

**Informal Learning in Local Farming Practices
by Rural Women in the Lake Chilwa Basin, Malawi:
Towards Coping and Adaptation to
Climate Variability and Climate Change**

Thesis submitted in fulfilment of the requirements of the
Degree of Doctor Philosophy
(Environmental Education / Social Learning)

Rhodes University

by

Gibson Yadunda Mphepo

16M9030

Supervisor: Distinguished Professor Heila. B. Lotz-Sisitka

March 2020

ABSTRACT

Evidence reveals that informal learning is a neglected research area, globally and nationally. Informal learning, like formal and non-formal learning, is context specific. In the case of my study, the context was in local maize cultivation and the associated local farming practices which are also neglected. Research has shown that rural women in Malawi are significant change agents in socio-economic sectors, yet they are heavily affected by inequality. For example, extreme weather events of droughts and floods in the Lake Chilwa Basin, disproportionately affect more women than men because of their traditional gendered roles such as home care. The complexity of the dualistic nature of being change agents and victims of injustices at the same time offers a catalytic opportunity for potentially transformative social learning for transformative adaptation.

Against this backdrop, I conducted a study to investigate and expand informal learning processes to contribute to building the resilience of women and other community members in Domasi and Nsanama Extension Planning Areas (EPA) within the Lake Chilwa Basin. Specifically, the study answered the following question: “How do drought and inter-seasonal dry spells influence informal learning processes to enable transformation adaptation among rural women cultivating maize in the Lake Chilwa Basin, Malawi?”

To address the question, the first stage was to review local farming practices and the associated informal learning processes in Malawi. I then used third generation Cultural Historical Activity Theory (CHAT) as an overarching theoretical framework to guide the subsequent research processes which were split into three main phases: mirror data collection for expansive learning, formative change laboratory workshops, and data analysis and reflection. CHAT is a theoretical framework that helps us comprehend and analyze the relationship between the human mind (i.e. what people think and feel) and activity (what people do). It is a formative and activist learning theory that posits learning as occurring through collective activities to meet or change a common object (Mukute & Lotz-Sisitka, 2012, p. 345). For Koszalka and Wu, 2001(p. 493), within a CHAT framework, knowledge is socially constructed by individual learners, building on existing historical experiences, within the learners’ context. To construct this knowledge, learners use technology or mediating tools, as Vygotsky (1978) calls them.

To collect mirror data, I conducted focus group discussions, observation studies, and document analysis. I also conducted key informant interviews with selected extension workers responsible for the two case study sites. The hub of my research constituted change laboratory

workshops to expand learning through four of the seven expansive learning actions, namely questioning, analysis, modeling and testing the model. One of the essential procedures I relied on to expand learning during these change laboratory workshops was identification and analysis of contradictions that were mirrored back to women. The use of contradictions as fertile ground for learning is premised on Engstrom's arguments that contradictions form a catalyst for learning. Data were analysed using two approaches: layered and power relations. A layered analysis is a step-by-step process of understanding a situation from the lower to a higher level (mature stage). For my research, this meant understanding sequential learning from questioning (session 1 – lower level) to testing the model (session 8 – higher level). The second data analysis approach, power relations, relates to the Women Empowerment in Agriculture Index (WEAI), a measure of the degree of women empowerment, their agency and inclusion in farming (Ruth et al., 2013, p. 3). I used this type of power analysis tool because my research was agriculture based. Both data analysis approaches relied on N-vivo which is a form of computer-based qualitative data management software. The software was ideal for my study which was also mostly qualitative.

During phase 1 of data collection, I identified five local farming practices associated with local maize cultivation, a focus of my study. These practices were slash and burn (*mphanje*); traditional insect pest control measures; soil fertility enhancement techniques through *kuojeka* (crop residue incorporation) and livestock manure; traditional weather forecasts; and multiple cropping (mixed and sequential cropping). Among these, the most preferred by the women I interacted with were *kuojeka*, livestock manure and mixed cropping. I discovered that these local farming practices are informally learned mainly through word of mouth, observation, trials, women-dominated social networks and drama. I also discovered that some of these informal learning pathways are catalyzed by drought and dry spells. For example, during the 1949 and 2002 drought periods, women reported that they had learned new types of coping strategies such as the use of sawdust and banana root flour in place of maize flour to prepare *nsima*, a staple food in Malawi.

During phase 2, change laboratory workshops, I identified 19 contradictions associated with local farming practices, most of which were related to the Government of Malawi bias towards modern farming practices such as hybrids. Other contradictions were related to traditional structures and norms and religion and traditional beliefs. Solutions were suggested for each of the contradictions. Some of these solutions were tested for their workability. These included setting up diversity blocks (demonstration plots) for local maize cultivation under irrigation

and engagement of the youth through WhatsApp groups for the first time at the study sites. The results of the tests show that there is potential to transform local farming practices at the study sites and build social resilience against drought and dry spells. For example, from a local maize demonstration plot in Nsanama Extension Planning Area (EPA), farmers learned that *kafula* local maize is fast maturing and therefore cushions them against hunger as they wait for the main harvest in later months. Eighty-eight households shared local maize seed harvested from the demonstration gardens for upscaling. The Head of Nsanama EPA had also set up another demonstration garden in 2018-2019 growing season consisting of *kafula* at Nsanama EPA Headquarters for further informal learning purposes.

This research has contributed new knowledge to the existing knowledge base about local farming practices and informal learning. These contributions are in the form of methods I used as well as results obtained. Among the key highlights of my contribution to the knowledge base is the development of scenarios as double stimulation tools for the emerging local farming activity system which emanates from the new model solutions resulting from change laboratory workshops. To the best of my knowledge, this was the first time rural communities were engaged in scenario development in Malawi. The first scenarios of this type were developed in 2010 for the Malawi State of Environment and Outlook Report and the process involved middle to senior managers of various institutions in Malawi. Through historical analysis, my research identified local crops that existed in the past but which are currently non-existent or rare. My study also identified unique local farming practices that even puzzled professionals, including the use of ripe banana peels of *makumbuka* and *sukari* to eradicate *nansongole* grass and native bamboos respectively. Both plant species are considered a nuisance in that they colonize land for cultivation.

A breakthrough for radical transformation of local farming practices via informal learning requires development and review of relevant policies in Malawi. Such a process requires evidence. This research has provided background information for this process. For those policies already developed, this research has provided information that can help guide implementation of the generalized list of activities outlined in implementation plans of the respective policies.

ACKNOWLEDGEMENTS

The success of my research was based on academic, moral, administrative and institutional support from individuals and groups. First and foremost, I wish to recognize the role of my main supervisor, Distinguished Professor Lotz-Sisitka of Rhodes University (RU) and my co-supervisors Professor Sheona Shackleton of University of Cape Town (UCT) and Professor Sosten Chiotha of Leadership for Environment and Development (LEAD) in shaping and monitoring my research agenda. My professional background is natural science. Inspired by my main supervisor, I was able to venture into a different and difficult journey of education and social learning to contribute towards transformative adaptation of the neglected local farming practices via informal learning pathways in the Lake Chilwa Basin Malawi. While I regard Distinguished Professor Lotz-Sisitka Heila as my coach on social learning in general, Professor Sheona Shackleton was my pillar in providing professional guidance on how I should articulate climate change-related aspects including resilience, adaptation, extreme weather events in both my proposal and thesis. Back home in Malawi, Professor Sosten Chiotha ensured my research agenda fitted into the Malawian context in general and specifically into Lake Chilwa Basin. He provided checks and balances to my research agenda and with his vast experience in climate change and natural resource management, he teamed up with Professor Sheona in providing guidance on climate change and natural resources management. Professor Sosten is also thanked for allowing me to do a study amidst critical and busy work schedules at LEAD, a self-financing institution that I was working with during my study. A few days before submission for examinations, Kim Ward played a critical role proof-reading and editing my thesis. I wish to thank her for this noble role.

I also wish to thank the following institutions for approving my research proposal: Rhodes University Ethics Committee, the National Commission for Science and Technology in Malawi and the District Executive Committee (DEC) members for Machinga District where my study sites were situated. I am highly indebted to International Social Council (ISC) for funding my research as part of the Transgressive Social Learning for Social-Ecological Sustainability (T-learning) Programme.

Finally, this research was dependent on women for its data and I am indebted to all the women that participated in my research through focus group discussions, observation studies and change laboratory workshops. For credibility, my research results were presented to over 80

participants at two validation workshops and I wish to thank them for their contributions. When I was testing model solutions, I engaged other participants apart from women and these included extension workers, traditional leaders and their subjects including the youth. These too deserve my thanks. The media played a critical role in creating mass awareness about local farming practices notably *mphanje* and thus I extend my gratitude to them as well.

Apart from my supervisors, I also wish to thank all those individuals that helped to shape my research journey, mostly through informal means. There are too many to mention them all but they include: Ms. Elida Mateketa, Ms. Bernadette Zimba, Mr. Frank Chimaimba, Ms. Joan Chilufya and Ms. Thokozani Njala (my research team members in Malawi); Dr Mutizwa Mukute, Dr Experencia Chisoni, Dr Tichanona Pesanayi, Dr Dick Kachilonda (friends); Ms. Anna James (research assistant – T-learning programme), Ms. Thato Tantsi (T-learning research programme administration manager) and Ms. Rebecca Chivundula (LEAD accountant).

Finally, I acknowledge the role of my dear wife, Gloria Jere, in my research journey. Her vision was to be called ‘*wife of **Dr** Gibson Mphepo*’ (not **Mr**) and this was a big source of inspiration for me. She allowed me to leave home to concentrate on my studies either at Rhodes University where I was registered as a student or in a ‘hide-out’ within the City of Zomba where the family lives.

DEDICATION

This thesis is dedicated to rural women farmers
who are victims of social injustices
yet also powerful agents of change.

TABLE OF CONTENTS

ABSTRACT	I
ACKNOWLEDGEMENTS	IV
DEDICATION	VI
TABLE OF CONTENTS	VII
LIST OF FIGURES	XV
LIST OF ACRONYMS AND ABBREVIATIONS	XVII
1. CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY	1
1.1 Introduction.....	1
1.2 My Positionality and Motivation for this Research	2
1.3 Justification for the Study	3
1.3.1 More research needed in the informal learning arena	3
1.3.2 Gaps on historical, present and future learning for adaptation need further investigation in the Lake Chilwa Basin.....	4
1.3.3 Contradictions to adaptation not well-researched at study sites	5
1.4 Research Focus.....	5
1.5 Research Questions	6
1.6 Study Sites	6
1.7 Description of Key Terms, Concepts, and Context of My Study	9
1.7.1 Key terms.....	9
1.7.2 Key concepts	11
1.8 Overview of Research Methodology.....	21
1.8.1 Research processes and methods.....	22
1.9 Outline of the Thesis	23
1.10 Conclusion	26
CHAPTER 2: REVIEW AND STATE OF INDIGENOUS FARMING PRACTICES AND INFORMAL LEARNING	27

2.1	Introduction.....	27
2.2	General Overview of Indigenous Farming Practices	29
2.2.1	Individual local farming practices elaborated.....	32
2.2.2	Options to address threats to local farming practices.....	52
2.3	Review of informal learning studies in Southern Africa and beyond	53
2.4	Informal Learning in Malawi.....	54
2.4.1	Informal learning as implied in national policy frameworks and strategies for Malawi.....	55
2.4.2	How some institutions have translated national communication policies and strategies into action via informal learning	58
2.5	Conclusion	60
CHAPTER 3: THEORETICAL FRAMEWORK GUIDING THE RESEARCH PROCESSES.....		61
3.1	Introduction.....	61
3.2	Review of CHAT application	61
3.3	Introduction to Cultural Historical Activity Theory (CHAT)	62
3.4	History of CHAT.....	63
3.5	Phases of CHAT.....	65
3.5.1	First Generation CHAT	65
3.5.2	Second Generation CHAT	67
3.5.3	Third Generation CHAT	70
3.6	The Concept of Expansive Learning in More Detail	72
3.6.1	Key features of expansive learning	74
3.7	Conclusion	95
CHAPTER 4: METHODS AND PROCESSES		96
4.1	Introduction.....	96
4.2	Protocols	97
4.2.1	Approvals.....	97
4.2.2	Prior informed consent	98
4.2.3	Research phases.....	98
4.3	Selection of Women Subjects of the Research	100
4.3.1	Selection for focus group discussions	100
4.3.2	Selection of women for the change laboratory workshops.....	101

4.4	Data Collection Processes in the Field	101
4.4.1	Focus group discussions	101
4.4.2	Observation studies	102
4.4.3	Document analysis.....	109
4.4.4	Change Laboratory Workshops.....	112
4.5	Data Processing and Management using NVivo 11	133
4.6	Data Analysis	138
4.6.1	Layered analysis	138
4.6.2	Power relations.....	139
4.7	Ethics, Validity and Trustworthiness	140
4.7.1	Validity and trustworthiness	140
4.7.2	Ethics and the role of the intervention researcher	143
4.8	Conclusion	144
CHAPTER 5: ANALYSIS OF CONTRADICTIONS RELATING TO LOCAL FARMING PRACTICES		146
5.1	Introduction.....	146
5.2	Interaction between Local Farming Practice Activity System and Other Activity Systems	146
5.3	Agriculture Extension Activity System in Malawi	148
5.3.1	History of Agriculture Extension in Malawi.....	148
5.3.2	Description of the current agriculture extension system at national level.....	151
5.4	Local Farming Practice Activity System.....	159
5.4.1	Specific features of local farming practices at Domasi and Nsanama Extension Planning Areas.....	160
5.5	Surfacing Contradictions	177
5.5.1	Malawi government structures, systems and norms.....	178
5.5.2	Traditional structures and norms that oppress women	187
5.5.3	Religion and traditional beliefs	191
5.6	Unclassified Contradictions	195
5.7	Summary of Contradictions and Suggested Solutions	196
5.8	Further Engagement with Women	201
5.9	Conclusion	202

CHAPTER 6: DOUBLE STIMULATION AND SOLUTION MODELLING - LEARNING FROM THE FUTURE USING LOCAL FARMING PRACTICE SCENARIOS	203
6.1 Introduction.....	203
6.2 Describing the Four Scenarios using Evocative Words and Symbols	204
6.1.1 Scenario one: Good Governance and Good Economy	205
6.1.2 Scenario two: Good Economy but Poor Governance.....	210
6.1.3 Scenario three: Good Governance but Poor Economy	214
6.1.4 Scenario four: Poor Economy and Poor Governance.....	218
6.3 Summary of the Four Scenarios with Catch Words and Symbols.....	223
6.4 Summary of the Role of Scenarios as Double Stimulation Tools for the Emerging Activity.....	227
6.5 Summary of how I adapted Vygotsky’s Double Stimulation Tool using Scenarios.	228
6.6 Conclusion	230
CHAPTER 7: CAN IT WORK? NEW MODEL SOLUTIONS UNDER A MICROSCOPE.....	232
7.1 Introduction.....	232
7.2 Model Solutions Tried Out	232
7.2.1 Makumbuka and Sukari Banana tests.....	232
7.2.2 Electronic and print media	236
7.2.3 Social networks	246
7.2.4 Diversity blocks.....	250
7.3 Conclusion	257
CHAPTER 8: CONCLUSION AND RECOMMENDATIONS.....	258
8.1 Introduction.....	258
8.2 Have Research Objectives been met?.....	258
8.2.1 What past and current informal learning processes have been catalyzed by drought and dry spells associated with maize production?	258
8.2.2 What are the past and contradictions to adaptation learning processes for maize production under stressors of drought and dry spells?.....	261
8.2.3 What are likely future scenarios relevant to informal learning processes considering the current adaptation drivers and pressures in maize production under extremes of dry spells?	262

8.2.4	How could expansive learning processes in informal learning settings potentially help rural women maize farmers progress from incremental to transformational adaptation practices?	264
8.3	Transformation Adaptation and the Role of the Model Solutions to Potentially Transform Local Farming Practices.....	268
8.4	New Knowledge Claims	270
8.5	Recommendations	271
8.5.1	Myself	271
8.5.2	Research Institutions.....	272
8.5.3	Training and capacity building institutions.....	272
8.5.4	Policy makers	273
8.5.5	All other concerned stakeholders	273
8.6	Conclusion	274
REFERENCES		275
APPENDICES.....		296
Appendix 1: Approval Letter from Rhodes University		297
Appendix 2: Approval Letter from the National Commission for Science and Technology, Malawi.....		298
Appendix 3: List of participants for the District Executive Committee Meeting held on 2nd September 2016		300
Appendix 4a: Signatures and thumb prints of the participants in Domasi EPA		302
Appendix 4b: Signatures and thumb prints of the participants in Nsanama EPA.....		304
Appendix 5: Questionnaire/checklist for focus group discussions.....		306
Appendix 7: Sample results of women consulting elders and other community members on learning to cope with drought, 1943 to 2017 (Domasi EPA).....		310
Appendix 7a: Names of community members who received local maize seed for upscaling, Katundu Section, Makuluni Diversity Block Nsanama EPA (Date: 26/11.2018)		311
Appendix 7b: Names of community members who received local maize seed for upscaling, Khuzumba Section, Namisisi Diversity Block Nsanama EPA		314
Appendix 8: Names of Nsanama WhatsApp Group Members		315
Appendix 9: Names of Domasi Youth WhatsApp Group Members		317

chiteng

LIST OF TABLES

Table 1-1: Differences between change intervention and formative change laboratory.....	22
Table 1-2: The JOHARI Window.....	23
Table 2-1: Traditional ways of mitigating disasters.....	30
Table 2-2: Plant and animal products used to prepare organic pesticide formulations to control field pests.....	38
Table 2-3: Myths and realities of slash and burn.....	44
Table 2-4: Examples of signals used to forecast weather by farmers in Chikwawa and Nsanje Districts of Malawi.....	51
Table 2-5: Informal learning pathways	53
Table 2-6: Informal learning pathways in the Lake Chilwa Basin	59
Table 3-1: Third generation CHAT principles and their relevance to my study	71
Table 3-2: The four manifestations of contradictions elaborated	76
Table 3-3: Types (levels) of contradictions	77
Table 3-4: Apparatus 1 and 2 and the model of double stimulation	89
Table 4-1: Data collection phases	99
Table 4-2: Mirror data type and role as double stimulant for expansive learning.....	99
Table 4-3: Names of men consulted to validate some of the women claims	103
Table 4-4: Dry season observation studies at Domasi EPA on 21 August 2017.....	104
Table 4-5: Nsanama EPA dry season observation studies	106
Table 4-6: Domasi EPA rainy season observation studies.....	107
Table 4-7: Nsanama EPA rainy season observation studies	108
Table 4-8: Videos reviewed.....	110
Table 4-9: Newspapers and reports reviewed.....	111
Table 4-10: Change laboratory session 1 plan for Domasi and Nsanama EPA	112
Table 4-11: Progressive development of intuitive and exploratory scenarios	119
Table 4-12: X-Y axis points for all the drivers considered in the scenario development....	121
Table 4-13: Criteria for selection of model solutions to be tested.....	126
Table 4-14: Process followed in setting up and monitoring the WhatsApp Group.....	128
Table 5-1: Key events in the development of agriculture extension system in Malawi	148
Table 5-2: Prioritization of local farming practices.....	159
Table 5-3: Local maize cultivars in Domasi EPA	160
Table 5-4: Local maize cultivars in Nsanama EPA.....	160

Table 5-5: Local crops commonly mixed with local maize in Domasi and Nsanama	
Extension Planning Areas	163
Table 5-6: Informal learning and coping strategies during drought episodes, Domasi	
Extension Planning Area.....	174
Table 5-7: Informal learning and coping strategies during drought episodes, Nsanama	
Extension Planning Area.....	175
Table 5-8: Suggested solutions to contradictions 1 and 5, baseline status and desired levels of informal learning for the top 3 three local farming practices (kujeka, livestock manure and mixed cropping).....	201
Table 6-1: Catch words and symbols for Domasi EPA	223
Table 6-2: Catch words and symbols for Nsanama EPA.....	225
Table 6-3: A summary of key drivers and how they will unfold under each scenario at Domasi EPA	226
Table 6-4: A summary of key drivers and how they will unfold under each scenario at Domasi EPA	226
Table 6-5: Scenarios used as double stimulation tools.	228
Table 7-1: Agentive expressions from WhatsApp messages presented during the review meeting held on 28th August 2018.	238
Table 7-2: Agentive expressions from the WhatsApp messages and speeches during the review meeting held on 7th November 2018	243
Table 7-3: Agentive expressions from speeches made by women, Domasi EPA.....	247
Table 7-4: Commitments and practical actions taken by women from Nsanama EPA.....	249
Table 7-5: Summary of agentive expressions, Makuluni Diversity Block	251
Table 7-6: Summary of agentive expressions, Namisisi Irrigation Scheme	253
Table 8-1: Evidence of expansive learning and transformative agency by women at Domasi EPA	265
Table 8-2: Evidence of expansive learning by women at Nsanama EPA.....	266
Table 8-3: Suggested research topics relating to local farming practices	272

LIST OF FIGURES

Figure 1-1: Map showing the location of Domasi and Nsanama Extension Planning Areas ..	8
Figure 2-1: The central idea (local maize) and its associates.....	28
Figure 3-1: Vygotsky's model of culturally mediated action (Vygotsky, 1978, p. 40).....	65
Figure 3-2: Mediated action (Common reformulation)	66
Figure 3-3: Hierarchy of activities, action and operations.....	67
Figure 3-4: An illustration of hierarchical order of the activity of building a house.....	67
Figure 3-5: Second generation CHAT activity system	68
Figure 3-6: Two interacting activity systems	70
Figure 3-7: Futures Triangle.....	90
Figure 4-1: Seven stages of expansive learning	114
Figure 4-2: An illustration of how the current state might inform the future	120
Figure 4-3: Plotting drivers on X-Y axis at Domasi EPA.....	121
Figure 4-4: Dorothy Meya (Nsanama EPA) doing the X-Y Plots.....	124
Figure 4-5: Zione John (Domasi EPA) doing and X-Y Plots.....	124
Figure 4-6: Nansongole grass	129
Figure 4-7: <i>Nansongole</i> grass (left), banana peels spread within <i>nansongole</i> (centre) and covered with soil (right)	129
Figure 4-8: Setting up the sukari banana test, Nsanama EPA.....	130
Figure 4-9: The colour (khaki) of the root system during set up of experiment	131
Figure 4-10: Essential NVivo steps I followed	134
Figure 4-11: Screen shot of sample documents I uploaded on Nvivo platform.....	135
Figure 4-12: ‘Model solutions’ (parent node) and its 13 child nodes.....	136
Figure 4-13: Screen shot highlighting parent node manifestations of contradictions, the nine child nodes and quotations from ‘male dominance over females’ child node	137
Figure 4-14: Screen shot showing scenario parent node with ‘worst’ case parent node expanded.....	138
Figure 4-15: Summary of how I adapted Engeström’s (2016) learning actions to my study	145
Figure 5-1: How local farming practices interact with other activity systems.....	147
Figure 5-2: Transfer of Technology Model.....	151
Figure 5-3: Extension Delivery Activity System	158
Figure 5-4: The Mphanje making process	170

Figure 5-5: Local maize on mphanje (right) and without mphanje but applied with chemical fertilizers:.....	171
Figure 5-6: Common informal learning pathways under local farming practices.....	172
Figure 5-7: Banana root processed into flour	176
Figure 5-8: Local Farming Practices Activity System.....	177
Figure 6-1: Generalized conceptualization of the four local farming practices scenarios...	204
Figure 7-1: Lackson Mtambo (right) with Elida Mateketa (left) burying makumbuka.....	233
Figure 7-2: GVH Ngithiwa	234
Figure 7-3: Changes in root and rhizome appearance after sukari banana test	235
Figure 7-4: Demonstration garden of kafula local seed at Nsanama EPA Headquarters initiated by the AEDC.....	256
Figure 7-5: Sharing local maize seed harvested from diversity block in Katundu Section, Makuluni Diversity Block.	256
Figure 8-1: An example of how drought catalyzes learning in different ways among men and women, the case of Lake Faguibine, northern Mali	260

LIST OF ACRONYMS AND ABBREVIATIONS

AEDC	Agriculture Development Coordinator
AEDO	Agriculture Extension Development Officer
AIDS	Acquired Immune-Deficiency Syndrome
CHAT	Cultural Historical Activity Theory
CSA	Climate Smart Agriculture
DADO	District Agriculture Development Officer
DAES	Department of Agriculture Extension Services
DAESS	District Agriculture Extension Service System
DEC	District Executive Committee
EPA	Extension Planning Area
FGD	Focus Group Discussions
GAP	Guide to Agriculture Production
GoM	Government of Malawi
GTA	Gender Transformative Approach
GVH	Group Village Headman
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel on Climate Change
LCBCCAP	Lake Chilwa Basin Climate Change Adaptation Programme
MGDS	Malawi Growth and Development Strategy
NGO	Non-Governmental Organization
SER	Socio-Ecological Resilience
UNESCO	United Nations Education and Scientific Organization
ZDP	Zone of Proximal Development

CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY

1.1 Introduction

This chapter starts with an outline of my positionality, followed by a justification of the study highlighting research gaps, research focus and research questions. I then describe the study area, which is the Lake Chilwa Basin in Malawi, followed by a description of key terms, concepts, and the context of my study. In the last three sections of this chapter, I give an overview of the research methodology (design, processes, and methods), and provide an outline of the thesis and then conclude the chapter accordingly.

I have justified my research based on three key knowledge gaps namely: neglect of informal learning (Macintyre et al., 2017, Engeström, 2016; Lotz-Sisitka, 2012), gaps in knowledge of historical, present and future learning for adaptation (Chiotha et al., 2018; IPCC, 2014), and limited understanding of the social barriers to climate change adaptation (Shackleton et al., 2015; IPCC, 2014). These barriers are manifestations of contradictions, which have been noted to be key driving forces of expansive learning (Sannino et al., 2016).

I explain that recurrent droughts and dry spells are the main reasons for the choice of the study site given the likelihood of these weather events as key drivers of informal learning to transform local farming practices, the focus of my study.

There are two terms that I describe, namely climate change and extreme weather events. With reference to key concepts, I have explained seven concepts as follows: adaptation, resilience, barriers to climate change adaptation, scenarios, learning (informal and expansive), transformation change and indigenous knowledge practices of farming. For each concept, I have explained how it is applicable to the Malawian context.

1.2 My Positionality and Motivation for this Research

My experience in interacting with local communities in the Lake Chilwa Basin dates to 2008. This interaction has mainly been through climate change adaptation projects notably *Building Capacity for Climate Change Adaptation in West and Southern Africa* (2008-2011) and the *Lake Chilwa Basin Climate Change Adaptation Programme* (2010-2017).

The first project, *Building Capacity for Climate Change Adaptation in West and Southern Africa* focused on capacity building, mostly through training of local communities, extension workers, district staff, policymakers, faith leaders and the media. Apart from Malawi, the project also took place in Mali and Senegal in West Africa. The target districts in Malawi were Machinga in the Lake Chilwa Basin and Nsanje in the Lower Shire because of their high vulnerability to droughts and floods respectively. The training sessions under this project covered climate change basics focusing on the science of climate change, impacts of climate change, adaptation, mitigation, coping and barriers to an effective response to climate change. I was **project manager** for this project.

The *Lake Chilwa Basin Climate Change Adaptation Programme* focused on building the resilience of both people and the ecosystem through training and capacity building sessions as well as practical action on the ground. Conservation Agriculture, livestock promotion, afforestation, fish farming, value addition on fish, cultivation of drought-tolerant crops and high-value crops such chili pepper, pigeon peas, and rice were the main practical action projects on the ground. The programme also created massive awareness about climate change and environmental degradation through radio, television, local newspapers, discussion forums and peer learning visits. The programme established its own radio called CHANCO Community Radio and promoted innovative citizen journalism approaches where selected local community members, after being trained, were empowered to record the voice of other community members. I held the position of **Natural Resources Management Expert** in the programme.

The Lake Chilwa programme published a book in 2018 titled *Socio-Ecological Resilience in a Fragile Ecosystem.: The case of Lake Chilwa Basin in Malawi*. The book was edited by Chiotha, Jamu, Nagoli, Likongwe and Chanyenga. The book can be accessed through Routledge Publishers.

During these nine years, I noted that generally, local communities were receptive to project interventions and positive results were also achieved, generally. Despite the successes, there

were also conflicts and contestations between local communities and project proponents mostly through inaction. For example, some local communities had dis-adopted what I call “modern” climate change adaptation approaches introduced by the projects. In conservation agriculture (no-tillage/minimum tillage farming), for instance, some farmers had gone back to traditional ridging. Although not scientifically proven, my own subjective assessment is that most interventions are still confined within the ‘seed’ communities without cascading beyond.

Following this behaviour of communities, I was inclined to agree with Tschakert and Dietrich’s (2010, p.2; quoting Schipper, 2007) generalized concerns that “policy and theory discourses have portrayed adaptations as something that is orchestrated, if not imposed”. In the case of the Lake Chilwa Basin, it means that some adaptation actions were probably imposed on communities for quick wins. Besides the alleged orchestrations and impositions, I suspected that there were deep-seated and unknown social-ecological system (SES) learning processes behind such farmers’ behaviour that required investigation.

I also noted that behind most of the project successes in the Lake Chilwa Basin was a woman, although decisions on control and use of the economic resources squarely rests with the men (Simtowe, 2010, p. 207). This is despite gender transformative approaches (GTA) promoted by the programme implementers. GTA are interventions aimed at promoting social change for the benefit of women and marginalized groups. This change is achieved by “acting on the norms, attitudes and wider structural constraints that limit women’s opportunities and outcomes” (Cole, Kantor, Sarapura, & Rajaratnam, 2014, p. 7). GTA engages with power relations and deep-rooted norms and the approach goes beyond women’s participation in various activities (ibid., p. 7).

Having noted that women in the Lake Chilwa Basin were the key activity actors, yet the main victims of social iniquities at the same time, I found it worthwhile to investigate the learning processes that could potentially transform the neglected local farming practices beyond their current forms which I found problematic in terms of building people’s resilience against extreme weather events of droughts and dry spells.

