.6
Water for gravity or manual pump irrigation system	11.1	2.3	86.5
Water from a motorized pump	5.7	0.8	93.55
Herbicides	1.6	-	98.4
Lime/soil improvers	2.6	0.3	97.2
Base	386	386	386

The inputs most commonly used 'on all (the tomato) crop' were insecticides, fertilizer, fungicide and certified seed, all with over 65.5% of respondents using these. Insecticides had the highest usage rate at 81.1%. Respondents were also using sprayers (55.4%), watering cans (52.1%) and compost/manure (52.3%). The least commonly used inputs ('on all crop') were: herbicides (1.6%), lime/soil improvers (2.6%), seedlings (3.1%), water from a motorized pump (5.7%) and water from a gravity system or manual pump (11.1%). There were respondents using these inputs on 'some (of the tomato) crop', but these were 4.7% of all respondents or less.

This suggests relatively high use of certified seed and agro-chemicals across the whole crop. The KII and FGDs found that farmers appreciate the importance of these inputs. A respondent in the Tomato FGD, Salima said: *"The difference is that for us who use these inputs, a profit is realized even when production is low, because there is no total failure of harvest."* Respondents from the Tomato FGD in Ntcheu commented: *"Without fertilizer, the soils in the area cannot give yield."* A second comment was: *"Without the pesticides and fungicides, tomato is too delicate and vulnerable to pests so common and diseases, hence no good yield would be possible."* The responses on inputs used for growing onions was as follows:

Table 15: Inputs used for onions

B.2.i Which of the following inputs did you use for growing onions in 2016?			
Input Type	On all crop (%)	On some crop (%)	None used (%)
Recycled seed (own crop)	5.1	3.4	91.5
Recycled seed (other source)	22.2	1.7	76.1
Seedlings (another source)	6.8	1.7	91.5
Certified seed	59.0	5.1	35.9
Insecticides	55.6	52.6	41.9
Fungicides	35.0	0.9	64.1
Foliar seed/fertilizer (inorganic)	74.4	3.4	22.2
Sprayer	35.9	1.7	62.4
Compost/manure (organic)	46.2	1.7	52.1
Water from a watering can	46.2	1.7	52.1
Water from a gravity or a manual pump	6.8	-	93.2
Water from a motorized pump	10.3	-	89.7
Herbicides	3.4	0.9	95.7
Lime/soil improvers	3.4	0.9	95.7
Base	117	117	117

The highest response for input use 'on all (the onion) crop' was inorganic fertilizer (74.4%), with high responses over 50.0% for 'certified seed' and 'insecticides'. Agro-chemicals were less important than for tomato, however, similar to tomatoes, close to half of the farmers used water from watering cans and compost/manure on all their onion crop. The least used inputs were herbicides, soil improvers, water from a gravity/manual pump, recycled seed and seedlings. As with tomatoes, a low proportion reported to have applied the inputs to 'some of the crop', suggesting that if used, the inputs are applied to all of the crop.

The inputs used by growers of Irish potatoes were as follows:

Table 16: Inputs used for Irish potatoes

B3.i Which of the following inputs did you use for growing Irish potatoes in 2016?			
Input type	On all crop (%)	On some crop (%)	None used (%)
Selected Recycled seed (own crop)	33.2	10.9	56.0
Recycled seed from another source	47.2	12.4	40.4
Certified seed	5.2	2.6	92.2
Insecticides	59.1	4.1	36.8
Fungicides	42.5	1.6	56.0
Foliar feed/fertilizer (inorganic)	91.7	2.1	6.2
Sprayer	43.5	4.1	52.3
Compost/manure (organic)	19.7	7.3	73.1
Water from watering can	28.0	9.3	62.7
Water from a gravity or a manual pump irrigation system	9.8	6.2	83.9
Water from a motorized pump	57	5.2	89.1
Herbicides	1.0	2.1	96.9
Lime/soil improvers	1.6	1.0	97.4
Base	193	193	193

Among the respondents, a very high proportion applied inorganic fertilizer (91.7%), followed by 59.1% applying insecticides to all crop. All the other inputs were below 50.0%, with scores below 10.0% for 'herbicides', 'lime/soil improvers', 'certified seed' and 'water from a motorized pump'. Use of recycled seed applied to 'some crop' ('own source' and 'another source') was reported by 10.9% and 12.4% respectively – otherwise, all other responses for 'some crop' were below 10.0%. Composting and watering were less important, reflecting the differing needs of Irish potato compared to tomato and onion. Relative to tomato and onions, there was less use of inputs on potatoes. The inputs used for mango growing in 2016 were:

Table 17: Inputs used for mangoes

B3.i Which of the following inputs did you use for growing mangoes in 2016?			
Input type	On all crop (%)	On some crop (%)	None used (%)
Seedling (grown by self)	8.5	4.3	87.2
Seedling (other source)	2.1	1.6	96.3
Certified/improved seedlings	0.5	1.1	98.4
Grafting materials	1.6	.7	95.7
Insecticides	-	0.5	99.5
Fungicides	-	-	100.0
Foliar feed/fertilizer (inorganic)	-	-	100.0
Sprayer	-	-	100.0
Compost/manure (organic)	10.6	3.7	85.6
Water from watering can	1.1	0.5	98.4
Water from a gravity or a manual pump irrigation system	-	-	100.0
Water from a motorized pump	-	-	100.0
Lime/soil improvers	-	-	100.0
Base	188	188	188

In contrast to the other three crops, the majority of respondents did not use any/many inputs for growing mangoes. Where these were used, the percentage that applied inputs to 'all (the mango) crop' did not exceed 11.0%, with the highest being 'compost/manure' at 10.6% and 'seedlings' at 8.5%. Even with the addition of application of inputs to 'some crop', the scores were still low, as none of these exceeded 5.0% applying to 'some crop'. Insecticides, fungicides, fertilizer, sprayer, irrigation and lime had no reported use at all. This suggests there is considerable room to increase the use of inputs for mango farming, compared to the other three crops.

The above tables highlight the specific areas where LOL could address gaps in usage. Overall, the use of certified seed and agro-chemicals was relatively high. Use of compost/manure and water from water cans was high for tomato and onions. Use of herbicides and lime/soil improvers was very low and not something respondents appeared to know about, as they were not mentioned in FGDs. There appears to be scope to increase uptake of irrigation.

3.2.1.2 Suppliers of Inputs

The appreciation of the need to use inputs is generally strong. Respondents were asked about the source of their inputs, which varied according to the type of input.

Table 18: Suppliers of inputs for tomato

B.1.ii For tomatoes, who supplied this input in 2016?									
Input	Base	Shop (%)	Vendor (%)	NGO (%)	GoM (%)	FBO (%)	Neighbor (%)	Own (%)	Communal source (%)
Recycled seed (other source)	23.2	13.8	39.7	-	-	-	46.6	-	-
Certified seed	26.7	86.9	9.7	2.2	1.4	0.4	0.4	-	-
Seedlings (another source)	24.5	29.4	11.8	5.9	-	-	52.9	-	-
Insecticides	31.9	76.8	17.6	2.5	1.6	1.6	1.3	-	-
Fungicides	26.1	77.4	16.9	2.7	1.1	1.1	1.5	-	-
Foliar feed/fertilizer (inorganic)	31.2	56.1	37.2	3.2	0.6	0.6	2.6	-	-
Sprayer	21.5	22.3	3.3	1.4	1.4	1.4	70.2	-	-
Compost/manure (organic)	16.5	0.5	0.9	-	-	-	20.9	76.7	0.9
Water from watering can	3	-	-	-	-	-	100.0	-	-
Water from a gravity or a manual pump irrigation system	47	-	-	-	-	-	4.3	14.9	80.9
Water from a motorized pump	21	-	-	-	-	9.5	38.1	52.4	-
Herbicides	4	75.0	-	-	-	-	25.0	-	-
Lime/soil improvers	10	-	-	-	-	-	30.0	70.0	-

Note that the base responses vary, according to how many respondents were using each type of input.

As would be expected the main source of tomato certified seed, insecticides, fungicides, fertilizer and herbicides was shops. However, vendors were also sources, ranging from 9.7% for certified seed up to a high 37.2% for foliar feed/fertilizer. Neighbors were the most important source of recycled seed, seedlings and sprayers, and the main alternative source for compost/manure. Respondents were the main source for compost/manure, water from a motorized pump and lime/soil improvers.

Table 19: Suppliers of inputs for onions

B.2.ii For onions, who supplied this input in 2016?								
Input	Base	Shop (%)	Vendor (%)	NGO (%)	GoM (%)	Neighbor (%)	Own (%)	Communal source (%)
Recycled seed (other source)	28	14.3	50.0	-	-	35.7	-	-
Seedlings (another source)	9	33.3	22.2	-	-	44.4	-	-
Certified seed	73	82.2	9.6	5.5	1.4	1.4	-	-
Insecticides	67	85.1	13.4	1.5	-	-	-	-
Fungicides	41	82.9	12.2	-	4.9	-	-	-
Foliar feed/fertilizer (inorganic)	89	76.4	23.6	-	-	-	-	-
Sprayer	38	5.3	2.6	5.3	-	86.8	-	-
Compost/manure (organic)	53	-	-	-	-	15.1	79.2	5.7
Water from watering can	1	-	-	-	-	100.0	-	-
Water from a gravity or a manual pump irrigation system	6	-	-	-	-	-	33.3	66.7
Water from a motorized pump	10	-	-	-	-	-	20.0	80.0
Herbicides	4	50.0	-	50.0	-	-	-	-

Shops were the biggest suppliers of certified seeds, insecticides, fungicides and foliar feed/fertilizer for onions. As with tomatoes, vendors were also an important secondary source and the most important source for recycled seed, supplying 50.0% of those that use it. Neighbors were important for sprayers recycled seed and seedlings, through the absolute numbers of these were low.

GoM and NGOs/projects had a limited role in supply, while communal sources were most involved in irrigation. The respondents ('own') were the biggest source of compost and were also involved in irrigation. Overall, the pattern is similar to tomatoes.

Table 20: Suppliers of inputs for Irish potatoes in 2016

B.3.ii For Irish potatoes, who supplied this input in 2016?									
Input	Base	Shop (%)	Vendor (%)	NGO (%)	GoM (%)	FBO (%)	Neighbor (%)	Own (%)	Communal source (%)
Selected recycled seed (other source)	106	4.7	40.6	1.9	-	0.9	51.9	-	-
Certified seed potatoes	13	23.1	38.5	7.7	-	-	30.8	-	-
Insecticides	121	74.4	23.1	-	-	1.7	0.8	-	-
Fungicides	81	71.6	25.9	-	-	1.2	1.2	-	-
Foliar feed/fertilizer (inorganic)	173	67.1	30.1	0.6	0.6	1.2	0.6	-	-
Sprayer	76	19.7	9.2	1.3	1.3	2.6	65.8	-	-
Compost/manure (organic)	46	2.2	-	-	-	-	13.0	82.6	2.2
Water from a gravity or a manual pump irrigation system	23	-	-	-	-	-	13.0	60.9	26.1
Water from a motorized pump	19	5.3	-	-	-	-	15.8	42.1	36.8
Herbicides	3	66.7	-	-	-	-	33.3	-	-
Lime/soil improvers	2	50.0	-	-	-	-	50.0	-	-

Insecticides, fungicides, herbicides and fertilizer for Irish potatoes were largely supplied by shops with more than 65.0% accessing from these. Vendors were an important secondary source of these, other than for herbicide which was not commonly used. Neighbors and vendors dominated the supply of recycled seeds by serving 51.9% and 40.6% of respondents. Manure was minimally outsourced and largely from 'own' source, as was the minimal amount of irrigation.

Table 21: Suppliers of inputs for mango growing

B.4.ii For mangoes, who supplied this input in 2016?						
Input	Base	Vendor (%)	NGO (%)	Neighbor (%)	Specialist (%)	Own (%)
Seedlings (other source)	4	-	25.0	75.0	-	-
Certified seedlings	3	-	100.0	-	-	-
Grafting material	7	-	71.4	-	28.6	-
Insecticides	1	-	100.0	-	-	-
Compost/manure (organic)	24	-	-	8.3	-	91.7

As noted earlier, very few respondents used inputs for mangoes, but all those who used certified seedlings and insecticides got them from NGOs. For compost/manure, 91.7% used their own manure. The usage pattern for mangoes is very different and reflects the FGD comments by farmers and the KIIs with GoM staff that it is not seen as a commercial farming activity.

Overall, the main suppliers of seed and agro-chemicals are first of all shops, but with vendors also playing a role. The concern with vendors is that the products may be fake

or tampered with, though the vendors can also act as a distribution channel that reaches further out than fixed outlets/shops.

3.2.1.3 Ease and Availability of Inputs

This section sets out the ease and availability of inputs across all four crops:

Table 22: Ease of Getting Inputs

B.5 Overall, for the inputs you bought in 2016, how easy was it to get them?			
Degree of easiness	Male (%)	Female (%)	Total (%)
Very easy	21.6	15.9	19.4
Quite easy	18.3	20.6	19.2
Neither easy nor difficult	12.6	8.9	11.2
Quite difficult	34.2	33.2	33.8
Very difficult	13.2	21.5	16.5
Base	333	214	547

For the 547 responses to this question, the ease of access to inputs varied considerably. On balance, it was regarded as 'quite' or 'very difficult' by the majority of respondents (50.3%), with 38.4% rating it as 'quite' or 'very easy'. Women reported finding it more difficult than men, but the difference was not statistically significant.

A further question asked about availability:

Table 23: Availability of inputs

B.6 Overall, for the qualifying crops, were these inputs always in stock in types and quantities you needed?			
Availability	Male (%)	Female (%)	Total (%)
Always	37.5	28.2	33.9
Most of the time	22.4	21.8	22.2
Some of the time	14.7	19.9	16.8
Not much of the time	21.5	25.5	23.1
Never	3.8	4.6	4.1
Base	339	216	555

The responses indicated that inputs were available either 'most of the time' or 'always' for a total of 56.1% of respondents. In contrast, 27.2% said that inputs were either 'never' available or 'not much of the time'. Female respondents report poorer availability than male respondents, which was significant in terms of the 'always' response, but not statistically significant on the other responses. It is not clear why this is the case and reinforces the need for a fuller gender analysis.

The FGDs found differing views on supply, which mainly reflects their relative locations. There are those that are closer to roads and markets where they can readily source inputs from agro-dealers. A Mixed Tomato FGD in Salima said: *"(Inputs are) readily available in agro dealer shops (Farmers World and Kulima Gold) in Salima and nearing trading centers."* These saw no problem with finding inputs, but some of the groups that said there was access, talked about the high cost of inputs. For example, the Women's Tomato FGD in Mangochi reported that they found it difficult to source funds for the inputs, even though they clearly understood the importance of these. The Mixed Onion FGD in Mchinji complained about the high cost of seeds. The response of some FGD participants to high cost was to buy from vendors, because they are cheaper (Male, Tomatoes FGD in Dedza), even though they recognize there is a problem with fake/adulterated products (Male, Irish potatoes FGD Dedza).

For some FGDs, accessibility was more of an issue due to their more remote locations. The Mixed, Onion group in Mchinji highlighted the issue of distance and travel costs. The Male Tomatoes group in Ntcheu addressed this by sending a representative to buy the inputs for the group, which meant shared transport and the possibility of a bulk

discount. The Mixed Irish potato group in Mchinji wanted to get the 'Violet' variety, but it was only available in Dedza, which they said was costly to reach. This suggests there are gaps in supply of key inputs that MSIKA could try to address.

The accessibility, cost and quality of the inputs supplied is an issue that LOL may want to investigate further to determine the extent to which vendors are supplying fake/tampered products and how much benefit vendors could provide through enhanced access if there are no readily accessible shops.

3.2.1.4 Spending on inputs

Respondents were asked how much money was spent on inputs:

Table 24: Total money spent on inputs per hectare by crop

B.1 Total MK spent on input per ha or tree in 2016				
Crop	Mean	Median	Maximum	Minimum
Tomatoes	115,543	85,250	401,000	20,000
Onions	112,495	90,500	365,000	19,167
Irish Potatoes	139,495	110,000	395,000	19,500
Mangoes	944	982	1,500	313

The mean average total spending on inputs per ha was similar for Irish potatoes, tomatoes and onions ranging from MK 112,030/ha to MK 139,495/ha. Within this, the spending ranges were wide from around MK 20,000/ha minimum to around twenty times that at MK 400,000/ha. High spending can reflect that some farmers have more than one crop per year. The wide range suggests there is considerable room for some farmers to increase their use of cash inputs, though affordability is likely to be a constraint for some farmers.

In contrast to the other three crops, spending on mangoes was very low at a mean average of MK 944/tree, probably reflecting the view of mangoes as a crop to harvest, but not to investment in inputs to get a higher yield and better overall returns. This has been highlighted in the comments earlier.

3.2.1.5 Time to source inputs

One of the indicators for MSIKA is the length of time from first sourcing inputs to selling the crop. To get this information, respondents were asked two questions. The first one was the number of days between first purchased input sourced and its first use.⁶

When trying to design the question for this indicator, it became clear that there are several issues with it. Inputs are not necessarily sourced at the same time, and it might be a good thing for farmers to buy them as soon as they sell their crop, as that is when they have cash. This would result in a long period between first sourcing and use. Overall, and most significantly, it is not clear if more or fewer days from sourcing inputs to use is desirable or not desirable.

The mean average number of days between the first expenditure on inputs and use was for tomatoes was 11 days, with a range from one to 90 days. The pattern was similar for onions with a mean of 13 days and range of one to 60 days. For potatoes, the range was much wider ranging from 1 to 150, resulting in a higher mean average of 15 days. Bearing in mind that few used mango inputs, the comparable data is a mean average of 10 days, with the range between one to 30 days. For mangoes, if farmers bought seedlings, then the time from first purchase to sale of all the first season's harvest would be several years!

⁶ The second is covered later, being the number of days between first harvest and final sale of the crop.

The low mean averages suggest relatively short periods from sourcing to use. What is not clear is how useful this data is. A short period means farmers access inputs close to the time of use, but there may be benefits in encouraging them to acquire inputs close to the time of the sale of the crop, when they have cash available, whereas they may not have the cash close to planting season and have to forego buying inputs. This issue is returned to in relation to the period from first harvest to sale of all the crop.

3.2.1.6 Land Area Inputs Applied To

One of the indicators for MSIKA is the land area that two or more of the inputs are applied to.

The survey found very high responses for the use of inputs, reflecting the content of the input lists with 96.6% of tomato growers, 92.3% of onion growers and 97.9% of potato growers saying they applied two or more inputs from the LOL list.⁷ This contrasted with just 4.3% of mango growers using two or more inputs. Based on this, LOL should consider a revised target, such as three or more inputs, or removing those inputs from the list that most farmers are already commonly using.

As well as the frequency of reaching the two or more input threshold, the mean average land area that the inputs are applied to was requested. With such high numbers reaching the threshold, then the land areas are similar to the overall average land areas, at 0.28 ha for tomatoes, 0.26 ha for onions and 0.38 ha for potatoes. Those mango farmers who applied two or more inputs did so to a mean average 8.0 trees. With such high adoption rates, then there is very limited scope for MSIKA to improve uptake rates.

3.2.2 Farming Techniques and Technologies

This section reviews the use of farming techniques and technologies (T&T)

3.2.2.1 Farming Techniques and Technologies Known and Used

To assist with assessing the effectiveness of activities designed to improve knowledge as a step to taking up the T&T, respondents were asked what farming T&T they **knew**, as an unprompted question. As this was an unprompted question, the actual knowledge may be higher, but it is difficult to rely on prompted scores as respondents tend to say yes than to look like they do not know these things. Unprompted gives a better picture on such questions.

⁷ Recycled seeds were excluded, although these were listed to determine the current usage.

Table 25: Techniques and technologies known for tomato growing

C.1.1 What techniques or technologies for growing tomatoes do you know?	
Technique/technology	Yes (%)
Composting	61.1
Manuring	55.4
Ridging	48.7
Mulching	52.6
Rotation	42.2
Minimum Tillage	21.0
Green Manuring	12.7
Own nursery	80.6
Staking	70.5
Succession planting	42.5
Water harvesting	34.5
Testing soil acidity	4.4
Adding lime to soil	4.4
Removing side shoots	73.1
Spraying for pests and disease	73.8
Base	386

The highest response for tomato farming T&T was (having their) own nursery (80.6%) followed by scores over 70.0% for spraying, removing side shoots and staking. Composting scored over 60%, and manuring and mulching were both over 50%. There were very low scores for testing soil acidity and adding lime (related issues) both at 4.4%. Other low scores, below 30.0% were green manuring and minimum tillage. Acidity testing has not been promoted to farmers in Malawi and is a potential opportunity for MSIKA.

Table 26: Techniques and technologies known for onion growing

C.2.1 What techniques or technologies for growing onions do you know?	
Technique/technology	Yes (%)
Composting	61.5
Manuring	44.4
Ridging	44.4
Mulching	60.7
Rotation	14.9
Minimum Tillage	22.2
Green manuring	17.1
Own nursery	75.2
Water harvesting	34.2
Testing soil acidity	6.8
Adding lime to soil	10.3
Spraying for pests and disease	53.8
Base	117

The most commonly known onion farming T&T was 'own nursery' with 75.2% of respondents. 'Mulching' and 'composting' were also well known by over 60.0 % of respondents followed by 'spraying' with 53.8%. The least well known were 'testing soil acidity', 'adding lime' and green manuring', all at less than 18.0%.

