



Conservation Farming Unit

CONSERVATION FARMING & CLIMATE SMART AGRICULTURE

**HOUSEHOLD ECONOMY ANALYSIS (HEA)
FOR IMPACT ASSESSMENT OF THE
CLIMATE SMART AGRICULTURE – ZAMBIA (CSAZ)**



**THIS REPORT IS PRESENTED TO THE CFU BY
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Acronyms

CA	Conservation Agriculture
CF MT	Conservation Farming Minimum Tillage
CFU	Conservation Farming Unit
COMACO	Community Markets for Conservation
CSA	Climate Smart Agriculture
CSAZ	Climate Smart Agriculture Zambia project
CSO	Central Statistical Office
FCDO	Foreign, Commonwealth and Development Office
FISP	Farmer Input Support Program
FOs	Field Officers
GDP	Gross Domestic Product
HEA	Household Economy Analysis
IGA	Income Generating Activities
LIAS	Livelihood Impact Analysis Spreadsheet
LIME	Longitudinal Impact Monitoring and Evaluation
LCMS	Living Conditions Monitoring Survey
LPT	Livelihood Protection Threshold
LZ	Livelihood Zone
SFO	Senior Field Officers
RT	Resilience Threshold
ZMW	Zambian Kwacha

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Executive Summary

Overview of the Outcome Analysis Assessment

The 2020 Outcome Analysis assessment is a follow up to two rounds of outcome analysis scenario studies which were done in September 2018 and October 2019 using the Household Economy Approach (HEA) approach involving both qualitative and quantitative methods to get a robust understanding of the differences between Climate Smart Agriculture Zambia (CSAZ) - conservation farming adopters and non-adopters in four selected Livelihood Zones where CFU operates in. The two rounds of outcome analysis for the 2017/18 and 2018/19 agricultural seasons were compiled after an HEA baseline was compiled in 2017 using **May 2016 to April 2017** as reference period. The Livelihood zones covered since the commissioning of the baseline compilation are: 1) ZM08 - The Commercial Rail Line Maize, Livestock, and Cotton; 2) ZM09 - The Southern Plateau Cattle, Maize and Tobacco; 3) ZM16 - Eastern Plateau Maize, Cotton and Groundnut; and, 4) Eastern Plateau Maize, Groundnut, Tobacco and Trade. These zones are under Central, Eastern, Western and Southern areas where the CFU Climate Smart Agriculture Zambia project is being implemented. The CSAZ project targets small-scale farmers in the rural and peri-urban areas. These farmers are in turn expected to practice, and therefore adopt one form or another of Conservation Farming Minimum Tillage (CF MT) practice. As part of the methodology to examine the impact of the CSAZ project, the third round of the Outcome Analysis study collected information from two groups of small-scale farmers: those that had adopted CSA CF MT and those that were using conventional farming system facilitating the use of difference-in-difference approach. This approach entails comparing before-and-after difference for the group receiving the intervention (where they have not been randomly assigned) to the before-after difference for those who did not. This third round of the Outcome Analysis became necessary to enable this longitudinal approach after the country had some fairly good 2019/20 agricultural season across all districts, hence the need to make an impact assessment of the benefits of adopting conservation farming in different circumstances.

Objectives of the Study

The outcome analysis round 3 study objective was to provide evidence on the functioning of local livelihoods, mainly agriculture, as a way of guiding appropriate decision making that incorporates context specific needs, particularly the distinction between Conservation Agriculture (CA) adopters and Conventional farmers, after exposure (or lack of an participation in) to an intervention and a hazard/shock. The primary purpose of the study this round of HEA Outcome Analysis was to provide one more piece of evidence of whether intervening with a climate smart set of technologies would make a difference between Conservation Agriculture adopters and Conventional farmers (non-adopters) in the face of adverse agriculture conditions.

Methodology

The Household Economy Approach (HEA) was used for collecting and analyzing field-based Livelihood information on different wealth groups, specifying problems in the current year (2019/20 agricultural season) on both prices and quantities in the current period and then profiling all these in Livelihood Impact Analysis Spread (LIAS) sheets and identifying the effects of these in livelihoods. This methodology allows for a holistic approach to understanding the way people normally respond to different shocks and hazards hence providing a good starting point for objectively demonstrating change in people's access to food and cash due to multiple changes by allowing analysis of the impact of changes in individual livelihood strategies as well as its contribution to total Livelihood access based on a baseline which was compiled in 2017 with **May 2016 to April 2017**¹ as reference period – a year used to describe and quantify occurring Livelihood patterns for households and is used as a benchmark against which changes in future access are measured.

¹ The year was a normal year with good harvest, pastures and adequate surface water for both livestock and domestic use characterized by improved livestock conditions

Key Study Findings

This study provided one of the clearest ways of answering the question: Does Climate Smart Agriculture work? This study has enabled a longitudinal approach to assess the benefits of climate smart technologies under different conditions ranging from drought years (for example the season 2018/19 was worse than any of the four years covered in the series of studies) to “normal seasons” such as the 2019/20 season although it had some pockets of drought in some areas particularly the southern part of the country. The 2018/2019 season was in no contest the worst season among the four seasons covered in this assessment study. In that particular bad season, the assessment provided a rare opportunity for a comparison between the performance of CSA adopting households and their Conventional farming counterparts in terms of household economies with particular focus on food security. The clearest and uncontested narrative coming from this Outcome Analysis study is that of adopters tending to be more food secure as a function of their reliance on consumption of food that they produce and also inclined to be more capable of maintaining their livelihoods in the face of shocks (to be resilient) when compared to Conventional farmers. This is evidenced by the capacity of both the Very Poor and Poor adopters in achieving both the Survival and Livelihood Protection Thresholds despite the production year being bad because of drought which became the biggest shock embedded in the that year. The current year 2019/20 was a fair to normal year in terms of rainfall distribution hence seasonal performance and provided yet another opportunity to compare adopters and non-adopters in these circumstances. The results showed in such a situation adopter still performed better than conventional farmers such that even the very poor household managed to achieve both the survival and livelihood thresholds which is an indication to potential resilience building and livelihood promotion. The Outcome Analysis study produced some overwhelming evidence that adopting Climate Smart Agriculture technologies (in this case “Conservation Agriculture”) provided a cushion against the effects of an array shocks and hazards (drought, inflation, pests and diseases). This report presents LIAS results for the Very Poor and Poor adopters and Conventional farmers because the evidence of the difference between the two groups was best articulated at that level which made presentation of results for the middle and better off households redundant. Climate Smart Agriculture CSA adopters, compared to Conventional farmers across the four Livelihood zones got more of annual food requirements from own crop production and less from casual labor as own crop production was less reduced by the drought compared to how it affected the Conventional farmers. The effects of crop and livestock diseases was less experienced in adopters as they have some money from crop sales to buy chemical to mitigate against the effects of these problems.

1. There is no question about the fact that adopting CSA technologies that the CFU is delivering to farmers in addition to extension support leads to increased food security when compared with conventional farming technologies. This study confirmed the position.
2. It is concluded that the main source of food is primarily farmers’ own crop production in all the zones. As previously observed, contribution of own crop production to household food sources is higher among adopters than Conventional farmers. However, it is important to note that there appeared to be consistently additional sources of food and income in zone ZM17, covering Chipata district and these non-agricultures related activities for both adopters and non-adopters.
3. The comparative profile of Livelihood strategies across the four Livelihood zones were explained exhibited that the major shocks associated with drought was reduction of maize production across the four zones for both adopters and Conventional farmers with an undisputable difference in the magnitude between Conventional and adopters. Across the four zones maize production was reduced by around 20% among adopters while Conventional farmers suffered losses of more than 40% in the 2018/19 season which was a very bad year compared to the baseline year 2016/2017. In the same vein, in 2019/2020 (the current season) where rainfall distribution was fair to normal, CSA adopters still performed better than their conventional farmers counterparts in terms of livelihood outcomes.

Impact Indicator Values - 2020.

This study established the current, May 2020, values for the two impact indicators. Detailed Indicator Values by Zone as well as for the Middle and Better off wealthier groups are found in Annex 1.

Indicator	Wealth Group	Adopting Households	Conventional Farmers
Impact Indicator 1: Proportion of Households above the Survival Threshold	Very Poor	100%	100%
	Poor	100%	100%
Impact Indicator 2: Proportion of Households above the Resilience/Protection Threshold	Very Poor	53.4%	19.7%
	Poor	73.0%	37.2%

In the current year, all households managed to achieve the survival threshold irrespective of wealth group or type of farming employed but for the livelihood protection threshold, this was achieved by more adopters than conventional framers and that trend was consistent across all wealth groups with own crop production contributing most particularly maize followed by groundnuts which although production levels were not very high. Groundnuts remained critical in livelihood protection threshold achievement because it a high value crop in both calories and price per kilogram.

Recommendations

1. There is need to lobby for a mechanism which ensures that farmers get inputs on time, either through building more capacity to Farmers Input Support Program (FISP) or a deliberate strategy of making farmers access risk indexed loans so that they can plan independently.
2. Post-harvest management trainings should be continued as it is an important part of the climate smart package to ensure all production is retained and there are no post-harvest losses.
3. While successes have been scored on the food security front, the output market linkage component of the CSA has greater potential for wealth creation. Given an opportunity, this component should be accelerated so that more results can be seen on the ground.

1. INTRODUCTION AND BACKGROUND

This third round of the Outcome Analysis study report presents findings that would help us to construct a conclusion about the CSAZ products: Were the interventions worth funding? Do results provide any justification for the use of funds in promoting the interventions or the intervention participants are no better than non-adopting farmers? The study was for assessing the performance of adopters and non-adopters after going through a similar hazard (in this case inflation affecting the prices of agriculture inputs as well as any possible effects of the COVID-19 pandemic since the current year was generally not affected by drought) against benchmarked indicators. The idea is to find the resilience of the two different groups in dealing with the effect of shocks that could affect households whose main livelihoods is agriculture based. Before this study, two similar Outcome analysis rounds in the cropping seasons 2017/18 and 2018/19 (severe drought) had shown drought as the main hazard. The results from those two rounds of Outcome analysis showed climate smart adopters were consistently performing better than non-adopters across all the four wealth groups. This study sought to establish whether or not this is still the case.

Field work was undertaken between the 28th of October and 7th November 2020 in Chongwe, Mazabuka, Choma, Katete and Chipata districts in Zambia as a direct follow up to the baseline assessment and two rounds of outcome analysis which were compiled for the same places in October 2018 and September 2019 respectively. The report is divided into four sections. The background section provides background information to the Outcome Analysis study including the importance of the Household Economy Analysis (HEA) and how it fits into both the baseline and the Outcome Analysis studies. Thereafter, the study methods describe the approach used, followed by an analysis of the findings. Finally, the conclusions and recommendations are outlined in the last section.

1.1 Understanding the CFU Climate Smart Agriculture Project

The Conservation Farming Unit (CFU), is a not-for-profit organization being sponsored by the British Government through the Foreign, Commonwealth and Development Office (FCDO), under its Climate Smart Agriculture Zambia Programme (CSAZ), provides trainings to an outreach of over 200,000 farmers annually across four (4) regions: Central, Eastern, Western and Southern. The CSAZ project had, at its peak, 81 Field Officers (FOs) and 11 Senior Field Officers (SFOs) across the four regions. Each FO trains and/or oversees training of about 2,700 farmers three times annually. The majority of trainees of the CFU are small-scale farmers in rural and peri-urban areas of Zambia. These trained farmers are in turn expected to practice minimum tillage through either hand hoe basins, animal draught power ripping, or tractor ripping. Minimum tillage is one basic component of conservation agriculture. Farmers that voluntarily come to engage with the CFU under the CSAZ project also get additional trainings and market linkages. The trainings include financial literacy, and post-harvest management. They also get to be able to seek extension support through the network of FCs and FOs as well as a new dial-in platform where farmers could ask questions as well as receive timely information throughout the year. These phone messages were tailor made to suit the period of the year such as land preparation. The farmers who have embraced and were using minimum tillage in combination with any other components of conservation agriculture are referred as adopters from a project perspective. It is with this

understanding that this third round of Outcome Analysis study was commissioned to assess and possibly confirm with some degree of certainty the difference between adopters and non-adopters if exposed to same hazards or shocks. The idea is to be able to get an understanding of how these two groups respond to different shock and hazards.

1.2 The Household Economy Approach

The Household Economy Analysis (HEA) was used for collecting and analyzing field-based Livelihood information on Outcome Analysis as a follow up to the baseline information which was compiled in October 2017. The baseline study was focusing on the wealth breakdown, seasonal calendar for main events and activities, and the profiling of Livelihood strategies, which include sources of food and cash income, expenditure patterns, and household coping strategies. To understand the evolving Livelihood situation, the baseline assessment identified **2017** consumption year as the year of focus in comparison to reference year collected for **May 2016 to April 2017** as reference period – a year used to describe and quantify occurring Livelihood patterns for households and is used as a benchmark against which changes in future access are measured. Livelihood strategies are a range or a combination of activities that people or households engage in order to achieve their livelihood goals. They also cover how people manage and preserve assets and how they respond to shocks (i.e. coping or expandability strategies employed). This methodology allows for a holistic approach to understanding the way people live. It provides a good starting point for objectively demonstrating change in people's livelihoods as well as access to food and cash due to multiple changes by allowing analysis of the impact of changes in individual livelihood strategies as well as its contribution to total livelihood access. The 2017 baseline study therefore sets a good platform for these successor studies; Outcome Analysis, which seeks to articulate the projected outcome after going through an intervention/hazard with some employment of some coping capacity.

All Livelihood information in the report therefore refers to how households' ways of obtaining resources to sustain their survival have changed from reference year to current with a projection for the current consumption year. The primary purpose of the study is to provide evidence of the difference between Conservation Agriculture (CA) adopters and Conventional farmers (non-adopters) so as to make informed decision on whether Climate smart agriculture really works for farmers in Zambia.