1.3 Justification for the Study

1.3.1 *More research needed in the informal learning arena*

“Most research on learning is conducted in formal educational settings” (MacIntyre, Lotz-Sisitka, Wals, Coleen & Tassone, 2017, p. 81). Furthermore, “social learning is a new,

emergent arena of research in the fields of environmental education, natural resource management, and human development” (Lotz-Sisitka, 2012, p. 12). By this statement, Lotz-Sisitka implied that limited social learning research (which includes informal learning, in my view) has been done. The bias towards formal learning research has resulted in a corresponding “most articles published even now focus on learning in classrooms” (Engeström, 2016, p. 14). There is a call for more research such as this study which focusses on informal and lifelong learning to adapt to climate change especially in this century when the change has become a “super wicked problem” because of its further exacerbating features compared to other wicked problems such as Acquired Immune-Deficiency Syndrome (AIDS) (Lazarus, 2009, p. 1160). Also, as Sefton-Green (2007, p. 6) had put it, informal learning constitutes an important segment of the ‘ecology of learning’ and should be ‘accorded status and understanding as we seek to enhance the education system more generally.’

For Malawi, the informal learning research in this study aimed to contribute to implementation of the activities highlighted in the Malawi Growth and Development Strategy III (MGDS III, GoM, 2018), National Climate Change Investment Plan (GoM, 2013) and Malawi’s Strategy on Climate Change Learning (GoM, 2013), among other national climate change strategic frameworks. These frameworks highlight the role of informal learning and traditional knowledge, a focus of my study. However, they are not specific on how informal learning and traditional knowledge systems will potentially address climate change in part because of inadequate data. For example, one of the proposed activity areas in the MGDS III is to “ensure the use of traditional, indigenous and local knowledge and practices to complement scientific knowledge in disaster risk assessment and early warning”. Specific details about “*use of*” these traditional systems require data generated through research such as this. The generalized concern by Engeström (2016, p. 14) that many publications abound in the formal sector and relatively few in informal learning arena is also applicable to Malawi (Latchem, 2014, p. 1). This research was therefore expected to generate new knowledge that will form a basis for an evidenced-based advocacy tool for development of informal learning acts and policies that are either currently non-existent, or at the very least, poorly developed in Malawi at present.

1.3.2 Gaps on historical, present and future learning for adaptation need further investigation in the Lake Chilwa Basin

With respect to resilience building along temporal scales, Tschakert and Dietrich (2010, p. 2) supported Nelson, Adger and Brown (2007) that attention should be on “understanding learning

about the past, present and future threats and accumulated memory of adaptive strategies” because this is important for policy praxis (Agrawal, 2008, p. 9). Learning *about the past* and *accumulated memory* (also highlighted by IPCC, 2014, p. 54) infers understanding historical backgrounds while learning for “*future threats*” is implied in scenarios (Chavula, Zambezi, Tsirizeni, Mmangisa, Ntupanyama & Gondwe, 2017, p. 837). Scenarios (see section 1.7.2.4) were developed in this research. By the time this study was conducted at the study sites, there was no evidence of in-depth research to understand informal learning in past, present and future time frames and how this had helped to address climate change via local farming practices such as cultivation of local crop seeds which are also neglected in Malawi (e.g. by the 2017 National Seed Policy which promotes hybrid).

1.3.3 Contradictions to adaptation not well-researched at study sites

Climate change adaptation efforts are challenged by three sets of barriers manifesting as contradictions and among these, the “social and cultural limits are not well researched” (Jones & Boyd, 2011, quoting IPCC, 2007). Seven years down the line, IPCC reported the same concern that “relatively few studies from Africa have focused specifically on barriers and limits to adaptation” (IPCC, 2014, p. 42). Furthermore, studies that theorize the role of barriers in adaptation are deductive in nature and are not well informed by experiences and opinions of those undertaking adaptation practices (Waters, 2014, p. 692). The scientific literature has also not clearly framed behavioural barriers related to the uptake of mitigation and adaptation strategies (García de Jalo’n, Silvestri & Granados 2015, p. 852). In Malawi, there have been some studies on these barriers, but these studies have not systematically identified and analysed such barriers at various steps of the adaptation process at planning, monitoring and evaluation and implementation stages (Shackleton et al., 2015, pp. 324-328). My view is that unless we identify and understand these barriers, it will be difficult to model solutions (e.g. through learning) to address them. Section 1.7.2.3 explains the concept of social barriers in more detail.

1.4 Research Focus

The study focus was on the potential of existing indigenous (local) farming practices to address drought, dry spells and climate change-related disasters in the Lake Chilwa Basin via informal learning approaches that are generally neglected as earlier indicated. The study intended to unlock the existing local farming practices potentials within a framework of transformative adaptation, through expansive learning processes. Since local custom reflected “*maize is life, but rice is money*” (Tiba, 2011, p. 1) in Malawi, the study had a special focus on traditional (local) maize cultivation practices and how these were integrated with other existing practices

such as soil fertility enhancement techniques, local weather forecasts, and traditional pest and disease control measures, to mention a few.

1.5 Research Questions

My main research question was *“How do drought and inter-seasonal dry spells influence informal learning processes to enable transformation adaptation among rural women cultivating maize in the Lake Chilwa Basin, Malawi?”* There were four sub-research questions as follows:

- a. What past and current informal learning processes have been catalyzed by drought and dry spells associated with maize production?
- b. What are the past and current contradictions to adaptation learning processes for maize production under stressors of drought and dry spells?
- c. What are likely future scenarios relevant to informal learning processes considering the current adaptation drivers and pressures in maize production under extremes of dry spells?
- d. How could expansive learning processes in informal learning settings potentially help rural women maize farmers progress from incremental to transformational adaptation practices

1.6 Study Sites

Data for this research were generated from the Lake Chilwa Basin area, Malawi. The basin itself is estimated to be 8,349 km² (Kafumbata, Jamu, & Chiotha, 2014, p. 4). Lake Chilwa is the second largest lake in Malawi with a surface area of 1,300 km². The lake spans across three districts of Machinga, Zomba and Phalombe. In the east, the lake shares borders with Mozambique (Njaya, 2001, p. 7).

The lake was declared a Ramsar site (a wetland of international importance) in 1997 under the Ramsar Convention. Three years later, the lake was designated a Man and Biosphere (MAB) Reserve by the United Nations Education Scientific and Cultural Organization (UNESCO, 2006) to addresses challenges linked to scientific, environmental, societal and development issues. The lake and the basin experience episodes of extreme weather events particularly droughts and floods resulting from below normal to above precipitation levels respectively. Since the seventeen hundreds, the lake has dried more than 50 times and some of the recorded drying episodes occurred in the following years: 1760-1850, 1900, 1903, 1913–16, 1952, 1960, 1968, 1973, 1995–96 (Njaya, Snyder, Jamu, Wilson, Clive, Allison & Neil, 2011, p. 23).

Besides these severe episodes, the lake also experienced minor recessions in 1881, 1922, 1934, 1943-1948 and most recently in 2012 (Jamu, Chapotera & Likongwe, 2012, p. 23). These droughts are projected to be exacerbated under climate change, and have, in the past, had serious consequences on people's livelihoods with women in the matrilineal dominated setting suffering the most (Nagoli, Binauli, Chijere & Chiotha 2018, p. 152). According to Nagoli et al. (2018, p. 152) this was because men migrate to other areas during drought or dry spells while women are "left behind to care for the young and the elderly and to secure their land from other encroachers". Local communities remain vulnerable to droughts and floods in the basin (Chiotha, Jamu, Nagoli, Chanyennga & Likongwe, 2018) despite large scale donor-funded projects since 1998. The never-ending vulnerability may be attributed to several factors including continued reliance on incremental (business as usual) adaptation. New approaches need to be tried, one being transformational adaptation (see section 1.7.2.9).

The specific study sites within the Lake Chilwa Basin were Domasi and Nsanama Extension Planning Areas (EPA) (Figure 1-1). Nsanama EPA lies in the northern tip of Lake Chilwa and is a relatively drier part of Machinga District. Data from unpublished EPA records show that Nsanama EPA is 35,447 hectares with 13,518 farm families of which 9,199 (68 %) are female-headed while Domasi is 19,890 hectares with 16,365 farm families of which, de facto, 10,078 (61.6%) are female-headed because most of the men migrate to other areas during drought and dry spells as pointed out above. In both EPAs, 100 % of the farmers cultivate maize but they also grow other crops including rice, cassava, sweet potatoes, groundnuts, pigeon peas, and sorghum. Farmers follow both traditional and modern farming practices such as local maize and hybrid maize cultivation respectively.

Both EPAs have highly degraded land and infertile soils (LCBCCAP, 2010, p. 8). Furthermore, the average land holding size per household of 1.2 hectares is relatively small and continues to decline (GoM, 2010, p. 110). As already pointed out above, Lake Chilwa is prone to droughts and dry spells and these worsen the existing situation. For local communities in the Lake Chilwa Basin, drought is synonymous with food insecurity or 'famine' apparently because of its disproportionately high impacts on crops, especially maize which is a staple food crop in Malawi (see more details about drought in section 1.8.1.2). Such commonalities in local community definition of drought show some 'boundary crossing' type of learning mainly through existing social networks.

The net effect of degraded land and drought is poor crop yields (including maize) leading to food insecurity and poor nutrition. Considering that my study involved action-oriented learning, these sites were expected to provide optimum learning opportunities to address drought and dry spells and low crop yields primarily of maize, the staple food crop in the two study areas.

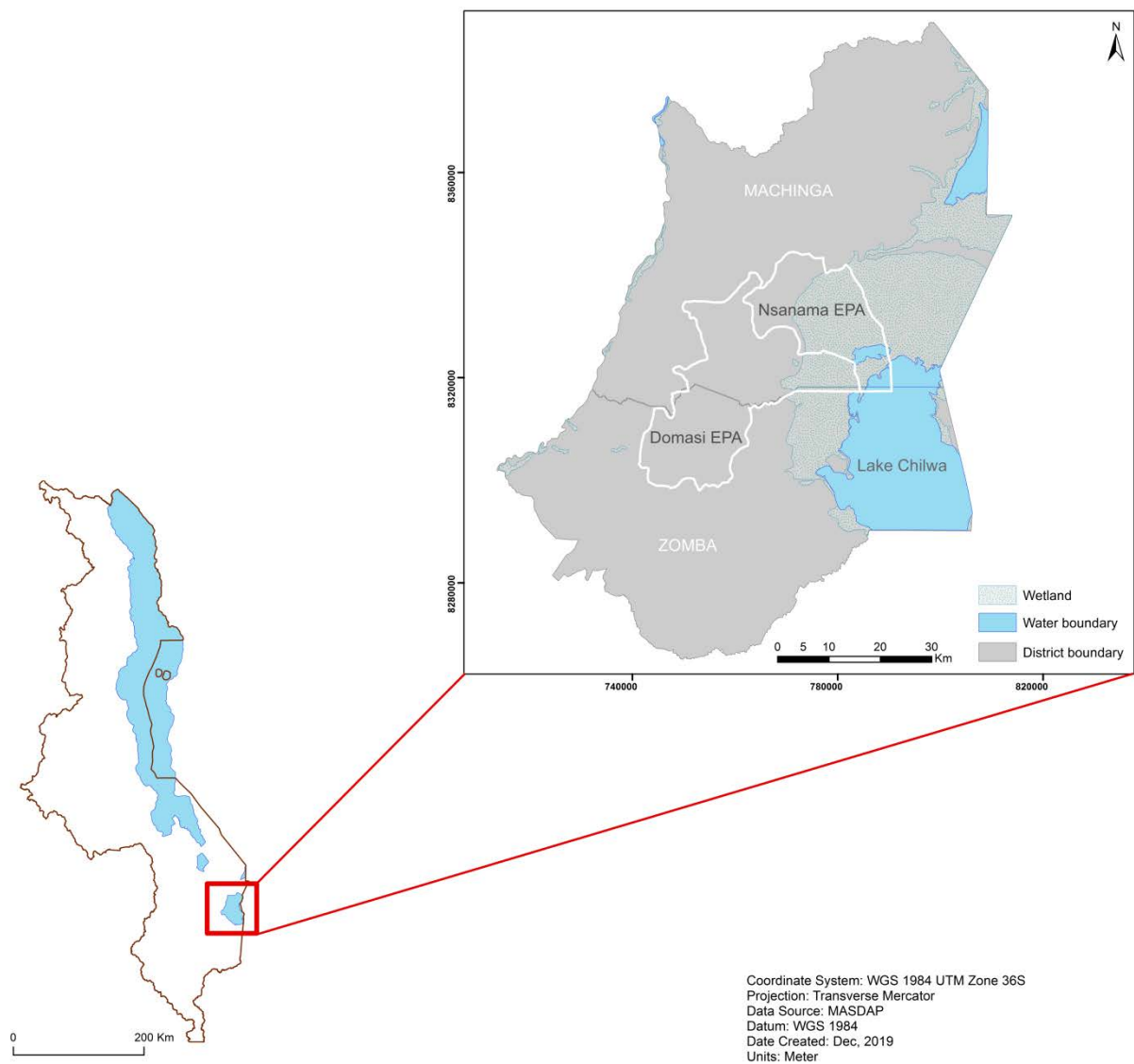


Figure 1-1: Map showing the location of Domasi and Nsanama Extension Planning Areas

1.7 Description of Key Terms, Concepts, and Context of My Study

1.7.1 *Key terms*

1.7.1.1 *Climate change*

Under Article 1 of the United Nations Framework Convention on Climate Change (UNFCCC), which is an international policy framework on climate change issues, climate change was defined as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural **climate variability**, observed over comparable time periods” (United Nations, 1992, p. 7). By 2016, globally, Africa was found to be the most vulnerable continent to the impacts of extreme weather events (Serdeczny, Adams, Coumou, Robinson, Hare, Schaeffe, Perrette & Reinhardt, 2016, p. 1585).

Climate variability refers to variations in the mean state of climate on all temporal and spatial scales beyond that of individual weather events (USAID, 2007, p. 2). While **climate change** reflects **changes** that occur over a longer period, typically over decades or longer, **climate variability** is about changes that occur within smaller time frames, such as a month, a season or a year. When discussing climate variability, scientists think of the way climate fluctuates above or below a long-term average value. Climate variability can cause abrupt disruptions, such as extreme weather events of floods, droughts, or tropical storms. These disruptions can have major consequences on a country’s economy if a significant part of economic activity is sensitive to weather and climate.

1.8.1.2 *Extreme weather events*

Weather is the state of the atmosphere at any given moment. It is what we see and feel on a daily or weekly basis and includes, but is not limited to, sunshine, rain, cloud cover, wind, hail, snow, and thunderstorms. An extreme weather event was defined by the Intergovernmental Panel on Climate Change (IPCC, 2014, p. 123) as “an event that is rare at a particular place and time of year”. In 2009, Southern Africa, floods and droughts were the two extreme events of concern (Stringer, Dyer, Reed, Dougill, Twyman & Mkwambisi, 2009, p.10). Extreme weather events of droughts and floods currently affect several sectors including health, livelihoods and food security of people on the African continent and globally.

Drought is a deficiency of precipitation from expected or 'normal' levels of precipitation that extends over a season or longer period (duration) usually a season or more in length (Wilhite, 2009, p. 6). It is a period without substantial rainfall that persists from one year to the next. There are four types of droughts (Pangolin & Dimou, 2015, p. 3), namely meteorological, hydrological, agricultural and socio-economic. Meteorological drought is a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. It is a significant negative deviation from mean precipitation. Hydrological drought occurs when precipitation shortfalls affect stream flows and reservoirs, lakes and groundwater levels. It is a deficit in the supply of surface and sub-surface water. Agricultural drought is a situation when soil moisture is deficient relative to water demands of plant life, usually crops. It is driven by meteorological and hydrological drought. Socioeconomic drought is a combination of the above three types leading to undesirable social and economic impacts.

A closely related phenomenon to drought is 'dry spell' which is a period where the weather has been dry, for an abnormally long time, shorter and not as severe as a drought (Mathugama & Peiris, 2011, p. 153). It is based on the length of the consecutive dry days. For Mathugama and Peiris, "dry spell" was first defined and used in British Rainfall in 1919 as being '*a period of at least 15 consecutive days to none of which was credited ≥ 1.0 mm*'¹⁸. Thereafter, various versions of definitions of a dry spell have been used by the different authors using different threshold values

Understanding droughts and dry spells was important in my study which focused on how informal learning can potentially help to address drought and dry spells via local farming practices with women as my subjects, as already highlighted in my main research question.

In Malawi, drought has been increasing in frequency and magnitude (GoM, 2006, p. 3; ActionAid, 2006, p. 4). Among the four types of droughts described above, agricultural drought has direct impacts on agriculture (Simelton, Quinn, Batisani, Dougill, Dyer, Fraser, Mkwambisi, Sallu & Stringer, 2013, p. 1) which is the main economic and food security activity in Malawi (GoM, 2017, p. 16). It is for this reason that in Malawi, agriculture drought is the centerpiece of local community understanding of the whole concept of drought. For example, in Kasungu and Chikwawa Districts, local communities define drought as "an extended dry spell that occurs during the growing season" (Sutcliffe, Dougill & Quinn, 2016, p. 1217) precisely matching the technical definition of agricultural drought; it also contributes to economic and food security activity in the country.

1.7.2 Key concepts

1.7.2.1 Adaptation

The IPCC (2007, p. 6) defined adaptation as “an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”. In my view, adaptation is primarily aimed at addressing adaptation deficit which is a gap between the current state of a system and a desired improved state at which point adverse impacts of climate change are minimized. Adaptation is a life-long learning process (Osbaahr, 2007, p. 17) which evolves and improves with new emerging conditions (McGray et al., 2007, p. 9). Adaptation can be planned, autonomous, reactive or anticipatory (Tol et al., 2009, p. 443). Planned adaptation refers to adaptation strategies that arise because of deliberate and pro-active policy decisions such as National Adaptation Plans of Action (IPCC, 2007, p. 69). Reactive adaptation takes place after preliminary impacts of climate change become unmistakable and have culminated in disasters, while anticipatory adaptation happens before the impacts are obvious. Autonomous adaptation happens naturally, sometimes unknowingly, and it is often more individualistic.

As the IPCC (2012, p. 56) noted, effective adaptation should prioritise measures that increase current as well as future resilience to threats (i.e. anticipatory). Resilience over time would increase if learning were a central pillar of adaptation efforts, including learning focused on addressing current vulnerabilities and enhancing disaster risk management efforts.

For least developed countries such as Malawi, adaptation has direct relevance to the reduction of suffering in vulnerable communities and ecosystems. Karabine et al. (2016, p.1) distilled nine key messages for Africa from the IPCC’s Fifth Assessment Report. Of these messages, three reflect on current and projected Africa’s vulnerability to climate change, one is about low carbon development practices and another on enhancing international cooperation. Three messages are directly related to adaptation. This means that the IPCC had also placed more emphasis on adaptation for Africa than mitigation. In the light of this preference of adaptation for Africa, my research focused on learning to adapt to the adverse effects of extreme weather events as mentioned above rather than learning for mitigation.

To conform with the IPCC and national priorities, Malawi developed the National Climate Change Policy (GoM, 2016, p. 16), the Malawi Growth and Development Strategy II and the Climate Change Investment Plan (GoM, 2013, p. 43), all of which highlighted adaptation as priority number one. This prioritization guided planning and implementation of several

national, regional and district-based climate change adaptation programmes including the National Agriculture Sector Wide Approach Support Project (ASWAP), National Climate Change Programme phase I (NCCP I), Enhancing Community Resilience Programme (ECRP), Achieving Sustainable Poverty Reduction through Increased Inclusive Resilience and Empowerment, Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP), and the Malawi Mozambique (MAMO) Sustainable Agriculture Programme.

In Malawi, the most common adaptation actions in the agriculture sector are small scale irrigation (e.g. treadle pumps, gravity fed and sprinkler), conservation agriculture, and crop and livestock diversification. Some of the practices emerge from local communities' own initiatives with knowledge mainly acquired through informal learning processes (Mphepo et al., 2011, pp. 27-37). Most practices are donor supported and they mainly involve organized non-formal learning processes (e.g. training and capacity building sessions).

1.7.2.2 Resilience

To define resilience, I draw on the work of Davidson, Jacobson, Lyth, Dedekorkut-Howes, Baldwin, Ellison, Holbrook, Howes, Serrao, Neumann, Singh-Peterson and Smith (2016) who argued that there is confusion and ambiguity in defining the concept which creates operationalization challenges for the concept. There are multiple interpretations of the concept of resilience stemming from a lack of consensus and fuzziness around its meaning. Furthermore, there are challenges in measuring progress in building or maintaining resilience and there is also a danger that the resilience concept will become nothing because of the lack of consensus in understanding it. Davidson et al. (2016) identified five domains of resilience namely ecological (ER), social-ecological (SER), urban (UR), disaster (DR) and community (CR). The first domain, ER is the capacity of natural systems to absorb disturbances caused by a shock and this is the origin of the whole concept of resilience. The second domain of SER relates to the capacity of social-ecological systems to absorb disturbance or persist against extrinsic or endogenous change. The third concept, UR, is the capability of an urban system to adjust to internal and external change processes. DR, which is the fourth domain, is the capacity of a socio-ecological system to proactively prevent, anticipate, adapt to, and recover from hazards and risks. CR, the fifth and last domain, relates to the ability of a community to respond effectively and bounce back in the face of adverse circumstances. Each of the five domains, according to Davidson et al. (2016, pp. 4-5) has three sub-categories, making a total of 15 archetypes and this further creates divisions among scientists and policy makers in defining the concept and coming to a consensus. The common resilience conceptual elements in all five

domains are persistence, absorption, recovery, identity retention, self-organization, adaptability, and transformation.

Among the five domains, the concept of SER, which evolved from ER, has become accepted as a useful heuristic for understanding, responding to and managing change in linked human-ecological systems (SES). Davidson et al. (2016) called SER “transformative resilience” and considered it to incorporate all elements of the other domains. This ‘transformability’ is the element that clearly distinguishes SER from the other domains. My research focus is to investigate potential transformation of the local farming practices via informal learning and potentially build community resilience (CR), particularly with rural women farmers at the study sites. However, meaningful CR cannot be achieved without sound management of environmental elements such as soil and water. SER resonates with my research focus and this will, therefore, be the overall guiding definition used in my research. The concept of transformation is described further in section 1.7.2.9.

1.7.2.3 Barriers and limits to climate change adaptation

In building resilience through adaptation, there are always impediments which are context specific. Debate on adaptation learning is expanding (Mersha & Van Laerhoven, 2016, p. 1701) and now includes a focus on barriers and limits to adaptation defined by Waters, Barnett and Puleston (2014, p. 691) as “obstacles that can be overcome with concerted effort”. As will be seen later in section 3.6.1.1, obstacles and limits are manifestations of contradictions that drive learning. For Jones and Boyd (2011, p. 1263), there are three categories of adaptation barriers and limits, namely human and informational, social and natural.

Human and informational barriers and limits are quite numerous and include spatial and temporal uncertainties associated with forecast modelling, low levels of awareness and information amongst policy makers on the impacts of climate change and lack of information of on how best to implement adaptation interventions (Jones and Boyd, 2011, p. 1263).

Natural limits to adaptation constitute physical and ecological constraints such as ecosystem thresholds and geographic and geologic locations. For example, extremely high temperatures may present critical thresholds beyond which some ecosystems (e.g. wetlands) may be unable to self-regulate or alter their functional state and system integrity (Jones and Boyd, 2011, p. 1263).

Social barriers and limits, a focus of this study, are concerned with the social and cultural processes that govern the way individuals and community members respond to climatic stimuli. To explore the implications of social processes, Jones and Boyd (2011) used an analytical framework to identify three distinct, yet interrelated proponents of social barriers and limits, namely cognitive behaviour, normative behaviour, and institutional structure and governance. These barriers and limits are further divided into three distinct yet interrelated proponents: cognitive, normative and institutional.

Cognitive barriers and limits to adaptation relate to how psychological thought processes, values and ethics influence the way individual or community members react to existing or anticipated climate stimuli. These cognitive traits may influence the types of adaptation employed and in certain circumstances can contribute to maladaptation. Examples of cognitive barriers and limits include the belief that uncertainty is too great to warrant taking adaptation action now; unwillingness to accept the risks associated with implementing adaptation action; change not yet seen as a problem.

Normative barriers to adaptation relate to the ways in which cultural ‘norms’ influence individuals and communities respond to climate stimuli. Normative barriers include cultural norms that discourage change and innovation; restrictive traditional and religious norms (e.g. reliance on traditional means of weather forecasting and planting).

Institutional barriers and limitations to adaptation relate to the way the organization and structure of interactions influence and permit individuals and community members to adapt to climate variability and change. Examples of these barriers and limitations include institutional inequities, social discrimination, and social/cultural rigidity (Jones and Boyd, 2011, p. 1264).

As highlighted by Shackleton, Ziervogel, Saillu and Tschakert (2015, pp. 325-327), adaptation options in Malawi face a string of barriers including poverty, poor soil quality, land fragmentation, poor roads, pests and diseases, lack of access to inputs, poor quality of seed and inputs, poor market access and lastly, lack of information on climate change predictions and weather, and possible adaptation strategies (informational barriers). Local community misconceptions about climate change also pose as adaptation learning barriers. An extract from Nation Publications Newspaper (Jørstad, 2012, p. 90) describes such community misconceptions:

In most African communities, dry spells are spiritual issues. People do not regard them as a problem caused by the changing climate but the expression of the wrath of gods. Among the Ngonde in Karonga, when a dry spell falls, people go to the shrine to plead forgiveness from the gods.

In such situations, local communities may feel that there may be no need for innovative learning to adapt or develop new practical actions; instead, prayer is adequate.

1.7.2.4 Scenarios

The Intergovernmental Panel on Climate Change (IPCC) defined a scenario as a “coherent, internally consistent and plausible description of a possible future state of the world” (Berkhout et al., 2001, p. 7, quoting Parry & Carter, 1998). Sandra, Marjolein, van Asselt, Grosskurth, Jasper, Chantal, Rijkens-Klomp, Rothman and Rotmans (2000, p. 7) regarded scenarios as “archetypal descriptions of alternative images of the future, created from mental maps or models that reflect different perspectives on past, present and future developments to serve as a basis for action” and this includes climate change adaptation, in my view. UNEP (2002, p. 320) defined scenarios as “descriptions of journeys to possible futures which reflect different assumptions about how current trends will unfold, how critical uncertainties will play out, and what new factors will come into play”. A critical uncertainty is defined as “a driver that is especially important in determining how the future will evolve, but whose future development is highly unpredictable” (Chavula et al., 2017, p. 189). Critical uncertainties have the greatest potential to impact on the environment (ibid.).

Based on contradictions affecting indigenous farming practices, my research developed scenarios to tell a story of the farming practices history, current status, likely prospects (next 25-30 years) and the associated informal learning processes. The 25-30 years timespan was based on the suggestion by Amer, Daim and Jetter (2013, p.26) for environmental-related storylines like mine. This timespan also falls within the period the Malawi Climate Change Learning Strategy (GoM, 2013, p. x) whose vision is “that Malawi will become a knowledge-driven climate change resilient population by 2030”. That means, when the Malawi Government operationalizes this strategy, it will potentially also consider resolving problematic issues and exploring opportunities in informal learning and local farming practices highlighted in scenarios.

Chapter Six illuminates locally derived scenarios in more detail.

1.7.2.5 Learning

Illeris (2003, p. 170) defined learning as “all processes leading to permanent capacity change – whether they be physical, cognitive, emotional, or social in nature – that do not exclusively deal with biological maturation or aging”. The societal interpretation of learning is that it deals with new problems “thus emphasizing externalization and contestation of the object and allowing people to see new problems and develop new solutions” (Mukute, 2010, p. 17). Mukute further argued that if learning deals with problems, then it fits in well with Engeström’s idea of expansive learning, which is concerned with transferring and creating knowledge to transform activity and develop agency. The concept of learning is further elaborated in section 3.6.1.4.

As pointed out in section 1.8.1.2, extreme weather events affect several livelihood sectors. The impact of these extreme weather events requires “taking urgent action” (United Nations, 2016, p. 25) to build human and natural resource resilience to climate change, ultimately reducing resultant suffering. This ‘urgent action’ includes learning (Ensor & Harvey, 2015, p. 510; Tschakert & Dietrich, 2010, p. 2).

Between men and women, the latter are regarded as more powerful agents of change (Resurreccion, 2013, p. 9). Furthermore, because of their gendered roles, generally low education and income levels, and restricted entitlements, women are amongst the most affected by climate change and natural resource degradation (Tasokwa, Nyariki, Mkwambisi & Kogi-Makau, 2011, p. 4). Women also “develop broad knowledge and experiences regarding their environment” (Carvajal-Escobar, Quintero-Angel, & Garci'a-Vargas, 2008, p. 277). In other words, women are key stewards (Villamor, van Noordwijk, Djanibekov, Chiong-Javier & Catacutan, 2014, p. 130) and critical labour contributors in the agricultural sector, especially in the context of subsistence agriculture and home food security (Alexander, Nabalamba & Mubila, 2011, p. 123).

Amongst women, the complexity of the dualistic nature of being change agents and victims of injustices offers a potentially catalytic opportunity for transformative social learning. In other words, women might be more inclined to learn to transform current adaptation practices and build SER than men, thus providing potentially important research findings. Also, as Villamor et al. (2014, p. 130) noted, “women’s choices are more socially oriented than men and they usually aim at achieving multiple goals”. Therefore, because of this social construct, they may potentially also make concerted and unified efforts to tackle climate change and problems of

natural resource degradation through learning. By making ‘concerted efforts’ through mutual trust, reciprocity and social networking, they could be regarded as engaged in building social capital (Jones, Koukoulas, Clark, Dimitrakopoulos, Eftihidou & Tsaliki, 2014, p. 2) which can be defined as “features of social organizations, such as networks, norms and trust that facilitate action and cooperation for mutual benefit” (Tzanakis, 2013, p. 6). As Jones et al. (2014, p. 3) noted, “higher levels of social capital will have a positive influence on the public acceptance of environmental policies”.