Table 27: Techniques and technologies known for growing potatoes

C.3.1 What techniques or technologies for growing potatoes do you know?	
Technique/technology	Yes (%)
Composting	29.5
Manuring	23.8
Ridging	58.5
Mulching	21.2
Rotation	31.1
Minimum tillage	5.7
Green manuring	3.1
Earthing up	61.7
Succession planting	14.5
Water capture	19.2
Testing soil acidity	1.0
Adding lime to soil	2.6
Chitting	38.9
Variety choice	31.8
Spraying for pests and disease	46.1
Base	193

The most commonly known potato farming T&Ts were 'earthing up' (61.7%) and 'ridging' (58.5%). Beyond these only 'spraying' scored above 40.0%. 'Testing soil acidity', 'adding lime', 'green manuring' and 'minimum tillage' all scored below 10.0%.

The T&Ts for growing mangoes that respondents knew unprompted were:

Table 28: Techniques and technologies known for growing mangoes

C.4.1 What techniques or technologies for growing mangoes do you know?	
Technique/technology	Yes (%)
Composting	25.0
Manuring	25.0
Pruning	59.6
Mulching	9.6
Spraying for pests and disease	5.9
Top working	8.5
Water harvesting	3.7
Testing soil acidity	1.6
Adding lime to soil	1.6
Base	188

The most commonly known mango farming T&T, by far, was 'pruning', at 59.6% of respondents. 'Composting' and 'manuring' were the next most commonly known, but scored only 25.0% each. All the other T&Ts were known by less than 10.0% of respondents.

The second question on farming T&T was about actual **use**, split across 'all crop', 'some crop' and 'none'

Table 29: Techniques or technologies used for growing tomatoes

C.1.2 What techniques or technologies for growing tomatoes did you use in 2016?			
Technique/technology	On all crop (%)	On some crop (%)	None used (%)
Composting	54.5	5.2	40.4
Manuring	49.5	7.0	43.5
Ridging	45.6	7.4	49.7
Mulching	48.2	6.5	45.3
Rotation	36.8	5.2	58.0
Minimum tillage	14.0	2.1	83.9
Green manuring	5.4	2.1	92.5
Own nursery	83.9	2.1	14.0
Staking	74.9	2.1	14.0
Succession planting	39.4	4.9	55.7
Water harvesting	34.5	1.8	63.7
Testing soil acidity	1.0	0.5	98.4
Adding lime to soil	1.6	0.5	97.9
Removing side-shoots	71.8	2.3	25.9
Spraying for pests and disease	71.0	5.2	23.8
Base	386	386	386

The high scores for 'own nursery', 'staking' 'removing side shoots' and 'spraying for pests and disease' were repeated and very close to those for knowledge. The same applied for 'composting', 'manuring' and 'mulching'. The lowest scores on use were for 'testing soil acidity', 'adding lime' and 'green manuring', similar to the knowledge.

Table 30: Techniques and technologies used for growing onions

C.1.2 What techniques or technologies for growing onions did you use in 2016?			
Technique/technology	On all crop (%)	On some crop (%)	None used (%)
Composting	47.9	2.6	49.6
Manuring	34.2	3.4	62.4
Ridging	39.3	-	60.7
Mulching	51.3	1.7	47.0
Rotation	33.3	5.1	61.5
Minimum tillage	13.7	-	86.3
Green manuring	6.8	2.6	90.6
Own nursery	68.4	4.3	27.4
Water harvesting	30.8	2.6	66.7
Testing soil acidity	-	-	100.0
Adding lime to soil	2.6	-	97.4
Spraying for pests and disease	45.3	3.4	51.3
Base	117	117	117

As with knowledge, the highest scoring onion farming T&T used was own nursery. Mulching was over 50.0% and composting and spraying over 45.0%.

Table 31: Techniques and technologies used for growing potatoes

C.1.2 What techniques or technologies for growing potatoes did you use in 2016?			
Technique/technology	On all crop (%)	On some crop (%)	None used (%)
Composting	27.5	4.7	67.9
Manuring	25.9	6.2	67.9
Ridging	71.0	4.1	24.9
Mulching	22.3	2.6	75.1
Rotation	37.8	5.2	57.0
Minimum tillage	3.1	0.5	96.4
Green manuring	1.6	1.0	97.4
Earthing up	75.1	1.6	23.3
Succession planting	19.2	3.6	77.2
Water capture	24.9	4.7	70.5
Testing soil acidity	1.6	0.5	97.9
Adding lime to soil	3.6	1.0	95.5
Chitting	50.8	2.1	47.2
Variety choice	34.7	7.8	57.5
Spraying for pests and disease	52.3	4.1	43.5
Base	193	193	193

Some scores for potato T&T actual use were higher than for knowledge. 'Earthing up' was the most common T&T used, followed by ridging at over 70.0%. 'Chitting' and 'spraying' both scored over 50.0%. 'Soil acidity', 'liming', 'green manuring' and 'minimum tillage' all scored less than 10.0%. As with the other crops, scores for use on 'some crop' were low, with all below 7.8%.

Table 32: Techniques and technologies used for growing mangoes

C.1.2 What techniques or technologies for growing mangoes did you use in 2016?			
Technique/technology	On all crop (%)	On some crop (%)	None used (%)
Composting	11.2	6.4	82.4
Manuring	11.2	6.4	82.4
Pruning	39.9	17.6	42.6
Mulching	3.2	1.1	95.7
Spraying for pests and disease	-	1.1	98.9
Top working	-	1.1	98.9
Water harvesting	1.1	-	98.9
Testing soil acidity	-	-	100.0
Adding lime to soil	0.5	-	99.5
Base	188	188	188

The most commonly stated mango farming T&T used on 'all crop' was 'pruning', matching its relatively higher level of knowledge, but only practiced by 39.9% of respondents. The only other T&Ts used on 'all crop' of note were 'composting' and 'manuring'. The higher response for 'pruning' on 'all crop' was matched by a higher level of application on 'some crop' at 17.6%, reinforcing that this is the most commonly used mango farming T&T by far.

Comparing across the crops, the levels of knowledge and use are generally close suggesting that where farmers know about something, they are using it. However, that does not mean that only knowledge needs to be addressed, as it may also depend on whether the farmers assess these T&T to be effective, viable and accessible.

The NGO KIIs found that some projects in Mchinji and Dedza Districts were providing training in farming T&T based on GAP. Others were mostly not conducting farming training, focusing more on finance and markets related training, though a government officer in Mangochi indicated that projects were providing training on mango grafting. In

Mchinji, a project is providing training on climate smart agriculture (CSA). In Mangochi it was mentioned that NGOs were not providing much support for production in his District.

Pest and disease issues were highlighted by GoM staff as an issue in all the Districts, but they did not give details of specific pests and diseases.

The interviews with GoM officials did not reveal much activity by GoM on training in farming T&Ts for these crops. An officer in Mchinji said there was training in making compost and on CSA, but without being specific on the content. The Mchinji team are providing training in vegetables and potatoes. The Dedza Officer said he is providing training in soil management popularly known as “*Mtayakhasu*”, which literally means “*throw away the hoe*” and refers to minimum/zero tillage and other conservation farming. Ntcheu team indicates they give advice on pests and disease on demand. Salima team says they provide training in “*modern agricultural practices*” and “*conservation farming*.” Mangochi team DADO said they emphasize diversification and have been promoting pigeon peas due to the ready market (and their drought tolerance). One Officer said GoM provides “*insufficient support*” to fruit and vegetable growers, due to lack of resources, being fuel for transport and funds for per diems. Another Officer said that access to GoM extension services was limited due to shortage of staff.

Overall, the picture is of limited NGO and GoM training in fruit and vegetable T&T and GAP.

3.2.2.2 Source of Learning

Respondents were asked for their source of learning about farming T&T:

Table 33: Source of learning T&T for growing tomatoes

Technique	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Composting	232	37.1	34.9	7.8	15.9	4.3
Manuring	221	43.4	33.0	8.1	11.3	4.1
Ridging	192	50.0	27.1	5.2	12.5	5.2
Mulching	214	36.0	37.4	8.9	14.0	3.7
Rotation	162	32.1	30.9	9.9	20.4	6.8
Minimum tillage	62	30.6	38.7	12.9	9.7	8.1
Green manuring	30	13.3	30.0	33.3	6.7	16.7
Own nursery	227	40.7	37.3	5.8	12.8	3.4
Staking	192	33.9	39.0	7.9	15.8	3.4
Succession planting	171	31.0	45.	7.6	9.9	6.4
Water harvesting	137	29.2	43.8	13.9	7.3	5.8
Testing soil acidity	8	-	37.5	25.0	25.0	12.5
Adding lime to soil	11	36.4	18.2	18.2	18.2	9.1
Removing side shoots	281	20.6	49.8	6.8	18.1	4.6
Spraying for pests an disease	294	19.4	46.3	7.8	22.8	3.7

Respondents gave relatively high scores to 'always known'⁸ and 'other farmer'⁹. This suggests the importance of community based learning and perhaps giving weight to what their parents and other farmers know (and do). GoM, NGOs and FBOs were recognized as secondary sources, with GoM and NGOs being more important than FBOs. It should be noted that these organizations were relatively important sources on less well known/used T&T, such as green manuring, soil acidity and liming.

Table 34: Source of learning farming T&T for onions

C.2.3 From who did you first learn?						
Technique	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Composting	64	39.1	40.6	6.3	10.9	3.1
Manuring	48	41.7	35.4	8.3	6.3	8.3
Ridging	47	51.1	31.9	2.1	4.3	10.6
Mulching	60	21.7	46.7	10.0	15.0	6.7
Rotation	41	9.8	46.3	14.6	14.6	14.6
Minimum tillage	17	5.9	52.9	23.5	-	17.6
Green manuring	12	25.0	8.3	25.0	16.7	25.0
Own nursery	88	31.8	43.2	9.1	11.4	4.5
Water harvesting	41	17.1	53.7	12.2	9.8	7.3
Adding lime to soil	3	-	33.3	-	33.3	33.3
Spraying for pests an disease	58	20.7	51.7	10.3	15.5	1.7

'Other farmers' were commonly given as the source of learning, followed by 'always known'. There were mixed scores for GoM, NGOs and FBOs, with no clear pattern, other than that they were secondary to 'always known' and 'other farmers'.

Table 35: Source of learning farming T&T for Irish potato

C.3.3 From who did you first learn?						
Technique	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Composting	59	49.2	33.9	3.4	11.9	1.7
Manuring	59	50.8	27.1	5.1	10.2	6.8
Ridging	147	52.4	23.1	5.4	16.3	2.7
Mulching	47	53.2	25.5	4.3	17.0	-
Rotation	83	38.6	31.3	3.6	24.1	2.4
Minimum tillage	7	14.3	42.9	14.3	28.6	-
Green manuring	6	-	33.3	16.7	50.0	-
Earthing up	147	56.5	27.9	6.1	8.8	0.7
Succession planting	43	51.2	32.6	2.3	14.0	-
Water capture	57	24.6	50.9	10.5	10.5	3.5
Testing soil acidity	2	100.0	-	-	-	-
Adding lime to soil	7	28.6	42.9	-	28.6	-
Chitting	101	33.7	44.6	6.9	13.9	1.0
Variety choice	80	28.8	46.3	7.5	17.5	-
Spraying for pests an disease	110	20.9	45.5	5.5	25.5	2.7

⁸ 'Always known' refers to long held knowledge where the source may not be specifically remember, but presumed to be from learning from parents or other family members as a child.

⁹ 'Other farmer' covers a mixture of trained lead farmers, influential local farmers and/or neighboring farmers. We did not specifically use the term lead farmer, as this could be interpreted in different ways. The question aimed mainly to find out about peer to peer learning rather than differentiating designated lead farmers and other influential farmers.

The most common source was 'always known' alongside 'other farmer', repeating the earlier pattern. Secondary sources were GoM followed by 'NGOs' and finally FBOs.

Table 36: Source of learning farming T&T for mango

C.3.3 From who did you first learn?						
Technique	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Composting	40	42.5	45.0	2.5	10.0	-
Manuring	45	53.3	33.3	4.4	8.9	-
Pruning	16	68.9	21.7	1.9	7.5	-
Mulching	11	45.5	45.5	-	9.1	-
Spraying for pests an disease	5	20.0	60.0	20.0	-	-
Top working	5	-	20.0	60.0	20.0	-
Water harvesting	2	-	100.0	-	-	-
Testing soil acidity	-	-	-	-	-	-
Adding lime to soil	1	-	-	100.0	-	-

As with the previous crops, 'always known' and 'other farmer' are the two main ways that respondents learned the most widely adopted mango farming T&Ts. Less commonly applied methods were leaned from 'other farmers' and 'NGOs'.

Overall on where farming T&T were first learnt, the predominant sources were 'always known' and 'other farmers'.

3.2.2.3 Land Area Applied to

One of the indicators for MSIKA is the land area that two or more farming T&Ts were applied to.

Almost all tomato respondents (99.5%), 93.2% of onion respondents, a very high 99.0% of Irish potato respondents, but only 22.9% of mango respondents were applying two or more farming T&Ts.

The mean average land area applied to for tomato is 0.28 ha, for onion it is 0.29 ha, for Irish potato it is 0.38 ha and for mango it is on a mean average of 9.2 trees.

LOL will need to consider reducing the list of what qualifies as a farming T&T or increasing the threshold number of farming T&Ts that need to be taken up, as most tomato, onion and Irish potato respondents are already meeting the indicator requirement and applying it to most of their land/trees.

3.2.3 Harvest and Post-Harvest Handling

This section reviews harvest and post-harvest handling (HPH) responses.

The KIs for GoM and NGOs put a lot of emphasis on the challenges of selling the targets crops before they perished, as one of the main challenges facing farmers. This was expressed in different ways, with a lot of reference to poor storage, but also weak marketing systems to ensure crop is sold. The Officers in Salima and Mangochi, both referred to the high temperatures, which increase the speed at which these crops perish, particularly tomato and mango. An Officer in Mangochi said: *"Mangochi experiences very high temperate and as such fruits like tomatoes easily go bad"*. A Mango FBO expressed that they were *"helpless"* when fruit starts to perish. Others highlighted that they just lower prices to sell off at any price they can. A Club in Salima said: *"Mostly our product goes bad because of poor information or access. For*

instance, a buyer would announce of their coming, but in many occasions it takes two to three days (longer)."

The issue was predominantly for tomato and mango, with less problems for Irish potatoes and onions, which have a longer life.

3.2.3.1 Post-Harvest Handling T&T Known and Used

Respondents were asked about their knowledge and use of harvest and post-harvest handling (HPH) T&T.

In relation to knowledge of tomato HPH, respondents were asked what T&T they **knew** as an unprompted question:

Table 37: Techniques and technologies known for HPH of tomatoes

D.1.1 What harvest and post-harvest techniques or technologies for tomatoes do you know?	
Technique/technology	Yes (%)
Timely harvesting	89.1
Handling carefully to avoid damage	73.1
Storing in cool places out of the sun prior to sale	71.2
Grading by colour, size and shape	73.6
Not over filling baskets and bags	58.3
Storing in crates to prevent damage in transporting	21.2
Not stacking more than three	42.2
Adding soft dry grass	78.5
Base	386

The most commonly known HPH T&T was 'timely harvesting' (89.1%), followed by 'adding soft grass/litter' (78.5%), 'grading by color, size and shape' (73.6%), 'handling carefully' (73.1%) and 'storing in cool places' (71.2%). The lowest responses were for 'storing in crates' (21.2%) and 'not stacking more than three' (42.2%). As these were unprompted responses, actual knowledge may be higher.

Table 38: Techniques and technologies known for HPH for onions

D.2.1 What harvest and post-harvest techniques or technologies for handling onions do you know?	
Technique/technology	Yes (%)
Harvesting and selling green onions with stalks on	50.4
Lifting when all tops bent over and dried, and leaving them in place until outer layer is cured	80.3
Letting the bulbs cure/dry in sun in the field for a few days	79.5
Trimming the dried stems and roots before packaging	52.1
Grading by colour, size and shape	70.9
Not over filling baskets and bags to avoid damage	43.6
Base	117

The most commonly known onion HPH T&Ts are 'lifting when tops are bent' (80.3%) and 'letting bulbs cure' (79.5%). 'Grading by color size and shape' was also well known (70.9%). The lowest scores were for 'not overfilling' and 'harvesting green onions with stalks on', but these were still moderately well-known at 43.6% and 50.4% respectively.

Table 39: Techniques and technologies known for HPH for Irish potatoes

D.3.1 What harvest and post-harvest techniques or technologies for handling Irish potatoes do you know?	
Technique/technology	Yes (%)
Harvesting when plants wilt/wither, slashing tops	63.7
Lifting potatoes with fork/prong, not hoe	17.6
Rubbing off dirty surface immediately after harvesting	33.2
Letting lifted potatoes get dry surface before packaging	49.7
Healing or curing any surface damages	58.0
Handling carefully/removing all damaged potatoes	34.7
Grading by color, size and shape	60.6
Using night vent sheds	41.5
Washing to approve appearance	19.2
Not over-filling the baskets and bags	30.6

The highest responses for Irish potato were for 'harvesting when plants wilt/wither' and 'grading by color, size and shape' with both above 60.0%. 'Healing or curing' was known by 58.0%, with all other responses below 50.0%. The lowest responses were for 'lifting with a fork' and 'washing to improve appearance', both at below 20.0%. This is more appropriate when selling to a prime retailer than at the roadside or in a market. This could be something LOL will need understand more from the farmers and get technical expertise for.

Table 40: Techniques and technologies known for HPH for mangoes

D.1.1 What harvest and post-harvest techniques or technologies for handling mangoes do you know?	
Technique/technology	Yes (%)
Harvesting when just started ripening & changing color	78.2
Harvesting by climbing the tree	70.2
Harvesting by special pole	70.2
Catching fruit before it falls using bags	26.1
Handling carefully	34.6
Storing in cool places	40.4
Grading by color, size and shape	45.2
Storing in crates	10.0
Washing to improve appearance	26.2
Not over-filling baskets to avoid damage	26.6
Base	188

The responses on mango HPH T&Ts known were much higher than for mango farming T&Ts. The respondents knew T&Ts around harvesting, with 'harvesting when just ripening', 'harvesting by climbing' and 'harvesting by special pole' all scoring over 70.0%. The scores around handling the crop were generally lower, with 'storing in cool places' and 'grading by color, size and shape' scored over 40.0%. The lowest score was for 'storing in crates' (10.1%).

In terms of HPH T&Ts that were **used** in 2016, the responses were:

Table 41: Techniques and technologies used for HPH for tomatoes

D.1.2 Which harvest and post-harvest techniques or technologies did you use for handling tomatoes in 2016?			
Technique/Technology	On all crop (%)	On some crop (%)	On none of the crop (%)
Timely harvesting	85.8	7.0	7.3
Handling carefully to avoid damage	76.2	3.4	20.5
Storing in cool places out of the sun prior to sale	66.1	10.4	23.6
Grading by color, size and shape	71.8	6.0	22.3
Not over filling baskets and bags	55.2	4.9	39.9
Storing in crates to prevent damage in transporting	16.6	2.8	80.6
Not stacking more than three	39.6	2.8	57.5
Adding soft dry grass	76.7	4.7	18.7
Base	386	386	386

As with inputs and farming T&T, the responses on tomato HPH T&T use were similar to the responses on unprompted knowledge. There were much higher scores for use 'on all crop', versus use 'on some crop'. This suggests that where a T&T is used, it tends to be on all the crop

Table 42: Techniques and technologies used for HPH for onions

D.2.2 Which harvest and post-harvest techniques or technologies did you use for handling onions in 2016?			
Technique/Technology	On all crop (%)	On some crop (%)	On none of the crop (%)
Harvesting and selling green onions with stalks on	37.6	12.0	50.4
Lifting when all tops bent over and dried, and leaving them in place until outer layer is cured	72.6	11.1	16.2
Letting the bulbs cure/dry in sun in the field for a few days	73.5	3.4	23.1
Trimming the dried stems and roots before packaging	41.9	7.7	50.4
Grading by color, size and shape	65.0	5.1	29.9
Not over filling baskets and bags to avoid damage	37.6	1.7	60.7
Base	117	117	117

As found in relation to tomatoes, the farming T&T used for onions were similar in profile to the knowledge. 'Letting bulbs cure' (73.5%), 'lifting when tops are bent' (72.6%), and 'grading by color, size and shape' (65.0%) were the most commonly used HPH T&T.

Table 43: HPH techniques and technologies used for Irish potatoes

D.3.2 Which harvest and post-harvest techniques or technologies did you use for handling Irish potatoes in 2016?			
Technique/Technology	On all crop (%)	On some crop (%)	On none of the crop (%)
Harvesting when plants wilt/wither, slashing tops	75.1	0.5	24.4
Lifting potatoes with fork/prong, not hoe	17.6	2.1	80.3
Rubbing off dirty surface immediately after harvesting	35.8	4.1	60.1
Letting lifted potatoes get dry surface before packaging	56.5	10.4	33.2
Healing or curing any surface damages	67.9	9.8	22.3
Handling carefully/removing all damaged potatoes	43.0	4.1	52.8
Grading by color, size and shape	76.7	5.2	18.1
Using night vent sheds	42.0	7.8	50.3
Washing to approve appearance	17.6	2.1	80.3
Not over-filling the baskets and bags	36.3	2.6	61.1
Base	193	193	193

As with farming T&T, the scores for HPH T&T actually used were higher than those that were known, as these were prompted responses. 'Harvesting when plants wilt' and 'grading by color, size and shaper' were the most commonly used T&T at over 75.0% of respondents on all the crop. 'Letting lifted potatoes dry before packing' and 'healing or curing' both scored over 50.0%. As with knowledge, 'washing to improve appearance' and 'lifting with a fork' both scored below 20.0%.