1.3 The Country Context in which the Project is set

Zambia's Gross Domestic Product has over the past 18 years averaged 5-6% but shrank to a paltry 1.7% in 2019 from 4.035% in 2018 and 3.504% in 2017.² GDP per capita has risen leading to Zambia being classified as a middle-income country. However, recent events in 2019 and 2020 have seen the IMF projecting that the Zambian economy will experience negative growth in 2020 and the COVID-19 is expected to exacerbate the conditions. Zambia, like most exporters of primary commodities,

² World Bank Report: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=ZM&name_desc=false

is currently going through a difficult patch following the fall in copper prices due to the reduced demand for the commodity in world markets, particularly in China. Whilst inflation and interest rate have more or less remained stable up to 2019, Zambia's currency has plummeted by about 70% against the US dollar since January 2015 and the decline has been largely magnified in 2020.

Out of an estimated 2019 population of 17,381,166, and a working age population (15 years or older) estimated at 9,706,101 the 2019 Labour Force Study (LFS) for puts Zambia's labour force at 3,423,486, male and female employment to population ratio was 39.4 percent and 23.4 percent, respectively. The majority of the labour force (84.6%) is engaged in the informal sector. The number of formally employed persons was 941,292 while that of informally employed persons was 2,053,811. The number of employed persons in the formal sector was 901,321. The employed persons in the informal and household sectors were 1,301,491 and 792,291, respectively.³

The proportion of the population living below the poverty line was 54.4 per cent. Poverty in Zambia still remains predominantly a rural phenomenon with poverty levels at 76.6 percent compared to 23.4 percent in urban areas. In 2015, 40.8 percent of the population was extremely poor while 13.6 percent was moderately poor.⁴

1.4 The Outcome Analysis Study Objectives

The Outcome Analysis is expected to clearly establish existing food deficits, if there are any differences between adopters and non-adopters based on the 2100 kilocalories required by an individual per day for a normal life. The Outcome Analysis goes further to establish the proportions of households that are not able to meet their daily energy requirements. The Survival Threshold is a performance threshold against which the adequacy of household access to food and income can be measured. Households falling below this threshold are classified as facing acute food insecurity (at least IPC Phase 3) and require emergency assistance. The CSAZ project seeks to build the resilience of participating households and this was measured using the Livelihoods Promotions/ Resilience Threshold. Through this Outcome Analysis, the Resilience threshold will be estimated and household at or above this threshold will be computed.

In terms of geographic coverage, the unit of analysis remains the Livelihood Zone (LZ). The Outcome Analysis covered all the 4 LZs that were covered in the HEA Baseline and these are:

- Commercial Rail line Maize, Livestock and cotton – ZM08
- Eastern Plateau Maize, Cotton, and Groundnut ZM16
- Eastern Plateau Maize, Groundnut, Tobacco and Trade – ZM17
- Southern Plateau Cattle, Maize and Tobacco - ZM09

³ 2019 Labour Force Survey – Report. Zambia Statistics Agency

⁴ 2015 Living Conditions Monitoring Survey Key Findings. Zambia Statistics Agency

The actual districts are as shown in Figure 1 (adapted from the TORs shared by the CFU). One of the LZs (ZM08) is however vast and it was decided cover two districts in that LZ to get a good and fair representation. Table 1 below shows the 5 districts and it was suggested that for the sake of maintaining a longitudinal perspective, data would continue to be collected from the same villages as in the baseline.

Table 1: CFU Areas of operation and the Proposed Study areas.

Livelihood Zones in in CFU Region	District	Specific Study dates
Southern Plateau Cattle, Maize and Tobacco – ZM09	Choma	28 th - 29 th October
Eastern Plateau Maize, Groundnut, Tobacco and Trade – ZM17	Chipata	2 nd and 3 rd November
Eastern Plateau Maize, Cotton, and Groundnut – ZM16	Katete	4 th and 5 th November
Commercial Rail line Maize, Livestock and cotton – ZM08	Mazabuka	30 th and 31 st October
	Chongwe	6 th and 7 th November

The baseline study objectives were aimed at providing evidence on the functioning of local livelihoods as a way of guiding appropriate decision making that incorporates context specific needs, particularly the distinction between conservation agriculture adopters and conventional farmers. These decisions are focused on current and future programming and evidence-based policy engagement on food security, livelihoods, nutrition and social protection in CFU operational areas. The Outcome Analysis is now a follow up to the baseline study and seeks to inform CFU to get an understanding of the socioeconomic benefits derived from the CSAZ project at household economy level and track both household and community level resilience and shocks related to the climate’s effects on agriculture. This was achieved by seeking to benchmark and create an understanding of any differences between adopting farmers and conventional farmers.

The CFU engaged technical expertise in the establishment of an HEA baseline and Outcome Analysis to enable the Unit to monitor and evaluate the performance of conservation agriculture under Climate Smart Agriculture (CSA) initiative in Zambia in a longitudinal manner. The Household Economy Approach (HEA) provides an analytical framework for understanding strategies employed by households to derive food and income. Three thresholds, the Survival Threshold, the Livelihoods Protection Threshold and Livelihood Promotion (Resilience) Threshold, are then used to measure the performance of households. For the purposes of this Outcome Analysis study, two relevant impact indicators were to be benchmarked and these are;

- ✓ **Impact Indicator 1:** Proportion of Households above the Survival Threshold (disaggregated by Socio Economic status and adoption status)
- ✓ **Impact Indicator 2:** Proportion of Households above the Resilience/Protection Threshold (disaggregated by Socio-Economic status and adoption status)

In brief the third round of Outcome Analysis study seeks to achieve the following objectives

- Consolidation to **problem specification**- where participants consolidate with more clarity how to translate shocks/hazards into economic costs and linking these to baseline data as a way of analysing impact on Livelihood access.
- Identification and **quantification of coping and response strategies** – participants to consolidate how to account for coping strategies in analysis particularly in quantifying opportunities and constraint's in responding to any natural and man-made hazards such as conflict, floods, drought and price increases.
- Defining **intervention thresholds**- Where participants consolidate on defining and quantifying the Survival and Livelihood protection thresholds to be used for determining type and quantity of emergency support required when households both CSA CA adopters and Conventional farmers that do not meet their needs.
- Identifying **monitoring indicators** for Livelihood change – where participants learn on identifying key parameters (key Livelihood sources) and how to set up a monitoring/surveillance system including putting trigger thresholds on indicators.
- Introduction to **analysis tools** where participants learn using the analysis spreadsheets
- The **final Outcome Analysis** – using the training theory and practical exercises provided, participants carry out Livelihood impact analysis for the four baselines to predict and forecast the food security and livelihoods situation in specific areas. This helps explain the overall impact of the CA intervention and hazards to ensure the identification of appropriate support interventions in the area.
- **Response Analysis** where participants learn how to convert analysis outcomes into decision making on possible interventions - (translating evidence into action).

This Outcome Analysis period was for **May 2019 to April 2020** consumption year. The Outcome Analysis followed a systematic step by step process outlined below;

Step 1: Identification of “key parameters”: Key parameters are significant sources of food and income which when access changes will have significant impacts on overall food and income for a household. They are the indicators monitored to conduct Outcome Analysis. Therefore, the first step of this Outcome Analysis was to identify and list these sources of food and income, identified from the baseline information. This process was just a repetition of what was done in the preceding two rounds

Step 2: Collecting data for key parameters: After identification, primary and secondary data was collected on all key parameters.

Step 3: Calculating “problem specification”: This process involved comparing current levels (2019/20 consumption year) of key parameter data to reference year levels (2016/17) – to quantify change (in percentage terms) from reference year. In other words, this process allows analyst to incorporate hazard/shock information into the analysis. This allows to translate the shock into economic consequences at the household level.

Step 4: Projecting the outcome: Lastly, hazard/shock information (problem specification) were applied into the analysis to calculate the projected outcome which shows the impact of the shock on food and income access. The outcomes are measured

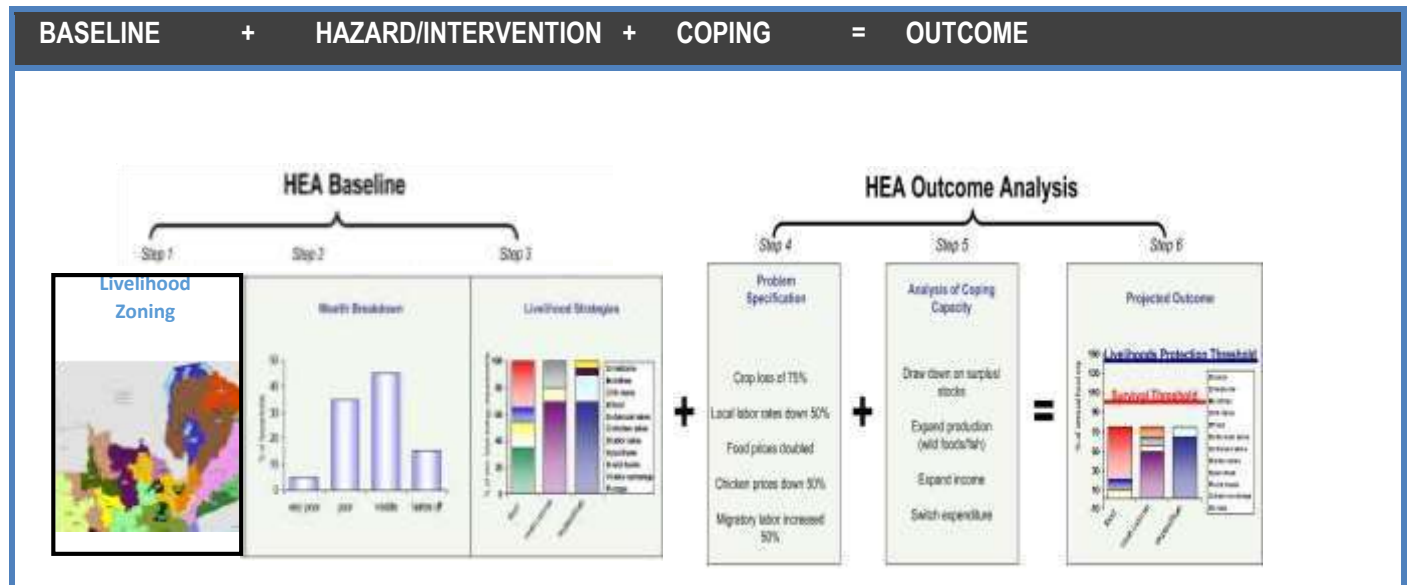
against two thresholds (Survival and Livelihoods Protection) which are described in detail in the methodology section (HEA Overview).

1.5 The Conceptual Framework

1.5.1 Household Economy Assessment (Outcome Analysis)

The Household Economy Analysis is a livelihoods framework for analysing the way people obtain access to food, income and expenditure patterns which pertain to their Survival and livelihoods enhancement. The analysis helps determine people's food and non-food needs and identify appropriate means of assistance for short term emergency assistance, longer term development programming and also assist in recommending policy changes to sustain good life. The generic framework is divided into six steps namely Livelihood Zoning, Wealth Breakdowns, and Livelihood strategies, Problem Specification, Analysis of Coping and the Projected Outcome as illustrated in the figure below:

Figure 1: Conceptual Framework



The table 2 below articulates the HEA steps in summary.

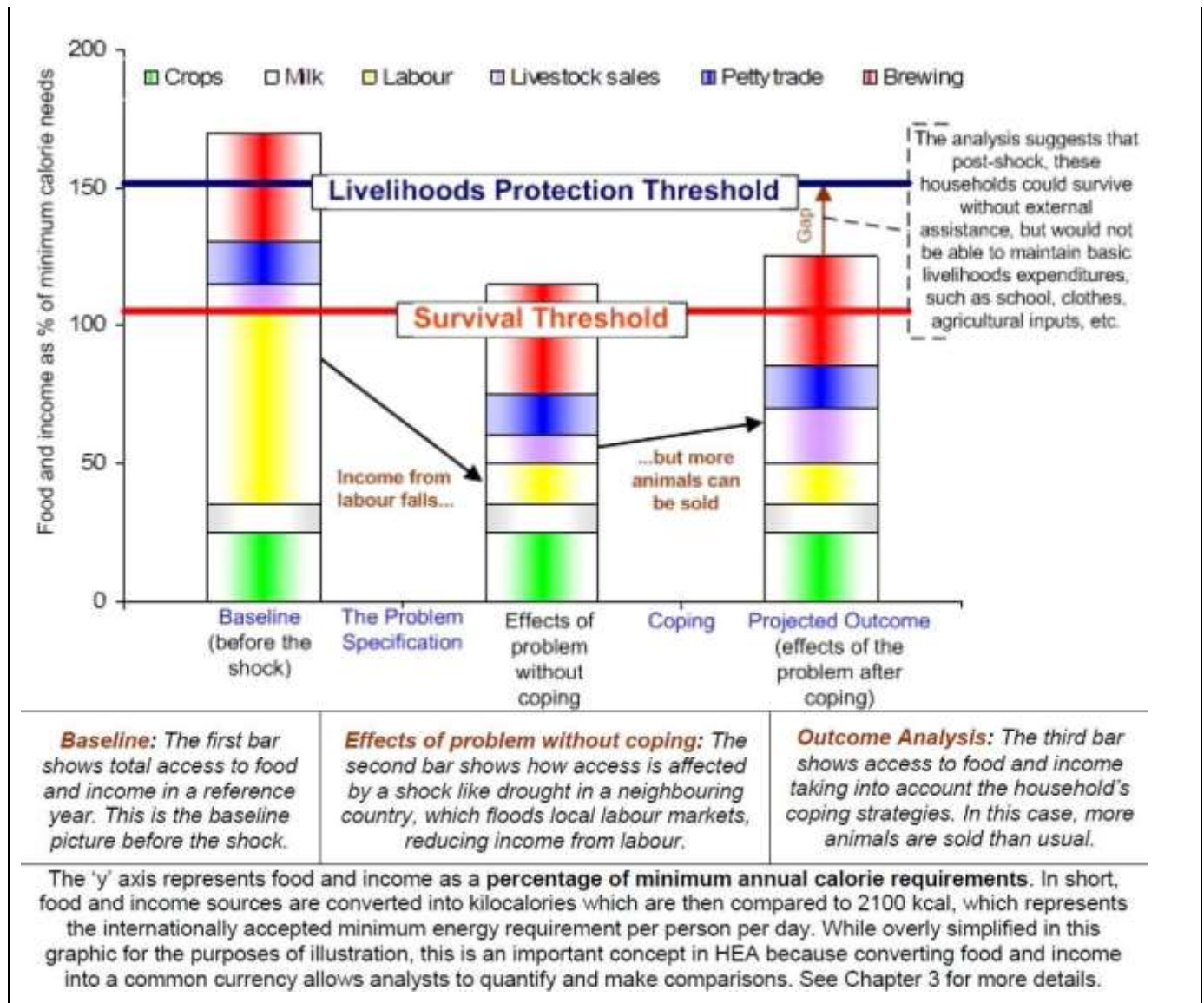
Table 2: Typical Methods Used to Gather Information for the HEA Framework