My research aims to expand informal learning to transform local farming practices. In the following section, I explore informal learning, expansive learning, and transformational change.

1.7.2.6 Informal learning

According to Ostrouch-Kamin’ska and Vieira (2015, p. 4, citing Livingstone, 1999), informal learning is “any activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies”.

Informal learning, like any other learning type, can be additive (i.e. adding or improving knowledge and skills). It may also be transformative, a change which “asserts that our success in creating a more just and sustainable world requires our ability to connect with the deepest longings of people, that we develop our emotional intelligence as well as our political analysis, that we live and practice justice and sustainability”(Gass, 2012, p. 6) ultimately leading to radical change of existing knowledge and approaches, including changes in social practices and institutions. According to UNESCO (2015, p. 17), informal learning is the most common type of learning. This learning type is important for several reasons including solving problems (e.g. those associated with climate change), protection, survival or preservation (Semali, Ladistaus & Kincheche 2015, p. 870) and it is also one of the life-long learning aims that helps one “to participate fully in society” (United Nations, 2015, p. 11).

There are three types of informal learning, namely self-directed, incidental and socialization (Schugururensky, 2000, p. 3). Self-directed learning is intentional “because the individual has a purpose of learning something” and it is also conscious because the learner is aware that he/she has learned something. In incidental learning, the learner has no specific intention to learn but finds him/herself having learned via experience. In socialization, the learner has no intentions to learn and is also not even aware if learning has taken place. In this study, my focus

was to expand self-directed learning and to explore how this learning can transform existing adaptation knowledge and approaches under extremes of drought and dry spells among farmers engaged in local farming practices relevant to local maize cultivation. I chose maize for my research because in most parts of Malawi including my study sites, “maize is food and food is maize” (Gronemeyer, Fink & Metzger, 2015, p. 50). Informal learning includes traditional cultural knowledge that is passed from one generation to the next through a variety of ways and at different times, including rituals, customs, historical legends, and stories.

For this study, learning to adapt to impacts of agricultural drought on maize production was my focus. Primarily, my research looked at how informal learning can be expanded (see section 1.7.2.8) to help rural women maize farmers transform from incremental (business as usual) to transformational adaptation primarily through development of a transformation adaptation ‘agenda, vision and pathway’ (Jakku, Thorburn, Marshall, Dowd, Howden, Mendham, Moon & Brandon, 2016, p. 2). In an agricultural context such as the one in focus in this study, transformational adaptation involves “major, purposeful action undertaken at the farm in response to potential or actual climate change impacts and opportunities” (ibid.).

1.7.2.7 Women and informal learning in Malawi

As already noted, my research subjects were women. Therefore, it is important to consider informal learning among women in Malawi. Malawi has a population of about 17.5 million people (in 2016) according to the United Nations Department of Economic and Social Development. Of this, about 73 % are formally educated and 27 % are informal learners. The literacy rate for adult females is at 58.6 % and 73 % for adult males. This means, by 2016, most women were informal learners, which may also be attributed to higher primary school drop-out rates for girls (at 13.5 %) versus boys (at 9.5 %) (GoM, 2013, p. 46). This also contributes to high illiteracy rates among women in the country. The dropout rate for girls was particularly high in the districts around the Lake Chilwa Basin (16.2 %) (ibid.) and this is well above the national average. Low literacy levels among women are not unique to Malawi. According to the 2017 United Nations Educational, Scientific and Cultural Organization (UNESCO) eAtlas of literacy, in 2017, there were 758 million adults who could not read or write and two-thirds of them were women, globally.

In order to promote informal learning the Malawi Government developed several strategic documents such as an Environmental Education and Communication Strategy (Allen, Chiotha, Kalowekamo, Trudel & Monique, 1996). In 2013, the Government developed an ambitious

long-term (2013-2030) Strategy on Climate Change Learning (GoM, 2013). Recently in 2018, the Malawi Growth and Development Strategy III (MGDS III) was developed “to promote lifelong learning opportunities for all” (GoM, 2018, p. 60) as one of the key development agendas. Further details about the Malawi Government attempts to promote informal learning are presented in Chapter Two section 2.2.

1.7.2.8 Expansive learning

According to Engeström and Sannino (2010, p. 2), “the theory of expansive learning puts the primacy on communities as learners, on transformation of culture, on horizontal movement and hybridization and on the formation of theoretical concepts”. Expansive learning is characterized by active participation, explanation, and translation of matters of concern by the facilitator and subjects alike. An important output of expansive learning is the construction of a new object and concept by the communities themselves, i.e. the learning is also transformative. This new concept is ultimately practised which makes up the new or expanded object of the activity. In this study, the matters of concern are drought and dry spells impacting negatively on local farming practices for maize production.

The expansive learning cycle occurs via seven learning actions namely (a) **questioning** some aspects of the habitual practices and existing wisdom; (b) **analyzing** problematic situation using genetic-historical analysis (i.e. tracing their origins and evolution) or actual-empirical analysis (constructing a representation of the inner systemic relations of the activity); (c) **modeling** the desired future based on the analysis; (d) **examining** the model through practical experimentation to assess workability and limitations that may arise; (e) **implementing** the model by means of practical application, enrichment, and conceptual extension; (f) **reflecting** on and evaluating the process; and (g) **consolidating** the outcomes toward a new stable activity (Sannino, Engeström, & Lemos, 2016, p. 600). Expansive learning is further elaborated in section 3.6.

1.7.2.9 Transformational change

At the level of society, a change could be incremental, transitional or transformational (Roggema, Vermeend & van den Dobbelsteen, 2012, pp. 2529-2530). Incremental change is the simplest. It improves what is currently being done rather than creating something new (e.g. training on traditional irrigation practices). Transitional change is “a gradual, continuous process of societal change, changing the character of society (or a complex part) structurally” (ibid.). The change replaces ‘what is’ with something completely new, changing from A to B.

The outcomes of both incremental and transitional change are known in advance. Transformational change is like transitional change in that it also seeks ‘completely new’ or radically changed practices from the old. The only difference is that with transformational change there is no known destination, and the journey has never been traveled before. It is ‘learning that is not yet there’ (Engeström, 2016). It embraces new learning and takes actions based on new discoveries. Such a process of transformation can be explained via three phases: preparing, navigating and stabilizing (Roggema et al., 2012, p. 2530), which broadly follows the expansive learning cycle highlighted above. While Roggema et al. (2012, pp. 2529-2530) identified two generalized forms of transformation, others like Jakku et al. (2016, p. 6) and Kates, Travis and Wilbanks (2012, p.7156) do not recognize ‘transitional’ as a form of transformation. For Jakku and his colleagues, there is only one form, transformational which is closely nested incrementally in a learning cycle. Kates et al. (2012) classified transformation adaptation options into three, namely those that are adopted at a much larger scale or intensity, those that are truly new to a particular region or resource system, and those that shift locations.

For this study, I adopted the most common form: transformation adaptation (as opposed to transitional) because I wanted to focus on learning that is not yet there amongst women maize farmers, to challenge social barriers as manifestations of contradictions to climate change adaptation and learning, but also to promote existing adaptation enablers. The research process focused primarily on the preparatory and navigating phases of transformation, since the longer-term stabilization stage may be difficult to achieve within the study period of three years of this research. However, some early signs of stabilization may become evident as has been shown in other expansive learning processes in southern African (Mukute, 2010).

1.7.2.10 Indigenous knowledge systems (IKS) of farming

The term ‘indigenous’ and hence the concept of ‘indigenous knowledge’ has often been associated with the primitive, the wild and the natural. There are several variants of IKS, and these include local knowledge, traditional knowledge, traditional ecological or environmental knowledge, ethnoscience, indigenous science, folk science and farmers’ and pastoralists’ knowledge.

Indigenous knowledge and its variants often exist in a local context, anchored and institutionalized to a particular social group at a time (Agrawal, 1995, p. 1). Traditional knowledge systems “are culture-based and interpreted differently for different areas” (Zuma-Netshiukhwi, Stigter and Walker, 2013, p. 403). In other words, IK is accultured to a particular

social group. Indigenous knowledge encapsulates society-specific epistemologies on subsistence practices such as agriculture, traditional medicine and celestial knowledge on weather forecasting and disaster prediction (MoSTE, 2015, p. 25). IK forms a greater part of the informal learning processes (Semali et al., 2015, p. 869) and is often gendered with women generally more epistemologically advanced than men (Ramphela, 2004, p. 13). Ramphela further argued that women provide ‘the first role models for behaviour’ at local community level. The gendered dimensions and inherent informal learning attributes of IKS are important in this study as it works primarily with women subjects. Indigenous knowledge has value not only for the culture in which it evolves but also for scientists and planners striving to improve conditions in rural localities. For instance, the IPCC started recognizing sharing of indigenous, traditional and local knowledge as a useful approach **to manage the risk of climate change** way back in 2007 (MoSTE, 2015. p. 1).

In this research, I relied on the term ‘local knowledge’ defined by Ngwese, Saito, Akiko Boafo and Jasaw (2018, p. 826) as “knowledge that people in each community have developed over time and continue to develop. It is based on experience, often tested over centuries, adapted to the local culture and environment and embedded in community practices, institutions, relationships, and rituals.” I chose this definition because the local farming practices that I studied had **developed over time** and **continue to do** so considering climate change. Since knowledge systems interact in ‘space’, I considered this as useful a working **definition** for my study.

In summary, indigenous knowledge is found locally and is specific to different situations and culture; tacit (unspoken or implicit) gathered through interaction among and observation of community members; transmitted orally from generation to generation or self-learned and getting refined in the process of transference; practical, applied rather than theoretical (even though theory is often embedded i.e. it is not a-theoretical knowledge); related to experiential learning which is specific to a locale. Further details of indigenous farming practices in Malawi are presented in Chapter Two ‘Review and state of indigenous farming practices and informal learning’.

1.8 Overview of Research Methodology

The research design for this study was based on third-generation Cultural Historical Activity Theory (CHAT) (see Chapter Three) developed by Engeström (1978) who drew on the earlier works of Vygotsky (1978) and Leontiev (1978). The third generation CHAT focuses on

multiple, interacting activity systems, networks and boundary-crossings between or among activity systems. For my research, I used third generation CHAT because the local farming practices I studied “interact with other activity systems and cross boundaries”. For example, local farming practice as an activity system interacts with extension delivery and seed production activity systems by sharing a common object, namely food security promotion. There is also boundary crossing of activities and communication systems among the three activity systems. (See Chapter Five for further elaboration.)

1.8.1 Research processes and methods

Research data were collected in three phases. First phase data were collected through focus group discussions, key informant interviews, document analysis and observational studies. Data collection during the first phase was used as mirror material during the second phase, change laboratory intervention, which constituted the focus of data collection. A change laboratory *formative* intervention was defined by Virkkunen and Newnham (2013, p.15) as “a tool kit for envisioning, designing, and experimenting with new forms of work and a social setting in which this can be done”. It is different from a change intervention in the ways outlined in the table that follows:

Table 1-1: Differences between change intervention and formative change laboratory

Aspect	Change Intervention	Formative Change Laboratory
Object	Local practice and habitual way of acting of a group	A historically developing system of collaborative activity
Starting point	Researcher defines the problem, content, and goals of intervention	Contradictory demands which participants encounter in their vital life activity
Process	The subjects are expected to experiment with a given solution. Difficulties are seen as weaknesses in the solution that call for refining it	The content and course of intervention are subject of multi-voice negotiation. The subjects gain agency in the process
Outcome	The full or partial reaching of the pre-established goal. A solution that can be as such transferred to other settings	New concepts that may be used as instruments of analysis. Participants’ transformative agency
Researcher-Interventionist Role	Owens, designs and controls the process	Provokes and sustains collaboratively led expansive transformative process

Source: Virkkunen & Newnham (2013, p.12)

From the above descriptions of the two forms of interventions, it can be construed that change intervention is a top-bottom approach and participants do not own the process. Such an approach often leads to rejection of results by the participants leading to unsustainability. The Johari Window model (see Table 1-2) is a representation of a person's (or group's) attitude, beliefs, skills and experiences in relation to others from essentially four perspectives called windows; change intervention would only strengthen the 'façade window' where participants know a lot about the subject matter but cannot open up due to fear of the researcher-interventionist. On the contrary, the change laboratory formative intervention research approach empowers participants to make decisions throughout the process, thus building their agency and potentially leading to sustainability. It was anticipated that they would move out of the façade window, open up and arrive at an 'open window' where they will have shared their ideas. It is for the in-built sustainability aspects of the change laboratory formative intervention approach that I decided to use this approach in my research. The approach was ideal for studying local farming practices which are already owned by local communities and change intervention would only create unmanageable tensions.

Table 1-2: The JOHARI Window

Open: Known to self and to others	Blind: Unknown to self but known to others
Façade: Known to self but not to others	Unknown: Unknown to self and unknown to others

Source: Saxena, 2015 (p. 136)

Further details of the research processes and methods are provided in Chapter Four.

1.9 Outline of the Thesis

Chapter One outlines the positionality of myself as a researcher who has vast experience working in the study sites, the justification for study and research questions. It also discusses key terms, concepts, and context of the study and provides a summary of the research processes and methods.

Chapter Two is a review of local farming practices and informal learning pathways in Malawi. The chapter discusses local maize as the focus of the study and five other local associated

farming practices, namely multiple cropping (mixed and sequential), slash and burn and (*mphanje*), soil fertility enhancement (*kuojeka* and livestock manure), insect pest control and weather forecast. Each local farming practice is described in terms of its current status, threats and future prospects. The chapter highlights that local communities will continue with their local farming practices. This is premised on local communities' perception that their local farming practices are cheaper and, in some cases, more superior than modern farming practices. For example, in the case of local maize, local communities I consulted argued that it is more resistant to fall armyworms than hybrid maize. With respect to informal learning pathways, the chapter gives six examples of Malawi Government policies and strategies that capture some elements of informal learning. Finally, the chapter gives an example of a programme which attempted to translate informal learning aspects captured in these policies and strategies into practical action (the Lake Chilwa Basin Climate Change Adaptation Programme).

Chapter Three focuses on the Cultural Historical Activity Theory (CHAT), theoretical framework that guided data collection for my research. The chapter discusses CHAT, its history and its three phases. The chapter elaborates on the concept of expansive learning drawing on Vygotsky (1978) and Bates (1972) learning phases; contradictions and their roles in learning; zone of proximal development; learning as a tool for building transformative agency; the connection between learning and development; and finally double stimulation and how scenario learning addresses this concept. While discussing these concepts, I also explain their relevance to my study.

Chapter Four explains methods and processes I followed in data collection and analysis. Regarding data collection, the chapter discusses the collection of historical situational data offering mirror data for change laboratory workshops through focus group discussions, observation studies and document analysis. Most of what is discussed in this chapter relates to two aspects: change laboratory workshops that included development of scenarios as double stimulation tools for learning; and methods I used in testing model solutions suggested by women subjects of my study and validated through two workshops one in each of the two case study sites. Relating to data analysis, the chapter outlines two analyses types of layered and power dynamics with N-Vivo as a data management tool.

Chapter Five is about the analysis of contradictions of four types, namely primary, secondary, tertiary and quaternary. This chapter starts with a description of extension delivery and local farming practice activity systems which I identified during historical situational mirror data

collection. Description of these activity systems focuses on their centrally and historically individual nodes of tools, subject, rules, community of others, division of labour and object. For the local farming practices, the chapter explains how these are currently or have historically been learned informally. Furthermore, the chapter provides evidence on how ecological dynamics of drought and dry spells catalyze learning at the two case study sites. History is important in analyzing contradictions and therefore the chapter provides history of extension delivery system and local maize cultivation. This chapter is a steppingstone to Chapters Six and Seven summarized below.

Chapter Six is about double stimulation and solution modeling: learning from the future using local farming practice scenarios. The chapter builds on learning actions one to four of the expansive learning cycle. It discusses the role of local farming practice scenarios as double stimulants for learning. There are four scenarios: good governance and good economy (best scenario); good governance and poor economy (middle of the road); good economy and poor governance (middle of the road); and finally, poor governance and poor economy (worst scenario). The best-case scenario uses model solutions suggested in Chapter Five as its descriptors while worst case scenario uses contradictions. To provoke thought and potential action among those reading or hearing about these scenarios, catch words, mostly presented as metaphors, were assigned to each scenario. Because the literacy rate is low at the two case study sites, besides catch words, symbols were also tied to each of the four scenarios.

Chapter Seven answers the question ‘can it work?’ and considers model solutions. In this chapter, some of the model solutions suggested in Chapter Five were tested for workability in the two study sites. Model solutions tested and discussed in this chapter fall into four categories: use of ripe banana peels of *makumbuka* and *sukari* to eradicate *nansongole* grass and native bamboos both of which colonize land for cultivation; diversity blocks where various cultivars of local maize and other local crops were cultivated under irrigation; electronic and print media covering use of social media notably WhatsApp for the youth, television, video and newspapers; and finally, women dominated social networks.

Chapter Eight, which is the final one, concludes the thesis and makes recommendations. The chapter answers two main questions: have research objectives been met? And, has this research generated evidence that the suggested and tested model solutions can potentially transform local farming practices via informal learning? The recommendations presented in this chapter

are made for consideration in my own working practice, and by research institutions, policy makers and all other concerned stakeholders.

1.10 Conclusion

Overall, this chapter provides the necessary background information to the study. It does this by summarizing the whole research agenda from research questions to how the questions were answered to key results, conclusion, and recommendations.

CHAPTER 2: REVIEW AND STATE OF INDIGENOUS FARMING PRACTICES AND INFORMAL LEARNING

2.1 Introduction

As outlined in Chapter One, this research is about local farming practices primarily used by women to cultivate maize. It also explores how informal learning can potentially provide transformative adaptation options following the seven expansive learning actions introduced in section 1.7.2.8. To assess transformative adaptation outcomes, there should be a benchmark against which changes are compared as the expansive learning processes proceeds from questioning to consolidation phase. The benchmark I used was the current status of local farming practices and the associated informal learning processes.

In this chapter, I review IKS related to local maize cultivation (my focus) with specific reference to five traditional crop production practices that are commonly associated with maize cultivation in Malawi (and more widely in Africa). These practices are multiple cropping; traditional weather forecasting; slash and burn (*mphanje*); insect pest control; and, soil fertility enhancement. I describe each traditional practice in terms of how it takes place in local communities; why they support it; why modern agricultural practice appears to be antagonistic towards it; as well as the prospects of each practice. The last paragraph under each practice highlights the role of learning and re-learning as potential approaches to transform the current status of the practice considering the contradictions it is facing now or potentially in future. Figure 2-1 below is an illustration of how local maize cultivation, a focus of my study, interacts with the other five local farming practices common in Malawi.

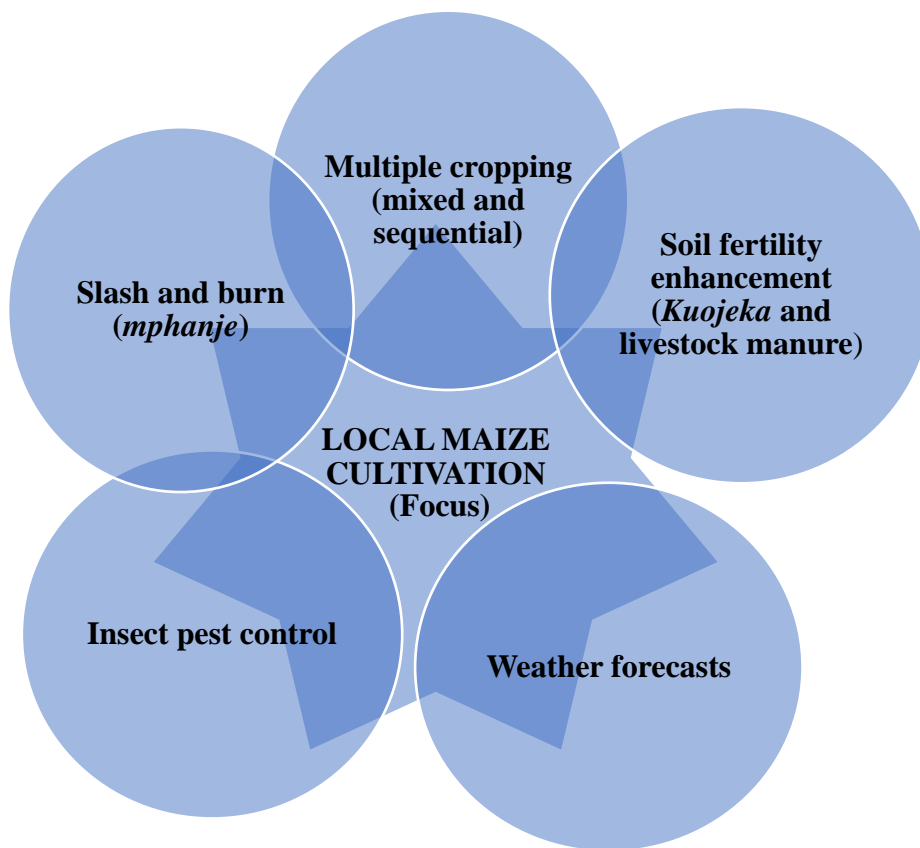


Figure 2-1: The central idea (local maize) and its associates

As seen in Figure 2-1, there are mutual interactions among multiple cropping, slash and burn agriculture, insect pest control and soil fertility enhancement. For instance, soil fertility could be enhanced through slash and burn and mixed cropping besides *kuojeka* and livestock manure. Likewise, insect pests could be controlled by slash and burn and multiple cropping.

Following the review of the local farming practices, I then focus on national communication and environment related strategies and policies for Malawi, systematically isolating and analysing informal learning plans and actions points. I then use the case of Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP) as an example of how projects have attempted to use informal learning to promote climate change adaptation and mitigation initiatives.

2.2 General Overview of Indigenous Farming Practices

Indigenous farming practices may be defined “as society specific epistemologies on subsistence agriculture” (MoSTE, 2015, p. 8). As indicated in Chapter One section 1.7.2.10, indigenous knowledge manifests in several disciplines including traditional medicine, weather forecasting and disaster prediction (MoSTE, 2015, p. 25). For Agrawal (1995, p. 1), IKS in general is “culture based and interpreted differently for different areas” and this can be extended to local farming practices under informal learning settings.

For local communities, their power lies in traditional knowledge. As Moyo (2010, p. 54) who conducted his research in Northern Malawi, noted, this power is ‘large’ meaning it can both significantly promote and frustrate development efforts. The power is embodied in local level social networks, Moyo further argues. Driven by experiential learning from previous climatic and other stressors, farmers use this power to guide decision-making processes in agriculture including adaptation and coping choices to manage associated risks and disasters. An example of where farmers used their power to accept or reject outside development projects is highlighted by Harrison (2001, pp. 194-196) working in Mozambique and Tanzania. For Harrison, farmers had resisted development projects through the concept of conspiracy of silence by not speaking for or against an idea, sabotage (e.g. through boiling seeds or planting them upside down), resisting teachings and advice from extension workers and sticking to their practices. However, the farmers also applied recommended farming practices promoted by government extension workers deemed appropriate to them. Farmers continuously carry out research on their traditional farming practices which may not be appreciated by scientists, but which enables them to develop knowledges that are used in securing livelihoods. It is as if scientists label local farmers as not ‘very good researchers’ while farmers castigate scientists as ‘not good farmers’ (Ramisch, 2014, p. 1).

A study conducted by Nagoli, Green, Mulwafu and Chiwona-Karlton (2017) at Chisi Island of the Lake Chilwa, highlighted the power island residents exercised against the colonial masters (*azungu*). In 1934, Lake Chilwa dried and the colonial masters ordered Chisi Island residents to grow cotton on the dry lake believing that the lake would not refill. The residents “laughed at the *azungu* as confused people who did not understand the lake” (Nagoli et al., 2017, p.5) because the lake later refilled. Clearly, the colonial masters got it wrong that the lake would not recover. The islanders used their power to resist cotton production in the basin that the

colonial masters wanted to impose. They did this by boiling or roasting the cotton seed before planting and so the seeds did not germinate (*ibiden*).

Traditional farming practices have the potential to serve as the foundation for the design of climate change resilient agricultural systems (Altieri et al., 2008, p. 14). As Altieri and Nicholls (2017, p. 39) noted, traditional farming practices are diversified and generally use less energy, pesticides and chemical fertilizers. In relation to the common disasters of bush fires, windstorms, droughts, floods, pest and disease outbreaks (such as army worms and red locusts) and strong winds, local farmers in Ghana used their traditional knowledge and power to mitigate against these incidences through a number of strategies, some of which are presented in Table 2-1 below.

Table 2-1: Traditional ways of mitigating disasters

Disaster Category	Coping mechanism
Bush fires	Construction of fire belts around farms
Windstorm	Plant trees around houses; place weights on rooftops
Droughts	Apply cattle dung on fields; make soil heap (mound) around crops; multi-cropping; use drought-tolerant crops
Floods	Build flood barriers; create water channels in farms; mud heap around crops
Pest and disease outbreak	Spray crops with crushed neem solution; apply animal dung on plants; mix grains and seedlings with crushed teak leaves; mix grains with wood ash before storage; sprinkle wood ash on crops in the field

Source: Ngwese, Osamu, Sato, Agyeman and Godfred (2018, p. 13)

Moyo (2010, pp. 17 and 215) added physical killing of crop pests and *dimba* (wetland) cultivation as coping strategies in anticipation of drought related disasters. Moyo (p.18) further argued that “it is an anticipated tradition that a household should have a *dimba* which is a garden in a nearby wetland”. Farmers plant maize in *dimba* between July and August and it matures before onset of the main rains in November or December which are currently characterized by **droughts, dry spells or floods**. In this way, *dimba* cultivation acts as a coping strategy against drought and floods.

Despite the potential positive roles of traditional knowledge in local, academic and scientific settings, over the past several decades, the knowledge has been threatened mainly through the concept of modernization generally. With respect to farming, it is promotion of modern agricultural technologies that threaten local farming practices. John Buchanan, back in 1885, considered a local farmer in Malawi from Shire Highlands as ‘dull’ while the colonist was seen as ‘intelligent’. In his words,

It has been said it is of no use an English agriculturist going to the Shire Highlands to teach the natives agriculture. This, in a certain sense, is true; in another sense it is not true. They grow their own crops very well in their own way; but then their way would not suit an English agriculturist, nor be adopted by any **intelligent** colonialist [sic].
(Buchanan, 1885, pp. 146-147)

So, historically, threats to traditional farming practices in Malawi date back to the precolonial period (before 1891) and continued to the colonial (1891-1964) and even post-colonial period (after 1964). During the colonial and pre-colonial periods, the major tool for the modernization of agricultural production was the transfer of science and technology to local farmers with the aim of substituting traditional farming methods with modern approaches (Moyo, 2010, p.101). Colonialists particularly targeted the elimination of traditional farming practices such as slash and burn agriculture because it involved deforestation and burning, leading to soil erosion and species extinction (Buchanan, 1885, pp 147-148). The state intervened in areas of production, extension, technology development, and marketing of agricultural produce to ‘*reform*’ agriculture (Mvula & Mulwafu, 2018, p. 182) from traditional to modern practices.

To summarize, modernization in the agricultural sector was largely forced on the local people of Malawi and many resisted the process. There are still some traces of using ‘*force*’ now in the form of ‘*persuasion*’, in my view. In this new form, the project proponents give inputs and other incentives in return for community support of the new intervention. An example of this new form of ‘*force*’ relates to climate smart agriculture (CSA) which became mainstream in Malawi in 2010 (Stewart , Hajat Zoran, & Asimenye , 2016, p. 18). According to Stewart et al. (2016), of the 900 000 farmers practising CSA only 2.7 % were self-adopters implying that the initial target farmers probably fell into a ‘persuasion trap’ of some kind by project proponents who saw benefits of CSA such as increased yield, improved soil fertility and soil moisture retention based on experiences from other countries. In the Lake Chilwa Basin, CSA resulted

in significant increase in maize yields (750-1 500 kg per hectare to 2 500 kgs per hectare), weed infestation was reduced and soil physical and chemical properties improved. However, as Sagona and Mahonya (2018, p. 116) pointed out, adoption rate was low, and some farmers went back to ridging because they expected input supply from the project proponents which never came. The practice was ‘donor driven’ and in some cases, CSA was also implemented in ‘wrong’ sandy areas, not ideal for CSA. The same ‘persuasion trap’ can be extended to the input subsidy programme which was highly commended for improving the food and income security of vulnerable households in Malawi (Holden & Mangison, 2013, p. 5). The input subsidy programme has gone through three successive phases: Starter Pack Initiative Scheme (SPIS) where all smallholder farmers received free starter fertilizer and hybrid seed of maize and legumes; Targeted Input Programme (TIP) that distributed free agricultural inputs to 1.5 million targeted households and Farm Input Subsidy Programme (FISP) where fertilizer and hybrid maize seeds and legumes were subsidized. All three phases saw high uptake of hybrid seed probably because it was heavily subsidized. The major stumbling block is that the FISP is not self-sustaining and it is also highly donor dependent. Likewise, CSA faces the same predicament of being unsustainable.

Abrahams (2014, p. 45) was of the view that modern agricultural technologies are gaining momentum but with lack of sustainability; we should consider recovering threatened indigenous knowledge systems since this “is seen as crucial in making the transition from victim to survivor, and survivor to revolutionary in the sense of achieving long-term qualitative change”. The perceptions by Abrahams need critical analysis considering that indigenous farming practices are also not immune to challenges. For example, local maize, though resistant to weevils yields lower than hybrid maize (Moyo, 2010, p. xxx).

2.2.1 Individual local farming practices elaborated

2.2.1.1 Local maize cultivation

Maize (*Zea mays* L.) was discovered in Cuba (Latin America) in 1492 by Christopher Columbus, an Italian explorer and colonizer. Christopher brought the maize to Spain from where it spread around the Mediterranean rim before it was introduced to West and East Africa in the 16th Century. This means maize reached Malawi in a matter of few decades. Maize varieties which spread via Europe are called Caribbean flint-type. They are different from the

American dent-type in morphological factors such as plant form and grain texture. Most traditional maize varieties in Malawi belong to Caribbean flint-type (JAICAF, 2008, p. 25).