'Letting lifted potatoes dry' and 'healing or curing' were applied by 10.4% and 9.8% of respondents to 'some crop' in addition to their responses concerning all crop.

Table 44: HPH Techniques and Technologies used for mangoes

D.4.2 Which harvest and post-harvest techniques or technologies did you use for handling mangoes in 2016?			
Technique/Technology	On all crop (%)	On some crop (%)	On none of the crop (%)
Harvesting when just started ripening & changing color	62.2	25.0	12.8
Harvesting by climbing the tree	35.6	46.3	18.1
Harvesting by special pole	32.4	47.3	20.2
Catching fruit before it falls using bags	10.6	16.5	72.9
Handling carefully	21.8	16.5	61.7
Storing in cool places	24.5	18.6	56.9
Grading by color, size and shape	31.9	16.5	51.6
Storing in crates	3.7	4.8	91.5
Washing to improve appearance	10.6	14.4	75.0
Not over-filling baskets to avoid damage	13.3	11.7	75.0
Base	188	188	188

As with knowledge, 'harvesting when just ripening' achieved the highest score relating to 'all crop' at 62.2%, but this was 16 percentage points lower than knowledge. However, although the scores for 'harvesting by special pole' and 'harvesting by climbing the tree' 'on all the crop' were the next highest, at 35.6% and 32.4% respectively, they were much lower than the scores on knowledge by 35-37 percentage points – in essence, usage rates were half the knowledge rates. As the score for 'catching fruit before it falls' was very low at 10.4%, this suggests that respondents are using other techniques for harvesting, perhaps collecting fallen fruit or using sticks/stones to bring it down.

Another difference for mango HPH compared to the other crops was that there were relatively high scores for application to 'some of the crop'. The shortfalls on HPH T&T 'on all crop' were made up by being applied to 'some crop'. This could be a function of too many trees, or trees that are too scattered for applying these T&Ts.

The main point for HPH T&T is that there was higher adoption of harvest T&T but lower adoption in relation to storage and handling T&T. Overall, the adoption rates were lower for Irish potato and mango. This could be because mango is less seen as a commercial crop, while for potatoes it is possible that the methods were harder to adopt or more costly.

3.2.3.2 Source of Learning

Respondents were asked about the source of their learning:

Table 45: Where first learnt HPH T&T for tomato

D.1.3 From whom did you first learn?						
Technique/Technology	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Timely harvesting	360	51.4	35.6	4.7	5.8	2.5
Handling carefully to avoid damage	305	50.2	33.4	3.6	9.5	3.3
Storing in cool places out of the sun prior to sale	294	40.8	38.4	5.8	11.6	3.4
Grading by color, size and shape	299	40.8	36.5	5.0	14.7	3.0
Not over filling baskets and bags	234	46.2	32.9	6.0	11.5	3.4
Store in crates to prevent damage in transporting	77	24.7	37.7	9.1	23.4	5.2
Not stacking more than three	165	39.4	41.2	7.9	9.1	2.4
Adding soft grass	316	41.8	41.8	5.1	8.2	3.2

As with growing T&T, the responses were high for 'always known' and 'other farmers' emphasizing the community nature of this knowledge and learning. GoM was more of a source, albeit secondary, than NGOs and FBOs, which were relatively unimportant.

Table 46: Where first learnt HPH T&T for onions

D.2.3 From whom did you first learn?						
Technique/Technology	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Harvesting and selling green onions with stalks on	59	39.0	47.5	6.8	3.4	3.4
Lifting when all tops bent over and dried, and leaving them in place until outer layer is cured	99	23.2	54.5	9.1	10.0	3.0
Letting the bulbs cure/dry in sun in the field for a few days	91	28.6	51.6	7.7	9.9	2.2
Trimming the dried stems and roots before packaging	59	25.4	55.9	6.8	8.5	3.4
Grading by color, size and shape	80	43.8	43.8	5.0	5.0	2.5
Not over filling baskets and bags to avoid damage	45	35.6	46.7	6.7	6.7	4.4

The source of learning for HPH for onions was similar to the source for farming T&T, in that the most common source was generally 'other farmers', followed by 'always known'. Scores for GoM and NGOs were similar to each other, but secondary to 'other farmers' and 'always known'. FBOs were the least important source.

Table 47: Where first learnt HPH T&T for Irish potatoes

D.3.3 From whom did you first learn?						
Technique/Technology	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Harvesting when plants wilt/wither, slashing tops	145	44.8	31.7	6.9	15.9	0.7
Lifting potatoes with fork/prong, not hoe	39	48.7	23.1	-	25.6	2.6
Rubbing off dirty surface immediately after harvesting	78	52.6	26.9	5.1	14.1	1.3
Letting lifted potatoes get dry surface before packaging	130	31.5	37.7	6.2	22.3	2.3
Healing or curing any surface damages	151	35.8	35.8	6.0	21.9	0.7
Handling carefully/removing all damaged potatoes	90	41.1	32.2	4.4	18.9	3.3
Grading by color, size and shape	157	37.6	32.5	6.4	21.7	1.9
Using night vent sheds	95	26.3	36.8	9.5	26.3	1.1
Washing to approve appearance	38	34.2	36.8	-	26.3	2.6
Not over-filling the baskets and bags	74	35.1	33.8	4.1	23.0	4.1

As with farming T&T for Irish potato, the most important sources were 'always known' and 'other farmer'. GoM was a comparatively important source compared to tomato' and onion' sources. NGOs and FBOs were of limited importance.

Table 48: Where first learnt HPH T&T for Mango

D.4.3 From whom did you first learn?						
Technique/Technology	Base	Always known (%)	Other farmer (%)	NGO (%)	GoM (%)	FBO (%)
Harvesting when just started ripening & changing color	156	92.9	3.8	0.6	2.6	-
Harvesting by climbing the tree	150	92.7	5.3	1.3	0.7	-
Harvesting by special pole	144	92.4	4.2	1.4	2.1	-
Catching fruit before it falls using bags	53	81.1	11.3	1.9	5.7	-
Handling carefully	69	79.7	14.5	2.9	2.9	-
Storing in cool places	78	73.1	14.1	5.1	6.4	1.3
Grading by color, size and shape	86	79.1	14.0	4.7	2.3	-
Storing in crates	15	86.7	6.7	-	6.7	-
Washing to improve appearance	44	70.5	15.9	6.8	6.8	-
Not over-filling baskets to avoid damage	44	72.7	20.5	4.5	-	2.3

The most commonly applied methods were harvesting related. There were very high responses over 90% for the source as 'always known'. For handling and storage related knowledge, these were also mainly high scores for 'always' know, with all over 70.0%, but some supplementary sources, mainly 'other farmers' followed by 'GoM' and 'NGOs'.

Across the four groups, as was found on farming T&T, respondents indicated that 'always known' and 'other farmer' were the most common sources. For tomatoes,

'always known' was more common than 'other farmer', whereas for onions, 'other farmer' was more common than 'always know'. For Irish potato, the two sources were similar overall, whereas for mango, 'always known' was a dominant source.

The source of learning is important for LOL to consider for its program design, as community-based source predominate. It is not that other sources could not be effective; rather they have not been as effective to date. Appreciating the reasons for why community based sources are more effective would be helpful in determining the means for bringing new learning on HPH T&T, as it would on inputs and farming T&T

3.2.3.3 Land Area That HPH Were Applied To

As with inputs and farming T&T, there was a high rate of application of tomato HPH T&T, with 96.1% of respondents applying at least two of these. The area of land on which these HPH T&T were applied was a mean average 0.29 ha.

For onions, 90.6% of respondents applied two or more of the HPH T&T. The land area on which these were applied was a mean average of 0.26 ha.

The proportion of Irish potato respondents who applied two or more HPH T&T in 2016 was a very high 99.5%. The mean average land area on which two or more HPH T&Ts were applied to was 0.38 ha.

The proportion of mango respondents that had applied two or more HPH T&Ts was 86.7%. The mean average number of trees on which two or more T&Ts were applied was 10.1, with a wide range of four to 70.

It is noteworthy that the scores on applying mango HPH T&T were considerably higher than for use of inputs and farming T&T for mango. As noted in the previous section, the scores on mango HPH adoption were very high, suggesting more limited scope for change in production practices.

3.3 Storage Facilities

This section presents findings on the storage facilities available and used in 2016. The floor areas of these storage facilities are also reported.

Table 49: Storage facility

D.5.i Where do you store your crop before selling it?			
Storage facility	Male (%)	Female (%)	Total (%)
Inside my house	67.3	83.1	73.9
Separate building/store	39.3	20.8	31.7
In a nkhekwe/outside store	3.6	3.1	3.4
Baskets/bags outside or in a pile	7.2	7.1	7.1
Farmer Organization storage	0.3	-	0.2
Base	361	255	616

Multiple responses possible

This was a question with multiple possible responses. Among the alternative storage facilities available, it was noted that the vast majority (73.9%) stored produce inside their houses prior to selling it. A considerable minority (31.7%) stored it in a separate building. Some were storing both inside the house and in a separate store. Only 0.2% used a FBO store suggesting overall that there is very limited formal storage. Using a room inside a house is common practice. But from experience, the conditions are not

well suited for storage, as there is insufficient ventilation, and the crop is rarely lifted off the floor. This would be an area that MSIKA could intervene in.

The differences between male and female respondents on storing 'inside my house' (more men than women) and storing in a 'separate store' (more women than men) are significant. However, there is no obvious explanation for this and it was not discussed in the FGDs or KIs as a topic, emerging only when the analysis was done. It is possibly a function of the crop and possibly the location.

Table 50: Floor area of storage

D.5.ii What is the store's floor area (square meters)?			
Storage facility	Mean	Maximum	Minimum
Inside my house	12	50	1
Separate building/store	24	225	1
In a nkhoekwe/outside store	13	42	4
Baskets/bags outside or in a pile	4	9	1

The highest mean average floor area was for separate buildings at 24m² and ranging from one m² to a very high 225m². The mean floor areas for 'inside my house', 'nkhoekwe/outside store'¹⁰ and 'baskets/bags outside/pile' were 12m², 13m² and 4m² respectively.

The overall mean average per responding household across all forms of domestic storage was 17m². The total floor area for the 604 respondents was an estimated 10,283 m².

From the survey FBO storage was insignificant. From the FBO KIs, only a cooperative in Mchinji, reported that they have a storage facility, which is used for aggregating, grading and storing potatoes. One other FBO in Mchinji has a store, but it is used for maize and soybean, not for any of the target crops. Both stores were built by a development project. The project in Dedza and Ntcheu said they encourage 'Diffused light storage' for potatoes: *"Under a project that phased out last year, we supported farmers to build 35 storage structures which we call Diffused Light Stores. These are better storage for stronger seed..."*

Otherwise, the FBOs indicated that they do not have storage facilities, and advise the farmers to make their own storage at home, which may reflect that these crops are more problematic to store in non-temperature controlled warehouses and the cost of temperature controlled stores is beyond what the FBOs can afford and also manage.¹¹ This is consistent with the survey findings.

A common response to the challenge of storage is for farmers to delay harvesting, so that product remains as fresh as possible in the ground or on the plant than it being harvested and begin to deteriorate. A project in Salima, said: *"When buyers come it is mostly when [meaning at that time that] mangoes are plucked from trees, packed and transported"*. Farmers in the FGDs also said they harvest tomatoes and mangos the day before they want to sell them. Many of the GoM KIs highlighted the problem of perishability as a major issue, primarily for tomato and mango, and particularly in the hottest districts of Salima and Mangochi, where these also grow well.

In the absence of appropriate storage and uncertain markets, late harvesting makes sense from the farmer's perspective.

¹⁰ This is usually a wicker/woven cylindrical store on legs, often used for maize cobs.

¹¹ Maintenance and the ongoing electricity charges. Grid electricity is also very unreliable in Malawi, often requiring back-up generators.

3.4 Gender and Crop Production

This section presents findings on the involvement of men and women in the production of fruits and vegetables. It also covers labor input and involvement in decision-making.

3.4.1 Roles in production and selling

The level of involvement of men and women is set out below:

Table 51: Involvement in activities for tomatoes, by sex

E.1 Who in your household does the work for tomatoes on the following?						
Activity	Base	Only by men (%)	More by men than women (%)	By men and women equally (%)	More by women than men (%)	Only by women (%)
Land preparation	383	18.8	25.1	42.8	7.8	5.5
Planting	383	15.7	19.6	52.7	6.8	5.2
Managing crop while growing	383	14.4	25.6	48.3	5.5	6.3
Harvesting the crop	383	7.1	19.4	58.1	9.2	6.3
Handling crop after harvest	383	10.2	17.0	48.4	14.7	9.7
Selling the crop	383	23.1	18.4	41.2	9.2	8.1

The highest proportion of respondents, ranging from 41.2% to 58.1% said that men and women performed activities equally. It was noted there is a relatively higher percentage of respondents that said more work is done by men (17.0-25.6%) than women compared to those that said women did more work than men (5.5%-14.7%). The proportions that were done by men only were higher compared to women only.

The level of involvement of men and women in onions is set out below:

Table 52: Involvement in activities for onions, by sex

E.2 Who in your household does the work for onions on the following?						
Activity	Base	Only by men (%)	More by men than women (%)	By men and women equally (%)	More by women than men (%)	Only by women (%)
Land preparation	114	16.7	33.3	43.0	3.5	3.5
Planting	115	15.7	25.2	50.4	5.2	3.5
Managing crop while growing	115	17.4	26.1	48.7	4.3	3.5
Harvesting the crop	115	13.0	17.4	58.3	7.8	3.5
Handling crop after harvest	114	10.5	20.2	52.6	11.4	5.3
Selling the crop	112	22.3	23.2	39.3	8.0	7.1

Like for tomatoes, the labor input was reportedly most commonly put in equally by men and women with those responses ranging from 39.3 to 58.3%. In addition, a higher percentage of respondents said that more work is done by men than women (ranging from 17.4% to 33.3%) compared to those that said women did more work than men (ranging from 3.5% to 11.4%). Also, a higher proportion said that the work was only done by men compared to those that said it was only one by women.

The level of involvement of men and women in Irish potato is set out below:

Table 53: Involvement in activities for Irish potatoes, by sex

E.3 Who in your household does the work for Irish potatoes on the following?						
Activity	Base	Only by men (%)	More by men than women (%)	By men and women equally (%)	More by women than men (%)	Only by women (%)
Land preparation	188	14.9	29.3	41.5	10.1	4.3
Planting	188	9.0	26.6	48.9	12.8	2.7
Managing crop while growing	187	12.3	27.8	14.7	10.2	2.7
Harvesting the crop	187	7.5	16.6	57.8	15.5	2.7
Handling crop after harvest	189	12.7	18.0	52.4	13.2	3.7
Selling the crop	187	28.9	20.9	38.5	7.0	4.8

The highest proportion of respondents, ranging from 41.5% to 57.8%, said that men and women performed activities equally. It was noted there is a relatively higher percentage of respondents that stated that more work is done by men than women (16.6 to 29.3%) compared to those that stated that women did more work than men (7.0% to 15.5%). The proportions for work done by men only were higher compared to those that stated that work was one by women only.

The level of involvement of men and women in mangoes is set out below:

Table 54: Involvement in activities for mangoes, by sex

E.4 Who in your household does the work for mangoes on the following?						
Activity	Base	Only by men (%)	More by men than women (%)	By men and women equally (%)	More by women than men (%)	Only by women (%)
Land preparation	120	17.5	19.2	37.5	8.3	17.5
Planting	88	26.1	12.5	35.2	5.7	20.5
Managing crop while growing	137	23.4	15.3	36.5	8.8	16.1
Harvesting the crop	168	13.7	15.3	45.2	11.9	13.7
Handling crop after harvest	158	13.3	13.3	40.5	16.5	18.4
Selling the crop	158	10.8	10.8	38.6	14.6	21.5

The highest proportion of respondents, ranging from 35.2% to 45.2%, said that men and women performed activities equally. There is a relatively higher percentage of respondents said that more work is done by men than women (10.8-19.2%) compared to those that said that women did more work than men (5.7-16.5%). However, unlike the other three crops, the proportions that said the work was done by men only were similar to the proportions that said the work was done by women only.

Across the above tables, respondents said that men are generally more involved in selling for tomatoes, onions and Irish potatoes, than at other stages. For mango, women seem to be more dominant when selling the crop. The consensus view across the FGDs and KIs is that women generally do a lot of the work on production, but men are generally more involved in the sales. One respondent from Dedza, ascribe this division to cultural norms and that men see themselves as the ones that do the trading and handling the money. Another club in Salima did give some split of the production tasks with men more involved in sucker removal and spraying (and with it handling

chemicals). A group in Ntcheu said that the work on production was done by both men and women equally.

The KIIs confirmed that women do a lot of the work on production, but there were local differences. It was mentioned that: *“Women do most of the tasks in Irish potato production...However, marketing is mostly done by women at Njolomole, but it is men at Tsangano... I don't really know but maybe because of Ngoni culture at Tsangano and ethnic mixture at Njolomole.”*

There may also be a difference where there are groups that are better functioning. In regards to mango groups in Salima, it was said that: *“In groups where women dominate, nursery and tree orchards care is closely monitored. Women are involved in managing nurseries, weeding orchards and managing sales activities.”*

The male mango FGD in Salima articulated a range of tasks that men do (and women do not), such as climbing the trees, fencing young trees, pruning and cycling with the (heavy) bags to buyers to sell. The group acknowledged the role of both men and women in watering and weeding, and that women have some specific roles about the handling post-harvest. The female mango FGD in Mangochi, took the view that there were no differences in roles, and that women went to the market as they can be more trusted with the money. This difference of views highlights that there are not necessarily clearly defined gender roles across the Districts.

While there is reason to provide some generalized view that women may do more of the production and men more of the selling, the picture is more complex with variations based on the crop, the location and ethnicity. This suggests the need for specific reviews for each crop across the target Districts to understand the range of gender roles.

3.4.2 Decision Making

The study also established the participation levels of men and women in decisions related to fruit and vegetable production.

Table 55: Participation levels in decision making, by sex

E.5 In your household, who makes the following decisions on fruits and vegetables?						
Nature of decision	Base	Only by men (%)	More by men than women (%)	By men and women equally (%)	More by women than men (%)	Only by women (%)
Whether to grow fruits of vegetables	633	35.4	16.0	31.9	4.1	12.6
Land allocation & land size for fruits and vegetables	637	36.3	17.6	29.5	4.9	11.8
Inputs to use	641	36.5	17.8	29.5	5.3	10.9
Growing methods	644	34.9	18.8	30.0	4.8	11.5
Harvesting methods	646	32.0	18.4	32.8	5.1	11.6
Who to sell to	641	33.1	16.5	33.2	5.6	11.5
When to sell	641	31.4	17.8	33.1	5.5	12.3

Most of the decisions were either made by men only (31.4 to 36.5%) or equally by both men and women (29.5 to 31.9%).

The FGDs and KIIs provided evidence to support the above with mixed responses around decision-making. It would be helpful to get more of a breakdown by location and by crop of the decision-making, as that could inform the program design.

3.5 Yields

This section looks at production levels of the four different crops in 2016. It also assesses whether the reported yields were actual or estimated amounts. The weather conditions are reported from the respondents' perception.

3.5.1 Yields per hectare

Respondents were asked for overall yields for their area of production or for the number of trees. Given the generally poor practices of record keeping at farm level, respondents were asked if their yield figure was an estimate or an actual.

For onions, 55.2% of the respondents reported the yields as actual, while for the other three crops, over 65.0% of respondents said they were giving estimates. Even if respondents reported actuals, this could not be verified and there are likely challenges in determining the actual weights in practice. For some of those that did not have actuals, the enumerators had to breakdown yield figures by helping the farmer remember how many units of packaging (bags, ox-carts, etc.) and then multiplying these by the standardized weights that the consultants were using. This highlights the need for caution in the reliability of yield data as being indicative rather than definitive. It also highlights a challenge for future measurement and for LOL to consider how it will be able to get more actuals than estimates. Suggestions on how this can be addressed are included in section 5 on strategies.

Respondents were asked for the yield and this was then standardized by the consultants per ha or per tree for mangoes to give the following results:

Table 56: Volume harvested in kgs/ha

Summary yields in kgs per ha or per tree				
Crop	Base (%)	Mean	Maximum	Minimum
Tomatoes	97.2	5,617	72,000	125
Onions	97.4	4,219	23,250	450
Irish potatoes	99.0	5,233	37,500	250
Mangoes	88.8	92	500	12

The mean average yield was 5,617 kgs/ha/year for tomatoes, 4,219 kgs/ha/year for onions and 5,233 kgs/ha/year for Irish potatoes. For mangoes it was 92 kgs/tree. These yields are annualized, so they include multiple cropping of tomatoes (mean 1.3 crops), onions (mean 1.2 crops) and potatoes (mean 1.3 crops), which increases the overall yields per ha. However, the yield ranges vary wide, with tomatoes from 125 kgs/ha/year to 72,000 kgs/ha/year,¹² so it might also be that there are some outliers/misreporting, particularly at the upper end. The consultants provide the data for Whisker plotting alongside the report so that LOL can review the outliers and can consider adjustments based on technical knowledge of realistic yields.¹³ More important than the issue of assessing outliers, the variation in yields highlights that there is considerable scope for MSIKA to address these variations in yields and improve overall yields.