<i>Step in the Framework</i>		<i>Information collection methods used (to date)</i>
<i>Baseline</i>	Livelihood Zoning	Semi-structured interviews; participatory workshops; secondary data review
	Wealth Breakdowns	Semi-structured interviews; proportional piling; census data review (to cross-check household composition)
	Analysis of Livelihood Strategies	Semi-structured interviews; review of secondary data (to cross-check yields, production, livestock numbers, etc.); proportional piling; participatory seasonal calendars and community mapping
<i>Outcome Analysis</i>	Problem Specification	Household surveys (to gather monitoring data such as crop production and prices); Semi-structured interviews; review of secondary information, especially time series data
	Analysis of Coping Capacity	Semi-structured interviews; review of secondary data (on labour markets, herd composition, viable off-take rates, etc)
	Projected Outcomes	No additional information goes into this step; this step comprises an analysis and processing of the data and information gathered in the previous steps

This framework is based on the principle of understanding how people live in normal year which is referred to as the Reference Year. Once a set of data which assesses access to income, food and expenditure is generated at the baseline stage as was done last year in October 2017 based on the **May 2016 to April 2017** reference period, then changes in access will be assessed in years that follow through collection of problem specifications in Step 4. Problem Specification and analysis of coping are then used to generate the projected outcome which is then compared to the Survival and Livelihood Protection Thresholds.

In the projected outcome, an analysis of Survival and Livelihood Protection Thresholds is undertaken to determine whether or not external assistance is required to support households to meet Survival needs to support their livelihoods. In this case a comprehensive picture is seen on how conservation farming adopters are compared to conventional farmers. The graph below presents the concepts which start by understanding the situation before a shock (baseline), the situation which is a result of the shock (effect of a shock eg drought/ inflation) and finally the final picture which takes into account the coping/effects of the Climate Smart Agriculture in Zambia (CSAZ) intervention. The scenarios are analysed in relation to Survival and Livelihood Protection Thresholds (defined below) which are Livelihood zone specific. An analysis of the three bars against the 2 thresholds gives an indication as to whether external support would be required or not.

Figure 2: The Household Economy Analytical Framework – a simplified illustration



The **first bar** from the left in the chart represents total access to food and income in a reference year for a particular group of people with similar access to food and income. This is the baseline, which presents a picture of the 'typical' household economy: of household assets; the strategies employed to derive food and income and the relationships between households and with the wider economy; and how households use that income to meet their basic needs, for investment or for social obligations. *One important point to make here is that the quantities represented in the bar charts are a percentage of minimum food energy requirements*; all food and income sources have been converted into their calorific equivalencies. This has the advantage of allowing for like-to-like comparisons, and also of ensuring that a rigorous cross-checking can take place. In most instances, HEA uses the measure of 2100 kilocalories - this is not to say that energy alone is a sufficient measure of nutritional adequacy; but it is the first measure of whether or not people will starve. Further nutritional analysis is possible with HEA, although specific Cost of Diet work is likely to be more appropriate for gaining specific pieces of nutritional information.

The idea is that once the baselines have been compiled, they can be used repeatedly for this type of Outcome Analysis over a number of years – until significant changes in the underlying economy render them invalid. A good food economy baseline will generally be valid for between 3 and 10 years. What varies is the prevailing level of food security, but this is a function of variations in hazard, not variations in the baseline. Put another way, the level of crop or livestock production may vary from year to year (hazard), but the underlying pattern of production (the baseline) does not usually change very rapidly. This is the justification why this year 2020 were are currently and confidently carrying out a third round of the outcome analysis using the same 2016/17 baseline.

The **second bar** (middle bar) in the chart – **the effects of the problem without coping** - shows us how specific sources of food and cash income are affected by a shock. In the hypothetical case presented in Figure 2, the shock is a drought in a neighbouring country, leading to an influx of labourers from the drought-affected area in search of work, who flood local labour markets reducing the daily wage. The effects of shocks are specific to different livelihoods and to different levels of wealth, and the detailed problem created by a ‘shock’ for particular households is defined in HEA as the **‘problem specification’**. In the illustrative example provided in Figure 2, the problem specification is shown between bars one and two, and results in reduced income from employment as shown in bar 2. It is worth noting here that HEA can be used to consider the effects not just of negative shocks, but also of positive changes as witnessed in the current year where because fair rainfall distribution, the harvests across the four selected zones were better compared to the other seasons. So, for instance, it is possible to consider just how much extra income might be obtained by poorer households who are provided with two goats, and what this might translate into in terms of increased food security. Or the relative food security benefits of a subsidy on kerosene might be weighed up against a price cap on staple maize.

Third, the framework takes into account household capacity to adapt to the economic stress caused by the hazard by drawing down on assets, cutting back on expenditures, or expanding other sources of food or cash. This is shown in **the coping step**, which is placed in between the second and third bar above. In this example, households are able to sell more livestock than usual, and this increases their access to food and income. Regarding **coping strategies**, it is not usual to include every possible strategy in the calculation of outcome. This would have the effect of under-estimating the need for assistance as measured by the deficit. Instead, only those strategies that are appropriate responses to local stress are included. In this context, appropriate means both ‘considered a normal response by the local population’ and ‘unlikely to damage local livelihoods in the medium to longer term’. In a pastoral setting, for example, it is usual to increase livestock sales in a bad year. This is an appropriate response to economic stress - provided the increase in sales is not excessive. **An HEA outcome analysis, therefore, determines the level of assistance required to prevent in-appropriate coping strategies that would undermine early recovery and longer term development.** In this regard HEA does not model actual behaviour – since in the absence of appropriate levels of assistance households will be forced to employ ‘in-appropriate’ coping strategies.

measures household access to resources necessary to meet their basic needs, and ii) **Livelihood protection** threshold measuring household capacity to maintain access to basic services and protect and sustain livelihoods in the medium and long term. Below is an outline of the key steps in the Household Economy Approach and how this analysis examines the parameters in this assignment.

1.6 The Outcome Analysis Implementation Strategy

The third round of Outcome Analysis assessment was done in four purposively selected Livelihood zones which were covered at baseline level: Commercial Rail Line Maize, Livestock, and Cotton (Chongwe – Mazabuka); Southern Plateau Cattle, Maize and Tobacco (Choma) Eastern Plateau Maize, Cotton and Groundnut (Katete); Eastern Plateau Maize, Groundnut, Tobacco and Trade (Chipata) where CFU climate smart initiative is operational in. These zones were purposively selected on the basis of the CFU coverage of districts in the zones and their accessibility to the assessment teams. The study made use of rapid rural appraisal techniques through holding focus group interviews with community leaders using the baseline defined wealth groups using local determinants and wealth group representatives of identified wealth groups and generate a good understanding of the problem specification – **Very Poor, Poor, Middle and Better Off**. A total of 72 key informant interviews were conducted.

The consulting teams undertook the following steps during this study:

- ✓ **Training:** A training workshop was held on 26th and 27th of October with a total of 6 participants. The topics covered included: HEA framework overview, key parameter identification from baseline storage sheet, problem specification, analysis of coping, projected outcome as well as the use Livelihood Impact Analysis Spreadsheet (LISA). The training had field practice (pre-test) embedded in it to allow better appreciation of the data collection instruments before the actual field work and also expose participants to the actual field work conditions.
- ✓ **Field Work Timing:** The field work was undertaken from 28th of October to 7th of November 2020. Trained participants were deployed to carry out the assessment with guidance and mentoring from experienced HEA practitioners who led the data collection process providing quality control.
- ✓ **Interviews with Household Representatives.** Wealth group interviews were held with 2 groups (CSA adopters and Conventional farmers). Each group had between 4 to 8 members. There were 8 communities per zone and 8 FGDs per community (consisting of 4 groups of CSA adopters- the Very Poor, Poor, Middle & Better Off and 4 Conventional farmers with the same four wealth groups). Household representatives at wealth group level provided information on current access to food, cash income and expenditure patterns to facilitate comparison with baseline access. This provided an opportunity problem specification calculation which is basically a translation of a problem into an economic consequence at household level.
- ✓ **Market Assessment:** The team visited 24 markets in the zone to collect price data and understand market hazards in reference year and current year for triangulation and running of price increase hazard analysis.

- ✓ **Data analysis and Livelihood baseline report compilation.** Data analysis was carried by HEA expert with remote support of research assistants giving guidance on specific field experiences. The process involved developing a typical picture of household Livelihood strategies for respective wealth groups.

2. OUTCOME ANALYSIS STUDY FINDINGS AT LIVELIHOOD ZONE LEVEL

The outcome analysis findings for this third round, like what was done during the preceding two rounds, are presented at livelihood zone level in order to be able to articulate context specific issues. The first part deals with the general zone description to give context of the area wherein the study was conducted. It should be noted that the agricultural season (2019/20) under review presented another opportunity for comparison of the effect three scenarios:

1. Fair rainfall distribution on rain-fed crop production and household economies;
2. An inflationary environment due to local currency depreciation
3. The early effects of the COVID-19 pandemic.

These three factors were, in essence some forms of shocks from an HEA perspective. The negative common across the four zone was the dwindling in the purchasing power of the Zambian Kwacha which had a bearing on agriculture input acquisition which affected both crop and animal production. In this regard, the distinguishing variable was therefore the fact that some households deliberately chose to take up Conservation Farming (Climate Smart Agriculture) while some opted to remain employing conventional tillage methods. In all Zones under the study this distinction will be used in addition to the wealth grouping of households which was done at baseline compilation level. It is the research team's argument that only the lower wealth groups are highly sensitive to both interventions (tillage methods) and adverse climatic, socio-economic and epidemiological conditions. For that reason, the study used only the Very Poor (VP) and Poor (P) households to assess the success or failure of CSA in building resilience like what was done in the previous two rounds so as to longitudinally track the results.

2.1 Key parameters – Problem Specifications

For all baseline level identified key parameters (a source that contributes at least 10% of kcals to one wealth group's total food or income OR at least 5% of kcals to two wealth groups' total food or income). The problem specification allows you to mathematically link the shock (or positive change) to each relevant livelihood strategy in the baseline. The problem is always expressed as a percentage and is calculated as

$$\frac{\text{Current quantity/price}}{\text{Reference quantity/price}} \times 100 = \% \text{ of reference year}$$

Any problem specification less than 100% indicates a drop in either quantity or price of an item in the current year relative to the baseline year while anything above 100% depicts an increase in quantity or price relative to the baseline.

Table 3: Key Parameters by Livelihood Zone

Item	Name of Livelihood Zone							
	ZM 08		ZM 09		ZM 16		ZM17	
	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
Maize	✓	✓	✓	✓	✓	✓	✓	✓
Groundnuts	✓	✓	✓	✓	✓	✓	✓	✓
Cowpeas	✓	✓	✓	✓	✓	✓	✓	✓
Sunflower	✓	✓	✓	✓	✓	✓	✓	✓
Sweet potatoes	✓	✓	✓	✓	✓	X	✓	X
Rice	X	X	X	X	✓	✓	✓	✓
Sorghum	✓	✓	✓	X	X	X	X	X
Beans	✓	✓	X	X	X	X	✓	✓
Soya beans								
Vegetables	✓	✓	✓	✓	✓	✓	✓	✓
Cotton	✓	✓	✓	✓	X	X	✓	✓
Tobacco	X	X	✓	✓	X	X	✓	✓
Cattle	✓	✓	✓	✓	✓	✓	✓	✓
Goats	✓	✓	✓	✓	✓	✓	✓	✓
Pigs	✓	✓	X	X	X	✓	✓	✓
Chicken	✓	✓	X	✓	X	✓	✓	✓
Charcoal	✓	✓	X	X	✓	✓	✓	✓
Firewood	✓	✓	X	X	X	X	✓	✓
Musipa (small fishes)	X	X	X	X	X	X	✓	✓
Sobo Drinks	X	X	X	X	X	X	✓	✓

Key ✓ Key parameter
 X Not a key parameter

2.2. Zone 1: The Commercial Railway Line Maize, Livestock, and Cotton (ZM08)

Brief Zone Description: The Commercial Railway Line Maize, Livestock, and Cotton (ZM08) Livelihood zone is located in the central plateau with an altitude ranging between 900-1200 meters above sea level and stretching across the districts of Kazungula, Monze, Mazabuka, Namwala, and eastern parts of Lusaka, Kafue, Chongwe, Chibombo, and Kapiri Mposhi along the main railway line and the well-developed road linking Livingstone through Lusaka to the Copperbelt. The zone falls within agro-ecological Region II, which receives an annual rainfall of 700–1000 mm per annum and is characterized by good soils and climate for agriculture. The soils are moderately to highly fertile sandy loam and clay that are well drained and suitable for a wide range of crops. The temperatures are usually high towards the start of rains between September and November, with highs ranging from 30-35 degrees Celsius. The dry months of May to July are coolest, with average low temperatures of 16-17 degrees Celsius. Open savanna grasslands and Mopane, Munga, and Miombo woodlands cover the zone. Forest reserves and rivers in the zone provide opportunities for charcoal production and fishing.