The maize varieties cultivated in Malawi may be classified into three types: traditional (local/unimproved), hybrid and composite (Holden & Mangisoni, 2013, p. 7). Local varieties are dominant in Malawi (Holden & Mangison, 2013, p. 6) and this is historical. For example, between 1990 and 1997, 73 % of the total arable land was planted with local maize, 27 % was allocated to hybrid while one percent was under composite maize (Smale & Phiri, 1997, p. 13). Most of these varieties are extremely late maturing and are grown in the rainy season (Heisey & Smale, 1995, p. 2). Hybrid varieties give bumper yields but are mostly planted only when the government introduces a support scheme, because of the high seed prices and the need for fertilizers (Holden & Mangisoni, 2013, p. 6). The composite type includes varieties generated by natural crossings between traditional varieties, and commercially available hybrid and synthetic. They are known as open pollinated varieties (OPVs).

Local (unimproved) maize refers to varieties that are not direct products of the research system. This is different from improved maize produced through controlled breeding systems (Heisey & Smale, 1995, p. 2). More often, local maize or ‘maize of the ancestors’ as Heisey and Smale (1995) called it, may be purchased on the market as food grain or acquired through local social networks with other farmers. Since most of the food grain found on the market at planting time is hybrid maize, local farmers may be planting second-generation hybrid seed and calling it ‘maize of the ancestors.’ Furthermore, in areas where adoption rates for improved maize have been higher, extensive areas of contiguous maize plots contribute to cross-pollination and the uncontrolled mixing of varieties lead to local maize, in the mind of a peasant farmer.

Ideally, the term local (*cha makolo*) refers to a maize seed system which is managed and controlled by local farmers. Any maize seed introduced by the extension system is often called *chimanga cha boma* (‘maize of the government’). The period local farmers have cultivated *chimanga cha boma* matters as well in our understanding of the term local maize. For example, when a cultivar has been introduced by the government extension services and the seed has been retained for several seasons, farmers refer to it as *cha makolo* rather than *cha boma*. In this thesis, ‘local maize’ denotes two things: a genetic mixture of traditional varieties maintained by farmers for specific traits that they value, and scientifically bred varieties that have been retained by farmers for at least 30 years.

There are several local cultivars of maize, most of which are identified by grain colour, height, place of origin or growth patterns of cobs. Based on grain colour, R.T. Ellis, Malawi's first maize breeder in the 1950s, identified the following local cultivars: *mkangala* (white), *mtuwa* (white), *kanjerenjere* (white), *kaluluwede* (purple), *chisowa* (spotted purple and red), *mkwela* (red). Other cultivars were identified based on growth patterns of cobs. For example, *mwadzaangati* had branched cobs. With a name based on height, '*kafula*' is an example of a short early maturing variety. The name '*kafula*' has its roots in the '*akafula*', or the bushmen, the short indigenous people of Congo. Based on place of origin, a local variety called Lilongwe is a good example. Local communities in the Lake Chilwa Basin claim this variety originated from Lilongwe, capital city of Malawi and most likely, this variety has another name in Lilongwe. In the 1950s only a few local varieties of maize had been identified; more than 50 have since been identified (Matewele & Singano, 2015, p. 22) based on the same characteristics as above. For example, based on color, *kambinde* and *kadzira* have been described as multi-coloured and bright yellow grains respectively.

Heisey and Smale (1995, p.20) noted that the early local maize cultivars were believed to be early maturing, but farmer selection practices have favoured later maturing ones for reasons that may require further investigation. Some of the early local cultivars are still being cultivated though it is doubtful if they are pure flint types because of uncontrolled cross pollination. In the Lake Chilwa Basin, for example, '*kanjerenjere*' maturing in 60-75 days, is still being cultivated by local communities. The maturity period of 60-75 days is much shorter than maturity period of most hybrids that range from 100-160 days (GoM, 2011, p. 91). Consequently, such local varieties may be promoted as part of a broader agenda to transform local farming practices. Similarly, *mkangala* and *chisowa* varieties are still being cultivated by local communities.

Maize is a historical crop in Malawi based on Buchanan's writings of 1885 (pp. 148-154):

... the crop which the natives on the Shire highlands grow chiefly is *chimanga* – Indian corn. It is grown extensively and thrives luxuriantly. In the Blantyre neighborhood you may see hundreds of acres of maize, 6 to 9 feet high, with beautiful dark-green leaves, each stalk bearing on an average two ears containing three to four hundred grains each. In the month of January, you take a walk through the more thickly populated places, and you see garden upon garden of splendid *chimanga*, an infallible proof that the country is good.

...the natives have been slow in extending the cultivation of this article (rice), and yet have had its beneficial results brought often enough before them; but they prefer their *ugali* (pottage) made from the flour of maize or sorghum to anything and everything else that has come within their reach.

From Buchanan's writing above, maize was widespread in the Shire Highlands of Malawi, cultivated in "hundreds of acres and thrived luxuriantly" and yields were high. Buchanan did not specify this variety of maize, but it was most likely a local or unimproved cultivar since maize breeding programmes started only in 1954 by R.T. Lewis in Malawi (Heisey & Smale, 1995, p. 22).

Smallholder farmers continue to maintain preferences for local as opposed to hybrid maize due to the perceptions that local varieties produce better quality flour, flour-to-grain extraction requires fewer external inputs and they exhibit better pest resistance against weevils in storage.

Compared to hybrids, local communities claim that the *nsima* (thick porridge) made from local maize flour tastes better. *Nsima* from maize is the main staple food for Malawi so much so that national food security is mainly defined in terms of access to maize (MoAFS, 2011). It is for this reason that the intention of most local farmers in Malawi is to 'fill their maize basket', that is, to ensure sufficient production of the staple food maize (Snapp & Fisher, 2014, p. 84). As a staple food crop, maize has been given flowery metaphors such as 'maize is food, food is maize' (Gronemeyer et al., 2015, p. 50), 'maize is life' (Tiba, 2011, p. 1), 'maize sustains life and it is flesh and blood' (McCann, 2001, p. 248). Because of the important role maize plays on ontology of the local farmer, cultivation is expected to continue. However, with threat of drought and dry spells, farmers need to learn new ways of cultivating local maize or look for more drought tolerant maize cultivars.

Multiple cropping

In Malawi, maize is grown as a monoculture or in polyculture system with other crops on the same piece of land at the same time sequentially or simultaneously. Dating back to 1885, Buchanan saw fields in Shire Highlands cultivated with sorghum, beans, potatoes, rice, millet, pumpkins, cucumbers, cassava, and various kinds of *eleusine* (grass family) either as single stands or mixed. He saw '*little mounds*' where peasant farmers sow maize seeds on their sides by '*making two, three or more cuts with a hoe according to the size of the mound, putting in a few grains*' and finally covering the cuts with earth. The other crops, notably, cucumbers were

planted in the centre of the mound '*as a rule*' (Buchanan, 1885, p. 119). Multiple cropping is therefore a historical farming system in Malawi.

Multiple cropping is one of the five sustainable agriculture indicators in Malawi, others being crop diversification, access to seed, farmland size and tools and implements. (Cromwel et al., 2001, p. 7). Closely related terms to multiple cropping are sequential cropping, mixed cropping and intensification. In **sequential cropping**, two or more crops are grown in sequence on the same field per year. The succeeding crop is planted after the preceding one has been harvested. Crop intensification is only in the time dimension and there is no intercrop. Under simultaneous cropping system, two or more crops are cultivated on the same field at the same time. This system is also called mixed cropping. Crop intensification is in both time and space dimensions. There is intercrop competition during all or part of crop growth. Farmers manage more than one crop at a time in the same field.

Studies have shown that where multiple cropping is a common aspect of agro-ecosystem management, productivity generally is more stable and constant in the long term (Gliessman & Garcia, 1981, p. 181). Combined production per unit area is greater with a crop mixture than with an equal area divided among separate crop units. It may be that each crop in the mixture yields slightly less than the monoculture, however, the combined yield of the mixture on less total land area is the important aspect. One of the main advantages of multiple cropping is that it is a risk mitigation strategy against total crop failure due to multiple stressors such as drought, dry spells, pests, diseases and market fluctuations. The system provides farmers with almost all their food requirements from a single field. For example, cassava, mixed with maize, beans and pumpkins, provides the farmers with green vegetables from cassava, pumpkins and bean leaves (Moyo, 2010, p. 235). The system enhances soil fertility through inclusion of legumes which fix nitrogen. Furthermore, since some crops planted are deep rooted and others shallow, there is multi-level soil nutrient usage.

Farmers use their own local knowledge to decide on which crops to mix. They usually chose crop varieties with combined attributes of high marketability, climate adaptability and better yield (Kansiime & Mastenbroek, 2016, p. 225). Women are exceptionally good in deciding which crops to mix and why. As Sachs (2018, p. 6) noted, scientists breed hybrid seeds with little recognition that rural women farmers not only know about a diverse array of seeds but also understand how to adapt them to ecological conditions. Because of these multiple benefits, multiple cropping is expected to continue in the next generations.

Multiple cropping has its own disadvantages too and these include increased competition for plant growth resources; mechanization is near impossible; harvesting and weeding may harm other crops; the system is more complex and less understood agronomically and biologically; there is shortage of trained personnel (technical and scientific) capable of managing multiple cropping systems; general lack of knowledge or understanding of multiple cropping by decision makers affecting funding for research to make such systems viable alternatives; and these systems can facilitate spread of crop pests (e.g. pigeon peas as a source of aphids for maize).

2.2.1.2 Traditional insect pest control measures

The success of maize cultivation in the field and during storage is hampered by an array of pests and diseases among other management challenges. Midega, Murage, Jimmy and Zeyaur (2016, p. 1) noted that among various categories of pests that affect maize, insect pests were major concerns in Sub-Saharan Africa. It is for this reason that most traditional ways of pest control are targeting insects (Mihale, Deng, Selemani, Mugisha-Kamatenesi and Kidukuli, 2009, p. 251). This is also the reason my review of pest control measures is focused on insects. The most notorious insect pests of maize in the field include stalk borer (*Papaipema nebris*), cotton bollworm (*Helicoverpa armigera*), aphids (*Rhopalosiphum maidis*), armyworm (*Pseudaletia unipuncta*), fall army worm (*Spodoptera frugiperda*) and red locusts (*Nomadacris septemfasciata*). During storage, larger grain borers, grain beetles and weevils are major economic pests. There are various factors that complicate management of insect pests. Climate change and environmental degradation have recently been the major factors in Malawi generally and specifically in the Lake Chilwa Basin (Chilima, Soko, Pemba and Phiri, 2018, p. 182).

Traditional control practices are the major means of insect pest management for small-scale farmers in Africa (Abate, van Huis & Ampofo, 2000, p. 645). These practices consist mainly of cultural control methods such as crop associations, planting and harvesting time; crop rotations; uprooting affected plants; physically killing; application of ash, soil or powder in maize whorl to suffocate stem borers. (Abate et al., 2000, p. 645); use of herbal products such as blue gum, tobacco, neem red pepper, and *Tephrosiavogelii* powder (Grzywacz, Stevenson, Mushobozi & Wilson, 2014, p. 75); lime application to control weevils (Morales & Ivette, 2000, p. 55). The ash that farmers apply may be general ash or specific plant or animal product ash. In some cases, farmers use a mixture of crushed grasshoppers and water that has stayed

overnight to control grasshoppers in vegetables. The logic behind this is: “once the vegetables are sprayed with this mixture, they will smell like the grasshoppers and that will prevent the grasshoppers from eating the vegetables because they will feel like they are eating themselves” (Kayira, 2013, p. 172).

Mihale et al. (2009, p. 254) have given a comprehensive analysis of traditional plant based formulations to control insect pests in Tanzania (see Table 2-2). Sometimes, insect pests are dealt with in a supernatural way.

Table 2-2: Plant and animal products used to prepare organic pesticide formulations to control field pests

Name (English, Swahili) of the plant and/or product used (Scientific name in brackets)	Mode of preparation and application
Neem, Mwarobaini leaves or seeds mixed with soft rice husks	The seeds or leaves of neem are ground and soaked in a liter of water for one day. Thereafter the mixture is filtered. The filtrate is applied by spraying on crops in the field. In most cases this formulation is intended for maize and/ or rice.
Red pepper mixed with tobacco leaves	A handful of red pepper fruits are ground and mixed with a cup of ground tobacco (<i>Nicotiana tabasum</i>) leaves. The mixture is then soaked in five litres of water and left for two days and then filtered. The filtrate is sprayed as an aqueous solution to crops at a rate of two litres per acre.
Red pepper and tobacco mixed with neem leaves	The fruits of red pepper and leaves of tobacco and neem are grinded separately and soaked in water in a container. After some days, the mixture is filtered and sprayed on cotton and maize.
Tobacco leaves mixed with tamarind (<i>Tamarindusindica</i>) fruits	The tobacco leaves and <i>Tamarindus</i> fruits are soaked in water for some time. Then the mixture is filtered and applied by knapsack spraying to cotton at a rate of 20 litres per acre.
<i>Utupa</i> in Kiswahili (<i>Tephrosiavogelii</i>)	The plant (15 g) is ground and soaked in a liter of water for a given time. The resulting mixture is then filtered, and the filtrate is sprayed to crops such as tomatoes, cotton and watermelon.
<i>Malumba</i> in Kiswahili (<i>Chenopodium opulifolium</i>)	The whole shrub is collected and soaked in water for a given time followed by decantation. The clear solution obtained is then sprayed to finger millet and maize at a rate of 20 litres per acre.
Cow urine and detergent soap mixed with neem leaves	Neem leaves (ca 200 g) are ground and put in a 20 litre container. In it about 50g of a detergent (clearly stated as OMO®) and cow urine (5 litres) are added. The mixture is then kept undisturbed for four days before

	filtration. Once filtered, the filtrate is sprayed to a variety of crops in the field.
Neem leaves mixed with cow dung	The neem leaves and cow dung are soaked in water in one container and stored for two days. Then the mixture is filtered, and the resulting solution is sprayed to cotton at a rate of ten litres per acre.
Neem leaves mixed with tobacco powder	The leaves of neem and powder from tobacco leaves are soaked in water and boiled for some time. After that, the mixture is filtered and kept for three days before being used. After the time, the solution can be applied by spraying to crops.
Neem leaves mixed with cow urine	The neem leaves are taken, ground, soaked in water and filtered to prepare about five litres of neem extract. The extract is then mixed thoroughly with cow urine (1 litre). The resulting solution is later applied to maize in the field at a rate of 1.5 litres per acre.
<i>Mjohoro</i> in Kiswahili (<i>Senna siamea</i>)	A handful of <i>Senna siamea</i> roots are soaked in a litre of water for three days until the colour of the solution becomes green. The solution is later decanted and applied to crops at a rate of one litre per acre.
Cow dung mixed with general ash	Ash originating from any source and cow dung are soaked in water in a container and left for some time. Then the mixture is filtered, and the filtrate is diluted in the ratio of 1:2. The diluted solution is then sprayed to any plant.
Rice husks mixed with tobacco powder	Ash from rice husks and tobacco powder are soaked in water for a period of time. The resulting solution is sprayed on grains without filtering.
<i>Mtumbatu</i> in Kiswahili (<i>Ocimum suave</i>)	The leaves of the plant are used with no further treatment. The leaves are simply arranged in layers in a bag of millet, maize or legume. One or more layers can be arranged in one bag.
Eucalyptus (<i>Eucalyptus spp</i>)	Leaves of Eucalyptus are taken, air dried and ground, and the resulting powder is mixed with the grains before or after packing in bags.
Cow dung	Cow dung here was prepared in two ways: soaked in water and made into paste or burnt into ash. When made into paste, it is used to plaster storage containers as a way of preventing pest entry. When made into ash, it is mixed with the grains before packed into bags.
Neem leaves	The leaves are taken, air dried and ground. The resulting powder is thoroughly mixed with the grains before or after packing.
General or rice husks ash	Any plant parts, whole plant, or plant and animal products (general) or rice husks are burnt into ashes. After cooling, the ash is collected ready for use. During storage, the ash is put in a bag of grains (maize, millet, legumes) in layers or mixed with the grains and then packed in bags.

Source: Mihale et al. (2009)

There is evidence that traditional insect pest control measures have been successful in some countries. For example, in the highlands of Guatemala, traditional farmers face few pest problems, and this is attributed to cultural practices used for centuries by Mayan farmers (Morales & Perfecto, 2000, p. 50). In Tanzania, Mihale et al. (2009, p. 254) reported that about 49% of the farmers interviewed said that indigenous control methods were effective, working like synthetic pesticides. Traditional practices could therefore present sustainable cost-effective alternatives to the use of pesticides in the agriculture sector.

The use of traditional insect pest control measures, like all other IKS, is generally neglected by Western science. However, since 2010, there have been attempts by crop scientists to scale up the use and exploitation of wild insecticidal plants after carefully analyzing their chemistry and efficacy. On a sad note, most traditional control measures still await further research and investigation before they can be widely recommended for use. For example, for control of fall armyworms, Prasanna, Huesing and Peschke (2018, p. 99) advised further research on application of sugar water to maize foliage and placement of ash/sand/soil/chili powder in maize whorls by farmer. In fact, the excuse for not recommending use of most traditional farming practices is that they have not yet been validated and this may go on and on, in my view.

Despite their potential role in controlling insect pests, detailed information on traditional pest management practices widely used by African farmers is often lacking. Generally, traditional insect pest control measures are poorly understood even among local communities themselves (Abate et al., 2000, p. 642).

Traditional crop insect pest control measures represent hundreds of years of adaptive evolution (Abate et al., 2000. p. 643). As insect pest outbreaks are becoming more problematic due to several factors including pesticide resistance, frequent drought and dry spells, farmers are also experimenting and learning new ways. In Malawi, some local communities have resorted to use of boom washing powder which they dissolve and apply to maize seed before sowing to prevent attacks from soil pests; some have tried to apply a soup of boiled dried fish to maize whorls to attract ants expecting that they would eventually attack stem borers including fall armyworms (personal observation). Local farmers are expected to continue using and modifying insect pest control measures because they are easily accessible, cheaper and generally more environmentally friendly than manufactured insecticides.

2.2.1.3 *Slash and burn practices (mphanje)*

Slash and burn agriculture (*mphanje*) or rotational bush fallow agriculture refer to any temporal and spatially cyclical agricultural system that involves clearing of land (usually with the assistance of fire) followed by phases of cultivation and fallow periods. A **fallow** period is a phase when a piece of land is left uncultivated for some years to allow native vegetation to regenerate to improve the physical properties of the soil and capture nutrients from deeper layers of the soil. When local farmers **shift**, they are essentially opening a new garden. Slash and burn agriculture is a form of shifting cultivation (Nath, Brahma, Lal, & Das, 2016, p. 1).

Practised as early as 10 000 BC, slash and burn is the most complex and highly diverse land use system of agriculture in the world (Spencer, 1966, p. 28). It has been practised in a wide range of ecosystems from montane to lowland ecosystems, and from tropical forests to grasslands (ibid.). Slash and burn have generally been regarded by western society as a destructive system of agriculture because it may lead to drought and soil erosion. Typical descriptions of those practising slash and burn are ‘savages’, ‘backwards’, ‘ignorant’, ‘stubborn’, ‘childlike’, or ‘aggressive’ pagans; or ‘infidels’ (Thrupp, Hecht & Browder, 1997, p. 9 quoting Hecht, 1993).

British explorers such as Sir Walter Raleigh thought that “indolent local populations” in areas being colonized needed the “guiding hand of civilization” (sic) to alter their natural resources into prolific enterprises (Thrupp et al., 1997 p. 9 quoting Stanley, 1899). In Malawi, Buchanan who visited Shire Highlands in 1885 castigated a man who “proceeds to the bush, cut out smaller trees with his axe but left very large trees **not because of any ideas he may have as to the effect on the landscape** but on account of hard work labour for he never leaves a fine truck standing within his powers of hewing down” (Buchanan, 1885, pp. 118-119). Though the majority of the 19th century explorers ridiculed slash and burn agriculture, others like Brian Morris (2016, p.68) were neutral. In his own writing, Morris expressed his neutrality to slash and burn as follows:

... But as MacDonald concluded, this method of manuring the ground by burning trees on it makes sad havoc of the beautiful woods. It is important to note, of course that the trees were essentially coppiced and that allowed for quick regeneration of *Brachystegia* woodland when the garden was abandoned.

Morris also seemed to respect peasant farmers saying, “I see that they know more about it (agriculture) than I do” (Morris, 2016, p. 71).

Below, I describe main features of slash and burn agriculture site selection and planting. I also explain myths and realities of the practice.

a. Main features of slash and burn

As stated in section 2.2.1.3, slash and burn agriculture is a cyclic farming system. The specific stages and features of each cycle vary according to an ecosystem type. However, the features are sometimes difficult to distinguish across various ecosystem types. In woodland and montane forms of slash and burn, which is the case in Malawi, the cycle is often comprised of six stages: site-selection and clearing, burning, planting, weeding, harvesting and succession. This is the form that I will review in my study.

b. Site selection and burning

In Malawi, historically, it used to be a man who selected a piece of land. The man, according to Buchanan (1885, pp 118-119) noted that “early in the dry season when grass has reached maturity, but still unburnt, a man proceeds to the bush and selects a piece of ground and puts his mark upon it either by ‘blazing’ a few trees or cutting a few tufts of grass”. His next move after cutting down trees was “to lop off the branches and cut them up into portable sections when they are piled together in heaps and having lain until they are sufficiently dry, they are set on fire”.

Burning is the typical method of clearing land by slash and burn farmers. Burning is done in two ways: open or closed. In open burning, slash and burn farmers systematically heap tree branches and grasses. After the end of two to three months of hot sunshine in the dry season, the farmers are sure vegetation they had cut is dry enough and they set fire to it. Burning is done on a calm hot day to create ideal conditions essential for the process (Moyo, 2010, p.168). Another approach is that reported by Buchanan (1885, p 119) where cleared vegetation is “covered with earth and what rubbish of weeds and dirt” and then burnt just before rains come and this is a closed burning system. Buchanan says the burning was slow, “smoldering for days or even weeks”.

The process of burning has pros and cons to the environment. In terms of benefits, Thrupp et al. (1997, p.7) identified five beneficial effects, all of which contribute to increased food production: reduced weed and insect pest infestations; alteration of soil structure to make

planting easier; decrease in soil acidity; sterilization of soil and reduction of microbial pathogens; and, reduction of labour requirements compared with other forms of clearing. Burning is harmful to the environment because the fire may kill useful plants and soil organisms. The open burning may increase concentration of carbon dioxide in the atmosphere, a gas widely blamed for causing global warming (IPCC, 2014, p. 62).

c. Planting

After the vegetation is cleared and burnt, farmers practising slash and burn make mounds or ridges, or they may scratch the soil lightly. For the mounds or ridges, the first crop was usually maize in the Shire Highlands (Buchanan, 1885, p. 119). In the northern region of Malawi, where the soil is minimally tilled after burning, the first crop was usually millet sown through broadcasting. In addition to the main crops of maize and millet, farmers also planted other crops such as beans and pumpkins on the ash. For pumpkins, there is a general perception that ash improves the taste of the crop, a typical quality aspect associated with potassium from ash (Moyo, 2010, p. 179).

d. Myths and realities of slash and burn practice

As pointed out in section 2.2.1.3, slash and burn has been labelled as a bad farming practice over the years. All the advantages seem to be masked and the practice is not viewed positively by modern agricultural discourse. Slash and burn farmers have been blamed for most of the world's tropical deforestation, land degradation, and climate disruption. Governments have set up antagonistic laws and policies to discourage slash and burn practices with the aim of replacing the system with new forms of farming considered to be more modern. Researchers also believe that modern agriculture always means agriculture that is settled, intensive, and makes use of monocultures and Western technologies. They have overlooked opportunities to learn from, use, and improve some of the effective features of slash and burn practices (Brookfield & Padoch, 1994, p. 37). For Thrupp et al. (1997, pp. 9-27), proponents of modern agricultural practices are myopic, missing the realities of slash and burn practices. A summary of myths and realities of slash and burn by Thrupp et al. (1997, pp. 9-27) is presented in the table that follows.

Table 2-3: Myths and realities of slash and burn agriculture

Myth	Reality
Slash and burn is a primitive precursor to more commercial ('modern') forms of production in the theoretical stages of agricultural development.	Slash and burn respond to agroecological and socioeconomic factors in dynamic, nonlinear ways.
Slash and burn systems in tropical rainforests are uniform and unchanging, and those practising are homogeneous poor peoples.	Slash and burn systems encompass a remarkably diverse range of land use practices developed and changed over time by farmers in varied social, ecological, economic, and political settings.
Slash and burn is the sole activity among rural subsistence farmers in forest margins and is unconnected to commercial market activities.	Slash and burn farmers engage in a wide variety of activities in subsistence and cash economies and often merge subsistence production with commercial surplus-oriented production.
Slash and burn is always characterized by low productivity and low yields and can support only low population densities.	Slash and burn systems are often productive, make relatively efficient use of resources, and have supported large populations.
Slash and burn systems are environmentally destructive, wasteful, unsustainable, and cause most of the tropical deforestation and soil erosion.	Slash and burn systems are not responsible for most of the deforestation or land degradation, and they have varying and complex environmental impacts, some of which may be sustainable and enhance biodiversity.
Slash and burn farmers usually use primitive, low levels of technology, have limited knowledge about agriculture and the environment, and rarely adopt new technologies.	Techniques used in Slash and burn systems are generally appropriate for their agroecological contexts (although not 'modern'), and cultivators often have complex and useful knowledge about resources, land use, and surrounding environment
Slash and burn systems exist in empty, open-access forests without any form of legal rights or controls, thereby necessitating state and private control for management.	Slash and burn cultures embrace a variety of tenure regimes that mediate access, use, and transfer of resources, including informal community-based, household, and individual rights that overlap with state authority.
State and international agencies use interventions and policies to bring about beneficial agricultural and environmental changes affecting the practice of slash and burn	Mainstream programmes and policies influencing Slash and burn farmers are biased and not neutral; they have often been unilaterally designed to stop, alter, or replace slash and burn agriculture or introduce land use practices that may not be appropriate for or desired by local people.

Source: Thrupp et al. (1997)

It is worth noting that as a form of crop rotation, Slash and burn practice was a viable form of agriculture in Malawi back in 1885, but it was only possible with a low population density and extensive tracks of *Brachystegia* woodland, otherwise it would 'have to be changed' (Buchanan, 1885, p. 117). Based on a study by Ricker-Gilberta, Jumbeo and Chamberlinca, (2014, p. 125) who found that higher population sizes are associated with smaller landholdings in Malawi, slash and burn practice is no longer possible in Malawi with a population of 17.5 million, four times higher than it was in the 1890s. There is nowhere to 'slash and burn' and thus there is no future for the practice in Malawi.

2.2.1.3 Traditional soil fertility improvement techniques

Soil nutrients are a vital component of crop production in Africa and beyond. For optimum plant growth, these nutrients must be available in sufficient balanced quantities. Soils contain natural reserves of plant nutrients; however, the reserves are mostly in forms unavailable for plant use unless they undergo biological processes to release them as organic fertilizers. The natural systems have been disturbed due to rapid expansion of extractive commercial farming compounded by increasing human populations. They are no longer able to supply organic fertilizers as required and this has led to an increase in the use of chemical fertilizers.

Both organic and chemical fertilizers have advantages and disadvantages. For example, chemical fertilizers quickly release nutrients after application thereby promoting fast growth. They are also high in nutrient content; therefore, only relatively small amounts are required for crop growth. However, over-application has negative consequences such as pollution of water resources, destruction of micro-organisms and 'friendly' insects, increased crop susceptibility to disease attack, acidification or alkalization of the soil (Chen, 2006, pp. 2-3). Most of the advantages of chemical fertilizers are also disadvantages of organic fertilizers and vice versa (ibid., 2006). For instance, while chemical fertilizers are high in soluble nutrients, organic fertilizers are comparatively low, so larger volumes are needed to provide enough nutrients for crop growth. Organic fertilizers improve soil water retention, promote soil aggregates and buffer the soil against acidity, alkalinity, salinity, pesticides and toxic heavy metals while chemical fertilizers have the opposite effects.

Traditionally, farmers have used their own ways of assessing soil fertility status. Their assessments help them decide on soil fertility improvement techniques using chemical fertilizers, organic fertilizers or biofertilizers. Local communities use a combination of factors

to detect soil fertility including soil colour, presence of soil organisms, topography, crop leaf colouration and general plant growth patterns in a particular soil (Barrios, Delve, Bekunda, Mowo, Agunda, Ramisch, Tryo and Thomas (2006, p. 253). For example, dark coloured soils are considered more fertile than the red *katondo* soils. Wetland soils are considered more fertile than upland soils. Farmers are aware that soil nutrients flow from upland to lowland areas where they accumulate due to soil erosion. Deep green colour in leaves is regarded as a sign of adequate soil nutrients. Soil making up ant hills is more fertile than that of the surrounding area (Dawoe, Quashie-Sam, Isaac, & Oppong, 2012, pp. 97-98).

In the earlier two sections of this chapter, I briefly touched on multiple cropping and slash and burn agriculture as some of the traditional soil fertility improvement approaches. I now discuss two other common practices namely *kuojeka* (plant residue incorporation) and livestock manure application in a greater detail.

2.2.1.4 Crop residue incorporation (*kuojeka*)

The process of plant residue incorporation has different local expressions according to the prevailing language. In Malawi, it is commonly called *kuojeka* and involves gathering crop residue and any weeds in the furrows and covering them with a bit of soil. *Kuojeka* commences immediately after harvest when the crop residue and weeds are still fresh to optimize their decomposition. Generally, residue decay rates are slower at the surface under conservation practices (e.g. Conservation Agriculture) than when incorporated in the soil under conventional tillage (Lemtiri, Degruene, Barbieux, Marie-Pierre, Chélin, Parvin, Vandenbol, Francis & Colinet, 2016, p.241) Many farmers in Malawi practise *kuojeka* and ridging at the same time to save labour and the process is called *kuwunga* – this also needs to be done well before sowing to enhance decomposition. If done late, the result will be partial decomposition of vegetation matter which often attracts termites that eventually attack crops. Besides enriching the soil with plant nutrients, plant residue incorporation has other benefits: improvement in soil aggregate stability and provision of nutrient sources for soil biota such as bacteria and earthworms which are important in maintaining soil ecosystem functioning and sustainability (Eldor, 2014, p. 112 & 137).