Table 57: Number of times crops were harvested

F.5 How many times did you harvest the crop in 2016?				
Crop	Base	Once (%)	Twice (%)	Three times (%)
Tomatoes	372	74.7	17.2	8.1
Onions	115	84.3	13.9	1.7
Irish potatoes	180	74.4	17.2	8.3
Mangoes	167	95.8	1.2	3.0

¹² The interquartile range predicts a maximum of up to 66,063 kgs/ha, so this value is around 10% above that. The consultant's view was that this outlier should be included.

¹³ The consultants removed outliers where the data appeared to be bad data.

Between 74.4% and 84.3% of respondents reported to have harvested the crops once for tomatoes, onions and Irish potatoes. 13.9% to 17.2% report having harvested twice and a further 1.7% to 8.3% said they harvested three times. For mangoes, the picture was very different with 95.8% saying they harvested once, 1.2% saying twice and 3.0% saying three times. Irrigation is likely to be a key factor in increasing the number of harvests per year that MSIKA could promote.

The KIIs with GoM staff contain details on the locations where there are concentrations of production of the target crops by EPA. It would be beneficial for the MSIKA implementation team to review this information to see if the target EPAs fit with the information from the GoM's District teams.

3.5.2 Weather Conditions in 2016

To enable future comparisons, respondents were asked about the weather conditions in 2016 on a comparative basis:

Table 58: Respondents' perceptions of weather in 2016, by crop

F.4 How was the weather for growing these crops in 2016?				
Crop	Base	Good (%)	Normal (%)	Bad (%)
Tomatoes	377	18.0	15.1	66.8
Onions	115	35.7	21.7	42.6
Irish Potatoes	183	15.8	13.1	71.0
Mangoes	171	32.2	34.5	33.3

In 2016, more respondents said that the weather was bad than said it was good. 66.8% and 71.0% of respondents said that the weather was bad for tomatoes and Irish potatoes respectively. Only for mangoes were the responses very similar for normal, good and bad at around one third for each, and from an agronomic perspective, mango production appears to be less susceptible to poor rains.

This pattern fits with the responses from FGDs and KIIs that 2016 was a generally poor to bad season for most crops. The GoM KIIs highlighted the issue of climate change, and talked about 'climate smart agriculture', but without giving much detail on what this meant. It is stated to be about crop choices, seed varieties, water conservation and harvesting, etc., but without a lot of detail. CSA is likely to be a convenient 'wrapper' for a range of agronomic activities that are consistent with variable climate, but without a tight consensus on what specifically it means.

To assist in calculations, respondents were asked how many times they harvested in 2016, which depends on access to irrigation or dambo land. The results were:

3.6 Sales

This section focuses on the selling related issues across the four crops for sales that took place in calendar year 2016. Weather was reported based on farmer perceptions, whether 2016 was a 'good', 'normal' or 'bad' season overall for that particular crop in their locality.

Table 59: Proportion of respondents who sold, by crop

G.1 In 2016, did you sell...?			
Crop	Base	Yes (%)	No (%)
Tomatoes	386	95.9	4.1
Onions	117	93.2	6.8
Irish potatoes	193	94.8	5.2
Mangoes	188	75.5	24.5

In 2016, over 93.0% of the respondents sold their produce, except for mangoes with almost one quarter of respondents that did not sell any. This suggests that LOL may

wish to increase the qualifying number of trees for a mango producer to be considered for inclusion, on the presumption that LOL is aiming to work with those that already sell at least some of their produce into markets.

The reasons for not selling were as follows:

Table 60: Reasons for not selling

G.2 Why did you not sell any?	
Reason	%
No surplus	64.8
Could not get buyer	9.3
Prices were too poor	11.1
Crop quality too poor	18.5
Other reason	42.6
Base	54

Multiple response possible

Among these, 64.8% did not sell because there was no surplus followed by 18.5% who said their quality was too poor to sell. Among the other reasons, the most common was consumed all of them, which is similar to no surplus and losses to pest and disease before they could sell.

Respondents that sold reported the following sales:

Table 61: Sales per respondent that sold, kgs

G.3 In all 2016, what quantity (kgs) did you sell					
Crop	Base	Mean	Median	Maximum	Minimum
Tomatoes	369	1,621	575	51,750	40
Onions	109	1,019	552	16,000	15
Irish potatoes	183	1,875	828	22,230	50
Mangoes	142	1,028	480	29,700	55

The mean sales ranged from 1,019 kgs per onion seller to 1,875 kgs per potato seller. The medians were much lower ranging from 480 kgs for mango sellers to 828 kgs for potato sellers, reflecting that the sales of larger-scale sellers increased the mean average sales.

Respondents were asked about the prices they got for their crop in 2016. These are standardized to give a price in Malawi Kwacha (MK) per kilogram (kg)

Table 62: Average prices (MK), by crop

G.6 In 2016, what was the average price (MK/Kg) you sold at?					
Crop	Base	Mean	Median	Maximum	Minimum
Tomatoes	350	128	120	560	25
Onions	98	157	109	500	50
Irish potatoes	174	173	167	385	28
Mangoes	117	57	50	163	18

The mean average price of Irish potatoes was the highest at MK 173/kg and lowest for mangoes at MK 57/kg. Mango is in a lower price range than the three vegetables, but one tree can produce a large amount of fruit within minimal expenditure, compared to the other three crops. Onion showed the most variation between the mean and the median, suggesting that some farmers are getting much better prices than others, which increases the mean.

The reported ranges were very wide, with very low prices possibly indicating sale of spoiled stock or distressed sales when sellers had no other options as stock was about

to be spoiled. The issue of selling at low prices when stock is perishing at the market or on farm was highlighted in the FGDs with farmers and KIIs with all stakeholders and discussed earlier.

Respondents were aware of the differences in prices at different markets and the issues with selling at the farmgate or taking produce to a market. A mango club said: *"The prices at the markets are better than the prices offered to us (at farmgate), because one mango sells at K50 but when these people come they pay us about K2 or K5 per mango."* A tomato club in Salima said that there are plenty of markets in the main season in May and June, but outside that, they more commonly sell at the farmgate. A big advantage for the farmer of selling at the farmgate is that the buyer is responsible for the transport and any damage that occurs. According to a club in Ntcheu regarding potatoes: *"If you sell a 50kg bag at MK 5,000, you are better off than selling the same at MK 6,000 at Tsangano because the latter market is farther, hence transport-costly and congested..."* Farmers were at least considering the transport cost, losses and risks of not selling at markets compared to farmgate/very local selling.

A FMO in Mangochi raised a different point that negotiation is not possible at the market, but if the buyer comes to the farmgate, they can negotiate, as the buyer is showing that they really want the product by coming and there are no immediate competing options. This is likely to be outside the main rainfed season.

It would be useful for LOL to further investigate these sales patterns and the pros and cons for the farmers or selling in markets versus from the farmgate.

Respondents were asked if they sold any crop through a written contract in 2016:

Table 63: Selling By Contract, By Crop

G.8.i Did you sell any of this to a buyer under written contract in 2016?			
Crop	Base	Yes (%)	No (%)
Tomatoes	370	1.4	98.6
Onions	109	0.9	99.1
Irish potatoes	176	1.1	98.9
Mangoes	142	-	100.0

The vast majority of the respondents did not sell under a written contract, with less than 1.5% doing so for tomatoes, onions and Irish potatoes and none for mangoes.

A tomato Club in Salima said: *"We have never had any sort of formal or written agreement with buyers."* This mirrored the experience of the FBOs that were interviewed and highlights the challenge for LOL in establishing formal contracts/agreements. The male and female potato FGDs in Dedza took product to market and sold to processors there, but not under a contract. The only partial exception found in the research was the tomato FGD farmers who were selling to a cooperative for processing, which appears to be a credit arrangement, but with a formal contract.

Table 64: Main Way of Selling Crops

G.9 Did you sell mainly with ...?	
Method	%
Other farmers in my farmer club/group	0.2
On my own as an individual	98.7
Other	1.1

The vast majority of respondents, 98.7% sold mainly by themselves as individuals than with others. From the KIIs with FBOs, there were examples of FBOs saying they negotiated and sold together, such as with potatoes in Dedza and tomatoes in Mchinji. It is not clear how well organized these sales are and how many members take part. These may be the exceptions, in that many farmers may not be part of an organized

group, so have to sell separately. Groups clearly provide an opportunity for collective selling and potentially negotiating better deals by offering already aggregated product.

Table 65: Main Place Crop Was Sold, By Crop

G.10 Where did you sell any of your crops?									
Crop	Base	Neighbors (%)	Local Market (%)	Traders who came (%)	Traders delivered to (%)	Distant market (%)	Direct to processors (%)	NGO/FMO (%)	Other (%)
Tomatoes	367	49.6	51.8	79.3	10.6	4.1	0.8	0.3	0.5
Onions	108	38.0	48.1	84.3	13.9	6.5	0.9	-	-
Irish Potatoes	183	27.9	41.5	77.6	5.5	2.7	1.1	1.1	0.5
Mangoes	140	30.0	55.7	74.3	8.6	2.1	2.1	1.4	-

Multiple response possible

For all the four crops, traders who came to the respondents was the most common response (over 75%), followed by local markets and then neighbors. Less than 2.0% of respondents sold directly to processors.

This pattern of where the crop was sold echoes the earlier discussions about the merits, as farmers see them, of selling at the market or at the farmgate. The physical challenge and related cost of transport to market for the heavier crops, like mangoes and potatoes is considerable, whereas tomatoes are also heavy and the most easily damaged. This deters farmers from transporting crops to further market beyond short trips to their local market, as does the need for having cash available to pay for transport. The only cold storage was in Salima. There was no reported refrigerated transport in these locations and the consultant did not encounter any, suggesting that in practice, there is no cold chain for F&V.

The male and female FGDs in Dedza (tomato) were selling to a tomato processor which is also a farmer co-operative. This was not under contract, but the cooperative organizes transport and though they sell on credit, they do feel reassured as people from the community work at the co-operative.

Respondents were asked what the best market was, without giving them a specific definition of best.

Table 66: Best market in 2016

G.11 Which of these was the best market for...?									
Crop	Base	Neighbors (%)	Local Market (%)	Traders who came (%)	Traders delivered to (%)	Direct to processors (%)	Distant market (%)	NGO/FMO (%)	Other (%)
Tomatoes	250	2.0	21.0	69.2	3.6	2.0	0.4	-	0.4
Onions	80	2.5	11.3	72.5	5.0	6.3	-	-	2.5
Irish Potatoes	87	3.4	24.1	63.2	2.3	2.3	1.1	1.1	2.3
Mangoes	78	1.3	32.1	52.6	7.7	2.6	2.6	1.3	-

Traders who came to them were seen as the best market by respondents. The reasons were noted earlier, such as not having to transport to market (cost, time and uncertainty), able to negotiate to some extent and limited alternative options.

One of the indicators for MSIKA is the time it takes from first input to selling the crop. In section 3.2, the measurement of the how long between the first purchase of an input and planting was discussed. This is the second part of the equation in order to work out the days from purchase first input to final sale of all crop.

Table 67: Period it takes from first harvesting to final sale

G.13 From the first day of harvesting, how many days did it take to sell all the crop?					
Crop	Base	Mean	Median	Maximum	Minimum
Tomatoes	364	8.5	4	120	1
Onions	108	24.7	14	150	1
Irish potatoes	179	15.2	7	120	1
Mangoes	136	15.2	6	90	1

Tomatoes had the shortest mean average at 8.5 days and a median of 4 days, while onions had the longest period from harvest to sale with a mean average of 24.7 days and a median average of 14 days. There was a wide range of days for all crops, with the widest being 149 days for onion. This could be a function of the harvesting, which can be done over a period which can be a function of succession planting (that LOL is planning to promote).

The indications from farmers in the FGDs and FMO KIs was that farmers picked the crop, particularly tomatoes and mangoes, just before they wanted to sell, or even while the buyer was present at the farmgate, due to the perishability of the crop if stored for any time. For potatoes and onions, as noted earlier, these can be left in the ground until there is an opportunity to sell, but the characteristics of these two crops are that they are not normally just lifted and sold immediately, but cured/dried so as to last longer once harvested.

The consultant's conclusion is that the nature of the crop affects the time period from harvesting to sale. However, the averages and range hide important agronomic/harvesting factors that need to be considered, such as the potential impact of LOL promoting succession planting which would result in extended harvesting periods and which would extend the first planting and first harvest to final sale period. Other measures that LOL wants to promote, such as improved storage to extend the life of harvested produce, would also result in a longer period from harvest to final sale, to take advantage of improved prices after the season peaks. The consultant's conclude overall that the indicator to measure first purchased input to final sale is highly problematic as LOL is likely to promote T&Ts and GAP that seek to extend this period in some cases.

Respondents were asked about spoilage levels and the place where spoilage occurs.

Table 68: Quantity that was spoiled in the post-harvest period, by place and by crop

G.14.a What amount of tomatoes was spoiled (kgs)?					
Stage Spoiled	Base	Mean	Median	Maximum	Minimum
Post harvest, but prior to transporting	212	189	50	4,000	10
In transport to market	31	71	38	400	10
At the market because not sellable	35	97	50	450	10

G.14.b What amount of onion was spoiled (kgs)?					
Stage Spoiled	Base	Mean	Median	Maximum	Minimum
Post harvest, but prior to transporting	40	78	50	375	10
In transport to market	5	100	50	250	50
At the market because not sellable	9	141	100	500	20

G.14.c What amount of Irish potatoes was spoiled (kgs)?					
Stage Spoiled	Base	Mean	Median	Maximum	Minimum
Post harvest, but prior to transporting	63	143	70	1,050	10
In transport to market	9	156	65	525	40
At the market because not sellable	23	264	150	1,750	10

G.14.d What proportion of mangoes was spoiled (kgs)?					
Stage Spoiled	Base	Mean	Median	Maximum	Minimum
Post harvest, but prior to transporting	37	107	55	550	16
In transport to market	16	61	53	100	10
At the market because not sellable	23	77	50	264	20

Tomatoes had the highest reported mean average losses followed by potatoes post-harvest, but prior to transporting. Transport losses were highest for potatoes and for onions. Losses from non-sale at market were notably highest for Irish potatoes and onions, perhaps reflecting the characteristics of the markets for these crops, where surpluses are not cleared. It appears that tomatoes and mango producers have more problems with on-farm with spoilage, and potato and onion producers have more problems at the market.

Potatoes had the highest overall mean average losses, followed by tomatoes. Mangoes saw the lowest overall mean average losses.

Table 69: Reasons for spoilage

G.15 What were the main reasons that the product was spoiled/lost?							
Crop	Base	Damaged in harvesting (%)	Damaged at farm prior to selling (%)	In transport (%)	Damaged at market (%)	Not sold before spoiled (%)	Other (%)
Tomatoes	282	27.3	69.1	15.2	19.1	16.3	10.3
Onions	66	30.3	45.5	27.3	18.2	22.7	16.7
Irish potatoes	103	42.7	54.5	12.6	14.6	27.2	11.7
Mangoes	71	43.7	47.9	12.7	29.6	19.7	1.4

Multiple responses possible

For tomato growers, the most common reason for spoilage at 69.1% was that the produce was damaged at the farm prior to selling. Damage at the farm, prior to sale, was also the most commonly stated reasons for the other crops. This suggests that there is scope to improve handling at farm level and that this would be an important area for the MSIKA project to address.

3.7 Farm Management

This section looks at good farm management practices that respondents knew or used, and the practices of labor outsourcing in crop production.

Table 70: Good farm management practices known

H.1 What good farm management practices do you know?	
Practice	Yes (%)
Keeping good farm records	33.0
Running your farm as business	54.4
Selling together with other farmers	23.7
Doing costings for growing crops	54.3
Calculating profits after selling	57.1
Planning your farm and how to rotate crops	33.1
Planning production for a specific market	44.1
Base	658

Multiple response possible.

This was an unprompted question to get respondents to state what they thought were good farm management practices. 'Running your farm as business', 'doing costing' and 'calculating profits' were known as good farm management practices by over 50.0% of respondents. The least known good farm management practice was 'selling together with other farmers' which is also reflected in the responses that farmers report that they predominantly sell their produce as individuals. However, it should be borne in mind that these are what respondents said are good management practices that they know, so the actual knowledge of the content/detail may be weaker than implied by the above.

In terms of practices that farmers apply:

Table 71: Farm management practices currently applied

H.2 Do you currently do the following?				
Practice	Base	Yes, in all ways (%)	Yes, in some ways (%)	No (%)
Keeping good farm records	646	20.6	12.8	66.6
Running your farm as business	652	48.0	19.6	32.4
Selling together with other farmers	653	6.0	9.8	84.2
Doing costings for growing crops	647	35.5	26.1	38.2
Calculating profits after selling	6474	39.4	26.0	34.6
Planning your farm and how to rotate crops	650	24.0	16.2	59.8
Planning production for a specific market	644	33.7	19.7	46.6

This question was prompted, so it is possible to have higher responses on applying some practices than for knowledge of that practice, as found here. There were no good farm management practices scoring above 50.0% in all ways. But combining 'yes in all ways' with 'yes in some ways', the highest good practice applied was 'running the farm as business' (67.6%), 'calculating profits after selling' (65.4%) and 'doing costing for growing crops' (61.7%).

The responses highlight the gaps where LOL could focus its farm management training efforts, notably 'selling together with other farmers', 'keeping good farm records', and 'planning your farm and how to rotate your crops'. However, as noted on knowledge, it would be important to doing further assessment (i.e. the pre and post training evaluations) of what the respondents actually knew and what they were applying at the point at which they enter the program for training.

The table below is based on those who responded that they were following a farm management practice in all or some ways to find out the source of the learning.

Table 72: Where respondents first learnt about a farm management practice

H.3 From who did you first learn?							
Practice	Base	Parent/ Neighbor (%)	Lead Farmer (%)	Gvt extension officer (%)	NGO/project (%)	FBO (%)	Other (%)
Keeping good farm records	210	25.2	23.3	26.2	-	14.3	11.0
Running your farm as business	430	34.2	21.2	23.0	0.7	9.8	11.2
Selling together with other farmers	122	28.7	27.0	22.1	-	13.9	8.2
Doing costings for growing crops	400	28.0	24.3	26.5	0.8	9.5	11.0
Calculating profits after selling	425	34.8	20.2	24.2	0.2	10.4	10.0
Planning your farm and how to rotate crops	259	21.2	28.8	33.2	-	10.8	6.6
Planning production for a specific market	343	27.7	26.2	30.3	0.3	7.6	7.9

The percentage of respondents who mentioned 'parent/neighbor', 'lead farmer' and 'GoM extension officer' as the source of learning were relatively similar, each accounting for about one quarter of responses. NGOs/Projects were the least commonly mentioned at less than 0.9%, with FBOs accounting for between 7.6-14.3%.

The KIIs with GoM District staff found that GoM training includes aspects of farming as a business, collective marketing and other aspects of marketing, but otherwise there was more emphasis on farming and HPH T&T. A Specialist in Dedza highlighted: *"...there is a gap in marketing skills. There is a need to do some business management trainings for most farmers in all EPAs"*

A program in Dedza highlighted marketing, group organization and basic management skills. Another highlighted marketing, finance and organizational management. These tended to speak more to FMO management than farm management. FGDs mentioned receiving training in Mchinji that provided training in group dynamics, collective marketing and business planning, but this appears to be a commissioned private training provider.

The overall feedback from the FGDs and KIIs is that there has been some farm management training of farmers, some of which has included some farm management practices, suggesting that there are still considerable gaps.

3.8 Employment

Respondents were asked if they employed anyone for more than four weeks in 2016.

Table 73: Proportion of Respondents Employing Someone

H.4 Did you employ anyone for more than four weeks in 2016?			
Response	Male (%)	Female (%)	Total (%)
Yes	18.3	10.8	15.0
No	81.7	89.2	85.0
Base	372	286	658

Among respondents, 15.0% had employed someone for more than four weeks in 2016.

The responses from KIs and FGDs indicate that farmers hire people at busy times to help with particular tasks, such as field preparation and weeding, which is termed 'ganyu'.¹⁴ This hiring is seasonally-related and short term in nature. The minimum of four weeks per year is difficult to use in practice as ganyu is typically for shorter periods, such as two to three days. Those providing ganyu labor generally do it to get food when they have run short and then return to their own farming. They may return later to do more short-term ganyu for the same hirer, or go to another farmer that needs short-term labor, but rarely would they do it for long periods for one farmer. Employment for a longer period would mean a person giving up their own farming, which many may be reluctant to do. The exception is that one member of a household might decide to accept formal employment due to the benefit of regularity of payment and potentially other benefits, which is very attractive. The four-week minimum period differentiates employment (rare) from ganyu, but means that the more common methods of hiring by farmers would not be captured.