This densely-populated zone contains about 55 inhabitants per square kilometer. Land cultivated for food and cash crops averages from 1-3 hectares per household. The Lenje and Tonga are the main ethnic groups. Rain fed and irrigated agriculture using manual labor or animal traction are the primary Livelihood activities, though a number of commercial, mechanized farms dot the zone. The main crops grown include maize, cotton, groundnuts, sweet potatoes, and beans, with minor production of millet and sorghum, primarily for household consumption. The growing season is medium to long, ranging from 100-140 days, which is suitable for maize. Cattle are mostly kept for sale and used as draft power. Other livestock in the zone include goats, pigs, and poultry, and are kept for sale or household consumption.

The zone has generally good physical infrastructure, facilitating market access and trade particularly along the road and railway line linking Lusaka and Livingstone and they cut across the zone. Access to markets is fairly good and mostly focused on the big towns of Lusaka, Kafue, Livingstone, and Kabwe. These markets are located within the zone and provide outlets for most commodities produced in the zone, as well as a steady supply of nonfood items. Good infrastructure and proximity to urban areas generate a strong demand for labor; local laborers work primarily on local farms or as casual labor in urban areas within the zone.

Outcome Analysis results for Zone ZM08

One of the sites for this Zone is in the Southern Province (Mazabuka) while Chongwe is in Lusaka Province. The current year for the Outcome Analysis is May 2019 to April 2020 based on the problem specifications of adopters and non-adopters below. As alluded earlier in this report, a standard key parameter is a food or income source which contributes at least 10% in wealth group or at least 5% of kcals to two wealth groups' total food or income. The HEA Baseline Storage Sheet (BSS) automatically identifies key parameters in the baseline under the worksheet Summaries (Summ) worksheet. The key parameters are then used to track

changes in access to food and cash income between the two periods, the baseline period (May 2016 to April 2017) and the current period (May 2019 to April 2020).

Figures 4 and 5 present two graphs but both showing the same information in different formats. Figure 4 shows the livelihood crop production problem specification in terms of actual percentage of baseline values (where baseline values are taken as 100%). Thus, for example, maize production was 43% and 37% of baseline for Adopters and non-adopters respectively. Figure 5 on the other hand shows that this production of 43% and 37% was in fact 57% and 63% below the baseline values. A close analysis of the results shows that, consistently and for all crops, in the presence of the combined impact of FAW infestations and a poor distribution of rains affecting all households in this zone (and indeed the whole of Southern Province), there is a some decrease in the way the climatic and other conditions affected households. This (43% for adopters) is an improvement compared to the previous season where, for example, maize alone had fallen for adopters to had fallen to 12% of the baseline value (fallen by 88%). In the previous season, conventional farmers had fallen by 96% to achieve only 4% of the baseline value. Note that Figure 4 and 5 show that for the adopters, vegetable production is above the baseline production by 5%.

Figure 4: ZM08 - Overall Problem Specification

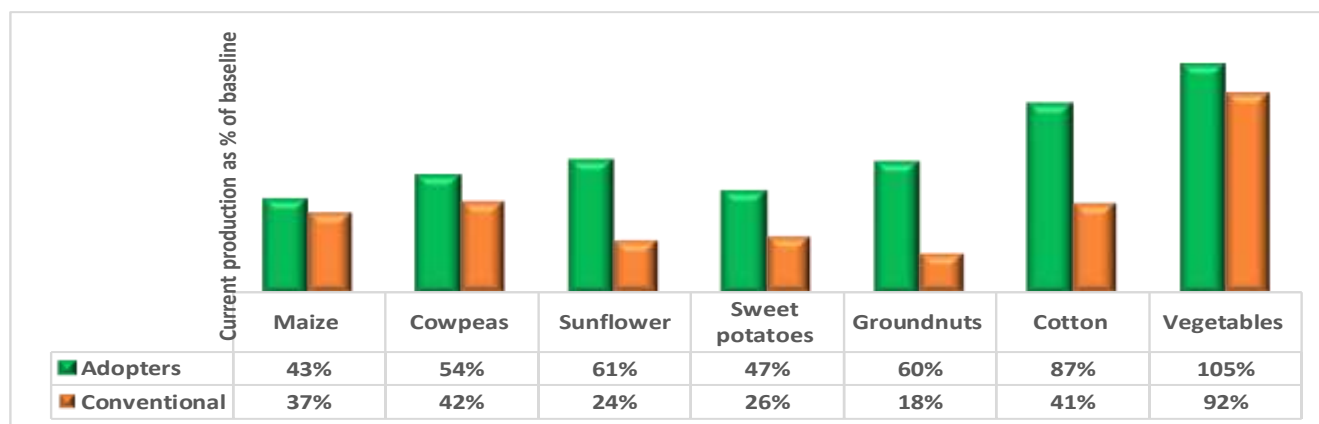


Figure 5: ZM08 - Problem Specification (margin of difference from baseline)

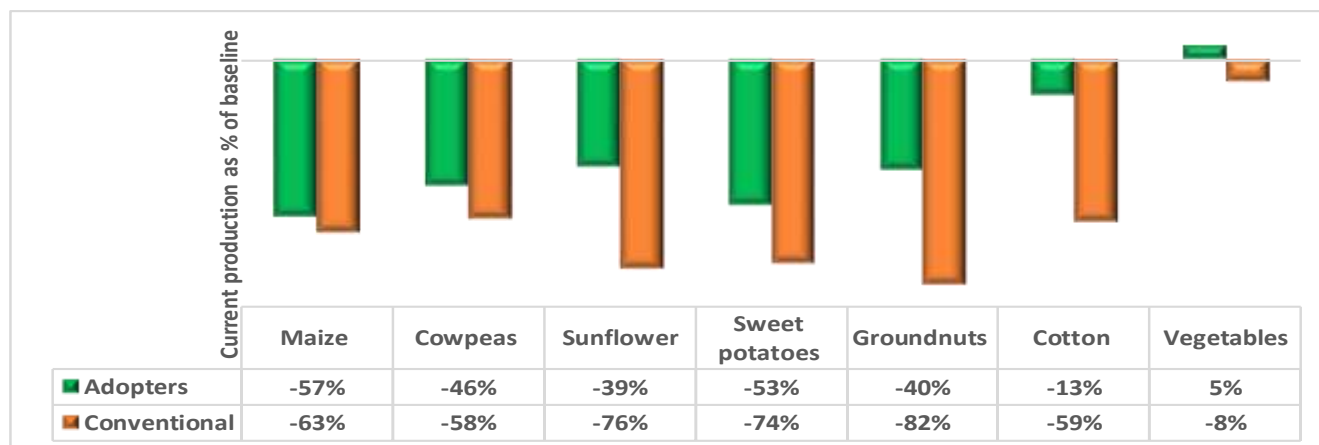


Figure 6: The Commercial Rail Line Maize, Livestock, and Cotton (ZM08) livelihood zone seasonal calendar

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Seasons												
Rainy season	Blue	Blue	Blue	Blue							Blue	Blue
Dry season				Gold	Gold	Gold	Gold	Gold	Gold	Gold		
Lean season	Red	Red										Red
Cropping												
Land preparation							Light Green	Light Green	Light Green			
Planting	Light Green										Light Green	Light Green
Weeding	Dark Green	Dark Green										Dark Green
Harvesting/threshing				Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green			
Green maize		Dark Green	Dark Green									
Livestock												
Kidding/calving								Purple	Purple	Purple	Purple	Purple
Milking	Purple	Purple	Purple								Purple	Purple
Hazards												
Crop pest/disease outbreak	Light Blue	Light Blue				Light Blue	Light Blue	Light Blue	Light Blue			Light Blue
Flooding	Light Blue	Light Blue										
Livestock disease outbreak			Light Blue									Light Blue
Legend												
				Land preparation		Sowing		Weeding				Harvest

Although the effect of a mild drought on was not as devastating as it was in the previous seasons, all farmers in this zone in 2019/20 cropping season CSA adopters experienced comparatively reduced severity than their conventional counterparts. This was mostly seen in crops where CSA technologies were used particularly for maize, sunflower, cotton and groundnuts. The differences between adopters and non-adopters were more pronounced in southern parts of zone particularly Mazabuka district, while the north eastern part of the zone, (Chongwe district) the difference was not that pronounced. On the overall, compared to the baseline production levels, CSA adopters suffered an average of 35% crop loss due to erratic rainfall and other obtaining shocks, conventional farmers lost nearly double (60%) production.

Focus was then directed towards the two thresholds and looked at the VP households in this Zone to get an understanding of the effect of the drought on households' access to food and cash. Figure 5 below graphically summarises the findings. Note that the threshold lines are as per current reference period and not baseline period.

Figure 7: Total Income (Food + Cash) ZM08 VP

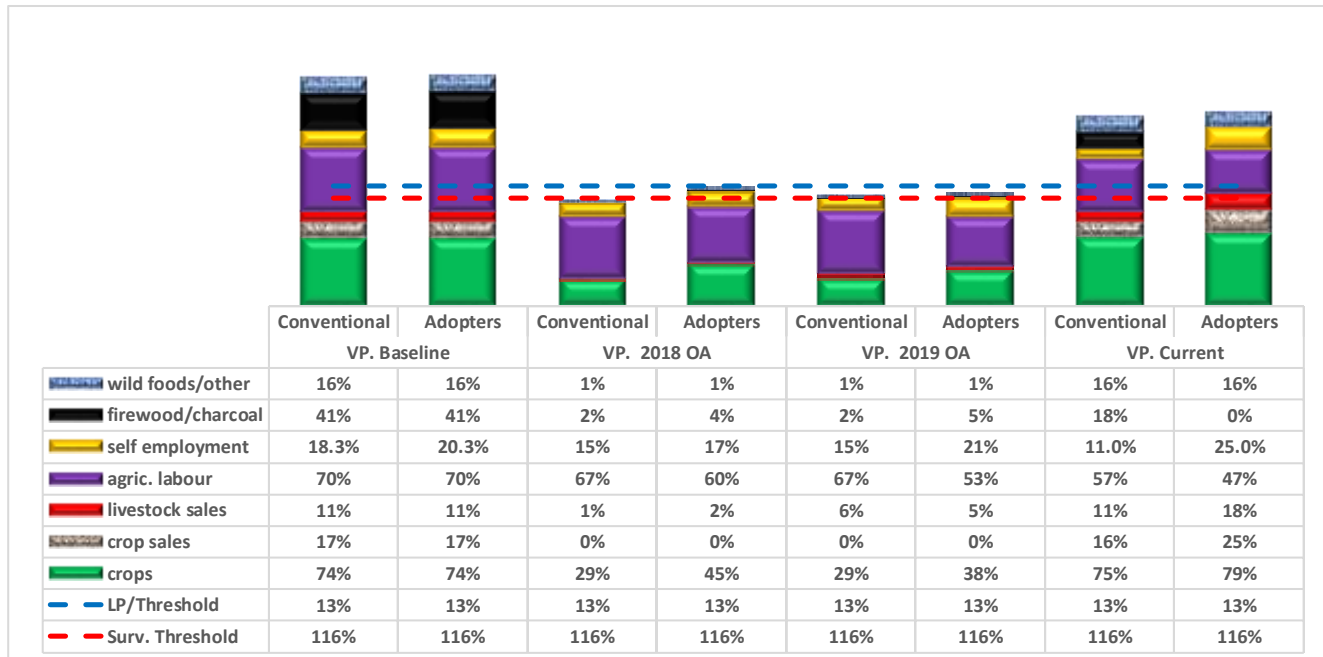


Figure 5 is a confirmation of what has already been noted in Figure 4; that the impact of the shock (mild drought, any early effects of the COVID-19 pandemic, as well as commodity price increase) was less pronounced among the adopters as they are cushioned by conservation farming adoption. Figure 4 compares years from baseline level (2016/17) and the subsequent three rounds of outcome analysis (2017/18, 2018/19 and 2019/20). A comparison of the four seasons shows that the baseline remains the best performing season followed by the current season which was never the less characterised by some erratic rainfall distribution particularly on the southern part of the zone. What is interesting is that for all the season, both adopters and conventional farmers managed to achieve the Survival as well as the Livelihood protection thresholds. Of importance to note in the difference in the contribution of own crop production in the across the four seasons. Adopters had a higher percentage of own crop production ranging from 38% to 79% while non adopters ranged 29% to 75%. In spite of achieving the Survival Threshold (ST), in 2017/18 and 2018/19 very poor conventional farmers faced a Livelihood Protection Threshold (LPT) deficit.

Remembering this equation:

$$\text{BASELINE} + \text{HAZARD/INTERVENTION} + \text{COPING} = \text{OUTCOME.}$$

It can be seen that across the four seasons, the adoption of conservation farming actually provided farmers with some form of cushion against the impact of embed erratic/delayed rainfall (COVID-19 and inflation in 2019/20) it can be seen that the shocks reduced crop production least amongst the adopters. One can also argue that *if there were no such shocks* and the Outcome Analysis equation was adjusted (after filtering out shocks/hazards) to:

$$\text{BASELINE} + \text{INTERVENTION} + \text{COPING} = \text{OUTCOME,}$$

The outcome could have seen more benefits of Conservation Agriculture with adopters achieving far above the Livelihood protection threshold which is the basis on which resilience is built.