An alternative term for *kuojeka* in Malawi is *kukhusa* which involves clearing the land usually with a hoe, gathering the residue and weeds in lines and then burning them when they are sufficiently dry (Luca, Costamagna, Zavattaro, Grignani & Bijttebier, 2015, p. 182). This

method is fast for clearing the field but destructive to the environment because it involves burning as in slash and burn agriculture. Farmers also choose this method when labour is not available earlier in the season and when it is too late to do the *kuojeka*. They also want to avoid any risks associated with incomplete decomposition of vegetative matter such as termite attacks and weed infestation (ibid., p. 182)

Crop residue in southern Africa is largely derived from maize which is the main food crop accounting for 50–90 % of the population's calorific intake (Rusinamhondzia, Corbeelsa & Giller, 2016, p. 80). At farm level, there will always be competing usage of maize crop residues and this may result in poor nutrient cycling efficiencies. Duncana, Bachewe, Mekonnen, Valbuena, Rachierd, Lule, Bahtaf and Erenstein (2016, p. 106) and Castellanos-Navarrete, Tiftonell, Rufino and Giller (2015, p. 28) conducting their research in Kenya found that at their study sites, over 70 % of maize residue was fed to livestock. Even with residue from other crops like legumes, farmers are faced with a dilemma as to whether to incorporate this into the soil or feed it to livestock. The tendency is usually to feed livestock. As Castellanos-Navarrete et al. (2015, p. 28) noted, the small amount of legume crop residue available (i.e., beans, cowpeas or groundnuts intercropped with maize) was mostly fed to cattle or added to stored manure with only tiny quantities left on the fields at their study site in Kenya.

Another source of conflict is between conservation agriculture (CA) and conventional farming. Conservation agriculture, especially the principle of maintaining permanent soil cover and promoting minimal mechanical disturbance of soil through zero tillage systems, is a strong contradiction to crop residue incorporation usually done with a hoe and occasionally a plough. In other words, zero tillage does not exist under crop residue incorporation practices. CA also competes with livestock feeding using crop residues (Sagona & Mahonya, 2018, p. 118).

The use of crop residues depends on four major interacting factors: farmers' preferences; crop production levels; access to alternative biomass resources and biomass demand (Erenstein, Samaddat, Teufels & Michael, 2011, pp 693-694). Farmers' decisions on crop residue use reflect their own needs and preferences, such as to burn or feed livestock. Crop production levels principally determine the amount of crop residue available for the household in a growing season. For example, a farmer who grew and obtained high yields from hybrid maize will have more crop residue than a farmer cultivating local maize. Access to alternative biomass resources determines the opportunity costs for a household to sell, use or replace crop residue.

For instance, access to communal lands reduces a household's need to collect and use crop residue as livestock feed or fuel (Valbuena, Homann-Kee, Erenstein, Teufel, Duncan, Abdoulaye, Swain, Mekonnen, Germaine & Gérard, 2015, p. 108). Finally, biomass demand depends on household needs such as livestock feed, cash, fuel, construction materials and soil fertility.

An important driver of consumption patterns in the African context is climate change which has cascading effects on virtually all livelihood sectors including agriculture (crop and livestock production), water resources, gender, forestry and fisheries as pointed out in section 1.8.1.2. Between crops and livestock, it is the former that are more vulnerable to climate change extremes notably drought and dry spells. Therefore, those farmers growing crops and keeping livestock are likely to continue feeding their livestock with crop residue as a safety measure against extreme weather events.

2.2.1.4 Livestock manure

Livestock plays an important role in stabilizing farming systems by providing manure (Alvåsen, 2007, p. 6) which is a valuable resource and can be used as a supplement to replace inorganic fertilizers. Livestock manure may also be used as fuel and as a building material (Jahnke, 1982, p. 31). Compared to inorganic fertilizers, livestock manure is cheaper and therefore ideal for low income local communities. Livestock manure contains a high level of nutrients such as nitrogen, phosphorus, potassium, and micronutrients. The manure also contains organic matter that improves the physical properties of soil such as porosity, soil structure, water infiltration rate, and moisture retention capacity (ibid.)

Livestock manure should be well managed to optimise its use. Management aspects include proper storage to avoid loss of valuable nutrients, determination of where, how much and when to apply. Any mismanagement may lead to negative effects on the environment. If, for example, the manure is poorly stored or faultily spread on agricultural land, it can cause environmental pollution problems (e.g. air pollution and water pollution) and may also cause problems with flies and odours. Livestock manure is bulky and its nutritive value is low (Zafari & Kianmehr, 2012, p. 78). Therefore, researchers like Jahnke (1982, p. 32) have suggested that it should be mixed with doses of chemical fertilizer.

An important aspect to consider is future usage of livestock manure in Malawi. Farmers are expected to continue applying livestock manure to their farms to promote crop growth.

However, there is a need to address current threats to livestock production, notably disease and parasite outbreaks, increasing human population and general environmental degradation. With increasing magnitude and frequency of extreme weather events in Malawi, climate change is also emerging as a major threat to livestock production in Malawi.

There are several ways in which climate change will affect livestock production in Malawi and these include: changes in the productivity of grazing areas and yields of feed crops such as maize; heat stress which directly impairs animal health and welfare; shifts in geographical areas of vector-borne diseases such as trypanosomiasis (Thornton, 2010, p. 2854 & 2861). Increasing human population will increase fragmentation of grazing lands in many places, thus making it more and more difficult for livestock owners to gain access to the feed and water resources they have traditionally been able to access. There will be increased urbanization, travelling and migration of people for trade and other livelihood needs and this will promote the spread of livestock infectious diseases into new populations (ibid., p. 2854).

2.2.1.5 Traditional weather forecasts

Human beings have attempted to predict the weather informally for millennia, and formally since at least the nineteenth century. Weather related predictions by the local community are called ‘weatherlore’ (David, 2011, p. 9). This ‘weatherlore’ is based on the experience of local communities and trained weather observers. Like all other forms of traditional knowledge systems, weatherlore is passed on intergenerationally from ancestors and this is consistent with scientific observations that it has been a human desire for millennia to make accurate weather predictions (ibid.).

In sub-Saharan Africa local farmers have developed several weather predictive and adaptation measures that have enabled them reduce vulnerability to climate variability and extremes. One important step in reducing this vulnerability is the development of an early warning system for the prediction or forecast of extreme weather events, notably drought and floods which have become common weather-related disasters in most African countries (Ajani, Mgbenka & Okeke, 2013, p. 25). The farmers in Africa have traditionally used early warning systems to understand weather and climate patterns and make decisions about disaster risk management strategies. They have used the forecasts (see Table 2-4) to guide farm level decisions including selection of appropriate tillage systems, crop varieties, planting dates and gauging potential markets and trends (Kalanda-Joshua, Ngongondo & Chipeta, 2011, p. 996).

Mapfumo, Mtambanengwe and Chikowo (2016), conducting their research in Zimbabwe, summarized the role of weather forecasts in decision making by the local farmer into three categories: strategic (medium-long term; ≥ 2 years), tactical (seasonal) and operational (within season). For their study sites, strategic decisions were made on how to allocate land resources (e.g. towards planting of fruit trees which require different weather elements compared to arable crops); how to manage food stocks and livestock; and how to participate in trade and resource-sharing arrangements. Tactical decisions were made on choices of crop types and varieties to grow in each season, timing of planting, how to secure and allocate nutrient resources. Operational decisions included activities like replanting, pest and disease control interventions. In Northern Ghana when droughts were predicted, an operational decision by farmers was to remove weeds to prevent competition for moisture between the crop and unwanted weeds during a dry period. Some farmers, however, decided not to weed because they believed that weeding exposes the plants and soil to heat, and thus the available moisture evaporates (Ngwese et al., 2018, p. 8).

Abundant literature shows that African farmers have been using various local weather indicators such as plants, animals, insects, the solar system and wind in predicting the seasonal climate (Elia, Mutula & Stilwell 2014, p.19). These indicators are usually used in combination (Mahoo, Mbungu, Yonah, Recha, Radeny, Kimeli and Kinyangi, 2015, p. 18); they may also be used singly though accuracy may be compromised. Examples of indicator combinations are the presence of several ants searching for food coupled with hot conditions signaling that rains are coming within the next two to three months according to local people's experiences learnt over time in Tanzania (Elia et al., 2014, p. 19). When grasshoppers are seen aplenty and ground hornbill birds makes frequent vocal sounds, this signals impending drought (ibid.). For floods, examples of indicator combinations are snails and hippopotamus moving out of water to higher ground and the presence of several species and quantities of mushrooms. Chiotha, Phalira and Gibson (2011, pp. 9-20) working in Nsanje and Chikwawa Districts of Malawi summarized some of the common indicators as presented in Table 2-4.

Table 2-4: Examples of signals used to forecast weather by farmers in Chikwawa and Nsanje Districts of Malawi

Signal	Indigenous Explanation
Prevalence of northerly winds	Good rainfall
Prevalence of southerly winds	Poor or no rainfall at all
Very windy just before or during rainy season	Poor or no rainfall at all
Very cold just before or during rainy season	No rain
Hot weather just before or during rainy season	Onset of rain
Moon with concentric rings	Good rainfall
Eclipse of the moon or sun	Good rainfall
Lots of mango flowers	Drought
When pangolins are sighted frequently	Drought
When pythons are sighted “belly up”	Drought
Bushbuck, common duiker, monkeys, hares running from the wild into villages	Drought
Several ants searching for food	Onset of rain
An increased number of hippopotamus coming out of water bodies and into villages at night	Flood
Frogs making noise	Onset of rain
Millipedes seen in abundance	Good rainfall
Frequent sightings and vocal sound of ground hornbill	Drought
Lots of mushrooms	Flood
Snails move out of water to higher ground	Flood
Grasshoppers (locust) seen aplenty	Drought

It appears farmers will continue using traditional weather forecasts in Malawi. In fact, several studies (e.g. Moyo, 2010; Chiotha et al., 2011; Kalanda-Joshua et al., 2011; Mphepo et al., 2011, Elia et al., 2014; Mapfungo et al., 2016) have revealed that farmers put more trust in their traditional ways of weather forecasting than modern methods. There are five possible reasons for this. Firstly, forecasts by meteorological services normally use climate regions as the lowest spatial scale, with different predictions for each region without giving concise information on local climatic variations. Secondly, the large temporal scales by the meteorological services

are awkward because they give the prediction for the total rainfall over several months, not usually stating when during that time the rainfall is likely to occur, yet this is crucial information for the farmer. Thirdly, there is an apparent lack of a credible communication procedure of the forecasts to peasant farmers. Fourthly, forecasts by the Meteorological Services are too scientific and technical further complicating weather information utility by peasant farmers (Kalanda-Joshua et al., 2011, p. 997). Fifthly, to date, modern science has not come up with a conclusive stance for or against the claims of indigenous weather forecasting (Aya, Desta, Gebru, Kinyangi, Recha & Radeny, 2015, p. 10). Therefore, even contemporary or scientifically trained forecasters do not have facts to convince communities that modern forecasting methods are superior to traditional means.

Although use of traditional weather forecasts is likely to continue, their reliability is at stake since they largely depend on biotic species, most of which are threatened by overexploitation, habitat loss and climate change. This could be a likely reason recent studies have grown increasingly pessimistic about the viability of these traditional weather forecasting mechanisms. The expansion of modern education is another factor marginalizing the claimed rationality of indigenous knowledge (Aya et al., 2015, p. 10). Modern education largely ignores traditional weather forecasts in the curriculum. The survival of indigenous weather forecasting skills is further undermined by poverty, lack of clear knowledge transfer mechanisms and poor documentation (ibid.).

2.2.2 Options to address threats to local farming practices

Since all local farming practices that I have reviewed in this chapter are threatened in one way or another, there will be need for innovative solutions including transgressive and transformative approaches with learning and re-learning leading the way. Already, in the case of livestock manure, some local farmers in Malawi have recently (in the past ten years) learnt and started using alternatives such as human excreta (Kumwenda, Kadewa, Ngwira & Morse, 2014, p. 7). Below I discuss ‘informal learning in Malawi’ with a focus on policies and strategies by the Malawi Government. Informal learning, as pointed out in section 1.7.2.6, can be transformative. Therefore, it is important to address the local farming threats that I have discussed above.

2.3 Review of informal learning studies in Southern Africa and beyond

Though not explicitly mentioning informal learning, some studies have been done in Southern Africa which mention this learning approach. A common question among these studies was ‘*How do actors learn?*’ and not ‘*How can informal learning potentially bring transformative change?*’ which was a focus in my study. The following are examples of such studies with elements of informal learning: Baloi (2017) ‘Exploring transformative social learning and sustainability in community-based irrigation scheme contexts in Mozambique’; Jalasi (2018) ‘Investigating and expanding learning across activity system boundaries in improved cook stove innovation diffusion and adoption in Malawi’; Kachilonda (2014) ‘Investigating and expanding learning in co-management of fisheries resources to inform extension training;’ Masara (2010) ‘Learning commercial beekeeping: Two cases of social learning in southern African community natural resources management contexts’; Moyo (2010) ‘The use and role of indigenous knowledge in small-scale agricultural systems in Africa: The case of farmers in northern Malawi’, Mukute (2010) ‘Exploring and expanding learning processes in sustainable agriculture workplace contexts’ and Pesanayi (2018) ‘Boundary-crossing learning in agricultural learning systems: Formative interventions for water and seed provision in southern Africa.

From these studies, several informal learning approaches were identified (Table 2-5).

Table 2-5: Informal learning pathways

Pathway	Investigator who identified it in his/her study						
	Baloi (2017)	Jalasi (2018)	Kachilonda (2014)	Masara (2010)	Moyo (2010)	Mukute (2010)	Pesanayi (2019)
Demonstration	√	√	√	√	√	√	√
Training	√	√	√	√	√	√	√
Practice	√	√	√	√	√	√	√
Meeting/workshop	√	√	√	√	√	√	√
Open day	X	√	X	X	X	X	√
Roadside shows	X	√	X	X	X	X	X
Observation	√	√	√	√	√	√	√
Question and answer session		√	X	X	X	√	X
Learning visits	√	X	√	X	√	√	√

Peers/more experienced others	√	√	√	√	√	√	√
Websites	X	√	X	X	X	X	√
Inheritance or spiritual calling ¹	X	X	X	√	X	X	X
Experimenting	√	√	√	√	√	√	√
Stories of change	X	X	X	√	X	√	√
Social networks	X	X	X	√	X	X	√
Reading (e.g. books, manuals and posters)	X	√	√	X	√	√	√
Radio	X	X	√	X	X	√	√
TV	X	X	√	X	X	X	X
WhatsApp social media	X	X	X	X	X	X	√

Key: √ = that informal learning pathway was identified and X = pathway not identified

¹Masara (2010, p. 99) identified ‘a unique learning process’ in Buhera, which he called “learning through inheritance or as a calling by ancestors”. At this study site, some people were motivated to learn beekeeping as they believed the practice had run in their family to the extent that a family might have been given a name such as *Dzere* (Honey Badger). The name was an indication of a family’s superiority in beekeeping, and this was a motivation for learning.

According to Table 2-5, the most common informal learning pathways identified by the seven investigators are training, demonstration, practice, meetings/workshops, simple experiments, observation, peers/more experienced others. The least common pathways were inheritance or spiritual calling, storytelling and use of WhatsApp.

2.4 Informal Learning in Malawi

Currently, there is no evidence that the Government of Malawi has developed policy and strategic frameworks specifically on informal learning. However, within existing frameworks, informal learning is mentioned as discussed in the next paragraphs.

In 1983, the first environmental education conference was convened in Malawi to discuss pathways for development communication (Tsirizeni, Chiotha, Mphepo, Likongwe, Daniels, Gillick and Kankuzi, 2018, p. 245). Development communication supports sustainable change by engaging key stakeholders. It establishes conducive environments by assessing risks and

opportunities, then disseminates information for behaviour and social change (Mefalopulos, 2008, p. 5).

An important outcome of the 1983 conference was the documentation of strategies to reach out to the general public on several issues including environment and climate change using available communication channels. The conference also suggested and agreed that community outreach programmes should include **informal education**, defined by the GoM (1996, p. 9) as “education that is acquired in passing, through conversations, storytelling, songs, news and personal experience over years”. Informal education is therefore synonymous with informal learning, already defined in section 1.7.2.6 as an “activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies” (Ostrouch-Kamin’ska & Vieira, 2015, p. 4; citing Livingstone, 1999).

2.4.1 Informal learning as implied in national policy frameworks and strategies for Malawi

Following the first environmental education conference in Malawi in 1983, various policies and strategies have been developed mostly for formal and non-formal education settings. These policies address some aspects of informal learning. Presented below are some of these policies and strategies.

2.4.1.1 National Environmental Education and Communication (EE&C) Strategy: 1996-1999

The National Environmental Education and Communication Strategy was developed “to provide a common vision for EE&C and a framework for action which will ensure the fullest possible participation by all sectors and levels of the community” (GoM, p. 11). It was also meant to enhance ongoing efforts in environmental education and resource management and provide an indication of EE&C priorities which need to be addressed. The strategy recognizes three forms of education: formal, non-formal and informal. The strategy outlines 12 approaches to achieve its goal, namely: traditional rites and media (e.g. ceremonies, folklore), drama, puppet shows, simulations/role play, exhibits, magazines, newspapers, worksheets, bulletin boards, posters, games, flannel board, radio, slide presentations, videos/films/television, demonstrations, projects (e.g. student projects), research, field trips, exchange visits, environmental sites, participatory monitoring and assessment. From this list, some (e.g. traditional rites and media) directly relate to learning informally through traditional knowledge systems.

2.4.1.2 National Environment and Climate Change Communication Strategy 2012 – 2016

The Malawi Government developed the National Environment and Climate Change Communication Strategy “to effectively and efficiently provide information, education, and communication guide on environment and climate change issues that promote positive behavioural change for sustainable development” (GoM, 2012, p. 4). The strategy highlights that climate change messages to be communicated should emphasize that: environment and climate change are real and the effects are long-term; it is possible to adapt to the impacts of environment and climate change; there are risks to the ‘do-nothing’ option; it is important to recognize the potential conflicts that exist between the long-term changes which environment and climate change bring and the short-term priorities that individuals and organizations often pursue; the general public is educated on the importance of environment and climate change and well informed of their roles. The strategy outlines 13 principles of which only one (principle 3.3.6) explicitly mentions indigenous knowledge and thus implies informal learning. The principle, which is about adaptive management, states “communicating environment and climate changes should be based on best practices, indigenous knowledge and benefit from lessons learned” (ibid., 2012, p. 8). Under one of its outputs “public awareness, knowledge, understanding and participation on environment and climate change among various target groups increased” (ibid., 2012, p. 35), the strategy has outlined ten activities with one on promoting use of traditional media (e.g. music, bands, drama, poetry, folklore etc). The remaining nine activities such as “conduct demonstrations on environment and climate change; produce and broadcast environment and climate change theme-based programmes through television, radio and general distribution” are more general and do not specify any of the three forms of education (formal, informal and non-formal).

2.4.1.3 National Agriculture Policy (2010)

This policy was developed to “contribute to the attainment of national food security, poverty reduction and national economic development objectives as outlined in the Malawi Growth and Development Strategy I” (GoM, 2010, p. 3). The policy proposed 16 policy actions; of these, three relate to indigenous farming practices: enhance appropriate crop mixes to ensure good returns in the green belt areas (relates to multiple cropping); promote the production of drought tolerant crops such as cassava, sweet potatoes, millet, sorghum and yams; promote the use of integrated pest and disease management technologies to enhance crop productivity and

these may include local methods (ibid., 2010, p. 14). Since traditional farming practices are mostly learnt informally, it can be construed that this policy partly considers informal learning.

2.4.1.4 National Agriculture Policy (2016)

The National Agriculture Policy of 2010 was revised in 2016. The revised policy goal is “to achieve sustainable agricultural **transformation** that will result in significant growth of the agricultural sector, expanding incomes for farm households, improved food and nutrition security for all Malawians, and increased agricultural exports” (GoM, 2016, p. 10). The policy has eight priority areas and one of them ‘Sustainable Agricultural Production and Productivity’ has elements of informal learning as indicated in one of the strategies: “Set up knowledge management communication and information sharing mechanisms and scale up the use of a suite of gender sensitive information and communication technologies, including print media, electronic media, video, audio, and cell phone voice and text to effectively deliver extension messages” (ibid., p. 31). Like the National Agriculture Policy (2010) above, there is nothing on indigenous knowledge systems, but these can also be inferred.

2.4.1.5 Malawi’s Strategy on Climate Change Learning (2013-2030)

This is the most recent strategy on communication and learning for development in Malawi. It captures the development aspect through climate change learning. The objective of this strategy is “to strengthen human resources and skills development for the advancement of green, low emission and climate resilient development” (GoM, 2013, p. x). There are three strategic objectives in the strategy: develop critical mass of human resources with the requisite understanding knowledge and skills to respond to impacts of climate change; develop strong organizations to champion public awareness and training in various aspects of climate change in government departments, vocational and technical institutions, non-governmental organizations and community based organizations; and, develop sustainable financing mechanism for climate change learning programme to respond to impacts of climate change. Of the three objectives, the first one, on the face of it, captures informal learning via one of its activity areas: “apply non-formal and informal approaches to raise awareness and enhance skills and knowledge in climate change issues”. However, a thorough review of the specific activities under this activity area reveals that the focus is on training (non-formal education) to acquire basic knowledge on climate change science. No mention is made about approaches to enhance knowledge about indigenous knowledge practices. This is ironic considering that the

strategy has highlighted on page 14 “inadequate awareness and utilization of indigenous knowledge systems” as a constraint to learning under climate change discourse.

2.4.2 How some institutions have translated national communication policies and strategies into action via informal learning

There are several climate change adaptation and mitigation projects in Malawi; most of them are donor funded. All the projects I am aware of have strong components of non-formal education through training and capacity building pathways. In this review, I focus on the Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP) and how it addressed climate change adaptation through informal means. The programme took place from 2010 to 2017 and was funded by the Royal Norwegian Embassy. The programme goal was “to secure the livelihoods of 1.5 million people in the Lake Chilwa Basin and enhance resilience to climate change of the natural resource base upon which those livelihoods depend”. The programme objectives were: to strengthen local and district institutions to better manage natural resources and build resilience to climate change; to facilitate and help build cross-basin and cross-sector natural resource management and planning for climate change throughout the basin; to improve household and enterprise adaptive capacity in basin hotspots; and, to mitigate the effects of climate change through improved forest management and governance. In a recently published book about Lake Chilwa, Chiotha et al. (2018, p. 247) recognized indigenous knowledge systems and hence informal learning as follows:

LCBCCAP used three communication blocks of building on local social forms, ‘adaptation as part of culture and effecting change from within culture’. The underlying assumption is that culture and indigenous knowledge systems help to engage vulnerable communities in ways that address barriers presented by technology, language, power relations and linking existing channels of communication that communities rely on.

The programme devised several informal learning pathways to create awareness and stimulate action in the Lake Chilwa Basin and beyond (see a summary in Table 2-6).

Table 2-6: Informal learning pathways in the Lake Chilwa Basin

No.	Informal Learning Pathway	Purpose	Remarks
1	Establishment of a community radio	Create awareness and disseminate information about climate change and environmental issues in general	The only radio in Malawi established with an environmental and climate change agenda and broadcasting on these issues
2	Radio listening clubs	Record local community voice to stimulate action on the ground	The clubs were based in rural areas, hard to reach or ignored by national radio and television media personnel. Club members were trained. Recorded programmes were aired on the community radio or by the national broadcasting unit.
3	Discussion forums	To provide updates to relevant stakeholders on key achievements of the programme and to discuss topical issues	Some of the forum discussions were recorded by national radio and television houses.
4	Peer learning and knowledge exchange	To learn more about successful practices within and outside the Lake Chilwa Basin	Sites were preselected from within the impact areas of LCBCCAP or by other Programmes based on their relevance to LCBCCAP interventions.
5	Electronic and print media	To create mass awareness on LCBCCAP outcomes and climate change and environment in general within and outside the basin	The main media houses were Malawi Broadcasting Corporation, Zodiac Broadcasting Corporation, Radio Islam, Youth Net and Counselling, the Nation Publications and Daily Times. The media personnel were advised on what to capture. Several videos were made.

Source: Adapted from Chiotha et al. (2018)

Chiotha et al. (2018) outlined some achievements from these informal learning pathways such as provision of early warnings leading to reduction of negative impacts and increased uptake of new practices and techniques. An example of an early warning that led to action is when the Chikala Radio Listening Club warned about an impending swarm of red locusts in 2013 prompting the Food and Agriculture Organization (FAO) to conduct a nationwide chemical spray to prevent the devastation of crops. Regarding uptake of new practices, Chiotha et al. (2018, p. 249) cited small-scale irrigation for winter cropping to grow vegetables and rice in

order to supplement food shortages that came about due to extreme weather events (flooding) following a radio programme produced by Mpyupyu Radio Listening Club.

A critical analysis of the messages packaged and disseminated through the various informal learning pathways highlighted in Table 2-6 above, however, shows a skew towards modern climate change adaptation and mitigation options as this was how the programme was designed. Like the national communication strategies and policies, the programme recognized indigenous knowledge, but implementation was problematic in part because the programme was donor driven.

There were some isolated cases though where informal learning involved traditional farming methods. For example, a video produced in 2011 (*Farming versus Climate Change*) highlighted indigenous and scientific methods of determining onset and reliability of rainfall where scientists faced local farmers in a discussion forum entitled ‘When and what to plant, farmer’s dilemma’.

2.5 Conclusion

This chapter has shown that local farming practices can positively contribute to upliftment of people’s livelihoods and achieve environmental sustainability. Although the practices contribute positive benefits and offer some hope to peasant farmers, they face a myriad of obstacles most of them centering on increasing human population pressure on the land; climate change and global warming; pressure from modernity to reject most of the practices unless they are scientifically validated; and, general environmental degradation such as deforestation. Furthermore, despite the trust local communities put in their practices, some of them (such as slash and burn) are undoubtedly harmful to the environment.

Relating to informal learning pathways, the review has shown that various communication and learning strategies, policies and programmes weakly recognize the role of informal learning to uplift traditional farming practices. I use the word ‘weakly’ because the recognition these policies give to informal learning has not been adequately translated into action plans. For this reason, in all local farming practices reviewed, there is a mention of learning or re-learning to lead transformations and ensure that local farming practices are better able to address climate change and improve welfare of the local communities.

This review has formed the basis of an understanding on informal learning for transformation of local farming practices via expansive learning cycles. The local farming practices reviewed in this chapter are further interrogated in Chapters Five, Six and Seven..

CHAPTER 3: THEORETICAL FRAMEWORK GUIDING THE RESEARCH PROCESSES

3.1 Introduction

This chapter describes Cultural Historical Activity Theory (CHAT), a framework that guided my research planning and data collection processes. The chapter provides a review of CHAT application by various scholars, discusses the origin of CHAT, phases of CHAT, expansive learning and its pillars, namely contradictions, learning and development, zone of proximal development, transformative agency, double stimulation tool and scenarios.

3.2 Review of CHAT application

Roth and Lee (2007, p. 77) defined CHAT as “**a cross-disciplinary framework** for studying how humans purposefully transform natural and social reality, including themselves, via activity as an ongoing culturally and historically situated, materially and socially mediated process” (p. 1). Pesanayi’s (2019) study focusing on ‘boundary-crossing learning in agricultural learning systems’ used CHAT because of this inherent cross-disciplinary nature of the framework. The CHAT framework helped Pesanayi “to conceptualize, understand and explain collective learning across different organizations, entities and their cultural practices within networked contexts” (2019, p. 110). The CHAT framework has also been used by several scholars including Jalasi (2018), Baloi (2017) and Mukute (2010).

For Jalasi (2018, p. 91) who studied improved cook stove (ICS) innovation diffusion and adoption in Malawi, CHAT helped her to explore how different actors learn the ICS technology; study the ICS activity focusing on the socio-cultural-historical factors shaping the activity; understand the ICS holistically based on the notation of the interacting activity systems embedded in 3rd generation CHAT (see section 3.5.3).

Baloi (2017) used the CHAT framework in his study of transformative social learning and sustainability in community-based irrigation scheme contexts in Mozambique. According to Baloi (2017, p. 79), CHAT “provided a contextually and historically rich process-based methodology and a vocabulary to describe learning in context and for expanding learning in relation to tensions and contradictions in context”.

Seeking a social theory that resonated with his research questions around a broad topic of sustainable agriculture, Mukute (2010, p. 33) found that CHAT was the most useful framework because of its dialectics in the notion of contradictions, reflexivity (that runs through the expansive learning actions) and agency (embedded in the idea of transforming activity systems

and enabling participants to externalize their learning by working more effectively on their object). CHAT helped Mukute to illuminate and expand the learning taking place in communities promoting and practising permaculture, organic farming and the Machobane Farming System (MFS); historicize sustainable agriculture practices to understand the learning and practice processes; and produce future tools to deal with new and emerging challenges. Having successfully applied CHAT in his study, Mukute (2010, p. 336) concluded that

CHAT is a useful theory for researchers that are interested in intervention research which seeks to enhance the three different forms of agency: **individual**, **relational** and **collective** through change-oriented learning. Working with CHAT enabled participants to construct solutions to address the contradictions that they were facing.

Inspired by the scholars above, I decided to use CHAT because I wanted to expand learning among women using local farming practices. CHAT frameworks resonated well with my study (see section 0) for further details. Below, I give further details of the CHAT framework in terms of its history, phases and resonance to my study.