The mix of male and female, full-time and part-time employment for the 15.0% that said they employed someone is set out below:

Table 74: Nature of Employment

H.6 Was the person/people employed full time or part time?			
Nature of Employment	Male (%)	Female (%)	Total
Full-time Male	48	47	48
Part time- Male	39	59	46
Full time Female	15	18	16
Part time Female	39	53	44
Base	33	17	50

Multiple responses possible

The patterns of employment were similar, other than that few female workers were employed on a full time basis. The difference was not statistically significant between full time and part time workers and between male and female employers.

The enumerators had challenges explaining to respondents how to classify part-time employment, as this is not a well understood concept, as work is more defined by task than time, leaving the provider to do it in the time period that suits them. This may have contributed to the lower number of responses to this question.

The tenure of employment/hiring had a mean of 11 weeks, and a median of 8 weeks.

This question also proved difficult for enumerators to get responses from respondents, possibly because most labor is casual and respondents did not know the number of weeks very accurately.

3.9 Market and Weather Information

This section presents findings on the sources of information that respondents used and those that they considered the best.

The table below shows the sources of information on places where farmers could sell, prices they could get, and weather that could affect crop production.

¹⁴ Ganyu is essentially a system of short term hire, often task based particularly in agriculture.

Table 75: Sources of market and weather information

I.1.a Where do you get information on the following?											
Type of Information	Base	Neighbor/ Friend (%)	Radio (%)	GoM Extension Officer	Buyer Extension Officer (%)	NGO Extension Officer (%)	SMS (%)	FBO (%)	Posters (%)	Other (%)	Did not get this (%)
Places where you can sell	645	67.3	15.0	9.9	7.4	3.1	3.4	4.2	3.3	6.0	19.1
Prices you can get the crop	632	65.2	15.2	8.7	6.5	1.7	2.8	4.7	3.6	6.8	19.9
Weather that might affect your crop	630	41.1	48.1	9.0	1.1	0.8	1.3	1.9	2.5	2.5	22.5

Both on the 'place you can sell' (67.3%) and 'prices of crops' (65.2%), 'neighbors/friends' was the most mentioned source. 'Radio' (48.1%) and 'neighbors/friends' (41.1%) were the two most common sources of information on weather.

Table 76: Best source of information

I.1.b Which of these was the best source?											
Type of Information	Base	Neighbor/ Friend (%)	Radio (%)	GoM Extension Officer	Buyer Extension Officer (%)	NGO Extension Officer (%)	SMS (%)	FBO (%)	Posters (%)	Other (%)	Did not get this (%)
Places where you can sell	259	59.5	6.9	9.3	3.1	0.4	4.6	4.6	3.9	7.7	19.1
Prices you can get the crop	252	59.5	7.5	7.9	2.4	0.8	4.4	4.4	4.4	8.7	19.9
Weather that might affect your crop	245	29.4	59.2	6.1	-	0.8	-	0.8	1.2	2.4	22.5

On 'place where you can sell' and 'prices of crops', 'neighbors/friends' again dominated, with 59.9% giving these as the best sources. On 'weather information', radio was clearly the best source according to 59.2% of respondents

From the farmer FGDs, the main source of information on 'places where they can sell' was reported as from within the community, such as 'friends' and to some extent from extension workers. The Male Tomato FGD, Ntcheu said: *"Members bring feedback from the market on the supply status to prepare fellow members on the impending pricing."* There is some price information coming from extension workers and projects, but the farmers report that it is out of date and by the time they go to the market, they are faced with different and usually lower prices. The Mixed Tomato FGD in Salima was very pragmatic: *"This information (on price) is not hard to get and is timely available, because we use phones or sometimes we physically go Kamuzu road and ask the price ranges."* They said that they have friends in the town that they ring to get information when needed. This fits with previous work that the consultant's did on the MoAIWD's market information system.

There are always challenges getting price information as it is quickly out of date and things change rapidly, due to the perishable nature of the commodity, so that the price varies during the day and between days, depending on demand and the number of sellers that have come to the market. Communicating information about today's price can have some value, but it will not necessarily tell the farmer what tomorrow's price is which is the soonest she/he can get to the market. To a greater extent, respondents were relying on neighbors and friends for places to sell and price information, and on radio for weather information.

3.10 Financial Services

This section focuses on the financial services available and accessible to the respondents in 2016.

The study found that 17.9% of the respondents had formal bank accounts in 2016, of which 81.8% were mainly used for savings, and the remainder for making payments. In the context of Malawi, savings are often very short term and more a means to keep the money safe and out of reach until it is needed.

Apart from the banks, other organizations that respondents made savings with were Savings and Credit Co-operatives (SACCOs)/Microfinance Institutions (MFIs) (5.4%) and, most commonly, Savings and Credit (S&C) groups (37.1%), also known as Village Savings and Loan Groups. There has been considerable progress on formation of S&C groups, such that these are now significant financial service providers in rural communities in Malawi.

The respondents were asked if they or a household member had taken a loan in 2016 and where it was taken from:

Table 77: Accessible credit institutions

J.5-8.a & 12-13.a Did you or anyone in your household have a loan from ... in 2016?			
Financial Institution/Source	Base	Yes (%)	No (%)
Bank	655	1.7	98.3
MFI or SACCO	658	4.4	95.6
Traders (cash or in-kind)	658	0.8	99.2
Family or friends	657	13.5	86.5
Informal groups in your community (cash)	658	36.5	63.5
Informal lender in your community	658	1.5	98.5

The most popular source of loans was an 'Informal group in your community (S&C group)' (36.5%), followed by 'family/friend' (13.5%). Banks (1.7%) scored poorly, probably due to poor accessibility and difficult terms to meet for borrowing, notably collateral requirements.

Informal lenders ('Katapila') (1.5%) and traders (0.8%) were the least used channels. It is possible that informal lenders (Katapila) are under reported as there is considerable stigma in borrowing from them and it is illegal to do so. This is a difficult group of lenders to get truthful responses about.

On farm inputs loan, a few farmers had received a farm inputs loan from buyers (1.2%), NGOs (1.8%) or GoM (1.1%) in 2016.

The proportion of respondents who had funeral benefit (1.2%), weather insurance (3.7%) and financial training (3.7%) was very low. Comparatively, there was a higher percentage of respondents making payments using phone, although these were still a small minority at 6.5% of respondents.

Those that had reported having a loan, were asked for the loan amount:

Table 78: Loan Amount from Formal and Informal Sources, MK

J.5-8.b & 12-13.b What was the loan amount in 2016?					
Credit Institution	Base	Mean	Median	Maximum	Minimum
Bank	7	74,286	50,000	150,000	20,000
MFI or SACCO	26	76,038	60,000	250,000	10,000
Buyer/trader	2	35,000	35,000	50,000	20,000
Family or friends	86	25,614	15,000	300,000	1,000
Informal group (Savings & Credit)	238	37,298	23,500	350,000	1,000
Informal lender	7	82,857	35,000	400,000	15,000

Within the identified credit institutions and individuals, informal lenders provided the highest amount of loan with a mean of MK 82,857, followed by MFIs/SACCOs at MK 76,038 and banks at MK 74,286. The difference between the mean average loans accessed from banks and MFIs was insignificant. The ranges were very wide.

Table 79: Amount of farm input loans, MK

J.9-11.b What was the amount of the farm input loan in 2016?					
Source	Base	Mean	Median	Maximum	Minimum
Buyer	4	65,000	62,500	130,000	5,000
NGO	7	137,143	80,000	400,000	3,000
GoM	4	30,250	32,000	50,000	7,000

For the few respondents that had farm input loans, NGOs provided the highest value farm input loans with a maximum of MK 400,000, a mean of MK 137,143 and a median of MK 80,000. GoM provided the least in value of loans, with a mean of MK 30,250 and a median of 32,000. Due to the small number of such loans (15/658 respondents), it is not possible to rely on the value of loans, only to conclude that these are rare overall.

This was a mix of formal financial players providing financial services, with four banks five MFIs and one project. In addition, financial training was provided by programs, a trade union and farmer co-operatives. In practice, the main services come through the S&G groups, which some of the projects/NGOs have been promoting.

The farmer FGDs found that some farmers reported having bank accounts, more reported membership of S&C groups, a few reported getting formal loans from banks/MFIs with more taking loans from S&C groups and one from an informal lender. For those that borrow through a S&C group, the loan interest can be 30%/month. Although interest is often seen as a barrier to borrowing, it is notable that people are prepared to borrow at 20-30%/month from a S&C and even 50-100%/month from an informal lender. The general view on rural finance is that access is more about availability and about affordability of the repayment¹⁵ than the actual cost (interest rate) of the finance, as demonstrated in the 'high' interest rates that S&C groups charge their members.

Secondary sources (LEO 2014) found a high reluctance among many micro and small agri-businesses to borrow from formal sources, due to the collateral requirements and their fear of losing assets should they be unable to pay the loan. Small businesses more commonly borrowed in cash and in kind (product) from other business people, including their competitors.

The female, potato FGD, Dedza had 16 of the 28 participants holding bank accounts, but all had zero balances. It appears that they have these for the time when they do get some cash and want to keep it safe for a short time until it is needed. In addition, this also likely reflects the low incomes and that January is one of the lean or so called 'hungry' months as farmers have invested in their farming, and are still to get a return.

In the place of savings or loans, several respondents in the FGDs stated that when they need money, they either sell livestock or do casual work (ganyu). Small livestock has been noted as a means of saving, while casual work is a common livelihood strategy for relatively poor households, particularly during the hungry months where farmers need to get food or some cash immediately.¹⁶

For MSIKA, there is still potential to promote the uptake of S&C groups which mobilize community funds and keep the interest/profit on loans within the community. These

¹⁵ The issue is normally the amount of the installment/payment not the interest rate. So a high interest rate on a small loan can still result in an affordable amount to pay.

¹⁶ Ganyu is often paid in food during the hungry season.

provide both savings and loans, both of which have value and could be used for financing farm inputs. The high uptake levels found in the survey, indicate that they are a valued service, even if there were some complaints in the FGDs about the interest rate.

There are also several active MFIs that LOL could refer those that need more finance to.

3.11 Processing

Respondents were asked about processing of crops.

Table 80: Value addition by farming households

H.8 Did you process any of the crops in 2016 into another product to sell?			
Nature of Employment	Male (%)	Female (%)	Total
Yes	1.1	0.7	0.9
No	98.9	99.3	99.1
Base	365	278	643

On value addition, only 0.9% of the respondents processed the product into another product to sell.

None of the FGDs or KIIs indicated processing by individual farmers, but there was processing by groups, such as a co-operative supported by a Government project that supports a range of activities, some of which involve making tomato sauce, jam¹⁷ and juice as well as potato (trading). This is relatively small scale, producing around 200 x 600 gm bottles per month of tomato sauce, which is sold individually by members in their area and some via the Government project outlet in Lilongwe.

Overall, the team found it very difficult to find processors of these crops. There are two main processors that are part of a large investment that has been promoting mango and banana production for drying and pureeing. The main processor has a contract with a South African company for making puree. So far, the impact is limited, with cumulative production volumes since commencement of 2,000 mT of mango puree exported. The drying plant can process about 50kg of dried mango per day, though the company reports a plan to expand it. They have a chilled warehouse of 1,500 square meters.

The main mango processor buys from the farmgate and transports mangoes to the warehouse, but says that i had many challenges: *"At the beginning, we had a contract (with farmer groups) which we terminated because there were members who registered, but had no trees. Now we are restructuring and considering those with mango trees."* The processor has been going through a period, with significant management change and retrenchment. It is looking for major finance for its operations, as it has relied heavily on donor funds to date.

The next biggest processor was a tomato processor in Dedza (see above, who buy around 47mT of tomato. The research team also met the owner of a small business in Salima Boma, grading and selling tomatoes (c.350x 25-40kg baskets) and drying tomatoes (40x20 liter buckets).The business depends on supply from other Districts outside the rainy season: *"Dowa and Ntcheu are two areas which have successive supply of tomatoes and mostly we get the crop from these two areas because Salima rural farmers depend only on rain fed tomato production"*. Storage of graded tomatoes is at the market *"collective"* shed where there is a communal storage facility, which it is presumed charges a fee for short term storage. The owner said: *"For graded*

¹⁷ A sweetened stiffened preserve, equivalent to US 'jelly'.

tomatoes, none is lost because it does not take up to three days to sell off. The tomatoes once dried lasts more than a month and by this period, all product is sold."

The consultants found small potato fryers, of whom there were many in the Bomas, but all at a small-scale. Some operate as restaurants/cafés, while others just sell fried potato. These were primarily making fries (also called 'chips')¹⁸ to be sold to consumers as a hot snack. The consultants interviewed an owner, in Ntcheu, who used to make fries but is not making potato chips ('crisps').¹⁹ These are bagged and sold as a cold snack, such as ta

The team found small-scale green mango achar processors, usually around the bomas. One such business has no permanent employees, and the owner also runs a chicken business which is reportedly doing better.

Only one processor has Malawi Bureau of Standards (MBS) certification, though another said that it has received training in certain MBS standards, but is not certified. The certified processor gets its product certified in South Africa.

The dearth of processing is a challenging issue for MSIKA to address.

4 Baseline Indicators

This baseline study informs the indicators for the MSIKA program, against which progress will be measured. The baseline survey provides data based on a sample of respondents whose profile is likely to be the same as, or similar to, the beneficiaries that LOL will target as it implements MSIKA.

The baseline data per indicator are set out in Annex 6.

There are several indicators that the consultants advise are changed, which can be seen in the comments columns. There are a group of indicators where the thresholds are too low, around the adoption of two or more techniques or technologies. This can be addressed by reviewing the listing of responses and removing some of those that are very commonly practiced. LOL can still promote these, as they are not necessarily universally practiced, but it will be hard to increase adoption rates if they are already very high. A second approach is to increase the threshold number from two or more to three or more or possibly four or more. This would require a further analysis of the data to determine at what threshold there would be sufficient room for a noticeable improvement to be made. A third option is the combination of revising the list to remove the very commonly practiced and increasing the threshold. Direction from USDA/LOL would be helpful as to which approach is more appropriate.

A second important issue is that because MSIKA is targeting four crops, either the baseline needs to be set per crop to reflect its specific results, or it will need to be re-set when the actual proportions of beneficiaries who grow each crop is known. This is because the mix of beneficiaries growing each crop will affect a number of the figures. For example, the average yields and sales per crop vary, so if the mix is skewed to crops with high or low yields and sales, this will affect the overall result. Based on the data that is available, the baseline numbers can be recalculated for the mix of beneficiaries that MSIKA actually reaches by mid-term. Or the baseline could be set per crop. Again, this depends on the direction from USDA/LOL on how to address this issue.

Although the study provides quantification of baseline indicators, it is important to note that the profile of the actual beneficiaries for MSIKA may differ, due to design decisions made as MSIKA commences. This should be addressed by undertaking a regression analysis to compare the actual beneficiaries with the baseline sample. However, it is

¹⁸ Described both as 'chips' as in the British terminology, which is equivalent to US 'fries'.

¹⁹ Thinly sliced potato, fried, salted and bagged.

also advised that the MSIKA team also gather data from individual beneficiaries and benefiting organisations at the point at which they enter the program, so as to establish their profile on entry and be able to track their subsequent changes in relation to the indicators.

At mid-term and endline, it would also be useful to ask some retrospective questions of the actual beneficiaries to provide further information on their situation before the program interventions.

5 Strategies

In this section, the consultants make a number of observations around the four crops and potential strategies to address some of the issues that have come through in the baseline.

LOL has identified eight areas of activity that it will deliver in the MSIKA program. The consultants comment on these individually, with some suggested strategies based on the baseline findings.

Activity 1: Training: Improved agricultural production techniques

There is considerable information in the baseline on the use of inputs and farming T&Ts. LOL should review the scores of inputs and farming T&T for each of the four crops to determine which inputs and T&T are already mostly adopted and those that could be the focus for LOL training activities. The profile of respondents highlighted that LOL will need to adopt training approaches that address the needs of people with low education which can cover low literacy, low numeracy and difficulty understanding new ideas. There should be a high focus on oral and visual messages, and at least ensuring all written material is at least in vernacular. The focus should be on direct engagement, telling and showing people appropriate approaches, such as through the YankhoPlot and mini-plots model.

Another theme that came through in the baseline was that people say they have learnt farming T&T from sources in the community. LOL should see how it can utilize community-based sources, such as lead farmer models.

Finally, the high levels of poverty of Malawian smallholder farmers suggests that LOL should focus on no or low-cost inputs, techniques and technologies. Farming households have limited resources to invest and will be both constrained from investing by what is available as well as cautious about investing what little they have.

Activity 2: Infrastructure: Post-harvest handling and storage

The baseline found a lack of storage and aggregation for fruits and vegetables which appears to reflect that these are more perishable crops than 'dry' crops, such as maize, soybean, rice, etc. It is difficult to hold any of the four crops in temperate storage for long periods, and putting newer produce with older produce may speed perishing. For grains, there is generally a clearer financial case for storing crop beyond the normal sale period to get a price premium. Fruit and vegetables are also likely to get a premium out of the main harvest season, but keeping them for long enough to get a premium may require a large investment in cold storage, that none of the FBOs have resources to do.

The baseline found that there were gaps in harvest and post-harvest handling, which can be seen in detail in the relevant tables, by crops. Harvesting generally appeared to have higher adoption rates, compared to post harvest handling. There were also noticeable high losses on farm prior to transport and sale, also suggesting that this an area for LOL to focus on. As noted on training for inputs and farming, LOL needs to concentrate on techniques and technologies that are no or low cost and to use materials and training methods geared to beneficiaries with low education.

Activity 3: Training: Post-Harvest Processing

The baseline found very little on-farm processing or even off-farm processing. This presents some challenges for LOL as there is limited experience among the target group to build on. The consultants small scale processing that was found was sauce, jam/jelly and juice for tomato; piri-piri sauce for onion; fries/chips and chips/crisps for potato and achar for mango. There are a few bigger processors, but it would be hard for small processors to compete with these bigger processors due to the investment that is needed, not just in equipment but building a recognized branded product that could be sold beyond the immediate locality, which is where the current small-scale processors are reaching. LOL should consider having lower targets in relation to processors/processing given how little is currently operational. LOL could potentially aim more for aggregation and quality grading which is an important step towards processing.

Activity 4: Capacity Building: Producer Groups and Cooperatives

The baseline research did find FBOs, though these appear relatively weak; for example, there was very little evidence of collective marketing being done by either the FBOs or by smaller groups of farmers. The nature of these crops, particularly the perishability, is likely to be an issue, as well as the challenges of aggregating and the cost of getting relatively bulky and delicate product to market compared to just selling to traders that come to the community. LOL should explore these challenges with farmers and determine if there are strong enough reasons for farmers to market their produce collectively and how this can be done in a practical way in the current market environment.

LOL has its AgPro training package, which can be deployed to help strengthen FBOs.

The success of S&C groups in rural areas is also a mechanism to build on. The consultant's observation over the years, is that S&C groups help build trust and cohesion, as there is a very obvious benefit to members. Once members develop this trust, they start to see more reasons to collaborate, and it is more likely to be successful to add more activities to S&C groups than to add activities to groups that do not currently deliver many benefits to members. Malawi has a lot of FBOs that have been formed to receive benefits from NGOs and GoM, so these groups often have a recipient mentality, and low motivation to do things for themselves. Starting with existing S&C groups or helping to stimulate more S&C groups, followed by adding training and supporting activities like collective buying and collective selling may work more effectively than trying to get formed, but not well functioning groups, to add activities.

Activity 5: Market Access: Facilitate buyer-seller relationships

The baseline found almost no formal contracts between farmers as individuals or in groups with formal buyers and processors. Even major processors were relying on going to markets and purchasing what they could find. LOL should consider meeting processors and seeing which are interested in developing relationships with groups of farmers that could involve support around increasing supply volume and improving quality, and/or growing specified varieties that are needed for processing. This will be difficult as the market is not used to contracting relationships, and there has been considerable bad experience by buyers/processors in other crops on supporting farmers with inputs and extension, only to find the farmers sell to a trader or even to a competitor of the buyer. Design of appropriate contract farming models will be crucial to success.

Activity 6: Financial Services: Facilitate agricultural lending

The baseline found very limited formal lending by banks, MFIs and SACCOs to farming households. There was much higher membership of S&C groups and these were also

a more important source of loans to farming households. There are challenges with formal lenders, particularly banks, such as collateral requirements. LOL should focus on MFIs that are already present in these target areas. LOL should also seek to build on the high membership of S&C groups as these groups are important community based 'providers' of savings and credit services. Enabling these S&C groups to build their size and scale, and supporting establishment of groups in areas where these are not present would be a good mechanism for increasing agricultural lending.

Activity 7: Financial Services: Provide SME finance

Other work on agri-businesses (LEO 2014) found limited formal lending to agri-business small businesses. There is interest among formal financial players to undertake small and medium finance lending (LEO 2014), but there are challenges. Rural agri-business SMEs are wary of borrowing for fear of losing their assets if these have to be pledged as collateral. The focus should therefore be on those formal financial players that have specific interest in rural SME finance to develop appropriate loan packages.