Figure 8: Total Income (Food + Cash) ZM08 Poor

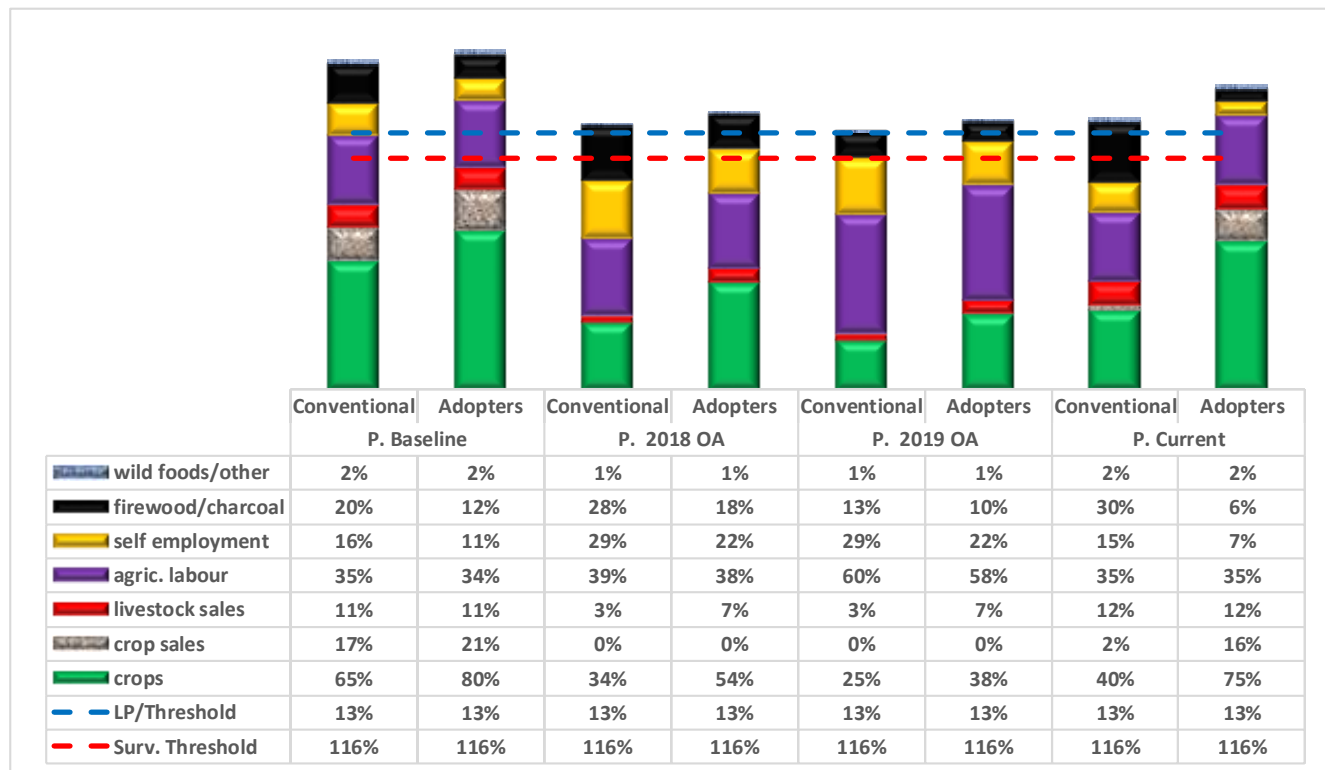


Figure 6 shows that after the shock/ drought (which was actually severe in the 2018/19 season as shown by seasonal timeline below in Table 2, although Poor households (both adopters and Conventional famers) in this zone still managed to achieve the Survival threshold and the Livelihood protection threshold the impact of drought and price changes is different between the adopters and the non-adopters. The differences between the two sets of farmers (adopters and Conventional) farmers is as expected; mainly accounted at crop production and sales level. For Conventional farmers, because of the hazard/drought, there was some significant drop in crop production particularly maize production from a high of 65% at baseline down to 40% (which is a 25% drop) of household food and income. On the other hand, as much as adopters were affected by the drought and price changes, the reduction in crop production (from 80% to only 75%) was not as huge as for conventional farmers.

Table 4: SEASONAL PERFORMANCE TIMELINE (ZM08)

A periodic or intermittent hazard is one that affects crop or livestock production in <i>some but not all years</i> :				
Insecurity – political tension/conflict		Insecurity – clan conflict		Border closure
Drought	Influx or in-migration	Wind	Epidemic crop disease	Wild Animals
Flood	Hail	Crop Pests	Epidemic livestock disease	Market events
Year	Seasonal Performance (1-5)	Event(s)		
2019/20	3	A fairly good year with pockets of areas with erratic rains like Mazabuka district. Seasonal performance was also affected with high prices of inputs and also livestock diseases		

2018/19	1	The season was characterized by severe drought coupled like crop and livestock diseases
2017/18	2	This was also a bad with erratic rains but the drought was not very severe
2016/17	4	This was fairly good year typical of a Household Economy Approach baseline where most characteristic a typical of an average year. Maize production was approximately 3.6MT at national level
2015/16	3	It was a fairly good year where maize production 2.8 MT across the country

Source: <https://knoema.com/atlas/Zambia/topics/Agriculture/Crops-Production-Quantity-tonnes/Maize-production>

Key to seasonal classification

5 = an excellent season for household food security (e.g. due to good rains, good prices, good crop yields, etc)

4 = a good season or above average season for household food security

3 = an average season in terms of household food security

2 = a below average season for household food security

1 = a poor season (e.g. due to drought, flooding, livestock disease, pest attack) for household food security

A trend analysis of Figure 6 shows the same pattern which was observed on the Very Poor household in this livelihood zone, where adopters performed better than conventional farmers in terms of crop production and achievement of survival and livelihood protection thresholds. The 2018/19 season was really a bad year because of the severe drought such that conventional farmers actually struggled to reach the livelihood protection threshold.

2.3. Zone 2: The Southern Plateau Cattle, Maize and Tobacco~ ZM09

The zone is located in the districts of Kalomo and Choma. The zone lies on a highland over 1000 meters above sea level bordered by low-lying areas moving towards Gwembe to the east and plains of the Kafue basin in the north. The zone is located within agro-ecological Region II, and receives an annual rainfall of 600–800 mm per annum falling between November and April. The average high temperatures are highest towards the start of rains between September and November, ranging from 30-35 degrees Celsius. Temperatures are lowest during the dry months between May and July with an average low ranging from 16-17 degrees Celsius. The soils are moderate to highly fertile, sandy loam that are well drained to moderately leached, which is good for tobacco production. The main vegetation consists of Miombo woodland forests and open-grasslands that are good for pasture.

The zone is moderately populated with 26 people per square kilometer, and land cultivated averages 8 hectares per household. Most land is used for growing of food and cash crops on a commercial scale. The main ethnic group in the zone is Tonga. The high prevalence of large landholdings for commercial production cultivated using draft power or by tractor, as well as the production of tobacco instead of cotton, distinguish this zone from the surrounding Commercial Rail Line Maize, Livestock, and Cotton Zone (Zone 8). Rain fed and irrigated, commercial cropping using draft power or mechanization drives the economy of the zone. The main crops grown include maize, tobacco, groundnuts, and beans. The growing season ranges from 100-140 days during the rainy season from November to April. Households keep some livestock in the zone for sale or for draft power. The amount of land cultivated, livestock owned, and productive assets are key factors that differentiate the wealth groups. The Poor households rely on own crop production and market purchase while the better-off, who have better production capacity, rely on own production throughout the year. The Poor obtain income primarily from the sale of small livestock, selling own labor, charcoal production, and, to a lesser extent, brewing and wild foods sales. Better-off households mainly rely on crop, livestock, and livestock product sales.

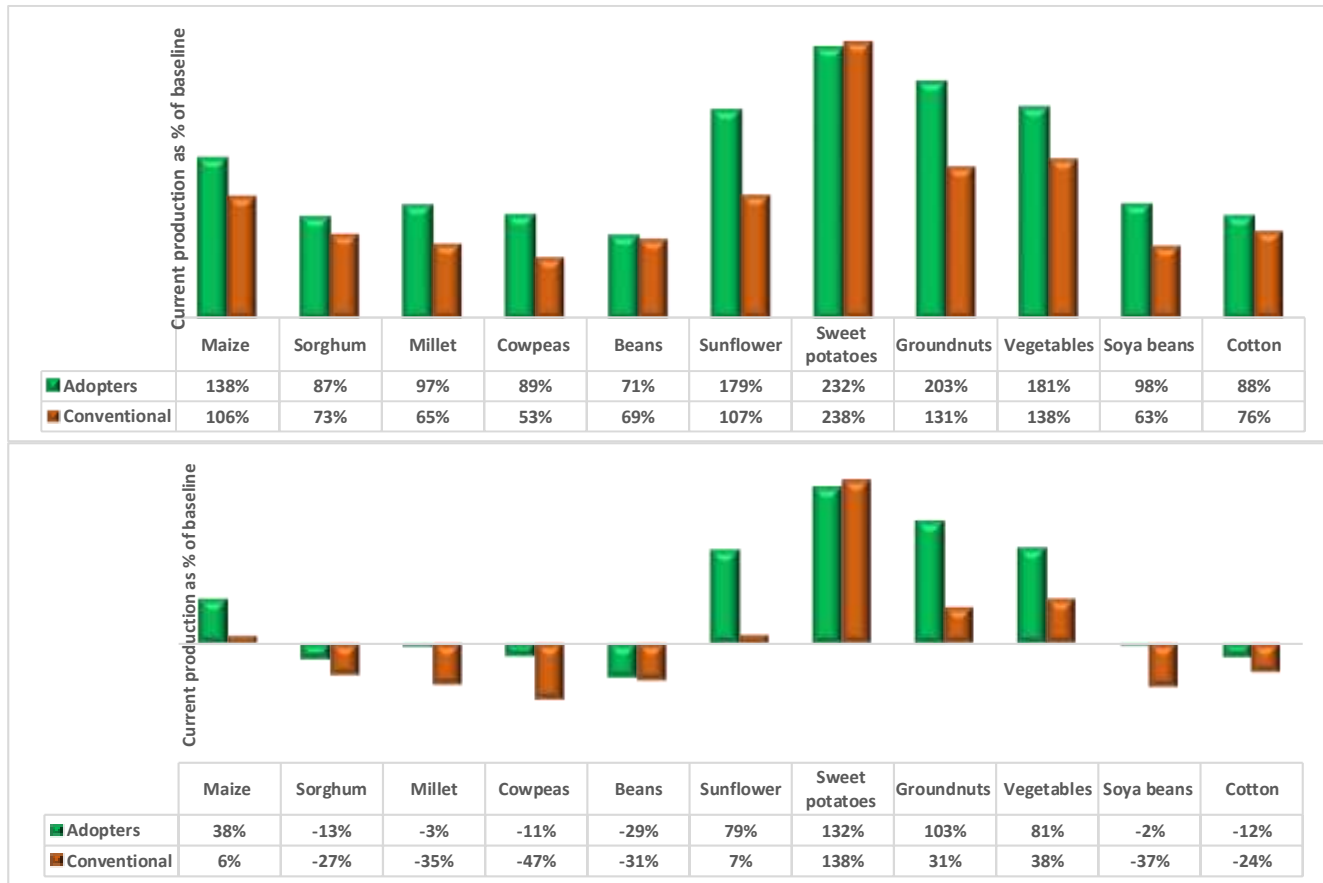
The zone has generally good infrastructure for markets and trade. Access to markets is good and mostly localized with the big towns located within the zone providing markets for most commodities produced in the zone and as supply markets for nonfood items. The largely localized labor market is either on farm or in urban areas within the zone. The main hazards are climate-related with at least one year in every three years being a bad year. Because coping strategies of Poor households are relatively successful at mitigating any production or income losses, the risk of food insecurity in the zone is relatively low.

Outcome Analysis results for Zone ZM09

In the current season this zone was characterised by the ability of households to bounce back from the effects of the dry spells which was experienced in the past two to three seasons for both adopters and non-adopters but importantly was the fact the adopters showed more resilience to shock and hazards as evidenced by the analysis in this part of the report. The chief passed the edict in the interest of climate change that demands preservation of trees in order to experience a balanced climate for his chieftdom which in essence supports the CFU driven climate smart agriculture.

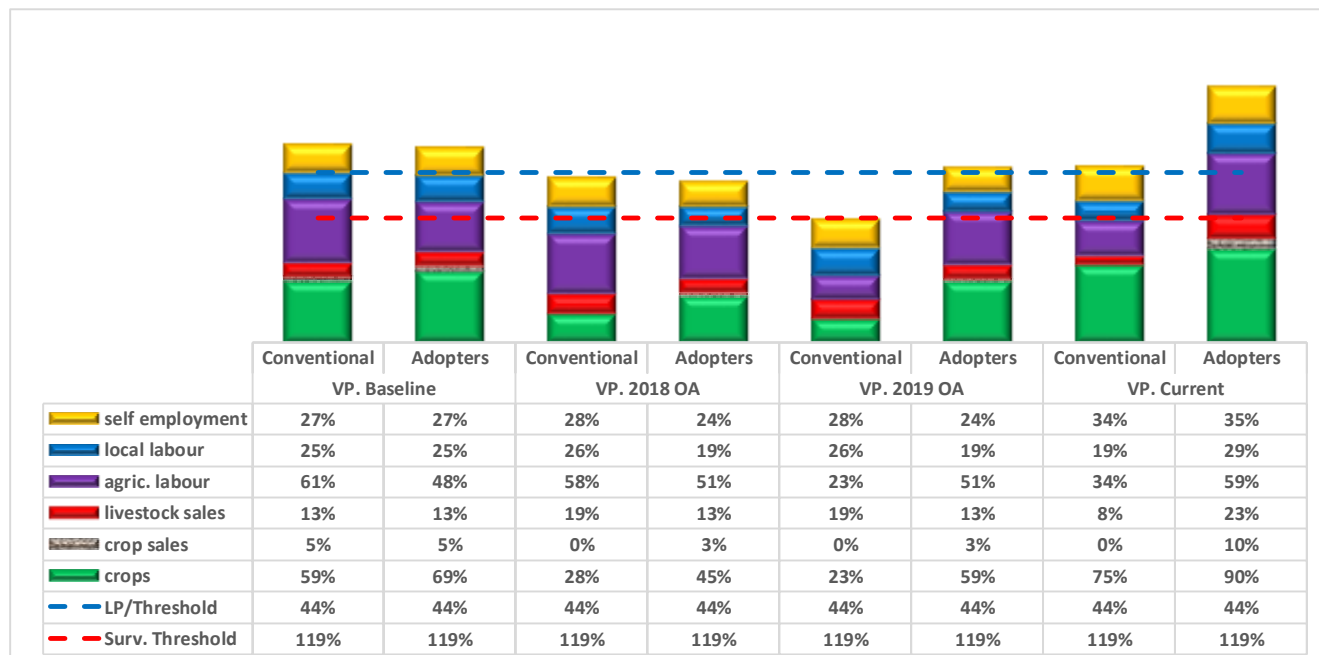
The problem specification (see Figure 7 below) for The Southern Plateau Cattle, Maize and Tobacco~ ZM09 Livelihood zone shows that while for the CA adopters there was a noticeable increase of 38% in maize production in the reference period, while conventional famers experienced only a marginal increase of 6% in maize production in the current reference period compared to the baseline year. The current period was a better one compared to the baseline year in terms of rainfall distribution and seasonal performance. Looking at groundnuts which was another crop (legume) that the CFU promotes in terms of climate smart agriculture particularly on the use of minimum tillage, the results show that although both the CSA adopters and conventional farmers enjoyed increase in production the increase was more pronounced among adopters who enjoyed a 103% increase while the increase for conventional famers was only 31%. The same situation was observed for sunflower and vegetables where the levels of increase were related to type of farming technologies (CSA versus Conventional). For those crops that suffered a negative trend such as sorghum, millet, cow peas, beans, soya beans and cotton, the results showed that non adopters (conventional farmers) had a wider margin of decrease in the production of these crops than the climate smart agriculture adopters.