3.3 Introduction to Cultural Historical Activity Theory (CHAT)

Worthen and Berry (2006, p. 124) summarized the concept of CHAT as follows:

CHAT provides a framework upon which it is possible to lay out **relationships** among the **multiple factors** that contribute to the **complex** situation and addresses them in a **systematic** manner. The essential premise of this framework are that **action** (in the context of **activity**, as in activity theory) is **purposeful**; that that purpose informs and animates consciousness; that all activity is ultimately **collective**, even when being carried out by an individual person; that purpose engages **with each other and against each other**; and that all activity has **historical** (both in the material and ideological senses) dimensions; is **socially constructed** and is **mediated** by socially constructed set of **tools** we call language. [my emphasis]

In the above summary, key words that describe CHAT are highlighted in bold. Below I elaborate on CHAT based on the above summary.

For Nardi and Kaptelinin (2006), CHAT is a theoretical framework that helps us comprehend and analyze the relationship between the human mind (i.e. what people think and feel) and activity (what people do). It is a formative and activist learning theory that posits learning as occurring through collective activities to meet a common object (Mukute and Lotz-Sisitka,

2012, p. 345). For Koszalka and Wu (2001, p. 493), under the CHAT paradigm, knowledge is constructed by individual learners, building on existing historical experiences, within the learners' context. To construct this knowledge, learners use technology or 'tools' as Vygotsky (1978) calls them.

CHAT is a relatively recent theory, but it has a substantial history already (Sawchuck, Duarte & Elhammoumi, 2006, p. 35). Since the 1990s, CHAT has drawn the attention of many academicians particularly in the education sector, globally (Nardi & Kaptelinin, 2006). The growing popularity of CHAT, according to Roth and Lee (2007, p. 6), is due to the fact that it addresses the troubling divides between individual and collective, material and mental, biography and history, and praxis and theory. Furthermore, CHAT offers a philosophical and multi-disciplinary perspective for analysing diverse human practices as development processes in which both individual and social levels are interlinked (Kuutti, 1995, p. 23). The strength of CHAT is also grounded in its long historical roots and extensive contemporary use.

3.4 History of CHAT

Vygotsky clearly viewed Marxist thought as a valuable scientific resource from very early in his career. Vygotsky saw in the methods and principle of **dialectical materialism** a solution to key scientific paradoxes facing his contemporaries. A central tenet of this method is that all phenomenon be studied as processes in motion and in change. In terms of the subject matter of psychology, the scientist's task is to reconstruct **the origin** and course of development of behavior and consciousness. Not only does every phenomenon have its history, but this history is characterized by qualitative changes both in form and structure. (Cole & Scribner, 1978, pp. 6-7).

According to Blunden (2011, p. 18) CHAT traces its origin to the work of Lev Vygotsky. From the above quotation, Vygotsky was inspired by the Marxist notion of dialectical materialism. Clearly, Vygotsky saw the relevance of **history** and **dialectics** as key tenets in understanding human learning and mind formation. Wehmeier et al. (2005), quoted by Mukute (2010, p. 13), defined dialectics, also found in dialectical materialism as "a philosophy of discovering the truth of ideas by discussion and logical argument and by considering ideas opposed to each other". In relation to development, Abercrombie and Turner (2006, p. 107) explained dialectics as "the view that development depends on the clash of contradictions and the creation of a new, more advanced synthesis out of the clashes".

Besides, dialectical materialism, historical materialism (or theory of society) also developed by Marx, played a fundamental role in Vygotsky's thinking (Cole & Scribner, 1978, p. 7). Marx described historical materialism as those "historical changes in society and material life which produce changes in human nature (consciousness and behavior)" (Cole & Scribner, 1978, p. 7). Vygotsky was the first to attempt to relate historical materialism to "concrete psychological questions by creatively elaborating on human behavior and tool use as the means by which man changes nature, and in so doing, transforms himself" (ibid., p. 7). Here, like in dialectical materialism, **history** is emphasized along with 'tool use' for socio-ecological transformations to take place.

To summarize, Vygotsky was the first person to systematically and 'psychologically' apply concepts of dialectical dualism and historical materialism for understanding higher mental processes (Vygotsky, 1978, p. 6). Marx was the main source of inspiration for him to develop the early stages of CHAT. Sawchuck, Duarte and Elhammoumi (2006, p. 67) summed it all as follows: "As Davydov (1996:497) indicated he could not have an elaborated theory of activity, but he had a historico-sociological concept of activity as it was established by Marx and others".

Vygotsky continued developing the early stages of CHAT, but was later joined by Aleksei N. Leontiev and Aleksandr Luria to constitute what Blunden (2011, p. 18) called 'the founding *troika*' of the cultural-historical approach to Social Psychology. The *troika* was later joined by five young scientists, namely Zaporozhets, Bozhovic, Slaving, Morozova and Levina forming what Sawchuck, Duarte and Elhammoumi (2006, p. 38) called *vosmyorka*:

...the **troika** and then the **vosmyorka** worked very closely: everyone participated in the elaboration of new ideas. So, for example, in the twenties, Luria made important empirical and theoretical contributions to the new cultural-historical development theory his research had important significance for the further cultural historical analysis of such problems as memory, speech and consciousness.

Likewise, Leontiev made further important improvements "especially with his investigation of the development of memory published in 1934". Regarding the idea of Vygotsky that 'the human psyche can be revealed only through the analysis of activity', Leontiev "placed this idea at the centre of his own scientific work ... and began to elaborate the problem of activity systematically" (ibid., 2006, p. 39). The improvements in CHAT have seen the framework progress through three successive phases as follows (Engeström, 2001): the first phase which

focused on mediated action, the second phase focused on the individual in collective activity, and the third phase which currently focuses on multiple, interacting activity systems and boundary-crossings between them. The three phases are described in detail in section 3.5 below.

3.5 Phases of CHAT

CHAT has progressed through three generations: first, second and third. These phases are described in sections 3.5.1 to 3.5.3 below:

3.5.1 *First Generation CHAT*

First generation CHAT was conceptualized by Vygotsky (1978) who criticized the then dominant psychological theory of behaviourism which suggested that development of the human mind was primarily associated with ‘**stimulus-response**’ processes in the human mind. In criticising this theory, Vygotsky argued that the relationship between a human subject and an object is never direct but must be sought in society and culture as they evolve historically, rather than in the human brain or individual mind unto itself. He further argued that mind development (consciousness) emerges from mediated human activity which occurs through the use of different types of tools and materials, semiotic and ideational artefacts that include culture and language.

For Vygotsky, there must always be ‘a second order stimulus (sign)’ – between first stimulus (S) and response (R) transcended by an intricate, mediated act (X in Figure 1-1). According to Vygotsky, the second order stimulus is “drawn into the operation where it fulfils a special function; it creates a new relation between S and R” (Vygotsky, 1978, p. 39). By ‘drawn into’ Vygotsky wanted to stress that “an individual must actively be engaged in establishing such a link”. This link, Vygotsky continued, “possesses characteristics of reverse action” (ibid., p. 39) meaning it operates on **an individual** and not the environment. Vygotsky’s idea of cultural mediation of actions is commonly expressed as the triad of subject, object and mediating artefact (see Figure 2-2).

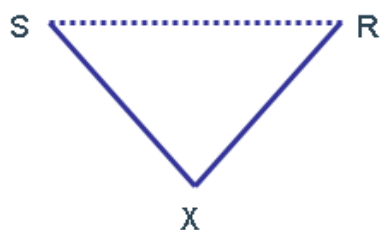


Figure 1-1: Vygotsky's model of culturally mediated action (Vygotsky, 1978, p. 40)

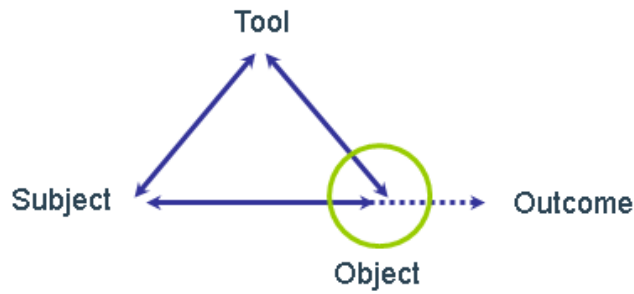


Figure 2-2: Mediated action (Common reformulation)

Source: Chiu, Wang, Popescu, Li, & Lau (2012, p. 142)

In mediated action, the **subject** refers to a person engaged in an activity; an **object** is the motive or motivation towards a future-oriented objective and is held by the **subject**. An object is the drawing power and refers to something at which human efforts are directed,

... the main thing that distinguishes one activity from another ... is the difference of their objects. It is exactly the object of an activity that gives it a determined direction.... The object of an activity is its true motive. The motive may be either material or ideal, either present in perception or existing only in imagination or in thought. (Leont'ev, 1978, p. 62)

The object **motivates** the existence of activity, giving it a specific direction. The subject uses mediating artefacts or tools to effect a change in the object of the activity. Mediating artefacts or tools play three main purposes. Firstly, they can create space for the subjects to manipulate or alter the object. Secondly, artefacts or tools can **restrict** what the subjects can do and this in turn often motivates improvements to existing tools or invention of new means (Verenikina & Gould, 1998, p. 16). Thirdly, artefacts exert reciprocal influence on the minds and actions of the subjects using them. This means that the transformative aspect of human activity is not only a tool-mediated transformation of material things, but also the transformation of the subject him/ herself. In Vygotsky's model, the unit of analysis was **individually focused**: mediation by and with other human beings and social relations was not theoretically integrated (Engeström, 2001).

From the above discussions, first-generation CHAT has been used to understand individual behavior by examining the ways in which a person's objectivized actions are culturally mediated.

3.5.2 Second Generation CHAT

First generation CHAT was too simplistic in that in real life situations, there is a continuous interaction among human beings and their environment in an **activity system**, a conceptualization developed by Engeström (1987). Moving forward, Engeström (1999, p 79) argued against first generation CHAT when he wrote “the focus of the study of mediation should be on its relationship with the other components of an activity system”. Engeström (1987) drew on the work of Leontiev (1978) who recognized the relationships in activity, and expanded Vygotsky’s concept, providing a distinction between an ‘**individual action**’ and ‘**collective activity**’. For Leontiev (1978), **action** and **activity** are different but closely related aspects in an activity system hierarchy (see Figure 3-3). An activity is defined by a motive (the object of activity). It develops over time in various social settings. An action, on the other hand, is consciously planned to achieve specific goals and occurs in a limited time. Actions do not make any sense on their own unless they are part of an activity. Actions are completed through **operations** determined by specific conditions. To summarize, **activities** consist of goal-oriented **actions** that are completed through **operations** determined by specific conditions.

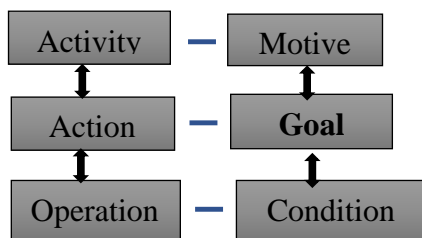


Figure 3-3: Hierarchy of activities, action and operations
Source: Kuuti (1995, p. 33)

For illustrative purposes, Kuuti (1995) explained the hierarchical order of the activity by giving an example of house construction (Figure 3-4).

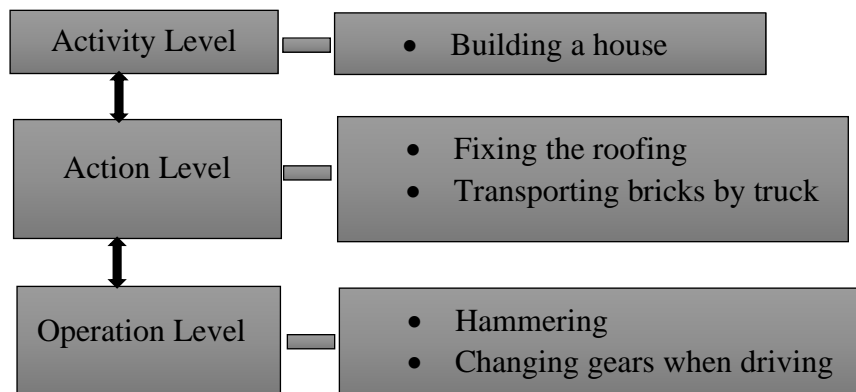


Figure 3-4: An illustration of hierarchical order of the activity of building a house
Source: Kuuti (1995, p. 33)

These three levels are neither stable nor fixed. As Leont'ev (1978, p. 67) noted, there are “continuously proceeding transformations” taking place between and among the levels:

Activity may lose the motive that elicited it, whereupon it is converted into an action realizing perhaps an entirely different relation to the world, a different activity; conversely, an action may turn into an independent stimulating force and may become a separate activity; finally, an action may be transformed into a means of achieving a goal, into an operation capable of realizing various actions.

3.5.2.1 Activity System

Building on the work of Leontiev (1978), Engeström (1987) developed the concept of ‘activity system’ to understand how people interact in a sociocultural context. For Engeström, these interactions can be examined using an historically evolving collective activity system. An activity system comprises a relationship among six elements namely: the object, subject, instruments (tools and artifacts), rules, the community relevant to the activity and the division of labour to carry out the activity (see Figure 3-5).

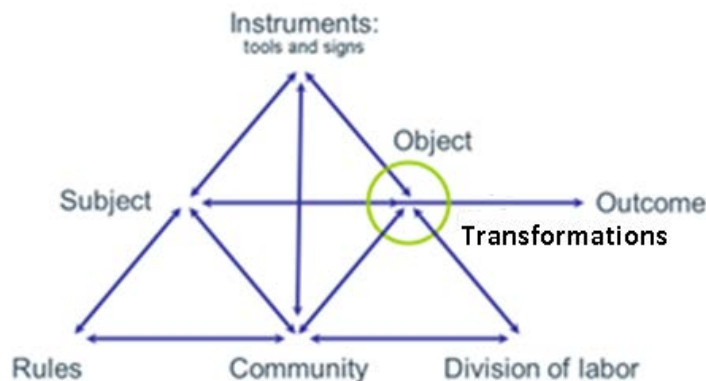


Figure 3-5: Second generation CHAT activity system

(Adapted from Engeström, 2016, p. 108)

In an activity system, a **subject** may either be an individual or a group whose agency is motivated towards the solution of a ‘raw material’ or ‘problem space’ (object of activity). The **object** is transformed through activity and produces outcomes. The object holds the community together and gives it long-term purpose (Engeström 2016, p. 133). It is the true carrier of the motive of the activity (Engeström, 2016 p. 41). Thus, in expansive learning activity, motives and motivation are not sought primarily inside individual subjects, instead, they are in the object to be transformed and expanded (ibid., 2016, p. 41). The object is continuously shaped

and kept in motion by the processes which reproduce it (Engeström & Blackler, 2005, quoted by Engeström, 2016, p. 133).

Community refers to the people that share the common object. Engeström (2016, p. 132) saw a community as the carrier or bearer of activity. The community is defined and bounded by its concrete historical form of the given activity system. Engeström (2016, p. 132) further argued that “in today’s world, communities are increasingly beginning to take the shape of weakly bounded and heterogenous mycorrhizae-like formations which rely on negotiation and peer review as coordinating mechanisms”. An **instrument or tool** is anything used in the transformation process to achieve goals and they include both material and non-material (e.g. mental capability, artefacts, etc.). Instruments, tools and artefacts mediate relationship between subject and object. **Rules** refer to explicit and implicit norms, conventions and social relations within a community. These rules could be both formal as well as informal and they enhance and constrain accomplishments and development of an activity system. Rules mediate relationships between subject and community and shape participation in the activity. **Division of labour** refers to both the horizontal actions and interactions among the members of the community and to the vertical division of power, resources and status related to the transformation process of the object into the outcome of labour (Engeström, 2001, pp. 136-137).

The six elements above do not exist and function in isolation from one another. Instead, they interact continuously. These interactions create tensions and contradictions within and between elements. Contradictions are described in detail in section 3.6.1.1. Furthermore, all the elements are historically formed and open to further development. Therefore, the analysis of any activity system should consider the dynamics amongst its constitutive elements.

The unit of analysis in second generation CHAT is defined as “object-oriented, collective, and culturally mediated human activity” (Kaptelinin, 2005, p. 10). The activity system analysis in second generation CHAT was limited to analysis of activity **‘within itself’** instead of analysis of how other activity systems shaped the core activity system i.e. there was no way of analyzing how activity systems were connecting around a shared object and this was considered a shortfall. The shortfall formed the basis for third generation CHAT described in the next section.

3.5.3 Third Generation CHAT

Third generation CHAT was proposed by Engeström (1999) and he intended to “develop conceptual tools to understand dialogues, multiple perspectives, and networks of interacting activity systems”. It draws on concepts of **dialectics** (see section 3.4) and **multi-voicedness** to expand the framework of second generation CHAT. The learning model in third generation CHAT is expanded to include minimally two interacting activity systems (Figure 3-6) but there could be more considering the complex contexts associated with livelihoods and climate change (see also Pesanayi, 2019; Jalasi, 2018; Baloi, 2017; Kachilonda, 2014; Masara, 2010; Mukute, 2010, who all discovered between three to five activity systems interacting in their third generation CHAT research in natural resources management contexts in southern Africa).

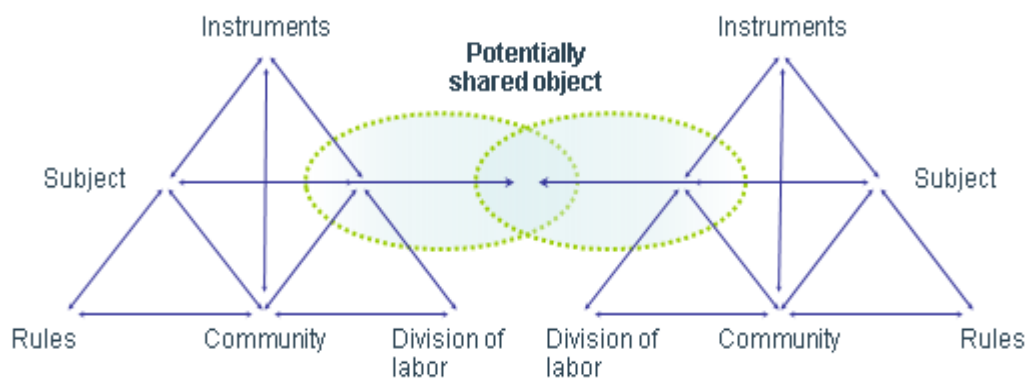


Figure 3-6: Two interacting activity systems

Source: Engeström (2001, p. 136)

To summarize, third generation CHAT centres on three core ideas: 1) humans act collectively, learn by doing, and communicate in and via their actions; 2) humans make, employ, and adapt tools of all kinds to learn and communicate; and 3) community is central to the process of making and interpreting meaning in all forms of learning, communicating, and acting.

3.5.3.1 How third generation CHAT resonates with my study

a. Resonance with key CHAT principles

There are five principles that underpin third generation CHAT, and all were relevant to my study as outlined in Table 3.1 below.

Table 3-1: Third generation CHAT principles and their relevance to my study

Principle	Explanations	Relevance to my study
Activity system a primary unit of analysis	Explained in the section below	The first phase of CHAT research assisted me to identify activity systems that relate to drought and dry spells in maize production and the associated informal learning processes of women farmers.
Multi-voicedness	<p>An activity system constitutes a community of people (multi-voices) with diverse views, traditions and interests on a subject item.</p> <p>Because of the community's diverse views, the multi-voicedness stirs dialogue around tensions but the tensions are also an opportunity for innovation.</p>	CHAT helped me identify actors (multi-voices) and their specific roles in the activity system identified above.
The central role of contradictions as sources of change and development	Contradictions are historically accumulating structural tensions within and between activity systems.	This research was about informal learning. In this regard, CHAT helped me to identify contradictions (see section 3.6.1.1) to stimulate expansive learning processes.
Historicity	Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history.	My study researched the past to inform the future of local farming practices via informal learning processes. In this regard, CHAT was useful as it helped me understand histories of specific informal learning processes and local farming practices for climate change adaptation.
Activity systems' possibility for <i>expansive transformation</i>	Activity systems move through relatively long cycles of qualitative transformations. As the contradictions of an activity system are aggravated, some individual participants begin to question and deviate from its established norms.	My research was about how drought and inter-seasonal dry spells influence informal learning processes associated with maize production. CHAT helped me organize learning with a vision of helping women farmers move from incremental to transformational adaptation practices through reflexivity (i.e. using existing knowledge to generate new knowledge), dialectics (discovering truth of ideas by discussion and logical argument) and resolution of socio-material contradictions.

b. Resonance with specific activity system elements

The activity system components were applied to my study as follows: The **subjects** were women disproportionately affected by recurrent drought and dry spells in local farming practices under maize production systems. Being the key **actor** in maize production in the study site (personal observation), and by reversing drought challenges into an opportunity, the women were inclined to learn to build their resilience using several mechanisms, one being expansion of existing informal learning processes (see Chapter Seven). Local farming practices relevant to maize production, constituted the central '**activity system**' of my study (see Chapter Five). Expansive learning approaches were employed within these local farming practices as an activity system with an aim of transforming them so that they can better play adaptation roles to drought and dry spells and improve food security (**object**), potentially leading to general well-being of women and other community members (**outcome**). Since women are central to agriculture and are involved in feeding for the family, **a community of significant others** would most likely be associated with local farming practices pertinent for maize production in accomplishing the object. The community of others included the spouses, children and other stakeholders including extension officers, government support agents and/or donors. In engaging the community of others in activity systems, **division of labour** ensued where some roles were feminized, others male dominated and certain co-implemented (see Chapter Five).

The Lake Chilwa Basin, where the study took place, has a structured society and so the agency of the **subject** along with **community of others** was expected to be shaped or influenced by the normative and prevailing **rules** and **regulations** (formal and informal e.g. cultural norms or policies). In the process of learning, **the subject** and **community of others** would use **mediating instruments** that may include social discourses, language and concepts, role models, drama, poetry and story, plants, animals and agricultural tools relevant to maize production and climate change adaptation.

3.6 The Concept of Expansive Learning in More Detail

In section 1.7.2.8 (Chapter One) I introduced the concept of expansive learning with a focus on seven learning actions. In this section, I want to expand on this and draw linkages between my study and key building blocks or 'theoretical roots of expansive learning' as Engeström (2016, p 40) called them.

The theory of expansive learning was first outlined by Engeström (1987). According to Engeström and Sannino (2010), this theory refers to "learning in which the learners are

involved in **constructing** and **implementing** a radically new, wider and more complex object and concept for their activity” (Engeström & Sannino, 2010, p. 2). As already stated in section 1.7.2.8, “the theory of expansive learning puts the primacy on communities as learners, on transformation and creation of culture, on horizontal movement and hybridization, and on the formation of theoretical concepts” (ibid., p. 2).

Edwards (2005a) outlined three conceptualisations of what happens in expansive learning. The first is scaffolding where the novice moves to the next level of understanding with the assistance of a more knowledgeable other. The second is cultural interpretation of learning. Here, the more knowledgeable other links the learner’s everyday knowledge and scientific knowledge through instructional discussion, ultimately generating mature concepts. The third layer is concerned with a collective interpretation of learning and takes place when a group of people with different experiences and perspectives seek to work on new problems and jointly develop new knowledge or tools to address the problems (Engeström, 1999). This third level of learning leads not only to the growth and development of the individual’s knowledge, but also leads to the transformation of the activity system (ibid., 1999). This level is particularly relevant to my study where women subjects were expected to **collectively learn** to transform the current local farming practices through informal learning pathways.

The theory of expansive learning builds on multiple layers of learning, particularly Bateson’s (1972) conceptualization of multi-layered learning (Engeström, 1987, pp. 140-144). Expansive learning can be defined as similar to Bateson’s “Learning III” where “one not only learns, but simultaneously learns how to learn, and simultaneously learns how to learn how to learn” (Tosey, 2006, p. 9). Looking at the mix of words describing learning III, it is clear that “such expansive learning is rare and risky. Even the attempt at Level III can be dangerous, and some fall by the wayside” (Bateson, 1972, p. 305).

The theory of expansive learning focuses on learning processes in which the very subject of learning is transformed from isolated individuals to **collectives and networks**. For the learning to occur, initially individuals begin to question the existing order and logic of their activity as already pointed out in Chapter One, section 1.7.2.8. Later, more individuals join in, leading to a collaborative analysis and modelling of the zone of proximal development (see section 3.6.1.2), another important root of the theory of expansive learning (Engeström, 2016, p. 28). “Moving up and outward”, expansive learning “tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects”

(Engeström & Sannino, 2010, p. 1). The learning effort which ideally results in implementing a new model of the activity encompasses all members and elements of the collective activity system (Thi Kim Anh & Marginson, 2014, p. 17)

Engeström and Sannino (2010, p. 20) underscored that ‘the most important outcome of expansive learning is agency’, that is participants’ ability and will to shape their activity systems. In expansive learning, “learners learn something which is not there ... the learners construct a new object and concept for their collective activity and implement this new object and concept in practice” (ibid., p.20). Expansive learning results in the creation of a new, expanded object and form of activity oriented to the object. The creation of the expanded object involves the development of a theoretical concept of the new activity, modelling the “germ cell”, ultimately giving rise to the new activity in diverse concrete manifestations (Davydov, 1990). In summary, the ‘what’ of expansive learning “consists of a triplet of **expanded pattern of activity**, corresponding **theoretical concept** and **new type of transformative agency**” (ibid., 1990, p. 80).

Expansive learning is different from traditional schooling and traditional science in this way: traditional schooling is fundamentally a **subject-producing activity** while traditional science is principally an **instrument-producing activity**. On the contrary, expansive learning activity is an **activity-producing activity**. (Engeström, 1987, p.125).

3.6.1 Key features of expansive learning

From section 3.3 above and earlier discussions on how CHAT has progressed over time, some of the key features (roots) of expansive learning processes include contradictions, zone of proximal development (ZPD), learning, learning and development, transformative agency, double stimulation, scenarios and agency building. These features do not operate in isolation, rather they function as a ‘unit’ or ‘whole’ to drive the expansive learning process. Below I explain these concepts and elaborate on their application to my study.

3.6.1.1 Contradictions

a. What are contradictions and why are they important?

There are two elementary ways in which the notion of contradiction is used in the English language (Harvey, 2014, p. 6):

the commonest and most obvious derives from Aristotle’s logic, in which two statements are held to be so totally at odds that both cannot possibly be true.

The statement ‘All blackbirds are black’ contradicts the statement that ‘All blackbirds are white’. If one statement is true, then the other is not.

The other mode of usage, Harvey (2014) continued, arises when two superficially opposing forces are concurrently present within a situation. Archer and Bhaskar (1998, p. xix) called these opposing forces **dialectics**, already defined in 3.4..

According to Harvey (2014, p. 7),

Contradictions can be a fecund source of both personal and social change from which people emerge far better off than before. We do not always succumb to and get lost in them. We can use them creatively. One of the ways out of a contradiction is innovation. We can adapt our ideas and practices to new circumstances and learn to be a far better and more tolerant person from the experience. Partners who had drifted apart may rediscover each other’s virtues as they get together to manage a crisis between work and family. Or they may find a solution through forming new and enduring bonds of mutual support and caring with others in the neighbourhood where they live, and I certainly don’t mean to imply any automatic negative connotation.

What Harvey implied above is that contradictions are key driving forces of expansive learning (Sannino et al., 2016, p. 600). They are “the motive force of change and development” (Engeström & Miettinen, 1999, p. 9). Contradictions are historically accumulated forces; they are not an automatism. They become actual driving forces of expansive learning when subjects deal with them in such a way that the emerging new object is identified and turned into a motive. Therefore, within an activity system, contradictions should be identified and analysed to help practitioners to focus their efforts on the roots and causes of tensions and problems, to rethinking relations in and between the six elements of an activity system, between activity systems and redesign accordingly. Harvey (2014, p. 7) noted that contradictions “have the nasty habit of not being resolved but merely moved around”. That means, resolving a contradiction results into creation of another form of contradiction that will also serve as a development precursor later. The process of identifying, analysing and using contradictions to stimulate discussions, learning and development is a continuous process, never ending.

In engaging contradictions as learning drivers, Engeström and Sannino (2011, p. 371) suggested that we understand two aspects. Firstly, a contradiction is a foundational systemic concept that should not be likened to obstacles, tensions, inconsistency, conflict, dilemma or

double bind as many of these are manifestations of a contradiction. Secondly, contradictions are historical and must be traced in their real historical development.

The way contradictions are operationalised often remains unclear especially as they cannot be directly observed and empirically analysed. They are spongy and ‘bleed into one another’ (Harvey, 2014 p.6). It is perhaps because of this blurred nature of a contradictions that Engeström and Sannino (2011, p. 221) regarded contradiction as a “broad and vague term, often used to describe different kinds of tensions and problems”. The ‘broadness and vagueness’ of contradictions may be due to the way they manifest themselves in several forms including disturbances, tensions, conflicts, deviations, disruptions, problems, ruptures, paradox, breakdowns, denial and clashes. To simplify this challenge, Engeström and Sannino (2011, p. 375) developed a framework for the analysis of four types of manifestations of contradictions: dilemmas, conflicts, critical conflicts and double binds (Table 3-2).

Table 3-2: The four manifestations of contradictions elaborated

Manifestation	Features	Linguistic cues
Double bind	Facing pressing and equally unacceptable alternatives in an activity system: Resolution: practical transformation (going beyond words)	“we”, “us”, “we must”, “we have to”, pressing rhetorical questions, expressions of helplessness, “let us do that”, “we will make it”
Critical conflict	Facing contradictory motives in social interaction, feeling violated or guilty Resolution: finding new personal sense and negotiating a new meaning	Personal, emotional, moral accounts narrative structure, vivid metaphors “I now realize that...
Conflict	Arguing, criticizing Resolution: finding a compromise, submitting to authority or majority	“no”, “I disagree”, “this is not true” “yes”, “this I can accept”
Dilemma	Expression or exchange of incompatible evaluations Resolution: denial, reformulation	“on the one hand ... on the other hand”; “yes, but”, “I didn’t mean that”, “I actually meant”

Source: Engeström and Sannino (2011, p. 375)

The difference between contradictions, their manifestations and linguistic cues indicating possible presence of those manifestations has important methodological implications. For example, if a researcher identifies linguistic cues such as ‘but’, ‘no’, ‘sarcastic metaphors and narratives’ or even rhetoric questions, these could be pointers to an existing inner contradiction though this is not always the case (Engeström & Sannino, 2011, p. 375). The researcher could use the cues to probe with the study subjects to identify deeper contradictions.