Activity 8: Government Capacity Building: Improve Enabling Environment

The baseline did not uncover major barriers to the development of these four crops that relate to the enabling environment, particularly in terms of legislation and regulation. There are gaps in quality standards and their uptake that LOL could work with the Malawi Bureau of Standards on. The problems with electricity over the last year in Malawi make investment in cool/cold storage more risky, but the absence of such facilities is not necessarily a function of electricity supply, but likely related to other challenges such as the absence of investors willing to offer storage as a service (see LEO 2014). Improvements in the enabling environment look like a lower priority than the other activities listed above.

6 Summary and Recommendations

The findings in this baseline report provide information for LOL on the nature of the target group in terms of their demographic, farming and poverty profile. The baseline also provides valuable information on how these target farming households currently farm these four target crops including knowledge and use of inputs, as well as farming and harvest & post-harvest handling techniques and technologies used. The findings also cover findings on how farmers sell, prices and markets.

From the baseline study, there are a number of recommendations, split into those that relate to the program design and delivery and those that relate to the process of monitoring and evaluation (M&E):

6.1 Program-related recommendations

The following program-related recommendations are made:

1. That LOL adopts the minimum land sizes for tomato and Irish potato of 0.2 ha, but reduces the land size for onions to 0.1 ha based on indications that onions are grown on relatively smaller plots;
2. That LOL adopts a higher threshold number of mango trees for inclusion of beneficiaries, as the minimum of four in the baseline was too low, such that many respondents were merely harvesting what they had rather than taking mango farming as a business. The exact number is open to further review, but should be closer to the mean average of eight trees;
3. That due to the low levels of educational attainment, LOL should ensure its training and communication materials are suitable for farmers with low literacy and delivered

in a way that is accessible and appropriate to those with low education, such as a high emphasis on oral and visual presentation over written;

4. That due to the high poverty levels found, LOL should focus on promoting inputs and techniques and technologies that are no or low cost to enable higher uptake;

5. That LOL leverage the existing network of agro-dealer shops and vendors to enable access to good quality, affordable inputs where there are identified supply gaps, such as for violet potatoes in Mchinji. Agro-dealers could also play a role in farming information provision and supplying less well known inputs like lime;

6. That LOL use existing community-based knowledge and community based mechanisms, such as lead farmers and demo plots, as these are highly valued sources of farming and HPH techniques and technologies ;

7. That due to higher adoption of harvesting T&T, that LOL focuses more on addressing storage and handling T&T;

8. That a more detailed gender analysis is conducted to help determine the specific gender roles in production and selling in each crop for each locality, and provide a more detailed analysis of how decisions are made ;

9. That LOL reviews the GoM KII data on high production EPAs to confirm that these match the target EPAs and that LOL builds good relations with the GoM District teams to ensure collaborative implementation and engagement;

10. That LOL conducts a more detailed assessment of farmer's actual knowledge and application of farm management practices as opposed to the reported data that a baseline can collect, so as to enable the definition of an appropriate curriculum for training;

11. LOL should adjust its program for processors to reflect their scarcity, such as targeting new processing investment, considering interventions that help small processors to expand, setting low targets around processing and focusing more on aggregation and quality related activities that feed into processing; and

12. That LOL focus on promoting S&C groups as an accepted financial service mechanism in rural areas as a means for targeted farming households to save and access small amounts of money for investment in fruit and vegetable production.

6.2 M&E-related recommendations

The following M&E-related recommendations are made:

1. That LOL reviews the list of inputs for each crop and removes those that are current practices that are not clearly Good Agricultural Practices (GAP), such as the use of recycled seed, with the intention of reducing the proportion of respondents that already use two or more of these inputs;

2. That LOL reviews the list of farming techniques and technologies for each crop and removes those that are commonly applied GAP, such as ridging, composting and manuring, with the intention of reducing the proportion of respondents that already apply two or more of these inputs. This should not discourage LOL from promoting these techniques; rather it recognizes that these are already commonly adopted and so should not be part of the scoring;

3. That LOL increases the number of inputs, farming techniques and technologies and harvest & post-harvest handling techniques and technologies that farmers should be measured as adopting from the remaining lists from at least two to at least three;

4. That LOL adopts a standardized set of weights for different types of containers that are used for harvested and marketed produce, such that comparisons with the

baseline, and across Districts can be made without resorting to costly, time consuming and impractical weighing of produce²⁰ in the field. LOL could adopt the weights used by Kadale, or it could conduct a weight standardization exercise across all known container types and apply these retrospectively to the baseline;

5. That LOL establishes its protocols, drawing on the baseline, as to how it will collect data reliable production data, based on the challenges that existing, including the lack of actual weighing and recording of harvest, losses and sales;

6. That Indicator 25, FFPr 2.3 “Average number of days required to move selected agricultural products from purchase of initial inputs to final product (ready for sale)” be dropped as there are good reasons both for making the time shorter (e.g. faster turnaround of capital), but also for making it longer (e.g. buying inputs early while cash is available, preserving the product to reduce perishing, selling when there is not a glut);

7. That there is more focus on hiring for short term, than on full-time equivalent employment, based on low levels of employment found in the baseline due to the small size of the farms, and that employment is often shorter term and more part-time than the current qualifying period of four weeks full-time; and

8. That where any of the recommendations makes future comparisons more difficult, that there is use of retrospective questions in relations to those issues in the mid-term and endline evaluations.

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Kadale: “A small thing blessed for service.”

²⁰ Kadale faced considerable resistance to establishing weights in the field, as sellers did not want produce to be handled, particularly tomatoes and mangos, due to the risk of damage. Weighing of other units, e.g. potato bags requires the assistance of several people due to their very large size. Sellers also do not want to be interrupted and miss sales opportunities.

Annex 1: Scope of Work/Terms of Reference (abbreviated)

Baseline Evaluation

Malawi Strengthening Inclusive Markets for Agriculture (MSIKA)
Food for Progress 2016 - Land O'Lakes International Development

1. Executive Summary:

This document contains the Terms of Reference (TOR) for conducting the baseline evaluation of the five-year Food for Progress

Program, funded by the United States Department of Agriculture (USDA) and implemented by Land O'Lakes International

Development (Land O'Lakes). The project will be implemented in Mchinji, Dedza, Ntcheu, Salima and Mangochi Districts of

Malawi starting in 2016. This document includes background information on the USDA-funded MSIKA project, the desired methodology including objectives and illustrative questions, the timeframe for conducting the evaluation and a list of required deliverables.

To maximize consistency in the evaluation approach and methodology, Land O'Lakes desires one evaluator to design and administer the baseline and midterm evaluations. This contract is for the baseline evaluation. Depending on satisfactory performance on this contract Land O'Lakes may request that the contractor enter into a separate contract for the midterm evaluation in accordance with its previously proposed methodology and budget. This contract does not guarantee any future contracts, including a possible midterm evaluation contract. Land O'Lakes has the discretion to re-solicit the MTE if necessary.

In addition to this baseline and midterm evaluation, an additional firm has been contracted to conduct a baseline and final evaluation to inform the quasi-experimental impact evaluation. The contractor for the baseline and midterm evaluation must be willing to collaborate with this external firm, including sharing data and notes, in addition to any reports, raw data, and presentations associated with these evaluations.

2. Background

MSIKA is a five-year value chain development project that will reach 42,000 smallholder farmers, 210 farmer-based organizations (FBOs), and 24 processors in south central Malawi in the fruit and vegetable value chains. The total project funding will be \$20,670,263 USD, including a cost sharing or matching contribution of \$75,000. MSIKA will catalyze increased value addition and income for value chain actors by facilitating improved processing, increased crop productivity, improved postharvest handling (PHH) and storage, expanded market linkages between farmers and processors, more efficient domestic trade, and increased potential exports of processed products in the long term. MSIKA interventions and market linkages will target generating a \$69.7 million increase in value of sales by project participants, and leveraging \$675,000 in new public or private investment by 2021.

Land O'Lakes will monetize 21,100 MT of Crude Degummed Soybean Oil and will use the proceeds to implement a project in Malawi focused on achieving the following objectives:

- Increase agricultural productivity in the fruit and vegetable sector by increasing the availability of improved inputs, improving infrastructure to support on-farm production, facilitating access to finance, and training farmers on improved agricultural techniques and technologies, as well as farm management.
- Expand trade of agricultural products in the fruit and vegetable sector by improving quality of postproduction agricultural products, training producers and processors on improved post-production processes, facilitating improved linkages between buyers and sellers, improving market and trade infrastructure, and facilitating improved management of buyer/seller groups.

2.1 Project Implementation

MSIKA plans to implement the following activities:

- 1. Facilitate improved agricultural productivity*
- 2. Infrastructure: Post-harvest handling and storage*
- 3. Training: Post-Harvest Processing*

4. Capacity Building: Producer Groups/Cooperatives

5. Market Access: Facilitate buyer-seller relationships

6. Financial Services: Facilitate agricultural lending

7. Facilitate Improved Enabling Environment

3. Evaluation Design

3.1 Purpose and Objective of the Baseline Evaluation

The purpose of the baseline is to analyze and document the extent to which the program has achieved its goals and objectives and to explain any deviations from the plan. Specific objectives for each evaluation are listed below:

Baseline Objectives

The baseline evaluation will:

- ☐ Establish the project baseline values;
- ☐ Provide recommendations for refining targets for project indicators in accordance with the findings;
- ☐ Identify potential strengths, weaknesses, opportunities and threats to project implementation in each of the target areas within each of the value chains;
- ☐ Develop strategies to maximize strengths and mitigate challenges; and
- ☐ Generate data to be used for comparative analysis across the life of the project to measure change.

3.2 Evaluation Methodology

This section details how data will be collected from the key program participants, stakeholders and non-participants to answer the key evaluation questions. A summary of the data collection methods for the baseline evaluation can be found below.

STAKEHOLDER DATA COLLECTION METHOD BASELINE

1. Participant Farmers
2. Household Survey
3. Focus Group Discussions
4. Non-Participant Farmers
5. Household Survey X
6. Focus Group Discussions X
7. Farmer-based Organizations Financial Data X
8. Key Informant Interview X
9. Processors
10. Financial Data X
11. Key Informant Interview X
12. Other Key Stakeholders Key Informant Interview X

Farmers: For the baseline evaluation, quantitative data will be collected from non-participant farmers in each of the target districts to assess their agricultural and post-production practices, crop yields, post-harvest losses, crop sales and use of finance.

The baseline will collect information from a statistically relevant number of households that participate in that value chain at the

95 percent confidence level. The sample should be proportionally representative of the population of fruit & vegetable farmers across the districts.

Since project participants will not be chosen before the baseline is conducted, the baseline sample will include non-participants through a multi-stage clustered design, where villages are randomly selected in the target extension planning area (EPA).

Households that meet the selection criteria for project participation will be randomly selected from those villages. This information will serve as a baseline for key indicators for both participants and non-participant farmers who will be interviewed in the MTE.

Qualitative data will also be collected from farmers in the targeted value chain through focus group discussions (FGD) at baseline, in each of the districts. The FGDs will provide context to the quantitative data to describe why farmers are or are not changing their agricultural practices, successes and challenges in growing and selling their crops, participation in FBOs and feedback on how the project can be improved.

Farmer-based Organizations: The evaluation will utilize monitoring data collected periodically from each FBO. This information will be collected at least every six months by project staff but will also be utilized by the evaluator. This data will include group agreements with input providers, processors and retailers, financial information on group sales and use of financing, and the progress on a group capacity score utilizing Land O'Lakes' performance management and measurement (PPM) tool that measures progress across six main performance areas: leadership; adaptive capacity; management; operations; supply, processing and marketing; and productivity and financial performance, which are aligned with the AgPro training curriculum.

The evaluation will also collect quantitative and qualitative information from a purposive sample of project-supported FBOs through structured key informant interviews to verify the monitoring data, understand their relationships with input providers, processors, and retailers; the functioning of the group and value they provide to their members; their successes and challenges of working as a group, and solicit feedback on how the project could improve its activities. The evaluation will sample FBOs across the different districts and value chains that are 1) under performing; 2) of average performance; and 3) performing well, according to their monitoring data.

Processors: Processors will share certain production and financial data for the evaluation, including quantity of production and value of sales. This data will be collected through regular project monitoring and will be provided to the evaluator from project staff. The evaluation will also collect quantitative and qualitative information through structured key informant interviews with all processors to understand changes they have made in their processing practices, ways they are engaging with the FBOs, use of financial resources, successes and challenges in their current functioning, and suggestions for project improvement.

Other Key Stakeholders: The evaluation will conduct key informant interviews at baseline with other key project stakeholders, including input supply distributors, trader/wholesalers, participating government staff, local leaders and program staff to understand how they have participated in the project, challenges and successes, and suggestions for improvement.

3.3 Evaluation Analysis

The quantitative data from farmers will be analyzed using simple regression analysis statistical approach to understand changes in key indicators for the participants over time. The quantitative data from FBOs and processors will be compared over time, showing the difference between baseline and midterm, and analyzed to understand profitability. Qualitative data from other stakeholders will be analyzed by themes to provide context and explanation for the quantitative information.

4. Key Tasks

These key activities must be completed:

Review of Documents: Undertake review of the MSIKA program documents and other relevant documents that are available at the time, including, but not limited to, the following:

- ☐ Project agreement with USDA including the MSIKA scope of work
- ☐ The MSIKA Performance Management Plan (PMP)
- ☐ Farmer performance survey reports
- ☐ Semi-annual reports submitted by Land O'Lakes to USDA;
- ☐ Any other program documents which will enable the evaluator to get acquainted with the project progress including value chain and financial studies.
- ☐ Relevant Government of Malawi reports and documents for background information and establishing the socioeconomic and political context in which MSIKA occurred

Refinement of methodology and data collection tools: The evaluator, in close collaboration with the Land O'Lakes Global Monitoring, Evaluation, and Learning team, will do the following:

- ☐ Develop a finalized methodology that can be used by the contractor and any future evaluator, including a sampling frame, sampling technique and sample sizes for both quantitative and qualitative surveys. The sampling frame must use a minimum confidence level of 95 percent and adhere to the other minimum standards listed within the evaluation methodology section.
- ☐ Based upon a reading of the program documents, propose any additional topics or issues for analysis prior to conducting each evaluation.

Field Data Collection

- ☐ Plan and coordinate the necessary logistics to collect the data in accordance with the selected methodology.
- ☐ Pre-test, edit, translate, finalize and reproduce the survey instruments.

- ☐ Train and orient enumerators and data collection team.
- ☐ Carry out the fieldwork using own transportation, including for household survey, focus group discussion with farmers, and interviews with key informants such as farmer group committees, input services providers, district agriculture officers and Land O'Lakes program staff.

Data entry, analysis and reporting

- ☐ Enter, clean, synthesize, analyze, and interpret data from both the quantitative surveys and the qualitative protocols using approved statistical packages.
- ☐ Prepare a draft baseline evaluation report addressing the objectives and questions of this evaluation outlined in this TOR and recommendations on the overall Land O'Lakes/FFPr MSIKA project for potential similar future project for review by Land O'Lakes staff and stakeholders.
- ☐ Develop a PowerPoint presentation of evaluation findings, present and submit to Land O'Lakes and stakeholders.
- ☐ Prepare a finalized evaluation report that includes revisions based on feedback on the draft report and presentation.

5. Schedule

Baseline Evaluation Activity Responsibility

(Person) Timeline Due Date

Review of relevant documents to prepare for inception meeting Evaluator 3 days December 1, 2016

Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline, Evaluator and Land O'Lakes GMEL team, December 5, 2016

Develop an inception report and data collection tools (questionnaires for quantitative data, FGD/interview guidelines, for all levels of data collection). Evaluator 1 week December 12, 2016

Inception report and tools due to Land O'Lakes Evaluator Deliverable December 12, 2016

Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluator Land O'Lakes GMEL Team, 2 days December 14, 2016

Prepare for field work and finalize tools based on Land O'Lakes feedback Evaluator 1 days December 15, 2016

Enumerator training, pretesting, and data collection Evaluator 14 days February 9, 2016

Data entry, cleaning, analysis and report writing Evaluator 16 days March 2, 2017

Draft evaluation report is submitted to Land O'Lakes Evaluator Deliverable March 3, 2017

Presentation of evaluation findings to Land O'Lakes Evaluator Deliverable March 7, 2017

Land O'Lakes reviews draft final report and provides evaluator with comments and suggestions for revisions for final report Land O'Lakes GMEL Team 4 days March 8, 2017

All Final Deliverables Due (Final report, clean data, photos, and PPT presentation) Evaluator *Deliverable* March 15, 2017

6. Required Deliverables

Inception Report December 12, 2016

Report should describe the following:

- i- Understanding of the project based on project documents and literature review
- i- Finalized methodology including detailed sampling plan and field procedures
- i- Quality control measures
- v- Communication protocol
- v- Finalized timeline (activities, responsible party, outputs, and timing)
- i- Draft Data collection tools

2 Final Cleaned Data March 3, 2017 Clean and final English versions of:

- quantitative data sets in Microsoft-Excel and any other utilized format (SPSS, STATA, etc)
- qualitative transcripts, field and interview notes, complete list of key informant interviews and FGDs in Microsoft-Word document

3 Draft final evaluation report March 3, 2017. The report should be submitted in English addressing all the evaluation objectives and questions listed in the scope of work

4 Digital Copy of PowerPoint

Presentation March 3, 2017 Presentation should include an abbreviated list of evaluation findings that can be presented to relevant internal and external stakeholders

5 Presentation of findings to Land O'Lakes using the digital version of the PowerPoint Presentation March 7, 2017 Presentation location and to be determined closer to the date.

Contractor should be prepared to present via GoToMeeting or other virtual platform.

6 Final version of the baseline evaluation report and supporting documents

March 15, 2017 Two (2) bound copies of the final evaluation report should be submitted in English as well as electronic copies in both Microsoft- Word and PDF version.

Report should include the following sections:

- a. Acknowledgements
- b. List of Acronyms and abbreviations
- c. Table of Contents
- d. Executive Summary (no longer than two pages)
- e. Background (Program description and purpose of baseline)
- f. Methodology and Implementation
- g. Results and Findings (in accordance with the objectives)
- h. Recommendations (for future similar project)
- i. Annex: Table of key program indicators with updated values in comparison to baseline values (for the midterm and final evaluations)
- j. Annex: Scope of Work for the evaluation
- k. Annex: Inception Report for the evaluation

Annex: Survey Instruments: questionnaire(s), survey(s), interview protocol(s), focus group discussion protocol(s)

7 High-Quality Photos March 15, 2017 15-20 high-quality pictures of the process l.

Please note that a draft evaluation report that does not meet Land O'Lakes expectations in terms of quality will not be accepted.

7. Relationship and Responsibilities

The evaluator will be responsible for all tasks listed in this TOR. Land O'Lakes Global Monitoring Evaluation and Learning

(GMEL) team, based in the Land O'Lakes headquarter office, will give the final approval on all evaluation deliverables and will work closely with the Malawi M&E team to ensure the deliverables are reviewed and shared among relevant staff and stakeholders.

Annex 2: Methodology

This annex sets out the baseline study methodology as planned in the inception. Changes to this are noted in the main body of the report, in Section 2. The following is taken from the Inception Report (30th December 2016) on Methodology:

“1. Key considerations and Approach

A number of points come out of the above review of the indicators:

1. Range of crops – there is a data collection and analysis challenge as there are four initial fruit and vegetable products, each of which will have some differences in terms of the Good Agricultural Practices (GAP) and PHH techniques and technologies to be applied and measured. There will also be different profiles for inputs and sales volume and value, such that the four will not be comparable. At the request of LOL, all four are to be treated as a single population, which works for common data, like farmer profiles, but is more problematic for other areas, such as those mentioned above.

Our proposal is to continue with the sample size, which will give the necessary overall confidence level, but to highlight in the analysis questions for which it is not possible to have the same high level of confidence due to the differences between the four crops.

2. Units of measurement – all four crops are normally sold by volume rather than by weight, usually in baskets (mangoes, tomatoes), pails (potatoes, tomatoes), bags (potatoes) and/or bundles (onions). These units can vary between sellers, though there is some approximate standardization; but the net effect is that there are differing sizes and weights. This will make it difficult to estimate weights. We propose to establish approximate weights per unit type, which can then be applied throughout the baseline, but will need to be applied at mid-term and endline.

3. Timing – the harvesting timing for the four crops differs. Some of the crops are harvested more than once, such as onions and tomatoes, if the farmer has access to water/irrigation in the dry season. This means there are different possible periods that can be used for the baseline. Due to the start of the project being after the project baseline, around end March/April, then the nearest complete year could be the calendar year, since data collection occurs in January. The other alternative would be to apply a nine-month period for the baseline, so that it runs from April 2016 to December 2016. This depends on whether there would be any crop expected for onions and tomatoes in January to March 2017. For mangoes and Irish Potatoes, then the crop is annual and would fall in the April to December 2016 period. We propose to ask in the pilot whether tomato and onion growers might get a harvest in the January to March period. If they do, then we propose a baseline period based on the calendar year, 2016. If they do not, then we can work to an April to March baseline year, as there are effectively no sales in the January to March period.

4. Inputs and sales timing – we noted the indicator on the days from inputs to sales. This is problematic as there may be several inputs that are not necessarily purchased at the same time. Also, if farmers are using recycled seed, then they may not be purchasing any inputs. This will make data collection difficult. It also runs counter to any plans to promote cool/cold storage to enable product to be sold later and ‘out of season’. We will seek this information at baseline, from first input bought/received through to last sale, but we think this will be difficult to use.