Figure 9: ZM09 - Overall Problem Specification



In this zone there was actually an increase in maize production for both adopters and conventional farmers by 38% and 6% respectively so was groundnuts production which increased by 103% and 31% respectively because of the fair distribution of the rainfall.

Figure 10: Total Income (Food + Cash) ZM09 Very Poor



In terms of seasonal performance, it could be observed that in this livelihood zone, Southern Plateau Cattle, Maize and Tobacco~ ZM09, the current season, 2019/20 was the best as compared to the baseline and two other seasons where two rounds of outcome analysis were carried out. The Table 3 below how the four seasons ranked in terms of season performance in crop production.

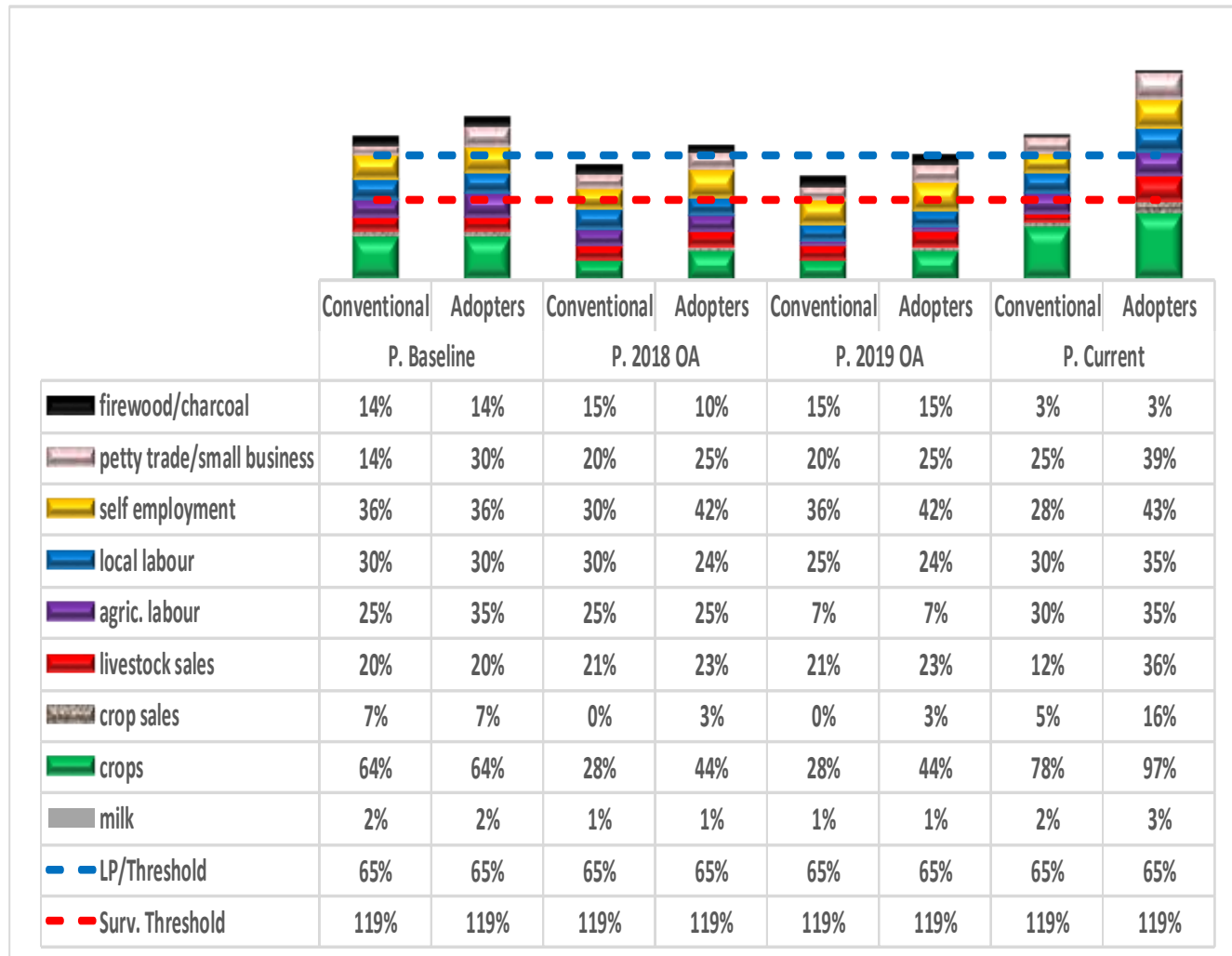
Table 5: Seasonal performance ranking

Year	Seasonal Performance (1-5)	Event(s)
2019/20	4	This was a best year compared to the baseline and the other two years where HEA outcome analysis was done. Season characterized with good rains though there some livestock diseases and price increases,
2018/19	1	The season was characterized by severe drought coupled like crop and livestock diseases
2017/18	2	This was also a bad with erratic rains but the drought was not very severe
2016/17	3	This was fairly good year typical of a Household Economy Approach baseline where most characteristic typical of an average year. Maize production was approximately 3.6MT at national level

- Key to seasonal classification:
- 5 = an excellent season for household food security (e.g. due to good rains, good prices, good crop yields, etc)
 - 4 = a good season or above average season for household food security
 - 3 = an average season in terms of household food security
 - 2 = a below average season for household food security
 - 1 = a poor season (e.g. due to drought, flooding, livestock disease, pest attack) for household food security

It is important to note across the four seasons under consideration, climate smart agriculture adopters continue to perform better than their conventional farmer counterparts. In 2018/19 season where there was some massive drought, the effect of the drought was not as severe on CSA adopters as it was on the conventional farmers who in that season almost failed to achieve the survival threshold. Adopters across the four seasons, despite the fact that they were in Very Poor wealth group, managed to achieve both the survival and livelihood protection threshold.

Figure 11: Total Income (Food + Cash) ZM09 Poor



In Southern Plateau Cattle, Maize and Tobacco~ ZM09 Livelihood zone, both Poor Conventional and adopters also managed to achieve both the Survival threshold and livelihood protection in the current season because of the nature of the season. What makes the adopters and conventional farmers differ (in spite of both reaching the survival and livelihood protection thresholds) is that the margins of exceedance for both survival and resilience however differ. Adopters were 37% above the Survival threshold and 24% above the Livelihoods protection thresholds while conventional farmers are 20% above the survival threshold and 7% above the livelihood protection threshold. Note that Conventional farmers had a Livelihood protection deficit in the 2017/18 and

2018/19 season because of their reduced coping capacity to deal with the effects of drought that characterised those two cropping seasons as compared to adopting households.

2.4. Zone 3: Eastern Plateau Maize, Cotton and Groundnut (ZM16)

The zone covers Northern parts of Nyimba, Petauke, Katete, and parts of Chadiza Districts along the eastern plateau on the border with Mozambique. It is a highland zone with an altitude measuring 1000-1200 meters above sea level. The zone is located within agro ecological Region II and receives an annual rainfall of 800-1000 mm falling between November and March. Temperature extremes range from an average minimum of 15 degrees Celsius during the winter months of May to July, to an average maximum of 35-40 degrees Celsius during the hot, summer months of September and October. The generally sandy, loamy, strong clay soils are fertile and suitable for crops and growth of pasture for livestock grazing. Miombo woodlands, bush shrubs, and savannah grassland make up the vegetation in the zone. Important natural resources include forest reserves, seasonal and perennial rivers, and thatching grass. The zone also contains green tourmaline and emeralds.

Population density is high in the zone with 37 people per square kilometer and average landholding of 3-5 ha per household used for cropping. The main ethnic groups include Chewa, Ngoni, Nsenga, and Kunda. Livelihoods in this zone are based on rain fed agriculture using manual labour and draft power, supplemented by livestock rearing and petty trade.

Land ownership and capacity utilization, livestock ownership, and access to productive equipment are the basis for differences in how households obtain their food and cash in a year. Maize and groundnuts are the most common crops, and contract-farming arrangements with cotton companies' supports cotton production. Goats are the main livestock reared, though pigs are also common. Cattle are typically owned by Poor, Middle and Better off households. All livestock are typically kept on free range. Other sources of livelihoods include limited activities in timber, handicrafts, and fish trade with Mozambique.

Own-produced maize is the primary source of food for all households, lasting between seven and nine months out of the year depending on wealth group. Typically, all households purchase staple food from the market for the remainder of the year. Market purchases of rice also play an important role for better-off households throughout the year, with both groups supplementing their diets with products from goats, pigs, and chickens – most of which comes from own production.

The most important source of cash for all households is the sale of crops. Better-off households also engage in formal employment, trading, and/or services (transport hire, etc.). Poor households earn additional income from vegetable sales, selling wild food and handicrafts, and brewing beer.

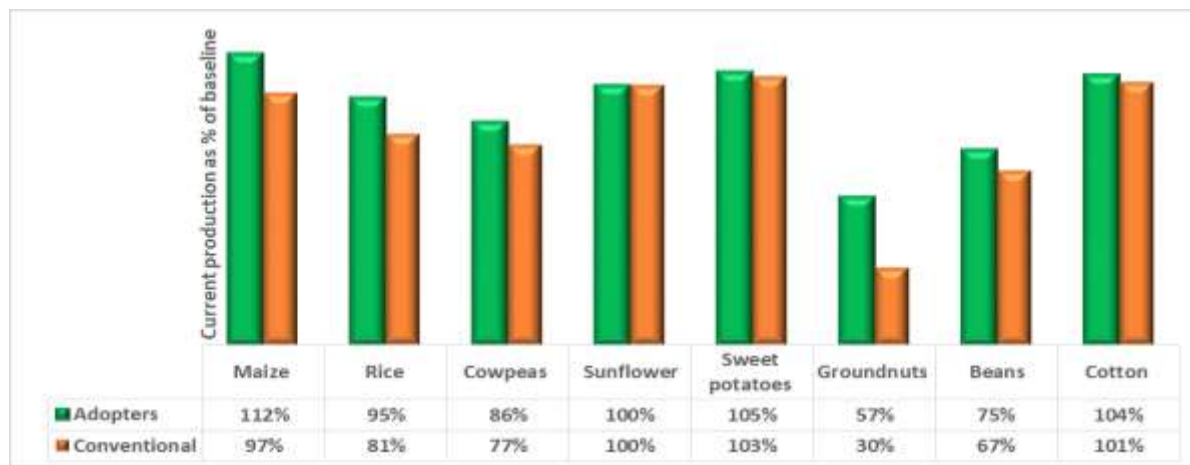
Road and communication infrastructure in this zone are good. For example, the Great East Road linking Lusaka and Chipata passes through the zone, linking markets and providing opportunities for roadside marketing. The proximity to Mozambique border offers a variety of opportunities for cross-border trade and labour exchange. A significant share of agricultural production in this zone is destined for large-scale or commercial trade. Most households sell maize to FRA, which then re-supplies the

households during the lean season. COMACO is the main buyer for groundnuts. NWK Agri-Services, Cargill, and Olam buy cotton.

Outcome Analysis results for Zone ZM16

The 2019/20 agricultural season was a better year compared to the previous two seasons though the zone was characterized by crop pests and livestock diseases which negatively impacted on the general livelihoods of the farmers both climate smart adopters and conventional ones. The difference was observed in the manner in which household responded to the problems (shocks /hazards). For maize production, adopters experience a 112% maize problem specification which translates to 12% increase relative to the base year (the reference period, **May 2016 to April 2017**) while conventional farmers had a 97% maize production problem specification which is a 3% **decrease** from the baseline period. The rest of the problem specifications for the individual crops are shown in Figure 10 for the Eastern Plateau Maize, Cotton and Groundnut (ZM16), which is mainly Katete district. The maize production for the adopters further magnifies the conclusion that the effects of shocks/hazards (erratic rain, pests, diseases and price fluctuations) on CSA adopters is comparatively less severe than it is on Conventional farmers. It is important to note that because of these embedded shocks, step 4 of the HEA framework (Problem Specification) showed that there was a drop in the production of most crops particularly groundnuts, cow peas and soya beans but of interesting to note is the fact the drop in crop production was more pronounced in conventional farmers. Figure 10 below summarises the problem specifications as alluded earlier.