Notwithstanding the potential of contradictions to catalyse transformation in an activity system, this transformation does not always occur as anticipated. This is because contradictions can play a twofold role: **enabling** learning to progress or **disabling** it, depending on whether they are acknowledged and resolved (Nelson, 2002, p. 34). Additionally, in order for systemic contradictions to lead to innovation, their resolution cannot occur at the individual level because contradictions are in social/material relations among groups who may hold contrary views to resolve a particular contradiction (Wardle, 2004, p. 5). As Murphy and Rodriguez-Manzanares (2008, p. 445) noted, some contradictions are invisible. They are usually taken for granted and may not even be recognised as problematic. An example of an invisible contradiction is a cultural assumption about how things are done and how relationships are managed. They may not be talked about because they are “embarrassing, uncomfortable or culturally difficult to confront” such as “gender issues or offensive personal habits of politically powerful programme stakeholders” (ibid., p. 446)

b. Types of contradictions and how CHAT works with them

According to Foot (2016, p. 16), there are four types of contradictions, each one emerging during different levels of the expansive learning cycle (Table 3-3).

Table 3-3: Types (levels) of contradictions

Level	Description	Corresponding learning level	Example
Primary	They are identified when there are persistent dilemmas and relatively few critical conflicts and double binds. They reflect the fundamental tensions in capitalist societies that stem from the opposition between use value and exchange value (see section c).	Generate the first learning action of questioning in the expansive learning cycle	Differing views of community of others in a local farming practice (e.g. differing perceptions of extension workers and peasant farmers (subjects) on local maize cultivation)
Secondary	Occur between two or more nodes of the activity system	Generate the second, third and fourth learning actions of analysis, modelling and examining the model	Between a rule and a tool (e.g. policy promoting hybrids and discouraging local maize seeds)

Tertiary	Occur between the old and new activity system	Generate the fifth and sixth learning actions of implementation and reflection	Introduction of ICT to promote local maize cultivation and existing local knowledge systems that do not recognize ICT
Quaternary	Occur between the newly reorganized activity system and its neighbouring activity systems	Generate the seventh learning action of consolidation	Clash between the hybrid seed production and marketing activity system and newly established system promoting unimproved seed

Source: Adapted from Engeström (2016, p. 16)

c. CHAT and the notion of exchange value and use value

As indicated in section 3.6.1.1 above, primary contradictions occur between the use value and exchange value, foundational economic concepts for understanding contradictions in CHAT (Foot, 2014, p. 20). Harvey (2014, p. 12) explained the two concepts as follows: “I walk into a supermarket with money in my pocket and **exchange** it for some **food** items. I cannot eat the money, but I can eat the food. So, the food is useful to me in ways that the money is not.”

In relation to the notion of contradictions, Harvey (2014, pp. 12-13) further elaborated the two concepts as follows:

All the commodities we buy in a capitalist society have a **use value** and an **exchange value**. The difference between the two forms of value is significant. To the degree they are often at odds with each other they constitute a **contradiction**, which can, on occasion, give rise to a crisis. The use values are infinitely varied (even for the same item), while the exchange value (under normal conditions) is uniform and qualitatively identical –a dollar is a dollar, and even when it is a euro it has a known exchange rate with the dollar.

Going further, Harvey gave an example of a house for our thorough understanding of the use value:

As a use value, the house provides shelter; it is a place where people can build a home and an affective life; it is a site of daily and biological reproduction (where we cook,

make love, have arguments and raise children); it offers privacy and security in an unstable world.

An as an exchange value, “we have to buy the house, lease it or rent it in order to have the privilege of using it. We have to lay out money for it.”

3.6.1.2 The Zone of Proximal Development

The zone of proximal development is a core CHAT concept that is especially related to transformational learning (Engeström, 2015, pp. 109-167). The concept is one of the major legacies of Vygotsky’s work in the social sciences.

According to Engeström and Sannino (2010, p. 15), “learning leads development”. Relating to the notion of activity system, development via learning can occur through an ‘improvement’ in or between the six elements across the activity systems, in my opinion. To ‘improve’ means there is a benchmark, something is already in existence but just needs ‘some help’ to make it ‘far much better’. Vygotsky (1978, p.170) called this benchmark “actual level of development that has been established as a result of certain already completed developmental cycles. When we determine a child’s mental age by using tests, we are almost always dealing with the actual developmental cycles.”

If an “actual level of development exists, naturally, there should also be a ‘potential level of development’”. It is on this understanding that Vygotsky probably defined ZPD as “the difference between what a person can accomplish when acting alone and what the same person can accomplish when acting with support from someone else and with culturally produced artefacts” (Vygotsky, 1978, p. 86).

Having defined the concept of ZPD, Vygotsky further argued that ZPD describes those “functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. These functions could be termed the buds or flowers of development rather than fruits of development.” ZPD occurs only in human beings because they can “go beyond the limits of their own capabilities” (ibid., 1978, p. 86).

Vygotsky had put forward the concept of ZPD in the context of mass education and literacy campaigns in Russia in the 1920s for children and adult learning ‘higher scientific concepts’ (Teddy & Gregory, 2009, p. 442). Consequently, many researchers have narrowly interpreted the concept of the ZPD as being primarily concerned with interactions between an expert and novices in which the novices’ state of knowledge is advanced through social interaction with

the expert (Lantolf, 2000, p. 18). Yet at the heart of the ZPD, Vygotsky emphasized the transformation of knowledge that occurs when someone **internalizes** concepts, in contrast to notions of '**transfer**' or '**transmission**' in rote learning (Teddy & Gregory, 2009, p. 442). Subsequently, Kuuti (1995) and Engeström (Engeström, 1999b), among others, advocated for a broader understanding of the scope of the ZPD to include peer-to-peer and multi-disciplinary learning beyond expert-to-novice and apprentice novice modes of learning, an activity which is inclusive of development of higher mental functioning.

According to Engeström (2015, p. 138), there are three types of development spheres namely individual explosive, invisible-gradual and collective-expansive. Among these, the third type requires intuitive mastery, that is the subjectification of the subject. The concept of the zone of proximal development is relevant to the third type of development because the concept is also "an instrument of subjectification" (Engeström, 2015, p. 138). The other two types of development, "can be purposefully affected and steered in a societally meaningful scale only indirectly, through the collective-expansive type" (ibid., p. 138).

Based on the 'collective-expansive' type of development, Engeström (2015, p. 138) provided a reformulation of ZPD as follows: "It is the distance between the present everyday actions of the individuals and the **historically new form of the societal activity that can be collectively generated** as a solution to the **double bind** potentially embedded in the everyday actions."

The ZPD does not occur automatically, it needs to be created. For example, in relation to the teacher-learner interactions, the teacher's task is to "create a system of culturally mediated social interactions, organized in such a way that the learners can, draw upon prior and ongoing learning, achieve a qualitatively distinct new understanding, a conceptual re-organization that enables conscious control over the newly acquired knowledge" (Vygotsky, 1978, p. 171). In this example, the teacher is a **more competent** person while the learner is **less competent** (Chaiklin, 2003, p. 55). Through interactions between the two, the less competent person ultimately becomes independently proficient at a jointly accomplished task.

ZPD as a tool is mainly used by psychologists and educators to understand the internal course of development. Vygotsky (1978, p. 87) summarized the role of ZPD in development as follows: "By using this method, we can take account of not only the cycles and maturation processes that have already been completed but also those processes that are currently in state of formation, that are just beginning to mature and develop".

Taking an example of child's development in a classroom environment, Vygotsky (1978, pp. 40-51) was of the view that "the zone of proximal development permits us to delineate child's **immediate future** and his **dynamic developmental state**, allowing not only for what already has been achieved developmentally but also for what is in the course of maturing".

3.6.1.3 Application of ZPD in my study

The concept of ZPD was an important notion for my study. The subjects of my study (women) already possessed some knowledge about local farming practices, that is they were at the actual development level. In terms of Bateson's (1972) learning levels, the motive for both myself as a researcher and my research subjects was to reach level III at which point women will have built their transformative agency to promote local farming practices through, for instance committing to act, taking concrete actions or simply envisioning the future of their farming activity. The ZPD was co-created by me and the women subjects. During the whole process of expansive learning, we were journeying through the ZPD, towards transformative adaptation via changes in the object of farming activity.

3.6.1.4 CHAT as a learning and development framework within the ZPD

As noted in section 3.2.1, all six elements of an activity system continuously interact to transform the old activity system into a new one via expansive **learning** stimulated by contradictions. The 'new one' is supposedly 'better off' and/or more **developed** than the older one otherwise transformation would not be justified. Two key CHAT concepts can be identified here, and these are **learning** and **development**.

a. Learning: Vygotskian (1978) and Bateson (1972) perspectives

As pointed out in earlier sections, Vygotsky played a significant role in the initial conceptualization of CHAT. Besides Vygotsky, Engeström (2016, p. 28) highlighted another important person that contributed to the 'roots' of expansive learning and this was Gregory Bateson, an anthropologist by profession. Both Bateson and Vygotsky played important roles in expansive **learning** as described below.

Vygotsky's concepts of learning were developed in response to the behaviourist assumptions in behavioural learning theory, originally put forward by Thorndike who proposed that human learning resulted from operant conditioning. According to Thorndike, "learning is the result of trial and error during which associations form between stimuli and responses. Such associations or habits become relatively stronger or weaker when certain responses come to dominate others

because they lead to reward” (Vygotsky, 1978, p. 83). According to Vygotsky (1978, p. 83), Thorndike’s behaviourist theory proposed that:

... learning is the acquisition of many specialized abilities for thinking about a variety of things which does not alter our overall ability to focus attention but rather develops various abilities to focus attention on a variety of things. According to this view, special training affects overall development only when its elements, material, and processes are similar across specific domains.

Young (2015, p. 1) shed some light on Vygotsky’s learning perspective “that all human learning is an ‘epistemic’ or ‘knowledge building’ activity and inescapably social. There is no learning (and no knowledge) that does not in some sense involve social relations.” He emphasized that we should differentiate between human (social) learning and other types of learning such as machine-learning, operant conditioning (i.e. behaviourism) and imprinting (habituation) by animals.

One of the key questions to ask in initiating expansive learning processes is “why do they learn, what makes them make the effort?” (Engeström, 2001, p. 133). This question reinforces the concept of *object-oriented* learning, that is, there is a motive for learning. To reach the motive, a learner may progress through various levels of learning from the lowest to the highest at which state he/she will have achieved the motive. The learner will have **expanded his/her leaning** from the lower level to the higher level, from an actual level of development to the desired state.

To elaborate on learning levels, I draw on the analysis of multiple layers of learning based on conceptualization of Bateson (1972). As already pointed out in section 3.3, the theory of expansive learning is in part built on layer III, one of the five layers of Bateson’s conceptualizations. The other layers are zero, learning I, learning II and learning IV. The five layers are based on “types of error which are to be corrected in the various learning processes” (Bateson, 1972, p. 287) as elaborated below.

Zero learning is characterized by specificity of response, which – right or wrong – is not subjected to correction. According to Bateson, at Learning 0 there is response to stimuli but no behavioural changes in response to these stimuli. Tosey, Langley and Mathison (2015, p. 5) gave an example of the two mice from the popular business parable ‘Who Moved My Cheese?’ by Johnson (1998). The two mice continued to look for their cheese (the stimulus) in the same

place each day even after it had disappeared. There was no learning and therefore no change in behaviour of the mice.

Learning I involves change in specificity of response by correction of errors of choice within a set of alternatives. Learning I comprises the forms of learning treated by various versions of connectionism habituation, Pavlovian conditioning, operant conditioning, rote learning and extinction. Both the goal and the means of learning are given. An example would be learning “how to plant carrot seed, with the help of someone when the conditions for doing so are set and conducive” (Mukute, 2010, p. 111).

Learning II is change in the process of Learning I, for example, a corrective change in the set of alternatives from which choice is made, or there is a change in how the sequence of experience is punctuated. Like learning 1, the goal is also given for learning 2. However, the learning is acquired through trial and error or experimentation to select the appropriate tool which already exists. The learner acquires learning by getting to know the context. Continuing with an example of carrot, “this would mean getting the carrot seed from the shop and learning how to plant it appropriately and discovering for instance that if covered with a lot of soil, it will not emerge from the ground and grow. Such knowledge could be available from other sources but was not known to the learner” (Mukute, 2010, p. 111). The outcomes of Learning II, which are essentially the habits or the ‘character’, save the learner from “having to examine the abstract, philosophical, aesthetic, and ethical aspects of many sequences of life” (Bateson, 1972, p. 303). The unconscious habits frequently lead the learner to **double bind situations**. This is because the habit, once internalized, becomes self-defeating in a superficially similar but structurally altered social context; or two mutually exclusive habits seem to be required at the same time.

Learning III is change in the process of Learning II, e.g., a corrective change in the system of *sets* of alternatives from which choice is made. Learning III is a rare event, shaped by the contradictions of Learning II. Under learning III, “the individual learns to control, limit and direct his Learning II. He becomes conscious of his habits and their formation” (Bateson, 1972, p. 304.) The subject becomes conscious and creative. He/she potentially also becomes a practical master of whole system of activity in terms of the past, the present and the future (Engeström, 2015, pp. 121-122). Individual manifestations of Learning III are commonly called ‘personal crises’, ‘breaking away’, ‘turning points’ or ‘moments of revelation’

(Engeström, 2015, p. 122). At this level, the learner does not merely solve the known problem but goes beyond to change the context of the problem so that it can be solved (Mukute, 2010, p. 111). Continuing with an example of the carrot by Mukute (2010, p. 111), “the carrot might not emerge even after only being covered by a thin layer of soil. The reason might be that the temperature was too low. Changing the context might here mean erecting a greenhouse that traps solar energy”. For my study, which focused on expansive learning of women farmers involved in local maize cultivating and the associated local farming practices, learning III was relevant. Learning IV would be change in Learning III. However, learning IV does not occur in any single living organism because it involves a combination of the evolutionary processes of phylogenesis and ontogenesis (Bateson 1972, p. 293), long-term processes beyond a person’s lifespan.

In applying the three layers, Tosey, Langley and Mathison (2015, p. 9) warned that

... it is not a stage theory of learning, whereby one ‘progresses’ from Learning 0 to Learning III. Bateson’s writing also suggests that all these levels may (but do not necessarily) occur simultaneously in experience. Nor is it the case that the higher one goes the better; Learning II and Learning III involve a questioning of meaning that can be uncomfortable.’

b. Learning and Development

According to Engeström (2015, p. 109), modern developmental psychology is faced with two classic dilemmas. Firstly, the problematic relationship between learning and development and secondly, ‘the equally problematic’ relationship’ between individual and societal development. I will elaborate on the first dilemma since it has direct relevance to my study.

The first dilemma (relationship between learning and development) is provisionally formulated by Baltes, Rees and Nesselroade (1977, p. 208) as follows: “The central question for our purposes is whether learning is identical to development or, at least, whether development can be conceptualized as consisting of some kind of accumulation of units of learning”.

Vygotsky (1978, p. 79) also noted that,

.... the relationship between learning and development remains methodologically unclear because concrete research studies have embodied theoretically vague, critically unevaluated and sometimes internally contradictory postulates, premises and peculiar

solutions to the problem of this fundamental relationship; and these essentially result in a variety of errors.

Using an example of child development at school, Vygotsky (1978, pp.79-81) reduced the relationship between learning and development into three theoretical positions: Firstly, learning as a purely external process that is not actively involved in child development; secondly, learning **is** development; and thirdly, a combination of the two. According to the first theoretical position, “development **always** outruns learning and precludes the notion that learning may play a role in the course of development. Learning forms a superstructure over development, leaving the later essentially unaltered.” In the second position, “learning is development” means that the learning process is “completely and inseparably blended with the process of development”. Furthermore, “learning and development coincide at all points”. The third theoretical position is an attempt to overcome extremes of the two positions with a key assumption that the two theories are not opposing each other and that they are mutually exclusive or they cannot be combined. To elaborate on this theoretical position, Vygotsky gave an example of Koffka’s theory in which development is founded on two intrinsically different but related processes each influencing the other: maturation and learning. According to this theory, the maturation process prepares and makes a specific process of learning possible. In a reciprocal manner, the learning process then stimulates and pushes forward the maturation process. The major shortfall of all three theoretical positions is that they do not consider pre-school or informal learning because this influences school learning (Vygotsky, 1978, p. 80). The learner already has ‘an actual level of development’ that needs to be considered in the lead-development dilemma.

Other psychologists such as Ann L. Brown regarded development as “the process of going from the specific and context-bound to the general and context-free”. For Brown (1982) quoted by Engeström (2015, p. 109):

Basically, the problem is how does the learner go from specific learned experiences to the formulation of a general rule that can be applied to multiple settings. How does the learner come to use knowledge flexibly? How do isolated skills become connected together, extended and generalized?

For Lenin (1976, p. 301), “development is the ‘struggle’ of opposites”, thus re-emphasizing the role of dialectics in development. This is like Abercrombie, Hill and Turner’s (2006, p. 107)

explanation that “development is a clash of **contradictions** and the creation of a new, more advanced synthesis out of the clashes”.

The reality of the matter regarding the ‘learning-development’ dilemma is that the two concepts are closely related (but not always) in the sense that “learning leads development” (Engeström & Sannino, 2010, p. 15); “good learning is that which is in advance of development;” (Vygotsky, 1978, p. 89); “it is the heart productivity activity” (Pihlaja, 2005, quoting Zuboff, 1988). In other words, development trails learning; development takes place after learning. I discuss in detail below the concept of learning, development and the link between the two.

c. Learning as a tool towards realizing transformative agency

According to Engeström 2001(p. 133), any theory of learning must answer at least four central questions namely: (1) Who are the subjects of learning, how are they defined and located?; (2) Why do they learn, what makes them make the effort?; (3) What do they learn, what are the contents and outcomes of learning?; and (4) How do they learn, what are the key actions or processes of learning? In this section I will continue answering question 2. As pointed out in section 3.6, “the most important outcome of expansive learning is **agency**, that is participants’ “ability and will to shape their activity systems” (Engeström & Sannino, 2010, p. 20). According to Heikkilä and Seppänen (2014, p. 8, citing Engeström & Virkkunen, 2007), agency is “the subject’s capacity to take purposeful actions to change their work activity”. This definition views activity as object-related and **collective**, and actions as individual (Leontiev, 1978), resonating well with the third generation CHAT that guided my research design and data collection processes. The ‘**collectiveness**’ Leontiev (1978) referred to resonates with the concept of **collective agency** defined by Mukute (2010, p. 109) as that agency “concerned with harnessing the collective strength of people to address a limitation”. A closely related concept to collective agency is **relational agency** which is the capacity to offer support and ask for support from others to expand the object (Edwards, 2005, p. 168). Relational agency recognizes that another person may be a useful resource to expand the object. For relational agency to emerge, an open **space** needs to be created by the main subject of the activity where other people interested in the object can also freely participate (Edwards, 2005, p. 172). In building agency, there are some critical steps to be followed. One of these steps is going beyond talk and turning ideas into actions (Heikkilä & Seppänen, 2014, p. 8), thus fulfilling the notion of “moving from the abstract to the concrete” (Virkkunen & Newnham, 2013, p. 44). Additionally, the relationship between an **individual subject** and **collective activities** is central in activity theoretical approaches to agency. The key issue in definition of transformative

agency by both Engeström and Sannino (2010, p. 20) and Heikkilä and Seppänen (2014, p. 8) is ‘capacity building’ implying that learning strengthens a learner’s capability to think critically and act purposefully. Gass (2012, p. 3) used a metaphor of a caterpillar shedding its skin within a ‘hard protective shell’ to elaborate the concept of transformative agency:

Surrendering to an irresistible inner urging, one day the caterpillar begins to shed its skin. Revealed within is the hard-protective shell that becomes the creature’s home, prison and womb for the change to come. This initiates one of nature’s miracles – the transformation from an immobile chrysalis whose only defense is camouflage – to a breathtakingly beautiful winged aviator we call “butterfly”.

From the above, taking ‘inner urging’ as stimulus, transformative agency is then all about liberation from ‘prison’, ‘freedom from bondage’ and later reaching a ‘beautiful world’ (the motive).

During formative interventions, there is great interest in understanding the emergence of agency. To this effect, categories of agency or agentic actions of the participants in intervention research have been examined. For instance, Sannino (2008, p. 247) discovered that agency surfaces when a person *commits to concrete actions* in an innovation process or gives reference to *former experience of good practices* as an explanation for a future solution. Sannino (2010) and Engeström (2011, pp. 623-624) identified five forms of participants’ transformative agency expressions during the expansive learning process: *resisting* interventionists or management, *explicating new possibilities or potentials* in the activity, *envisioning new patterns or models* of the activity, *committing to concrete actions* aimed at changing the activity, and *taking consequential actions* to change the activity. In 2012, Haapasaari et al. (2012) added a sixth agency expression, *criticizing*. According to Heikkilä and Seppänen (2014, p. 8), resisting and criticizing show that the situation is regarded as unsatisfactory, which is a starting point for change efforts. Explicating means that one or more alternatives have been identified, and envisioning is a further elaboration and concretisation of these alternatives.

d. Relevance to my study

The concept of transformative agency manifesting as ‘collective or relational agency’ was relevant to my study. At the onset of the change laboratory workshops, the motive of both myself and the women subjects of my study was to build transformative agency along the winding road of expansive learning from questioning (abstract) to action (concrete) with regard to local farming practices. As will be seen in Chapter Four of this thesis, a conducive space

was co-created by myself as a researcher and the women participants. This enabled other community members including extension workers, the youth and traditional leaders to be engaged in the expansive learning process, thus going beyond women subjects of the study to other community members interested in the object.

e. Double stimulation as a catalyst to expansive learning

Double stimulation is used as a basis for learning under the formative intervention process. It is used as a basis for efforts that resolve ongoing contradictions at systemic level linking the activity theoretical framework to the concept of expansive learning (Haapasaari & Kerosuo, 2015). The concept may refer to everyday practices used by people to undertake difficult actions (Vygotsky, 1960/1997a-d). For instance, counting one, two, three by an individual may stimulate action in that individual to either jump into a pool of cold water or stay warm; an alarm clock may help a tired person to get out of bed (Sannino, 2015). In these two examples, counting and clocks are cultural artefacts used to regulate behaviour and gain control i.e. to accomplish volitional action. Vygotsky (1997) described the advent of ‘will’ as a process concerning two apparatus (1 and 2) which are ‘relatively independent of each other (p. 213) and which correspond also to ‘two stages in the genesis of will’ (p. 218). Apparatus 1 is decision forming while apparatus 2 is decision implementing. Apparatus 1 consists of four phases

Table 3-4) with examples from the waiting experiment. In this experiment, human subjects are brought to a room and instructed to wait until someone fetches them. A conflict between staying in and leaving the room arises. A clock on the wall can potentially help human subjects in this experiment to break the dilemma by deciding to leave at a particular time indicated by hands of a clock (Sannino, 2015, cited by Haapasaari and Kerosuo, 2015, p. 2). The decision-implementing apparatus follows decision formation (i.e. Phase 4b).

Table 3-4: Apparatus 1 and 2 and the model of double stimulation

Phase	Description	Example
Apparatus 1: Decision forming	Comprises phases outlined below; at issue is choice of closure path	
1. Conflict of stimuli	Demands or expectations that pull in opposite directions	Being asked to stay vs. having no purpose in empty room
2. Conflict of motives	Activated by conflict of stimuli, the human is at mercy of motives	Conforming to instruction to wait vs. wanting to leave
3. Auxiliary motive	Conversion of stimulus to auxiliary motive, subject begins to control her behaviour	Deciding to use clock to make decision
4a. 'Real' conflict of stimuli	Occurrence of neutral stimulus confronting subject with signal and meaningful connection	Clock reaches particular time
4b. Closure of a conditioned connection between an external stimulus and the decided reaction	Decision to act in particular way, subject makes decision based on occurrence of external stimulus	Participant decides to leave the experiment
Apparatus 2: Decision implementing	Activation of the conditioned connection	Participant leaves the experiment

Source: Haapasaari & Kerosuo (2015, p. 7, citing Sannino, 2015)

From Table 3-4, it is clear that in double stimulation, there are two stimuli: the first stimulus which is triggered by the existing problematic situation; and the second one which is essentially an artefact used to direct or take control of one's actions. The second stimulus also helps to organize behaviour, support remembering and conceptually re-interpret a situation. Hopwood and Gottschalk (2017, p. 36) noted that the second stimulus can either be developed by the researcher or by the subjects on the "basis of their interpretation of the researcher's intention".

f. Double stimulation, scenarios and agency building

One of the approaches that can potentially help to decide on activities to achieve transformative agency is use of scenarios. Within the expansive learning process, scenarios may act as **double stimulation** tools for learning, thus fitting well in the expansive learning process. As will be seen in Chapter Six, four local farming practices scenarios were developed, from worst to best. The worst scenario represents the existing problematic situation, that is the first stimulus option and the best scenario represents conflict of motive. The best possible scenario provides a motive for the activity and represents a possible ZPD for the activity (using the language of

expansive learning). The difference between the best-case scenario and the worst is the ZPD. Below I give further details about scenarios.

a. What are scenarios?

In section 1.7.2.4 of Chapter One, I gave two definitions of scenarios, one by Berkhout et al. (2001, p. 7) and another by Sandra et al. (2000, p. 7). Important points in the two definitions for me, are ‘internally consistent, alternative images of the future, and basis for action’. To sum up, the two definitions say that scenarios (images of the future) are internal (that is organizationally specific), they stimulate some action and are built around the past and present circumstances of the subject matter. Inayatullah (2008, p. 8) summarized the interactions between the future and the present using a diagram that he called ‘the futures triangle’ which consists of pull of the future, push of the present, weight of history and plausible scenarios (Figure 3-7).

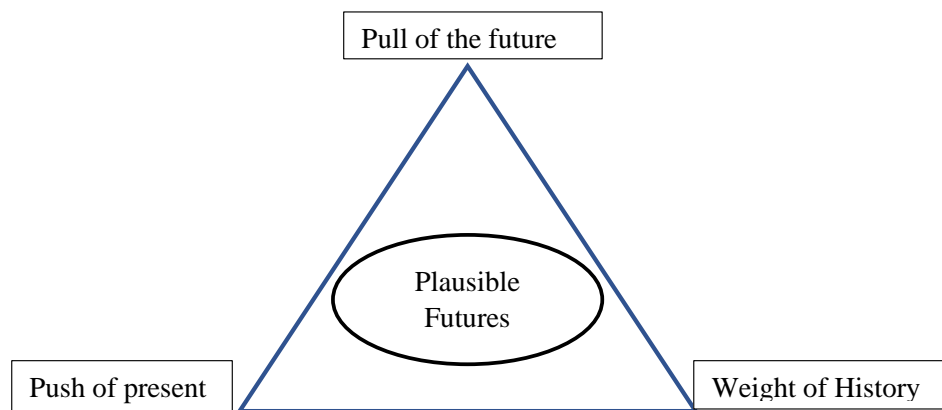


Figure 3-7: Futures Triangle

For Inayatullah (2008), the pushes are quantitative drivers and trends that are changing the future, and these include human population. Weights are contradictions to the desired future. Each image has differing weights. For example, a globalized world may be weighed down by nationalists. Inayatullah (2008) re-emphasized that by analyzing the interaction of these three forces, the futures triangle helps us develop plausible futures and these lie somewhere within the triangle. He is also re-emphasizing the importance of the past when he writes that some scenarios can be ‘back to the future’. This is a situation when we want to go back to the past because of several reasons such as clearer hierarchy and less disruptive technology. “Current change seems too overwhelming, the way is lost, and we must go back” (ibid., p. 8).

Kahn and Wiener (1967) quoted by Sandra et al. (2000, p. 7) added an important dimension of **causalities** to scenarios when he wrote that scenarios “focus attention on causal processes and

decision points”. In other words, scenarios entail that action should not only dwell on the empirical layer (what we see) but also go ‘deeper’ into historical aspects of the situation at hand. By going ‘deeper’ into the root causes, scenarios seem to encourage critical thinking about risks and systems relationships to help stakeholders break out of established routines (hegemonies) such as incremental adaptation (business as usual) practices. Scenarios should be both credible and useful, meeting five conditions, namely: pertinence, coherency, likelihood, importance, and transparency. From the above, it is clear that there are various definitions of ‘scenario’ but one key point is that they are not predictions into the future (van der Heijden, Bradfield, Burt, Cairns, & Wright, 2002, p. 63) As Ringland (1998, pp. 33-34) noted, predictions have a history of getting things wrong and therefore may not be reliable planning approaches:

In the 1960s, the world was fascinated by the apparent triumphs of science. So, for instance, twenty-seven top TRW¹ scientists in 1966 were asked the question: "**What will the world want and need in the next twenty years?**" Schnaars (1989) reports on the wide publicity and discussion arising from these predictions of undersea motels, factories and recreation centers powered by nuclear power, commercial passenger rockets to the moon by 1980, that by 1977 low-cost 3D color TV would reduce business travel, and that by 1973 there would be large-scale educational teaching machine systems.

Of the 335 predictions released, nearly every prediction was wrong. The scientists ignored the economic aspects of markets: their mental model included state-driven mega-projects, which by the late 1960s had started to decline, after the moon-shot had succeeded.

For my research, from various definitions of scenarios, I isolated key content materials relevant to my study. For example, an aspect of **causality** was important in the definition given by Kahn and Wiener (1967) while that of Sandra et al. (2000) highlighted the importance of the *past* and *present* in scenario development, again resonating well with Cultural Historical Activity Theory (CHAT), which enables researchers to undertake historical research as well as contemporary ethnographic research to understand past and present dynamics of activity. In this research I did not use scenarios as predictors of the future, but rather as double stimulation tools to catalyze expansive learning, and to create a plausible zone of proximal development for the transformation of farming activity towards climate resilience amongst women farmers.