5. Practices, techniques and technologies – these terms are used in the indicator descriptions. We take ‘practices’ to equate to ‘technique’, being the ways in which farmers prepare land, grow the crop and harvest it. These are things they ‘apply’ – we will use only ‘techniques’ to keep it simple. ‘Technologies’ involve money spent on an asset or farm input (seed, fertilizer) either by the farmer or some other party that provided it to the farmer (like a NGO/Project). We have set out the techniques and technologies in the instrument, based on the information we have from LOL and the clarifications sought. It is difficult to fully anticipate all the techniques and technologies that will be promoted, not least because they vary according to the crop (see point 1 above).

2. Sampling

As per our original proposal, the evaluation will adopt a mixed method approach to determine simple differences using quantitative and qualitative methods. A cross-sectional household survey of qualifying households that grow at least one of the target fruit or vegetables will be used to collect baseline data on the output and outcome indicators for the program. Focus Group Discussions (FGDs) and Key Informant Interviews (KIs) will be conducted to complement the quantitative data.

We have decided that we need to visit each District in advance of the fieldwork to establish a relationship with the key Government of Malawi (GoM) personnel and to gather additional information on the EPAs to enable the sampling to be finalized. Although we have received information on the main fruit and vegetable EPAs from LOL, there could still be parts of those EPAs where fruit and vegetable growing is more heavily clustered or is mainly absent, which would affect how we sample. Growing vegetables is likely to be correlated with available year round water sources, so there is need to consider if further pre-selection of sample areas is necessary and appropriate. To do this, we need to meet the key Ministry of Agriculture, Irrigation and Water Development (MoAIWD) personnel in each of the five Districts, being the District Agricultural Development Officers (DADO) and the Crop Specialists/ Horticulture Specialists. We also want to meet the Ministry of Industry and Trade (MoIT) Officer who can provide information on processing and trading.

2. Survey/Household Sampling

As per the direction from LOL, growers of the four initially targeted crops will be treated as one population. It is possible that a household could be growing all four crops or just one, but we think that it is more likely that they may be growing two, possibly three crops. We will seek to establish which of the four crops are grown, and in what combinations, as well as what other non-target fruit and vegetables they grow. We think this will provide interesting insights for LOL.

In terms of the five target districts, LOL has provided details of the target EPAs where fruit and vegetables are most commonly grown, in bold and underlined.

#	DISTRICT	F+V EPAs
1	Dedza	<u>Lobi</u> , Kabwazi, Mayani, <u>Bembeke</u> , <u>Golomoti</u> , Mtakataka, <u>Kanyama</u> , Chafumbwa, Linthipe, Kaphuka.
2	Ntcheu	<u>Tsangano</u> , <u>Njolomole</u> , Nsipe, <u>Manjawira</u>
3	Salima	<u>Tembwe</u> , <u>Chiluwa</u> , Chipoka, Matenje, Chinguluwe, Katerera, Makande
4	Mchinji	<u>Mlonyeni</u> , <u>Mkanda</u> , <u>Mikundi</u> , <u>Chiotcha</u> , <u>Zulu</u> , Situ, Kalulu
5	Mangochi	<u>Maiwa</u> , <u>Lungwena</u> , Mpiripiri, Masuku, <u>Nasenga</u> , <u>M'bwazulu</u> , Chiripa, Nankumba, <u>Katuli</u> , Mthiramanja

We propose to conduct the baseline in these EPAs, as it will be important to find a critical mass of farmers to interview and to provide information on households in these EPAs.

A key decision is the minimum land area to fruit and vegetables for a household to be targeted by LOL. Although LOL will want to target more commercially oriented farming households, in Malawi, the relatively small land areas per household and the likelihood that land will be put to other non-fruit and vegetable crops, especially maize, but also crops such as groundnut, soybean and cotton, suggests that a land area of half an acre/0.2 hectares allocated to vegetables is a reasonable minimum for inclusion as this is more than needed to provide vegetables for the household. The sampling will still be random within the sample, so it will establish the land area profiles for the fruit and vegetable growers.

Mangoes are not commonly planted as an orchard crop, based on our understanding of practices in Malawi, but likely to be scattered at random over the household's land. Therefore, we propose to use a minimum number of trees to qualify to be included in the baseline sample, rather than a minimum land area. Having too small a number of trees as the minimum risks including households that just consume what is produced, while too high a number means that qualifying households will be difficult to find. Taking a relatively modest number of trees for the survey will also help LOL to work out what the range in number of trees is, even if it subsequently decides to target households with higher numbers. We propose to use a minimum of four trees that produce fruit, as the qualifying point for a household to be included in the baseline as a mango grower

The original proposal stated:

"The study team will work with Land O'Lakes GMEL/MEL team to determine the number of households farming by value chain, based on the value-chain studies and carry out a proportional to population size (PPS) sampling to ensure the sample is representative of the population in the target sites, as well as the target Districts. The value chain studies will inform the sampling and are due to be available by 4th November.

The team will adopt a multi-cluster sampling strategy. Villages will be randomly selected in targeted EPAs, with a method such as listing of households in selected villages. The sample size for each EPA will be based on the number of identified farmers by values chain i.e. the sampling frame at EPA level,

which is a subset of the sampling at District level. A random sampling will be conducted with a defined sampling interval. The team will interview farmers by value chain until the target is reached.

The project aims to benefit 42,000 smallholders across the four Districts. However, calculating the sample size prior to being engaged is difficult without more information on the estimated populations of fruit and vegetable growers. In the absence of actual populations involved in fruit and vegetable production, for the proposal, the consultants have taken the active adult population (aged 19-64) per District (2016 Population Projections by District, National Statistical Office) and applied an estimate of how many might be growing either vegetables, fruit or both. At this point, the consultants have assumed that 20% of the adult population in the target districts is involved in fruit and vegetable farming; this will be confirmed/changed based on the Value-Chain studies.”

At the time of this inception report, the value-chain studies are not yet available, nor is there information on the actual/estimated numbers of households that grow the target crops. We also have a direction from LOL to treat the fruit and vegetable households as a single population, as treating them separately would result in too high a sample for the budget available at the 95% confidence level. Therefore, we will modify our approach and base the sample using a PPS based on the whole District population, not on the sub-population of fruit and/or vegetable populations, as we do not have sufficient information to do this by the sub-population.

In our original proposal, the sample size was calculated as follows:

“Using the Donor Committee for Enterprise Development (DCED) sample size calculator with value chain production/yield as a key variable, the minimum sample size for the baseline is calculated to be 599. Kadale proposes to conduct a cross-sectional survey with a target of 610 households to allow a small cushion in case of questionnaires that cannot be used.”

The MSIKA program aims to benefit 42,000 smallholder households. The challenge with the data currently available is that we do not know the proportion of households in each District that are fruit and/or vegetable farmers, or at the next level down for the four target crops. It was hoped that the fruit and vegetable value-chain studies might provide some estimates, but these are not yet available, and it is unclear if they will provide such estimates.

In our proposal, we made a working assumption that 20% of households would be growers of fruit and vegetables, from which we calculated a sample of 599, increased to 610²¹ to allow for some unusable questionnaires. In the absence of better information, we continue to use 20% to calculate the estimated population of fruit and vegetable growers across the five Districts (274,555)²² and from this to calculate the overall sample and how it would be split across the Districts.

The evaluation will aim to get information at 95% confidence level. Using Yamane (1967:886), a simplified Cochran formula has been used to determine the sample size. The following assumptions are made:

Precision (e): 5%

Degree of Variability: 0.5

N is the population target, 274,555

Sample size is calculated by, $n = \frac{N}{1+N(e)^2}$

Based on these assumptions and desired confidence, the estimated minimum sample size is 604. We intend to oversample by around 3% to account for any unusable instruments, giving a planned minimum sample of 622 farming households.

²¹ These were based on four Districts (original SoW), so the overall population was lower than now

²² 20% of the Active Adult District Population (19-64) in the five target Districts.

Based on the 2016 census projections, the split by District is therefore:

Sample based on 20% of the total population (aged 19-64)				
District	Population	N (20% of Total)	Proportion (%)	PPS sample
Dedza	305,341	61,068	22.24	138
Mangochi	146,743	83,349	30.36	189
Mchinji	245,103	49,021	17.85	111
Ntcheu	234,729	46,946	17.10	106
Salima	170,859	34,172	12.45	77
Total	1,372,775	274,555	100.00	622

Our estimate of 20% of households being fruit and vegetable growers was considering all fruit and vegetable growers, whereas discussions with LOL have clarified that it will be targeting those that are more commercially oriented.²³ Depending on LOL's decision on the minimum land for growing vegetables and minimum number of mango trees, this will reduce the number of households that fit these criteria and so reduce the minimum sample. Because of the way the calculations work, the sample will not likely be very much smaller, but it means there is more margin for error. However, if LOL sets a high minimum land size and/or high number of trees that fruit, then we will have difficulties finding farmers that qualify. We have proposed a minimum of half an acre/0.2ha for vegetable growing and a minimum of four trees in fruit. We need to agree the minimums with LOL. These will be embedded in the screening for the household survey.

A more comprehensive sample by EPA and villages will be provided by Kadale after the initial meetings with the DADOs in the target Districts.

3. FGDs

The original proposal on FGDs was for four FGDs per District, with male and female participants in separate groups, but has increased to five. We will continue with running 16 FGDs split across the five Districts.

During the initial visits to the five Districts, Kadale will discuss with the DADO on the locations where it would be appropriate to do FGDs, specifically where there are concentrations of fruit and vegetable households that can be identified. The aim will be to find farmers that range from the minimum likely to be targeted by the project, to larger more commercial growers, so that a range of views can be obtained which reflect the levels of commerciality. We will also aim to get a split across the four target crops. Until we have met with the DADOs, it is difficult to finalize the split.

We recommend maintaining male and female only groups, so that we can be sure that we get both male and female perspectives.

4. KIIs

Our original proposal on KIIs stated:

- ***“Processors:** KIIs will be conducted with potential processors that could be included in the project implementation. A snowballing technique will be used to identify and interview processors within the selected areas that could potentially be included in the project. The evaluators note that access to processors is a key issue and so proximity to the project target areas is important. This will provide room for potential recommendation on who should be included for the project. The number for this cannot be predetermined at this point but, it is assumed that each district will have **four** processor KIIs. It should be noted that processing could vary considerably in scale. Subsequently for the MTE, interviews will be held with the actual processors supported.*
- ***Farmer Based Organizations (FBOs):** At baseline, KIIs will be conducted with FBOs that will potentially work with the project. The evaluators will aim to get FBOs within the selected EPAs and potentially one at a district level. Numbers cannot easily be predetermined at the baseline point.*

²³ Discussion with Steve Harris, 8th December 2016.

The evaluation team will plan for **four** in each District. Subsequently at the MTE, interviews will be held with the actual FBOs.

- Key Stakeholders: Other key stakeholders will be identified in the target Districts and EPAs. KIIs will be conducted with these. The stakeholders will include government staff and possibly local leaders to understand how they have might participate/have participated in the program, the challenges and successes, and suggestions for improvement. This would be a minimum of **two** per District. There will be no control group for this level as it does not make sense to have one.

Sample for KIIs, baseline

Target Group	KII Per District	Category	Total KIIs
<i>Processors</i>	4	<i>Vegetable and/or Fruit</i>	16
<i>FBOs</i>	4	<i>Vegetable and/or Fruit</i>	16
<i>Government/ Other stakeholders</i>	2	<i>As appropriate</i>	8
Total			40

Our initial focus for the KIIs are the DADOs and Crop Specialists / Horticulture Specialists at District level. The DADO is important, both because of their knowledge of the District, but also for protocol reasons to establish a good working relationship with each of them. In addition, we want to meet the MoIT Trade Officer, who can provide information on trading, markets and processing. These three interviews per District, will give us 15 KIIs.

These particular District level KIIs will be conducted w/c 12th December, as the Kadale Research Manager will travel to each District to explain the research we are doing, will find out more about the EPAs and likely areas within them where there are concentrations of growers and will gather more information on fruit and vegetable production, markets and organizations involved (see KII topic guide)

Protocols are very important when meeting the District GoM staff. As a courtesy, it is necessary to request to see the District Commissioner (DC) in each District, if they are available. It would be helpful to have a letter of introduction from LOL which introduces the project and explains that Kadale is conducting the baseline on LOL's behalf. A draft has been submitted for LOL to amend, sign and scan.

We have yet to determine the balance of the final KIIs, as this will depend on information gained during the initial round of District visits. These could be NGOs or Projects working in similar or related fields. We will definitely include some Farmer Based Organizations (FBOs), some of which may well be processing. We will use the meetings with the DADOs to determine which are the active FBOs and also if there are other privately owned/managed processors in the District. Until we meet the DADOs, it is difficult to determine who many and what diversity we may find.

At this point, we are increasing the number of GoM interviews to an expected 15. We also want to leave scope for more NGOs/Projects operating in similar or related fields, which we estimate to be one per District. That leaves two processors and two FBOs per District. As a result, the revised KII table is as follows:

Revised Sample for KIIs, baseline

Target Group	Total KIIs
<i>Processors</i>	10
<i>FBOs</i>	10
<i>Govt/Other stakeholders</i>	20
Total	40

5. Quality Control & Logistics

Kadale adopts comprehensive quality control procedures to ensure data quality that should help project implementers make informed decisions based on quality evidence. Data quality will be ensured in the instrument design, piloting, training, incentives, data collection supervision and data entry protocols. The outcome of these is that we expect the data analysis to be made using robust data.

Instrument design - In the instrument design, we include some questions that are intended as cross-checks within the tool that may not be very obvious for the enumerator. This is to guard against remote filling of fictitious responses. We will seek input from LOL on the draft instruments to get clarifications/corrections. We will also seek input from TANGO, to benefit from their extensive experience in instrument design, and to help align the instruments with what they intend for the impact baseline.

Instrument piloting/testing – we will pilot test the draft instrument across two days in locations around Lilongwe to determine that the questions are clear enough to get the expected responses, that the structure of the questionnaire flows as intended and to determine if there are unexpected responses that we have to cater for in the revised versions. As well as the research supervisor, we will use at least one member of the team that has not been involved in preparing the instrument so that it more closely simulates using enumerators. During the piloting, we will amend and re-test questions on day two following any changes identified on day one, so that we have at least been able to see if the revised questions work. If we find that further changes are needed, other than minor wording, then we will consider a further day of pilot testing.

Training enumerators – the training of enumerators is important to delivering quality. We will identify enumerators from our pool that we have used or that have been used by organizations we know and trust. We will call for training at least two more than we intend to use, so that we can select the best. Our experience is that the enumerators generally have no major challenges with implementing the instruments because they are designed to be clear and logical, but that some individuals have attitudinal problems, such as turning up late, taking calls or not giving attention. In general, our selection is based on attitude, and occasionally on a person's limited capacity to deliver the work.

One aspect that we have found useful in getting enumerator understanding of the instruments, is to get them to translate it during the workshop. This helps them to understand the particular meanings as they propose, discuss and agree on the best translation. This is particularly important where there are important nuances to get across to the team, for example what is meant by new agricultural 'practices' and 'technologies'. It also brings out ideas from the team on options that might have been missed and we encourage them to look for and identify logic flow errors in the instructions. We find that the enumerators like to compete in the group to make suggestions that others have not seen. This all helps to further improve the instruments.

An additional part of the training is to do test interviews in the class, where they practice in pairs or in bigger groups where they are observed interviewing and playing the role of respondents. This also brings out unanticipated responses and highlights the need to clarify points/questions/instructions. At the end of the training, the team goes to selected sites to conduct test interviews in the field. By this point, we expect the enumerators to have understood the instrument, so this stage is to just ensure that we can observe them in operation and correct issues around how they conduct the interview (introductions, confidence, and body language). It also enables the team to test how to identify and select respondents.

The team debrief following the field test and any final amendments are made. The final team is selected and provided with the final translated instruments.

Incentives – Kadale has a policy of paying a basic fee plus a quality bonus to enumerators. Our experience is that making a part of the payment dependent on quality provides an incentive to enumerators to do the job properly. We intend to contract enumerators with at least 25% of the payment linked to quality. Enumerators will be given clear warning if their quality is below the expected and that this will affect their bonus if not corrected immediately.

Data collection – The role of the Field Supervisors for each of the teams is important for quality control. There will be extra training for the field supervisors in how to manage the team, and in their additional/different role compared to the enumerators. The Field Supervisor will accompany 5% of interviews with the enumerators to ensure that questions are asked and recorded properly, as designed. Another 5% back checks will also be conducted by the field supervisor where a sample of households that have already been interviewed will be revisited and have a subset or an extract of some questions

in the questionnaire will be re-asked to ensure that the enumerators actually asked the questions and that the response is correctly recorded.

At the end of each day, Field Supervisors will record and check all questionnaires that have been completed by the enumerators to look for omissions or incorrect completion. Each evening the team will debrief on challenges faced, clarification on questions and any other issues that arise. If there are quality issues, then the Field Supervisor will talk to the individual concerned or to the whole team if it affects all. The Field Supervisor will speak to the Research Manager each day/evening to discuss any issues that need clarifying. If there is an issue that needs communicating to all the teams, then the Research Manager will contact all the Field Supervisors immediately, so that all are following the same approach.

The Kadale Research Manager will visit each team to observe the Field Supervisors and enumerators. He will also check completed questionnaires at random and communicate with all the teams over any issues that arise. He will check with all four teams daily on both progress and quality control issues.

Data entry - During the visits by the Research Manager, completed questionnaires will be collected and brought back to Kadale office in Lilongwe for data entry. Kadale finds merit in commencing data entry in the first week of data collection so that any issues identified during data entry, such as incomplete or incorrect responses, can be addressed before too many questionnaires have been completed. Feedback will be provided by the Data Manager through the Research Manager to the field teams on any issues that need to be addressed in the data from the field.

Survey data will be entered in SPSS v20. Data will then be exported to Excel and logic checks run by the Data Manager to ensure that collected and entered data makes sense. Data Clerks will be trained in the instrument and will be supervised by the Data Manager. A random selection of questionnaires for each Data Clerk will be re-entered and compared with the original entry to review for differences. This will enable the Data Manager to identify if there are errors in interpretation or carelessness by a particular Clerk. This will lead to back-checking all questionnaires from that Clerk on the particular issues identified. This will be communicated to the individual, but also to the team to ensure consistency of entry.

Data analysis – We will run a series of logic checks to enable us to check and clean the data. In addition, as we run the data tables, we will also identify if there are errors, as well as checking data findings that we would regard as out of the norm based on our experience and understanding.

Overall supervision - The Research Manager will report to the Kadale Team Leader on a daily basis over mail, phone and Skype during the period of training, fieldwork and data entry. There will be a continued collaboration between the MSIKA-MEL team to make sure that decisions made are consultative. The Team Leader will lead on the instrument design and will review all decisions made by the team on piloting, sampling, training, fieldwork and data entry to ensure that they are aligned with the objectives of the baseline and the quality standards required.

6. Instruments

As per the previous section, there will be a single household survey instrument to cover all four crops and other fruit and vegetables. This is challenging, as noted in the earlier sections, as there are different inputs, GAP, PHH and markets for each of these crops. The instrument is sent under separate cover, so that it is easier to edit and comment on.

The FGDs will use a topic guide with a menu of topics. These will contain a relatively long list of topics, some of which are mandatory, and some of which we will ask the facilitators to use for particular groups as it may be too much for each group to discuss every topic. The facilitators will be encouraged to explore interesting comments that come out, as long as these are relevant to the evaluation. FGDs will be recorded using digital recorders to assist in recall of quotes and key points. The write-ups (in English) will be checked by team leader, who will request clarifications and additional information/quotes if these are merited. The instrument is sent under separate cover so that it is easier to edit/comment on.

The KII instruments will be prepared as topic guides that will vary according to the role of the person to be interviewed. These will primarily be conducted by the Kadale Research Manager, starting with the DADOs in each District, as well as the Crop Specialist or Horticulture Officer where these exist. There is also usually an Officer from the MoIT who can advise on processing and other trade aspects. At this point, we are only providing KII topic guides for use with the District GoM staff, as this will then provide more insight from which the other KII topic guides can be prepared. The instrument is sent under separate cover so that it is easier to edit/comment on."

Annex 3: Household Survey Questionnaire

See separate file as too large to include here.

Annex 4: FGD Topic Guide

District: _____ EPA: _____ Village/location: _____

Name of Facilitator: _____ Date of FGD : _____ 2017

FGD is: *Male only Female only Mixed (Circle)*

Main crop focus: *Tomato Onion Irish Potato Mango (Circle one)*

Other target crops grown: *Tomato Onion Irish Potato Mango (Circle all that apply)*

For the rest of the discussion, focus on the main crop that the group is growing.

Estimate the approximate age range and whether there are more of a certain age range than others:
From approximately _____ years to _____ years. Main range is _____ to _____ years

A. Introduction and Consent:

Hello, my name is <name> and I am working for Kadale Consultants. Kadale has been asked to talk to fruit and vegetable farmers by Land O'Lakes, a US organization that works with farmers. We would like to discuss your experiences as <crop> growers. Are you willing to take part in the discussion?