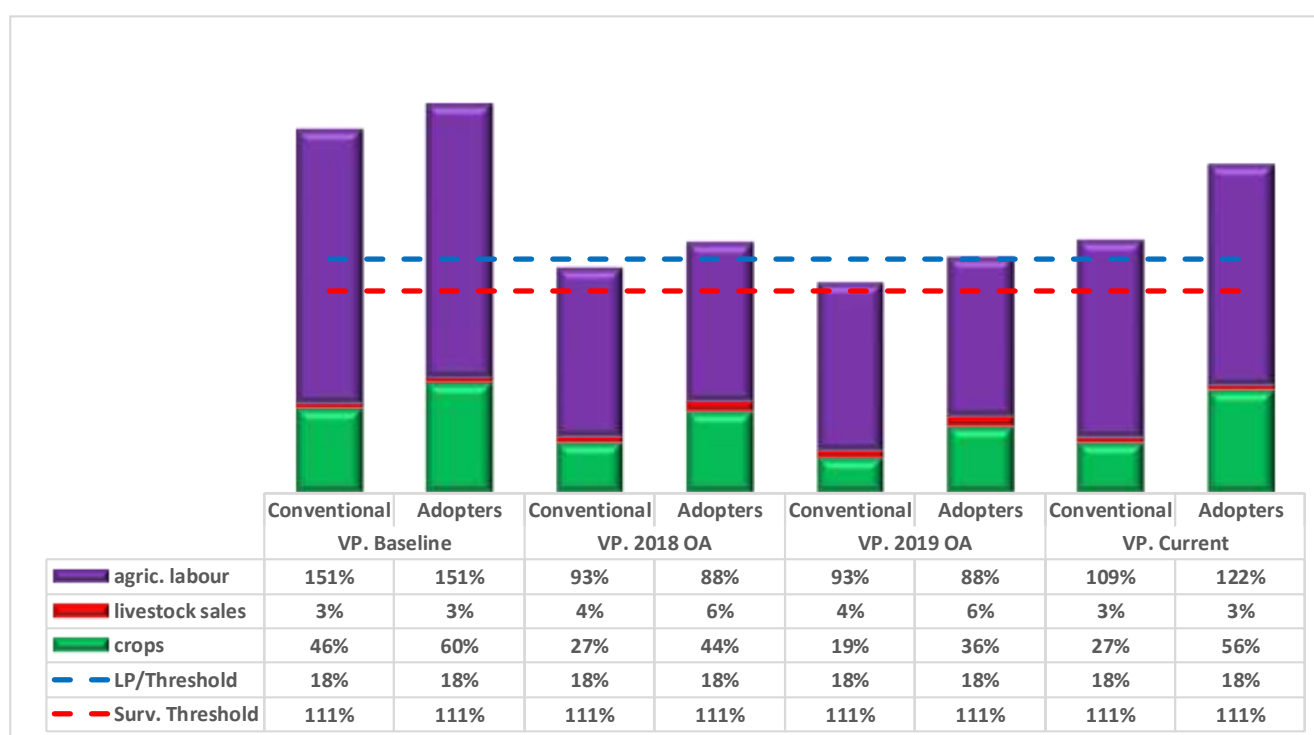
Figure 12: ZM16 - Overall Problem Specification





In the Eastern Plateau Maize, Cotton and Groundnut (ZM16) Livelihood zone, Very Poor households have limited Livelihood options such that there is (as was seen in the baseline) high dependence on crop production and agriculture labour for both food and income.

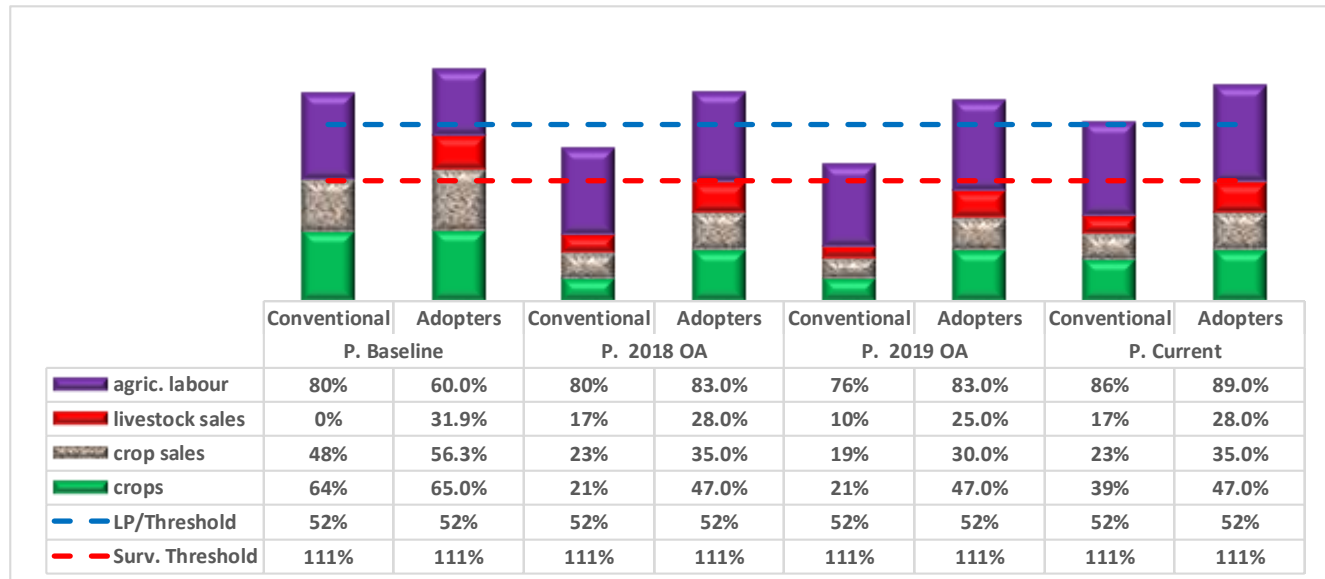
Figure 13: Total Income (Food + Cash) ZM16 Very Poor



Although in the baseline both Very Poor adopters and non-adopters managed to achieve both Survival and Livelihood protection threshold at varying levels, non-adopters could not achieve the Livelihood protection threshold in the 2017/18 and 2018/19 seasons. Note that the achievement of the Survival threshold and Livelihood protection threshold by both groups in the current period (2019/20) remained precariously premised on the availability agricultural labour. It was noted in the baseline that VP

conventional farmers had more contribution from own crops towards total household food and cash. The shock of a drought clearly reversed this as seen in Figure 11 as the Conventional farmers were hard hit while the CSA clearly cushioned from the effect of the same shock on Adopters. The presence of drought continued to reduce the contribution of own crop production on both farmers but the reduction was heavier on non-Adopters.

Figure 14: Total Income (Food and Income) ZM16 Poor



An analysis of Poor households in the Eastern Plateau Maize, Cotton and Groundnut (ZM16) Livelihood zone, showed that both Conventional farmers and adopters achieved the Survival as well as the Livelihood protection threshold in the baseline although the contributions of crop production and sales were drastically reduced in the 2018/19 season because of the impact of drought. Again, in the baseline, contribution of own crop production to the household economy of Poor Wealth group household was almost the same. In the current season 2019/2020 which was generally a good year in terms of agriculture performance as much as both type of farmers managed to achieve the survival and livelihood protection thresholds the adopters shows more capacity which points towards attaining of resilience to shocks and hazards.

2.5 Zone 4: Eastern Plateau Maize, Groundnut, Tobacco and Trade (Chipata) ~ ZM 17

This Highland (1000-1500 meters above sea level) zone on the eastern plateau covers Chipata, Lundazi, southern parts of Chama, and parts of Vubwi Districts along the border with Malawi. The zone lies in agro-ecological region II, with average annual rainfall ranging from 800-1,000 mm per year, falling from November-April, the main growing season. Temperatures range from a minimum of 11-19 degrees Celsius in June to a maximum of 25-30 degrees Celsius in October. The sandy loam and clay loam soils are good for crop production and support open Miombo woodland vegetation. The zone also has aquamarine and emerald deposits.

The population is more concentrated along the main roads than in the interior parts of the zone. The average population density for the zone is about 26 people per square kilometer with relatively moderate landholding averaging 2 ha per household. The main ethnic groups include Chewa, Tumbuka, Ngoni, Senga and Kunda. Livelihoods in the zone are predominantly based on crop and livestock production. Agriculture is mainly rain fed, with animals used for draught power. Mechanized agriculture is insignificant in this zone. The high rainfall, long growing season (100-150 days), and the fertile soils are favourable for production of maize, tobacco, cotton, and groundnuts. Beans are grown at a small scale. Dams and rivers provide the main source of water for communal livestock that includes goats and cattle. Trade with Malawi is important as it provides opportunities for exchange of agriculture products and labour.

Land and livestock are the main wealth determinants. Better-off households own a wide range of livestock, including cattle, goats, pigs, chickens, and domesticated doves. Poor households' livestock ownership is limited to goats and chickens. In addition to crop and livestock sales, the better-off also obtain income through trade. The Poor rely primarily on the sale of their labour, some livestock sales, and beer sales for cash. The better off households rely on their own production of maize throughout the year, as well as groundnuts and sweet potatoes seasonally. Poor households rely on own-produced maize from March-August and purchases or in-kind payments for the rest of the consumption period. In return, Zambians get *chitenge*, groceries like *sobo* orange juice, and tea.

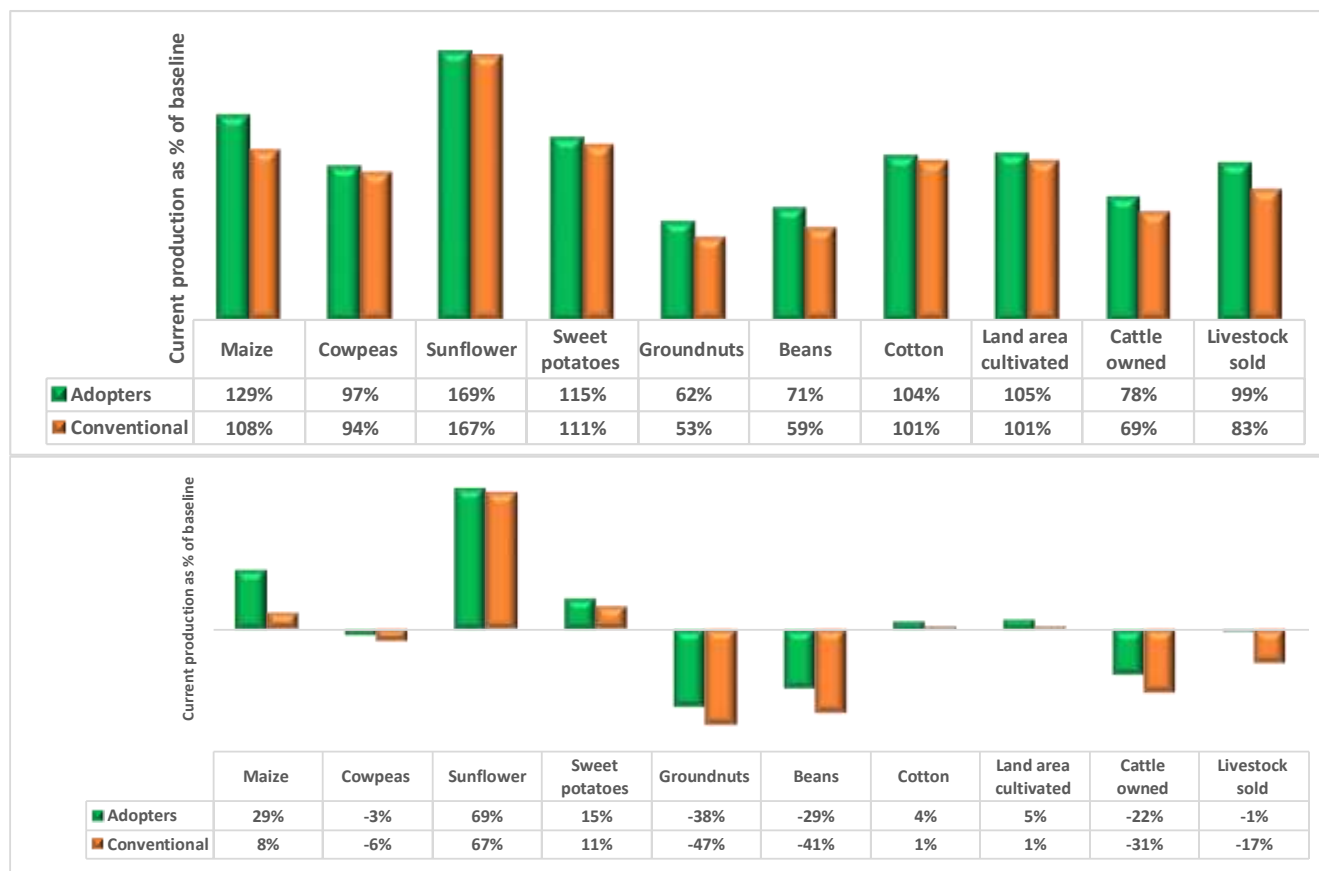
Market access is good due to a comparatively good road network linking Chipata and Chama with a number of secondary roads connecting to the main road and Malawi border, facilitating an easy movement of goods and services. Households sell tobacco to private companies, maize to FRA, and groundnuts mainly to COMACO and some private traders. Trade with Malawi mainly concerns tobacco, maize, fish, and livestock.

In lean years, Poor households usually intensify the search for casual labour opportunities, providing labour to richer households within the zone or migrating to towns. In such years, Poor households prioritize working to earn cash or food in kind, over working in their own fields, thus potentially reducing area planted or yields compared to average.