_____yes all _____yes some _____no (recruit as appropriate) (Circle one)

Give any reasons for not giving consent and then ask those who do not to leave the group:

B. Background Information (to get the group talking)

- How long have you been growing <tomatoes / onions / Irish potatoes / mangoes>?
- Is it a good crop to grow? (Comment: they may jump into production, or sales related issues – you can move to the section on these if that seems natural)
 - What makes it a good crop to grow?
 - What makes it a bad crop to grow?
- How much did you produce in the last growing season? (Use table below)
(Probe: check if they grow more than one crop per year – e.g. tomatoes/onions – add both crops if more than one so getting calendar year total; check on type of measurement – do they use baskets, bags, pails, etc. What is the weight of each? Was it a good/bad season? Why?)

Name	Type of units - bags, pails, bundles, etc	# of units produced	Approx. land for this crop (rough estimate)	Comments e.g. if a good or bad year, expanding/contracting production, etc

Nb – get them to explain the unit sizes – ideally in kgs if possible, but do not get stuck on this issue – approximate is fine. Get comments on if a good crop or not, weather/pests experience, etc.

C. Inputs

- What farm inputs are needed for growing this crop?
(Probe: to get seed, chemicals, fertilizer, equipment; ask about specific seed/seedling varieties, specific chemicals, etc. We want the detail)
- How easy is it to get these inputs?
(Probe: Where do you get them, what difficulties in getting inputs (gaps in availability, prices, etc.?) Why do you use these inputs (price/quality/availability?)
- What differences do these inputs make to your production?
(Probe: which are most important/useful?)
- Does anyone use irrigation or watering can?
(Probe: what area, how far is water source, reliable source, how obtained the irrigation/cans, how was the irrigation financed?)

D. Good Agricultural Practices and Extension services

1. What are the good practices you know for growing this crop?

(Probe: to get at least one different practice from most FGD participants; check if all agree or there are some that have different views or do not know it.)

2. What training have you received in growing these crops? (

Probe: who from, when, what covered, what was most useful?)

3. What challenges do you have in the growing of this crop?

(Probe: this is about production challenges, so need to find out about problems with yield/productivity and quality? Markets comes later. Ask about the impact of variable/unpredictable weather – what have they seen and what have they done to mitigate?)

4. What extension services do you have access to?

(Probe: Who provides, how good is the service, what could be done to improve it, how has it helped in production?)

F. Post-harvest handling

1. What practices do you know about handling the crop at harvesting, on the farm (storage) and at the market?

(Probe: ask about all three areas to get common practices they know or have been told;

2. Where do you get losses of crop?

(Probe to see where the losses occur; get them to quantify the losses at each stage?)

3. What have you done to reduce losses?

(Probe: What more could you do? Check if they get any help from any organization with storage/warehousing, handling and transporting)

G. Markets

1. Do you sell on your own, or with others?

(Probe: why on own/with others, who with, advantages/ disadvantages, what opportunities to aggregate and sell together?)

2. Where do you sell the crop?

(Probe: sales to neighbors, local markets, further markets, traders/buyers).

3. *(If anyone selling to a formal buyer....)* How easy is it to make agreements with traders and formal buyers?

(Probe: Are the agreements formal/written or oral? Are the agreements enforceable? Do farmers sometimes not do their part? What challenges with supplying formal agreements?)

4. Why sell to that/those markets?

(Probe: what advantages, what disadvantages, how far, who collects/transport, who pays for what, what costs are there for this market – transport, market fees, losses, etc.)

5. What information do you have about where to sell?

(Probe: get the specific details, who provides, how often, how timely, how useful?)

6. What information do you have about market prices?

(Probe: get the specific details, who provides, how often, how timely, how useful?)

H. Gender

1. What are the different roles of men and women in the growing of the crop? *(Probe: tasks only one or other does? Is decision making joint or one/other? What special challenges do women face? Who makes decisions related to crop. Include decisions on purchasing inputs, marketing/selling, and use of money from crop sales?)*

2. What are the different roles of men and women in harvesting and handling it on the farm? *(Probe: tasks only one or other does? Is decision making joint or one/other? What special challenges do women face?)*

3. What are the different roles of men and women in selling/marketing the crop? *(Probe: tasks only one or other does? Is decision making joint or one/other? What special challenges do women face?)*

I. Finance

1. Do you or your spouse have savings?

(Probe: Do you belong to any savings groups? Do you have a bank account to keep money? See if any of them have any form of savings, but remember they may not be willing to say too much on how much in public)

2. Where do farmers like you get the money for growing your <fruit/veg> crop?

(Probe: own resources, including keeping seed, borrow from informal (family/friends), borrow from value-chain players (traders/vendors/input suppliers/crop buyers) and borrow from a formal financial organization like a bank or MFI. Ask around each type that comes up to get a sense of the importance, the amounts available, and the main terms, such as interest and repayment timing).

3. What challenges do you face in getting finance and repaying loans?

(Probe: try to get beyond the usual moans about interest rates and poor prices – we know this.....)

J. Other factors

1. What policies or rules from Government are helpful or not helpful to you as <fruit/veg> farmers for growing, transporting and selling your produce?

(Probe: looking for restrictions that affect them or government actions that affect them, such as restricting movement, inspecting produce, control of markets. Cover activity of District based ministries – extension staff, trade officers, etc. but also Police, Malawi Bureau of Standards, District Assembly, etc.)

2. Are there any challenges with ownership/access to land and water affect that your production?

(Probe: seeing if security of tenure affects their decisions on investing in land and water/irrigation; are there restrictions/conflict)

3. Are you or family members part of community organizations which support your households growing of this crop? This could include SACCO, women's group, water access group, livelihood cooperative, or other group established by iNGOs.

Other Comments from the group

Other observations from the facilitator

Annex 5: KII Topic Guide - NGOs

A. Introduction and Consent:

Hello, my name is _____. I am working for Kadale Consultants. Kadale has been asked to do an independent survey for Land O'Lakes which is planning to implement the MSIKA project in this District starting from April 2017. MSIKA will work to assist fruit and vegetable farmers to improve the volume and quality of production and to find improved markets. The interview will take approximately 1 hour. Would you be willing for me to ask you questions? *{If recording ask: "Are you willing for me to record the interview?"}* **Yes (continue) / No (end interview) (Circle)**

Explain: Land O'Lakes is initially targeting tomato, onion, Irish potato and mangoes. There may be other fruits and vegetables added later. *(If they do more than one target crop, try to get information across all)*

A. Background (5 minutes)

4. How long have you been working in this District as <Job Role>?
5. Briefly outline your role and how much involvement you have in fruit and/or vegetables. *(Probe: what other roles are important for fruit and vegetable production and sale in this District Office?)*

B. Respondent Organization's Role in Fruit & Vegetables

1. What role does your organization play in support of fruit and vegetables? *(Probe: any focal crops among our four; how long for, what are the specific areas they work on, etc.)*
2. How many farmers and in what locations do you work? *(Probe: numbers in 2016, clusters, particular FOs, etc.)*
3. What FOs do you support? What other organisations do your support *(private/govt/CBOs, etc.)?*

C. Fruit and Vegetable Production in this District

1. Tell me about the production levels, locations, number of farmers, across the District for <crops> *(not just the ones they are working with, which you asked earlier)? (Probe: for clusters/locations with more farmers, why these farmers produce these crops in these places, etc.)*.
2. How has the level of production of these crops changed over the last 3 years. *(Probe: What influenced these changes? How has the price of these crops changed over the last X years? What influenced these changes?)*
3. What proportion of production is consumed by HH and what is marketed? *(nb. Check if estimate or they have data on it)*
4. What are the main challenges for farmers growing < crops> in this District? *(Probe: If hard to answer all at one time, ask crop by crop. if multiple crops are discussed start each paragraph with the CROP name in ALL CAPS for easier disaggregation and analysis. Are the key farming inputs readily available? What is missing? Ask around irrigation schemes and opportunities. What plans do they know about?)*
5. Where are the main markets/marketplaces for these four crops? *(Probe: names/locations of the markets and when market days are. Get details of the big markets that specialize in any of these four crops)*
6. How much/proportion of these four crops is bought and sold at the farmgate by traders compared to sales that occur in marketplaces? *(Probe: trying to get an estimate of how active/important traders going village to village are versus the physical markets – this then determines who is responsible for the transport from farmgate to market).*
7. How are fruit and vegetables stored by farmers, FOs and processors that they know of? *(Probe: Is there any cool or cold storage? Where, operated by whom? Any info on area is useful)*
8. Where is the main loss of crop – on the farm, farm to market (transport and traders) or at the market (not sold)? *(Probe what they know about the reasons for the losses, any initiatives to address?)*

D. Training of fruit and vegetable farmers

1. What has been your organization's involvement in training farmers in production, soil management, climate smart agriculture, post-harvest handling and/or marketing of these four crops and other fruit and vegetables? *(Probe: training in what techniques/technologies in soil mgt/climate smart agric/post-harvest-handling, by whom, when, etc. What are the most important areas of training that Govt and others are providing? What are the big gaps in training? When do (or did) these activities/trainings occur – is it ongoing? Get any details of the main content/curriculum if you can).*

2. What has been GoM/DADO's involvement? *(Probe: Same as above)*
3. Which other NGOs/Projects/Others have been involved in training of farmers in these areas for these four crops and other fruit and vegetables? *(Probe: training in what, by whom, when, etc. Get any details of the main content/curriculum)*
4. Is there additional training that you feel these farmers need but are not yet receiving?
5. Who has extension staff targeting fruit and vegetable production? *(Probe: including this organization. How many? What challenges are there for extension services?)*

E. Active Fruit and Vegetable Farmer Organisations

1. What farmer groups/associations/co-operatives are active in the four target crops? What can you tell us about them? *(Probe: size/membership, location, how well functioning, what are they processing, where selling, any NGO/body supporting them, etc.)*
2. What training have the FOs received from any other organization, whether Govt, NGO/Project or private firm? *(Probe: for details of what, when and whom by;)*
3. *(Ask all FOs specifically as we have to report it)* Has your organization provided training in any of the following:
 - i) Good agricultural practices for growing this crop?
 - ii) Harvesting and post-harvest handling?
 - iii) Finance and organization management? *(Probe: who by, involving what, etc.)*
 - iv) *If supporting processing:* Quality standards and management?
 - v) *If supporting processing:* Do you train FOs or processors in any of the following: ISO standards, HACCP (Hazard Analysis and Critical Control Points), Euro-GAP, Global GAP, Malawi Bureau of Standards certification. *If yes, what do you know about them and are you using any of them?*
4. Do FOs negotiate deals for their members or members sell individually? If they do make deals, who are they selling to? *(Probe: Are the deals formalized in contracts? Are there intermediaries involved?)*

F. Fruit and Vegetable Processing

1. Who is doing processing of these four crops, including private business, FOs and NGOs? *(Probe: Names, where, what scale, what challenges encountered, etc.)*
2. Where is this process product being sold *(locally, other Districts, nationally)?*
3. What opportunities exist for processing? *(Probe: things that might be being planned by GoM, NGO or private)*
4. What organisations (private or public) are involved in, or interested in, supporting processing in the District? *(Probe: get contacts where possible for follow up).*

H. Women

1. What role do women play in production, trading and processing of fruit and vegetables in this District? *(Probe: for production, trading and processing separately, are they equal participants? are they prohibited from participating in any role based on customs or norms?).*

I. Finance Organizations interested in Fruit and Vegetables

1. Are any banks/lenders active in giving loans to farmers, farmer organisations or processors *(Probe: Who, what are they doing? Anyone else involved in finance?)*

Other:

1. What national policies, legislation or regulations affect Fruit and Vegetable farmers? *(Probe: Are there any local or national policies that are currently being drafted that may impact F&V farmers?)*

Other comments from the NGO?

Interviewer's observations

Annex 6: Key Program Indicators with Values

Indicator	Suggested Baseline Value	Notes on how baseline value was calculated	Report reference	Suggested Change (if any)	Other Comments
Percentage change in yield of beneficiary producers as a result of USDA assistance	Tomato - 5,617kgs/ha Onions - 4,219 kgs/ha Irish potatoes - 5,233 kgs/ha Mango - 92 kgs/tree	Household survey - mean averages	Reference: Section 3.5.1	None	
Number of individuals benefiting directly as a result of USDA assistance	Baseline is 0.				
Number of individuals benefiting indirectly as a result of USDA assistance	Baseline is 0.				
Number of individuals who have received short-term agricultural sector productivity or food security training as a result of USDA assistance	Baseline is 0.				
Percentage of producers utilizing improved soil fertility management practices	Composting: Tom: 54.4%; Onion: 47.9%; Pot: 27.5%; Mango: 11.2%. Min. tillage: Tom: 5.4%; Onion: 6.8%; Pot: 1.6%; Mango: N/a. Adding lime: Tom: 1.6%; Onion: 2.8%; Pot: 3.6%; Mango: 0.5%.	Household survey - mean averages for use on all crop	Section 3.2	None	Could select other soil fertility practices - ridging, mulching, green manuring according to what intend to promote
# of ha of land under improved T&Ts as a result of USDA assistance	Tomato: Avg ha: 0.27 inputs 2+: 96.6% farming 2+: 99.5% HPH 2+: 96.1% Onion: Avg ha: 0.22 inputs 2+: 92.3% farming 2+: 93.2% HPH 2+: 90.6% Potato: Avg ha: 0.34 inputs 2+: 97.9% farming 2+: 99.0% HPH 2+: 99.5% Mango: not measurable as cannot define land area	Household survey Average ha/farmer/crop % of farmers applying two or more for inputs, farming and harvest/post-harvest handling	Sections 3.1 & 3.2	The very high proportion already applying 2+ suggests need to revised the list, set new threshold & regather data	Ha will also depends on profile of beneficiaries - e.g. it differs by crop - e.g. mean avg ha for potato (0.34 ha) is higher than onion (0.22 ha)
# of individuals who have applied new T&T as result of USDA assistance	Tomato: inputs 2+: 96.6% farming 2+: 99.5% HPH 2+: 96.1% Onion: inputs 2+: 92.3% farming 2+: 93.2% HPH 2+: 90.6% Potato: inputs 2+: 97.9% farming 2+: 99.0% HPH 2+: 99.5% Mango: not measurable as cannot define land area	Household survey % of farmers applying two or more for inputs, farming and HPH	Section 3.2	The very high proportion already applying 2+ suggests need to revised the list, set new threshold & regather data	This is technically zero, as no individuals have yet received support
# of individuals who have applied improved farm management practices (i.e. governance, administration, or financial management) as a result of USDA assistance	12,432 households	Based on proportion reporting applying farm mgt practices in all ways averaged across 7 practices (29.6%) defined by LOL x 42,000	Section 3.7	Indicator refers to governance and admin which are more appropriate for Farmer-based Organisations not individual farmers. Use list provided by LOL	This is technically zero, as no individuals have yet received support

Number of agro-dealers and village based input agents operating in target districts as a result of USDA assistance	Baseline is 0.				
Number of irrigation schemes facilitated	Baseline is 0.				
Number of individuals receiving financial services as a result of USDA assistance	Baseline is 0.				
Number of loans disbursed as a result of USDA assistance	Baseline is 0.				
Value of loans provided as a result of USDA assistance	Baseline is 0.				
# of producers who can cite two or more improved agricultural techniques and technologies	Tomato: farming T&T 2+: 91.7% Onion: farming T&T 2+: 88.0% Potato: farming T&T 2+: 77.7% Mango: farming T&T 2+: 33.5% Average % across four crops = 75.8% 42,000 x average across four crops = 31,833	Household survey, based on those that could give two or more farming T&T by crop, then averaged and multiplied by 42,000	Section 3.2	The very high proportion already knowing 2+ suggests need to revised the list, set new threshold & regather data	
Percent of agricultural producers in target region who can identify key characteristics of a well-managed farm	42.80%	Household survey Average of the % of farmers able to name any of the seven farm mgt practices listed by LOL	Section 3.7	None	
# of on-going agricultural research initiatives by DARTS supported by USDA assistance	Baseline is 0.				
# of policies, regulations and/or administrative procedures in each of the following stages of development as a result of USDA assistance	Baseline is 0.				
Percent of producers who have access to current market information through their cooperatives or producer associations	4.70%	Section 3.9		Need to specify information to be market prices as this is regular rather than one off information on where to sell	Not many producers are members of a FBO

# of private enterprises, producers organizations, water users associations, women's groups, trade and business associations, and community-based organizations (CBOs) that applied improved techniques and technologies as result of USDA assistance	Baseline is 0.			Organisations cannot apply T&T, only their members. Suggest change to # of organisations whose members (at least 25% of them) are trained in T&T	The baseline is technically zero for this indicator
Number of public-private partnerships formed as a result of USDA assistance	Baseline is 0.				
Volume of commodities (metric tons) sold by project beneficiaries	Average sales: Tomatoes: 1,621 kg/HH Onions: 1,019 kg/HH Potatoes: 1,875 kg/HH Mangoes: 1,028 kg/HH Average sales: 1,386 kg/HH 42,000 HH sales= 58,201,500 kgs	Household survey: Took average sales per HH selling that crop Average across all four crops x beneficiary #	Section 3.6		Result will vary depending on mix of crops. You could change the baseline when know final mix of growers to weight the different crops
Number of jobs attributed to USDA assistance	Baseline is 0.				
Value of sales by project beneficiaries	Average sales: Tomatoes: MK 207,488/HH Onions: MK 159,983/HH Potatoes: MK 324,375/HH Mangoes: 79,002 kg/HH Average sales: MK 192,712/HH 42,000 HH sales= MK 8,093,904,000	Household survey: Mean average price x mean average sales per crop. Mean average sales across four crops x beneficiaries	Section 3.6		
Value of new public or private investment leveraged by USDA assistance	Baseline is 0.				
Average number of days required to move selected agricultural products from purchase of initial inputs to final product (ready for sale)	Not calculated			See report - recommended that this indicator is dropped as some interventions will increase days and others reduce - both are beneficial sets of interventions.	
Percentage of selected products that are in compliance with international standards for product quality	Only Malawi Mangoes has any international certification for its mango and banana puree, but this is not any of the certifications listed by LOL			This would be better as number of products as it is not possible to work out the overall number and calculate a percentage.	There are few processors in the target District, so this would need to be extended to cover processors in the main cities of Malawi

Percent of registered processing firms in target sectors that obtain certification with international standards related to product quality	As above			This would be better as number of firms, as it is not possible to work out the overall number and calculate a percentage.	It is unclear what registered firms means. All businesses are meant to register with the District Assemblies, but records are not accurate or up to date.
Percent change in post-harvest losses for beneficiary producers	Tomato: 357 kgs/HH = 22.0% Onion: 319 kgs/HH = 31.3% Potato: 563 kg/HH = 30.0% Mango: 245 kg/HH = 23.8% Average all four crops: 26.8%	Household survey: Mean average loss post harvest as % of mean average yield Averaged across four crops	Section 3.3 & 3.6		The result will vary depending on the proportion of each type of crop among the beneficiaries.
# of producers who say they use two or more improved post-production handling practices	Tomato: 96.1% Onion: 90.6% Potato: 99.5% Mango: 86.7% Average all four crops: 93.22% 42,000 beneficiaries = 39,155	Household survey Mean average applying for each crop, averaged across the four crops x # of beneficiaries	Section 3.2	Change "Post-production" to "post-harvest" Need to reduce list or increase the threshold to three or more.	
Total increase in installed storage capacity (dry or cold storage) as a result of USDA assistance	Malawi Mangoes is the only processor with cold storage at 1,500 square meters Other processors did not have good quality cold or dry storage fruit/veg FBOs did not have good quality cold or dry storage for fruit/veg	Based on KIIs.	Section 3.3 & 3.11		
Number of national export promotion advertising campaigns as a result of USDA assistance	Baseline for this figure is 0.				
Number of sales agreements between FBOs and Processors	Baseline for this figure is 0.				
Number of FBOs using improved financial management practices and systems as a result of USDA assistance	Baseline is 0.				
Percentage of extension agents demonstrating improved technical extension skills as a result of USDA assistance	Baseline is 0.				

Percentage of FBOs who are aware of international production and handling standards as a result of USDA assistance	Baseline is 0.			It is proposed that this indicator is dropped as there are unlikely to be many FBOs entering processing.	
Number of loan officers trained	Baseline is 0.				
Number of processor staff trained in quality standards	Baseline is 0.				
Number of producers trained in good agricultural practices	Baseline is 0.				
Number of producers trained in post-harvest handling practices	Baseline is 0.				
Number of FBOs trained in improved financial and organizational management	Baseline is 0.				
Number of producer group/buyer marketing meetings conducted	Baseline is 0.				
Number of public-private dialogue sessions	Baseline is 0.				

Annex 7: List of KIIs & FGDs

REDACTED

Annex 8: Sample Calculation

A descriptive research option was used in the DCED calculator which aims to estimate characteristics of a population in the target districts and EPAs. The calculator requires a range in which 95% of the data falls in. For this study, it is assumed that 95% of data will fall in a price range of MK 50 per kg to MK 301 per kg, arrived at in consultation with statisticians from the Ministry of Agriculture, across the fruit and vegetable value chains. With the assumptions above the calculation by the DCED calculator is summarized below:

What range will 95% of your data fall in?

50-301

This implies that your data have a mean of 175.5 and a standard deviation of 62.75.

What margin of error do you require?

5

Your margin of error is 5, which is 2.85% of 175.5, your implied mean.

What confidence level do you need?

95 %

What is the population size?

274,555

Your minimum sample size is **604**