Outcome Analysis results for Zone ZM17

Figure 10 below shows in the current year 20219/2020 there was some increase in crop production for maize, sunflower and sweet potatoes and cotton for both conventional and climate smart agriculture adopters but there was remarkable increase in adopters as compared to conventional which is a confirmation of the already articulated that adopters continues to perform better than their non-adopters counterparts. For the crops which showed decrease in the level of crop production (such as groundnuts), the level of decrease was more pronounced among conventional farmers (47% drop) while the adopters had a 38% drop compared to the baseline levels. The problem specification for this zone, Eastern Plateau Maize, Groundnut, Tobacco and Trade (Chipata) ~ ZM 17 keeps the same narrative of the effects of shocks/hazards on crop production as in the other three zones already presented above and this corroborates the conclusion that the effects of drought/floods on CSA adopters is comparatively less severe than it is on Conventional farmers.

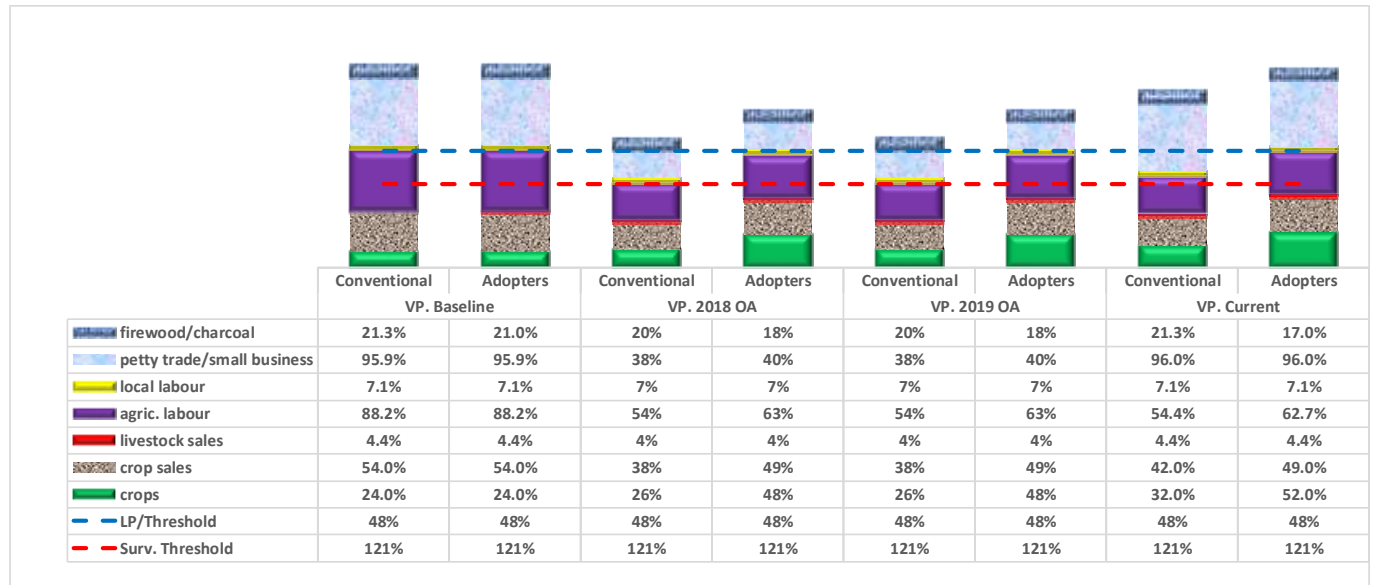
Figure 15: ZM17 - Overall Problem Specification



In the Eastern Plateau Maize, Groundnut, Tobacco and Trade (Chipata) ~ ZM 17 the season was relatively fair compared to the other two preceding seasons. It interesting to note as much as much as both the adopters and conventional farmers managed to achieve the both the Survival and the Livelihood protection thresholds the contribution of agriculture (both crop and livestock) was less prominent as compared to the other three zones in this outcome analysis study which confirms that the livelihoods in this zone are beyond agriculture. Petty trade and crop sales made a significant contribution to the survival of the households as shown in Figure 14 below. In terms of crop sales, those with excess maize opted to sell across the border to Malawi for cash since price across the border is better even if they to use the middle men. Soya beans, produced locally in ZM 17 and there is usually always a good market for it in Malawi where Malawians process it into soya chunks and this finished product is also sold back to Zambia where some locals buy in bulk and now trade is as part of petty trade. The same arrangement is done by households which produce tobacco.

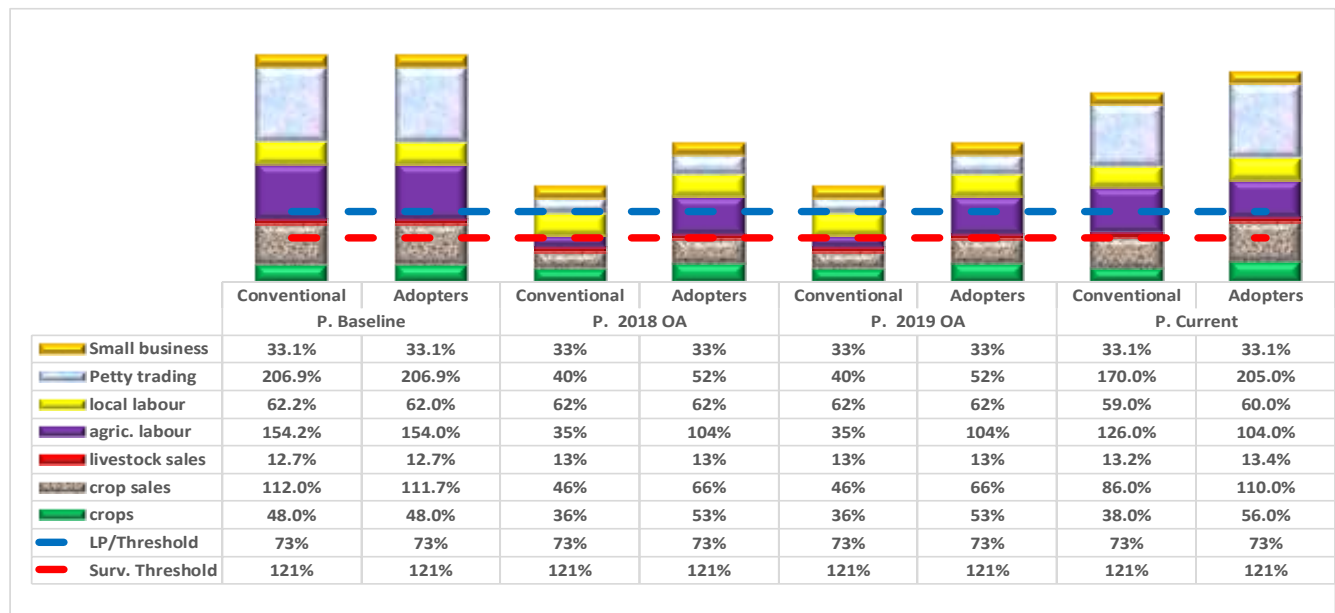
In this zone, there is structure petty trade where small fishes (*musipa*) from Malawi is bought in bulk and households sell locally as part of petty trade goods. Buyers come from as far as the Copper belt to make orders for the small fishes. Households in this zone are also involved in drinks petty trade (*sobo* drink) from Malawi and people locally seem to like it more than local drinks. This explains why the contribution of petty trade in this zone is generally high for both conventional farmers and adopters.

Figure 16: Total Income (Food and Income) ZM17 Very Poor



The same trend which was seen in the other Livelihood zones, where the adoption of Climate Smart Agriculture (CSA) was cushioning farmers against the effects of shocks/ hazards (drought, pests and diseases) is once more seen here and, again, the same conclusion was made; that in the presence of a typical shock, even Very Poor adopters were comparatively more resilient than their Very Poor Conventional farmers.

Figure 17: Total Income (Food and Income) ZM17 Poor



Poor households in this zone managed to achieve both the Survival and Livelihood Protection Thresholds as was seen among the Very Poor households and it can be observed that the only differences between the Very Poor (Figure 11) and Poor (Figure 12) is the contribution of own crop production to household consumption; adopters have more than their Conventional farmer counterparts. The same observation is seen where adoption of Climate Smart Agriculture is providing some cushion against the

effects of shock and hazards though clearly it can be seen that the difference between adopters and non-adopters in this zone is not very significant. Farmers in the zone (both Very Poor and Poor) also engaged in some coping mechanisms by increasing both agricultural labour and local labour that is mainly provided by the middle and better of households.

3. KEY FINDINGS & RECOMMENDATIONS

3.1 Key Findings

This third round Outcome Analysis has confirmed that the adoption of climate smart agriculture technologies has huge benefits for different climatic conditions. There is no question about the fact that adopting CSA technologies combined with all other components (that the CFU is delivering to farmers in addition to extension support) leads to higher food security when compared with conventional farming technologies. A time series analysis of the different seasons shows that in years where rainfall is low (drought) the intensity of crop loss is reduced for adopters and during seasons where there is adequate rainfall, the increase in crop production particularly maize is higher than for conventional farmers. What is coming out explicitly is that the intensity of the problem differs across wealth groups just as it also varies between adopters and conventional farmers. It became very clear that the problem is less pronounced among adopters of CA technology. The explanation was that CA technologies greatly capture and at the same time become moisture preservation options such that crops under CA suffered less from the effects of prolonged moisture stress. As much as adoption of climate smart technologies brought in some benefits to farmers which point towards resilience building, it was observed that farmers could have enjoyed more benefits if there were accessing inputs on time. The Farmers Input Support Program was not availing inputs timeous.

In the current year, all households managed to achieve the survival threshold irrespective of wealth group or type of farming employed but for the livelihood protection threshold, this was achieved by more adopters than conventional framers and that trend was consistent across all wealth groups with own crop production contributing most particularly maize followed by groundnuts which although production levels were not very high. Groundnuts remained critical in livelihood protection threshold achievement because it a high value crop in both calories and price per kilogram.

3.2 Recommendations

This Outcome Analysis also makes the following similar recommendations:

1. There is need to lobby for a mechanism which ensures that farmers get inputs on time. While it is outside the mandate of the CFU/CSAZ, the donor community (or the FCDO) should seek to influence the Government to build even stronger capacity to the Farmers Input Support Program (FISP) so that inputs are always timely.
2. Post-harvest management trainings should be continued as it is an important part of the climate smart package to ensure all production is retained and there are no post-harvest losses.
3. While successes have been scored on the food security front, the output market linkage component of the CSA has shown great results and continues (with more support) to have greater potential for wealth creation. Given an opportunity, this component should be accelerated further so that even more results can be seen on the ground.

ANNEXES

Annex 1 – Impact Indicator Summary Tables by Zone

Indicator Summary Table: Zone ZM08								
	Very Poor		Poor		Middle		Better Off	
	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.
ü Impact Indicator 1: Proportion of Households above the Survival Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	100%	100%	100%	100%	100%	100%	100%	100%
ü Impact Indicator 2: Proportion of Households above the Livelihood Protection Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	48%	14%	75.5%	17.6%	55%	24%	85%	52%
Indicator Summary Table: Zone ZM09								
	Very Poor		Poor		Middle		Better Off	
	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.
ü Impact Indicator 1: Proportion of Households above the Survival Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	100%	100%	100%	100%	100%	100%	100%	100%
ü Impact Indicator 2: Proportion of Households above the Livelihood Protection Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	53.9%	20.7%	69.6%	42%	73%	52.1%	88%	62%

Indicator Summary Table: Zone ZM16								
	Very Poor		Poor		Middle		Better Off	
	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.
Impact Indicator 1: Proportion of Households above the Survival Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	100%	100%	100%	100%	100%	100%	100%	100%
Impact Indicator 2: Proportion of Households above the Livelihood Protection Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	54.6%	21.6%	70.8%	45.2%	76.1%	49%	77%	51%

Indicator Summary Table: Zone ZM17								
	Very Poor		Poor		Middle		Better Off	
	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.	Adopters	Conven.
ü Impact Indicator 1: Proportion of Households above the Survival Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	100%	100%	100%	100%	100%	100%	100%	100%
ü Impact Indicator 2: Proportion of Households above the Livelihood Protection Threshold (disaggregated by Socio-Economic status and adoption status) [Percent of households in Zone]	57.1%	22.51%	76.1%	44.0%	81.9%	49%	86%	51.9%

Indicator	Wealth Group	Adopting Households	Conventional Farmers
Impact Indicator 1: Proportion of Households above the Survival Threshold	Very Poor	100%	100%
	Poor	100%	100%
Impact Indicator 2: Proportion of Households above the Resilience/ Protection Threshold	Very Poor	53.4%	19.7%
	Poor	73.0%	37.2%

Annex 2 – Assessment Team and Field Schedule

List of Research team members




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The table below summarises the areas visited in the four zones:

Livelihood zone	Livelihood zone name (actual districts under study)	Areas visited
ZM 08	Commercial Rail Line Maize, Livestock, and Cotton (Chongwe, Kafue and Mazabuka)	Nkondola (Chongwe) Lukoshi (Chongwe) Nkomesha (Chongwe) Dumba (Mazabuka) Chiyawa (Mazabuka)
ZM 09	Southern Plateau Cattle, Maize and Tobacco (Choma)	Chipande Mbabala Kamwanu Njebe
ZM 16	Eastern Plateau Maize, Cotton and Groundnut (Katete)	Mwandafisi Singa Mpamba Chikuni (Vulamukoko) Kampambe 1
ZM 17	Eastern Plateau Maize, Groundnut, Tobacco and Trade (Chipata)	Tigwilizane Chiparamba Chitaza Chibale Mshikate

Annex 3 – Data Collection Tools Used In the Assessment

Annex	Item	Attachment
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<p>Annex 3.1</p>	<p>HEA Tool 1 Key informant Tool</p>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  ZM08 Non Adopters FGD Guid </div> <div style="text-align: center;">  ZM08 Non Adopters FGD Guid </div> </div>
<p>Annex 3.2</p>	<p>HEA Tool 2 Market Tool</p>	<div style="text-align: center;">  Interview Form 2.doc </div>