Further details about how scenarios played a double stimulation role are presented in Chapter Six.

b. How far into the future and how many scenarios?

As pointed out above, scenarios look into the future. However, most futurist researchers grapple with a question ‘how far into the future?’ and ‘how many scenarios?’ Amer, Daim and Jetter (2013, p. 26) advised that “in general scenarios can be developed for any time frame but generally they provide greater usefulness if developed for long term”. ‘Long term’ is context dependent. For example, ten years is considered as long term in the fashion industry whereas it is relatively short term for many environmental issues including climate change. Generally, 25 years or more may be considered long term for most scenario exercises (ibid.). A time scale of three to ten years might be thought of as short term for scenario work, illustrated by the study of the food and beverage market by a Dutch nutrition company (van Notten, 2005, p. 22). Regarding the number of scenarios to develop, Wollenberg et al. (2000, p. 66), quoting Wack (1998, p. 146), were of the view that “it is not so much to have one scenario that gets it right, as to have **a set of scenarios** that illuminate the major forces driving the system, their interrelationships and the critical uncertainties”. This **set** can then be refined with new concepts or richer language (e.g. proverbs) as will be seen in section 6.2. Wack (1998) did not define for us this ‘set of scenarios.’ Similarly, Burt and van der Heijden (2003, p. 1019), have only advised us to develop a ‘wide range of options’ or ‘multiple possible options. Instead of providing actual numbers of scenarios, other futures researchers have simply suggested scenario categorizations, and these can easily be converted to numbers. For instance, Dator (2002, p. 10) suggested that scenarios can be categorized as continued economic growth (or simply continuation), collapse (e.g. due to economic instability), disciplined society (future strongly organized around ancient values such as traditional beliefs) and transformed (end of current form and emergence of new one) and this translates into four scenarios. Inayatullah (2008, p. 17) said scenarios can be preferred future, the disowned future (the world that we reject or are unable to deal with), the integrated (where owned and disowned are united in a complex fashion) and the outlier (the future outside of these categories) and the total is four again. For Amer et al. (2013, p. 26), quoting Robertson (2007), scenarios can be: business as usual, disaster, authoritarian control, and hyper-expansionist. It seems; therefore, most futurists develop four scenarios. Amer et al. (2013, p. 32) also recommended limiting scenarios to four. The cost of drafting and evaluating many scenarios would be very high and not justifiable. Furthermore, it would be difficult to discuss or even remember more than four scenarios.

Wollenberg et al. (2000, p. 72) advised us to be aware of the ‘middle road’ approach to the future as is often the case with high, medium and low categorization because too often managers will be tempted to prepare action according to the middle because it is ‘most likely’ and this defeats the purpose of scenarios because they are not predictions. Wollenberg et al. (2000, p. 72) also discouraged developing only one scenario because this will be a prediction, thus not yielding any alternate future or future options. Two scenarios are usually based on two extreme situations (optimistic and pessimistic scenarios) and they should also be avoided.

Based on perspective, scenarios can be classified as either descriptive or normative scenarios (Porter, 2010, p. 40). Descriptive scenarios are extrapolative in nature and present a range of future likely alternative events. Normative scenarios are goal directed and respond to policy planning concerns in order to achieve desired targets. Scenarios are also classified according to topic (problem specific verses global scenarios), breadth of the scenario scope (i.e. one sector verses multi-sector scenarios), focus of action (i.e. environmental verses policy scenarios), and level of aggregation (i.e. micro verses macro scenarios) (Amer et al., 2013, p. 26). The futurists above inspired me in terms of determining the number of scenarios to develop and how far into the future to consider for the local farming practices and associated informal learning pathways in my research.

c. Scenarios and their relevance in learning

My research is about learning and for me to monitor qualities and processes of learning through scenarios, I was mainly inspired and guided by Fahey and Randal (1998) *Learning from the future: Compleitive foresight scenarios*, Engeström’s (2016) *Learning what is not there yet*; Wollenberg, Edmunds and Louise (2000) *Using scenarios to make decisions about the future: Anticipatory learning for the adaptive co-management of community forests* and Berkhout et al. (2001) *Socio-economic futures in climate change impact assessment: Using scenarios as ‘learning machines’*. It is therefore clear that besides myself, others have also identified scenarios as potential tools to support learning.

The conventional and most common term that futures researchers use in scenario is ‘scenario planning’ but Fahey and Randal (1998, p. 5) preferred the term ‘scenario learning’ because of the important role that scenarios play in learning. It is for that reason that Berkhout et al. (2001, p. 1) regarded scenarios as ‘learning machines’ to enhance ‘deep learning’. Scenarios are ‘learning from the future’ (Fahey & Randal, 1998, p. viii) which:

show you how to identify the forces [**manifestations of contradictions**] that determine different **possible future** operating environments and how you can prepare an organization to be the first to understand and exploit the significant opportunities each future affords. In our rapidly changing world, your success, and the survival and growth of your organization, depend on mastering the ability to first project these futures and then **to learn from them**. (Emphasis mine).

There are four reasons Fahey and Randal (1998) opted for ‘scenario learning’ rather than the conventional scenario planning. Firstly, learning is not simply a means of generating or acquiring knowledge. Rather learning puts knowledge to action, producing new practices. To elaborate further on the role of scenarios in learning, I once again draw on Engstrom’s (2016) expansive learning and ‘learning what is not there yet’ notion. For Engeström, (scenario) learning can be expansive if it encapsulates “potential to produce new material objects, practices and patterns of activity” (Engeström, 2016, p. 18). In my view, ‘learning what is not there yet’ may imply “learning images of the future (since they are not there yet) and developing contingency plans to act on them”. Taking this view, scenario learning fits in perfectly with the notion of ‘learning what is not there yet’. Engeström (2016) drew a distinction between this notion with another form of expansivity where learners merely go ‘beyond the information given and paraphrase’ what they have learnt. In other words, this is a type of expansivity where learning generates novel ideas but without any action. Secondly, scenarios challenge existing mind-sets by developing plausible alternatives. They compel decision makers to suspend their traditional beliefs, assumptions, and preconceptions in line with the possible futures. Therefore, scenario learning challenges historic ways of thinking and operating and long-held assumptions about important issues. Thirdly, Fahey and Randal (1998) continued, learning implies discussion and dialogue. During such discussions, there could be tensions and conflicts which are manifestations of contradictions, important for stimulating collective learning as pointed out in section 3.6.1.1. Fourthly, learning presupposes that scenarios continuously provide input to decision making processes. These decisions may in turn catalyze further reflection and thinking, thus stimulating “forward-looking joint learning and negotiation” (Wollenberg, Edmunds & Louise, 2000, p. 69) put it.

As noted above, there could be more than one scenario developed. Each scenario reflects the past and has a distinct view of the future and this becomes a focus for learning. Scenario learning takes place at various stages of their development. For this research I was monitoring learning throughout the scenario development process.

Despite its usefulness in stimulating anticipatory learning, there are three key challenges faced by organizations wanting to adopt and execute scenario learning. The first is to learn about and from the future before the future happens. The second is how learning can be integrated into decision making and lastly, how an organization can learn about and prepare for the future better and faster than its competitors?

In my research, I considered that scenarios may help those currently supporting local farming practices to develop anticipatory ‘contingency plans’ in the event of worst-case local farming scenarios happening. These plans may include, but are not limited to anticipatory adaptation plans, modifying and even designing new and innovative informal learning approaches such as citizen journalism, a mass media communication system for and by the community members themselves, or other co-creation platforms. For those opposing, including the government on traditional seed supply, worst case scenarios could potentially raise an alarm, and this may catalyze development and implementation of conducive policies to promote local farming practices and avoid total collapse.

3.7 Conclusion

This chapter has shown that the CHAT model of an activity system is constantly evolving through collective learning actions, in response to systemic contradictions. The essential task of CHAT analysis, as described in this chapter, is to grasp the systemic whole of an activity, not simply its separate components. The main thrust of the whole CHAT model is expansive learning via double stimulation processes to achieve collective and transformative agency which reflects will and motives for transforming activity.

CHAPTER 4: METHODS AND PROCESSES

4.1 Introduction

This chapter summarizes the process I followed in collecting and analyzing data for my research. The outline of this process is as follows: description of research protocols; research phases; selection of research participants; data collection through focus group discussions; observation studies; document analysis; change laboratory workshops; testing model solutions; and data analysis. The chapter closes with a conclusion.

Research protocols highlight approval processes in Malawi and at Rhodes University. In research phases, I have explained three key stages namely mirror data collection, expansive learning and data analysis. Relating to research participants, I interacted with three main groups: women focus group, change laboratory group and WhatsApp group which involved the youth. My core group consisted of 30 women (i.e. 15 per EPA). The focus group was composed of 48 women that I interacted with on different occasions to provide mirror data. The WhatsApp group consisted of an initial number of 20 youth members per EPA. The two groups were constituted in April and July for Nsanama and Domasi EPAs respectively to ‘test’ the workability of WhatsApp as a potential pathway to promote local farming practices.

Data collection processes were largely informed by CHAT as discussed in Chapter Three (Theoretical framework guiding the research process). My study was a case study, therefore, I used multiple research methods (Mukute, 2010, p. 117) or pragmatic approaches as Nagoli (2016, p. 57) called them. For Nagoli (2016), a pragmatic approach is based on “interpretive perspectives” to increase understanding of “critical, social and organizational issues”. ‘Interpretive perspectives’ also recognize data collection through research as a “social construct, developed through a relationship between researcher, research participants, research context and objectives” (Moyo, 2010, p. 64)

The whole process of data collection was interactive. In other words, I collected data **with** my participants. The word ‘with’ is important here and is synonymous with the notion of empathy research whereas researcher, I needed to “feel (perceive) the feelings (emotions) of other people”, women subjects in this case. I had to be “responsive to the feelings of another person” (Changming & Hill, 1996, p. 263). To collect data **with** participants, the first process was co-creation of a stimulating discussion space where I, as a researcher, and the research subjects exercised our collective agency to discuss the problem space relating to local farming practices and informal learning and suggest solutions to the solve the problem. Collective agency was

expressed through resisting traditions, criticizing the current hegemonies, explicating new possibilities, envisioning new models, acting or committing (Lotz-Sisitka et al., 2017, p. 903). Overall, in the whole data collection process, I acted as a formative interventionist researcher seeking to co-engage with women farmers in ways that could potentially enhance the agency of all of us engaged in the process to “undertake epistemic actions of analyzing the need and possibilities for change in their activity, to model the historical development of the activity system and its current developmental contradictions, and to design a new concept as well as new representations and tools for the new activity” (Pihlaja, 2005, p. 185).

My research team was composed of two males and three females. This arrangement provided comfort zone for the women subjects of my study to interact freely **with** the research team considering that women in Malawi are generally shy towards men (a cultural issue).

4.2 Protocols

4.2.1 Approvals

My research involved human subjects and this kind of research requires ethical approvals (Moyo, 2010, p. 64). Approvals were arranged as follows: Faculty of Education Higher Degrees Committee of Rhodes University (see Appendix 1: Approval Letter from Rhodes University); National Committee on Research in the Social Sciences and Humanities (NCRSH), a department of the National Commission for Science and Technology in Malawi (see Appendix 2: Approval Letter from the National Commission for Science and Technology, Malawi); and finally at district level, the project was endorsed on 2 September 2016 by the District Executive Committee (DEC) which constitutes district heads of institutions that coordinate projects at district level. DEC meetings are chaired by district commissioners or his/her designate. The DEC has the power to either approve or reject a project depending on its alignment with district development plans. Since my research would contribute to the Machinga District Development Plan (DDP) where my study sites were located, the project was approved along with the proposed sites of Domasi and Nsanama Extension Planning Areas. The approval process was done through voting after I made a presentation of the research. All 33 DEC members present raised their hands in support of the research project (see list of DEC members that approved my research in

Appendix 3: List of participants for the District Executive Committee Meeting held on 2nd September 2016). Following approval by DEC, the next step was to brief the Agriculture Extension Development Coordinators (AEDCs) about the project by means of telephone conversations. AEDCs are EPA heads. The last phase of approval was with women themselves whose agreement to participate in the study was most critical.

4.2.2 Prior informed consent

As Mansour, Zaki, Abdelhai, Sabry, Silverman and El-Kamary (2015, p. 156) and Tindana et al. (2006, p.1) noted, international regulations and guidelines for research with human subjects require investigators to obtain voluntary informed consent from each research participant. Informed consent is mandatory, as well as being a right of the human subjects involved in the research. It plays a critical role in influencing and shaping long-term relationship, trust and confidence with the human subjects (Getz, 2002, p. 30). In countries where there is a non-literate population, the use of written consent may be problematic, and this was the case with women subjects of this study. Therefore, I used oral consent.

The first step in the consent process was for me to develop consent forms that described the research objectives, anticipated benefits and risks, implications of volunteering to participate, respect for culture, traditions and religion. The forms were translated into Chichewa, the official language in Malawi. The second step was to convene a meeting with the women who would potentially participate in the research. These women were briefed about the project in terms of objectives, lifespan, anticipated risks and benefits.

4.2.3 Research phases

Data collection was done in three phases as outlined in Table 4.1.

Table 4-1: Data collection phases

Phase	Key purpose	Methods	Research objective addressed
Phase 1: CHAT data mirror collection processes	Identification of activity systems, preliminary list of contradictions, key drivers of drought and dry spells, existing adaptation and coping options	1. Document analysis (historical and contemporary data) 2. Focus group discussions (historical and contemporary data) 3. Observation studies (contemporary data)	a, b and c
Phase 2: CHAT Expansive Learning processes	To provide a space for learners to question the existing local farming practices, construct and implement their own through potentially transformative learning processes	Analysis of, and description of expansive learning emerging from the Change Laboratory Workshops. Observations of experiments to aid solution modelling and implementation.	d
Phase 3: Analysis of CHAT data	To isolate and synthesize key informal learning insights from phase 2	Power-relations and layered or sequential data analysis. NVivo 11 (a qualitative data management software package) was used to organize data into nodes to make it easier to analyze and write field reports in a systematic manner.	a, b, c and d

The first phase was collection of mirror data guided by the third generation CHAT framework described in Chapter Three. The mirror data was used as double stimulation material during phase 2 (expansive learning). See appendix five: Questionnaire/checklist for focus group discussions. The same checklist also guided document analysis and observation studies, the two other methods I used for mirror data collection as indicated in Table 4 1. Table 4 2 gives a summary of the mirror data types I collected and their role as double stimulation materials.

Table 4-2: Mirror data type and role as double stimulant for expansive learning

Data type	Role as double stimulation material
Existing local farming practices	Provided a basis to question modern farming practices
Key drivers to drought, dry spells and disasters	Shaped participants thinking on modelling solutions and development of scenarios of local farming practices
Key social barriers and enablers	Enabled participants' critical thinking about potential contradictions
Current informal learning processes	Shaped participants' thought processes to question the existing informal learning pathways for local farming practices
Existing women dominated social networks	Helped to shape women's critical thinking about collective roles in agriculture generally and local farming practices activity system in particular
Role of women in climate change adaptation options	Same reason as the above

The final phase involved analysis and description of the expansive learning process and outcomes using layered analysis (section 4.6.1) and power relations (section 4.6.3). I also relied on NVivo 11, a computer based qualitative data management tool to organize data into nodes to facilitate analysis and report production systematically (see section 4.5 for more details). Each of the three research phases had a purpose, data collection methods and addressed particular research objectives, as noted in Table 4.1. It was important to state which objective were being addressed in each instance to minimize missing out any objectives during data collection.

4.3 Selection of Women Subjects of the Research

4.3.1 Selection for focus group discussions

When the AEDCs were being briefed about the research (see section 4.2.1), they were also requested to consult respective traditional leaders to help identify 24 women from various local governance committees within their EPAs who would be willing to act as ‘seed’ participants. The 24 seed women were then invited to a meeting on 17 January 2017 where they were briefed on the project and their potential role in the research. During the meeting, criteria were co-developed for selection of the final list of 24 participants to participate in the focus group discussions. The following criteria were co-developed and used to select these participants: age (20-40); length of stay in the Lake Chilwa Basin (20-30); willingness to participate voluntarily; adequate knowledge about climate change though this was contested by one woman who said that we should include those less knowledgeable so that they could learn about climate change, this being a learning research project; the criterion was revised accordingly. Each seed participant was then requested to suggest five names from their respective villages. They were free to nominate themselves. With their consent, the suggested names were then assigned numbers that were randomly picked until the number 24 was achieved. The final list of 24 names was split into two groups of 12 following Fern’s (1982, p. 12) recommendation of 8-12 participants for a focus group discussion. According to Fern (1982), too small a sample (<8) may lead to loss of data and too large (>12) may be difficult to manage. The technique of using seed participants to identify the hidden and knowledgeable participants is called Respondent Driven Sampling Technique (National Alliance of State & Territorial AIDS Directors, 2014). Since a cordial relationship with local communities in the study sites had already been developed through the Lake Chilwa Basin Climate Change Adaptation Programme (see section 1.2), the probability of any women being unwilling to participate in my study was quite low.

In the unlikely event that any of the selected women were unwilling to participate, I agreed to redo the selection process with the seed women until the required number was reached.

4.3.2 Selection of women for the change laboratory workshops

From a group of 24 women that participated in the focus group discussions for each study site, 15 were selected as subjects of the change laboratory workshops. This number was chosen because Virkkunen and Newnham (2013, p. 66) advised that “if the number of participants exceeds 15-20 people the participants can no longer work effectively throughout the process as one group”. The 15 women were identified through a voting process guided by selection criteria co-developed by the researchers and participants.

4.4 Data Collection Processes in the Field

4.4.1 Focus group discussions

My choice of focus group discussions as a research technique was primarily based on the work of Wilkinson (1998) entitled *Focus Group Discussions on Feminist Research: Power, Interaction and the Co-construction of Meaning*. Wilkinson reviewed over 200 studies and concluded that focus group discussions help in generating high quality, nuanced interactive data in feminist research. The latter has been defined by Webb (1993, p. 416) as “research on women and for women” where the researcher seriously considers women’s needs, interests, and experiences with an aim of improving their lives (in a changing climate, for example). Initially, I planned to conduct eight focus group discussions, but this was reduced to six because responses were becoming repetitive, meaning I had reached a saturation point.

4.4.1.1 Questionnaire design

A focus group discussion questionnaire was prepared to capture data on the key drivers of drought and dry spells; what social-ecological state and impact these have created; existing, historical (30-year time lines)¹ and planned adaptation and disaster risk responses and the role of women; social barriers and enablers; the informal learning processes taking place; rules, regulations and tools for adaptation and learning; key barriers and enablers to successful transformational adaptation options; how women would like their future to be under a changing climate; the existing social networks and their relevance to transformational adaptation processes. Before commencing formal data collection, the questionnaire was pre-tested at

¹The 30-year timeline in this study is far below the 50-60-year recall period that Belay (2012, p 186) used successfully in his Participatory Mapping, Learning and Change PhD studies. Therefore, I expected good memory with the shorter period of 30 years.

Chitsanzo Radio Listening Club (RLC) in Phalombe District, one of the three districts surrounding Lake Chilwa Basin. My observations after pre-testing included that the questionnaire took longer (more than three hours) to complete than the planned two-hour duration, some questions led to ambiguous responses in addition to being too technical for local communities. Consequently, I revised the questionnaire by removing ambiguities, re-ordering the flow of questions and tabulation to facilitate more careful data generation. Technical questions were also removed and later administered to three technical staff members (as key informants) of which two were AEDCs and one was a Crops Officer for Machinga District. I also split the questionnaire administered to focus group participants into two phases, to be completed on two different days though I still counted this as a single focus group (since it was one questionnaire in two days). The final questionnaire I used for focus group discussions with the women is presented in appendix five: Questionnaire/checklist for focus group discussions.

4.4.4.2 Questionnaire administration

There are various methods of questionnaire administration including face-to-face, telephone and electronic. Among these methods, the least burdensome is the personal, face-to-face interview (auditory channel) as this only requires the respondent to speak the same language in which the questions are asked, and to have basic verbal and listening skills. The method allows probing for more data, gives room to clarify ambiguous questions and adjust the order of questions based on responses given during the discussions (Bowling, 2005, p. 281). Furthermore, it is ideal for a longer questionnaire as the interviewer motivates the respondents. This is the method I used during the focus group discussions with women subjects. Focus group discussions started at around 9:00 a.m. and were planned to be completed by 11:00 a.m. though in most cases the discussions went beyond the planned finishing time and this was already mutually agreed with women when they were signing an agreement to participate in the research. Interviews were done on Tuesdays and Thursdays for Domasi and Nsanama Extension Planning Areas. All the discussions that mostly constituted voices of facilitators and respondents were recorded on a voice recorder and later transcribed into English for inclusion in this thesis.

4.4.2 Observation studies

Baker (2006, p. 173), quoting Gorman and Clayton (2005), defined observation studies as those that “involve the systematic recording of observable phenomena or behavior in a natural setting”. It is a kind of ethnographic study aimed at understanding people within their natural

environment (ibid.). In my research “observable phenomenon” constituted adaptation and coping practices (the “doings” (Kemmis, 2009, p. 6) and “behaviour” highlighted the social-cultural aspects including the sayings and artefacts relevant for adaptation learning at the study sites. Furthermore, I also observed the “relatings” (ibid.) in terms of, for example, how women link adaptation, coping and social cultural practices. All observations I made were recorded in my diary as field notes, but I also took pictures, and audio recorded and occasionally video-taped events. On three separate occasions, I engaged Muslim Radio and Television, Malawi Broadcasting Corporation Radio and Television and local newspapers to do the recording. Data collected during observation studies helped triangulate results of both focus group discussions and document analysis. Through chance encounters, I also had informal and unstructured interviews with six men on contentious issues of labour division between men and woman and the decision making processes at household level. These informal interviews were also aimed at triangulation of the results provided by women during focus group discussions. Before being interviewed, prospective respondents were asked if they would be willing to be interviewed, be audio taped and have their names and pictures publicized. Table 4-3 indicates names, status, location and dates these men were interviewed.





Table 4-3: Names of men consulted to validate some of the women claims

Name	Status	Date Interviewed	Location
Ernest Chingwaru	Lead farmer	21 August 2018	Domasi EPA
Clifford Khomba	Agriculture Extension Development Coordinator	21 August 2018	Domasi EPA
Lackson Pwetete	Grandson to Agnes Amisa, one of the focus group participants	22 August 2018	Domasi EPA
Isaac Mtambalika	Husband to Mercy Kauye, one of the focus group participants	22 August 2018	Domasi EPA
Usman Mamu	Lead farmer	29 August 2018	Nsanama EPA
Jealous Matandika	Group Village Headman	29 August 2018	Nsanama EPA

Presented below (Tables 4-4 and 4-5) are observation study visits to the two study sites during both dry and rainy seasons to compare results. These sites were identified during focus group discussions and change laboratory sessions (see section 4.4.4 for more details about the sessions).






4.4.2.1 Dry season observation studies



Table 4-4: Dry season observation studies at Domasi EPA on 21 August 2017

Site description	Activities	Photo
Flood risk control band (Domasi River)	Interviews with Zione John, a woman participant in the research. Interviews on history of flooding in Domasi River; labour division during construction works, contradictions faced	
'Mphanje' a local farming practice	Interviews with <i>mphanje</i> farmers on the history of <i>mphanje</i> , why <i>mphanje</i> , how it is made, learning pathways and contradictions	
Human waste manure	Interviews with Jennifer Maiteni who uses human waste manure. I enquired why she was using this manure and about surrounding communities' perceptions	
Conservation agriculture (minimum tillage) and conventional farming (ridging) demonstration plot	Interviews with Mr. Steven Gonani (an extension worker from Domasi EPA) on why two contradictory practices are promoted by extension workers	

Maize under bucket irrigation system	Interviewed husband to Maria Petro, a woman who participated in the focus group discussions, to validate some of the responses provided by women. Also interviewed a lead farmer again for validation purposes.	
Banana roots dried and ground into flour (in place of maize) for coping with drought	Interviewed Margret Mbulaje, a participant in focus group discussions and her daughter on how this coping strategy is learnt, how its usage varies with drought (i.e. assessing if drought is catalysis for use of banana roots)	
Trial plot with Irish potatoes	Interviewed an innovative woman (Zaidati Jali) who is trying to cultivate Irish potatoes in her village. Irish potatoes are not normally cultivated in the village due to unfavourable weather conditions	



Table 4-5: Nsanama EPA dry season observation studies

Date	Site description	Activities	Photo
29/7/17	Wild yam as a coping strategy	Interviews with Halima Sailesi (research participant) and her husband on origin, learning pathways and how drought catalyzes usage of wild yams	
	'Mkokabwato' creeping plant as a coping strategy	Focus group discussion with participants who gathered at site. Also interviewed a teenage daughter to Emma Chalaka (one of the participants in the research) for her to shed light on the reasons for use, how learning takes place and how drought has catalyzed usage	
	Social networks; 'Azimayi a Ziwiya' (literally meaning utensils promoting and sharing group) and 'BankiMkonde' (village banking)	Interviews with women on the purpose of these social networks and the role they can play in addressing drought and dry spells and the associated contradictions	
	Local rice seed cultivation	Interviewed Elestina Mkanamwano (research participant) on how this variety helps her to adapt to climate change and the associated contradictions	
	Sweet potato cultivation as a coping mechanism	Interviews with Mary Amon (a focus group participant) and her husband on why they opted for sweet potatoes cultivation and how this is catalyzed by drought. How labour is divided and how decisions are made.	

30/7/17	Whitman manure, made by a blind farmer	Interviews with Mr. Edward Whitman on why this manure, how it is made, contradictions faced, and how it is catalyzed by drought	
	Manure ' <i>a mpendamphepo</i> ' (literal: manure against wind direction')	Interviews with participants (including lead farmers) who gathered at site. Participants explained how the manure is made and its role as an adaptive measure under drought and dry spells	



4.4.2.1 Rainy Season Observation Studies

Table 4-6: Domasi EPA rainy season observation studies

Date	Site description	Activities	Photo
22/02/2018	Demonstration plot: Conservation Agriculture (minimum tillage) and Conventional Farming (ridging)	Asked an extension worker (Mr. Steve Gonani) on how maize has fared under conservation agriculture and conventional farming using ridges.	
22/02/2018	Visited a female model farmer cultivating both local maize and hybrid	Interviewed the farmer on reasons for her continued cultivation of local maize despite aggressive extension campaigns to go for hybrid; how she compares performance of local maize and hybrid under drought and fall army worm attacks that devastated most of maize during the 2017/2018 growing season	

22/02/2018	Visited Zaidati Jali, a farmer who had cultivated rice in a field she had initially grown Irish potatoes on a trial basis	Asked about successes and challenges she faced cultivating Irish potatoes on trial basis	
19/12/ 2017	‘Mphanje’ field	Interviewed farmers on progress since they were visited by the research team in August 2017 during dry season observation studies mission	

Table 4-7: Nsanama EPA rainy season observation studies

Date	Site description	Activities	Photo
8/11/2017	Whitman manure, made by a blind farmer	Interviews with Mr. Edward Whitman on how the ‘new’ Whitman (with new ingredients) is better for promoting maize growth compared to the previous type shown to us during dry season observation studies	
22/03/2018	Local maize cultivation	Interviews with Group Village Headman Patete and his subjects to get details about local maize cultivation, why continuing with local maize, why cultivate hybrid at the same time	

4.4.3 Document analysis

Document analysis is a meaning-making process by a researcher from the documents accessed. The word “document” is here used in a broader context and includes public records (e.g. mission statements and strategic plans); media (e.g. newspaper reports and radio programmes), personal documents (e.g. e-mails and Facebook entries) and physical evidence found in the study site (e.g. artefacts, flyers and posters). I used document analysis to obtain and interpret historical (50 year timelines) and current information on drought, adaptation strategies, coping strategies, contradictions to adaptation practices and the associated **informal learning processes**. Despite their wide use in qualitative research, documents are rarely produced with researchers in mind and they can be lengthy, incomplete, undated and with questionable authenticity. To curb this problem, I held two validation workshops with relevant stakeholders (see session seven of the change laboratory workshops ‘*Examining the model through validation workshops*’).

I reviewed several documents especially those relating to Lake Chilwa Basin and these are presented in Tables 4-8 and 4-9.

Table 4-8: Videos reviewed

Video name	Year produced	Brief description and relevance to my study
Farming versus climate change	2011	Highlights indigenous and scientific methods of determining onset and reliability of rainfall. Key drivers of climate change are also highlighted. Determination of rainfall amount and onset is highly contested in the video and this is a manifestation of contradictions, key stimulants of expansive learning.
Kanthu Nkhama (literally meaning ‘No Sweet Without Sweat’)	2012	Video highlights imminent drying of Lake Chilwa in 2012 and the importance of anticipatory learning, key drivers of Lake Chilwa drying, gendered impacts, solutions to impacts and traditional beliefs relating to women catching fish in the Lake
Climate Change: How does it affect livelihoods?	2015	Video highlights drivers to deforestation, the power of knowledge in tackling climate change and role of various stakeholders in combating climate change including the media and youth.
Lake Chilwa dry	1996	Video shows Lake Chilwa when it dried up in 1996 and refilling thereafter. Impacts on gender, fisheries and boat transport are highlighted.
Extreme Weather Patterns documentary	2013	Video highlights impacts of climate change on livelihoods including education sector at Chancellor College, University of Malawi which was closed due to drying of Mulunguzi Dam in 1992. The dam is the sole supplier of water to the college. Farmers’ dilemma (contradictions) on when to plant considering unpredictable rains are mentioned and solutions to drought impacts are proposed
‘Kusintha kwa Nyengo’ (Climate Change) Stories	2014	Video highlights power of prayer in bringing rainfall, flood impacts and bribery
‘Chiyambi Cha Mvula mu 2013 kumwera kwa Malawi’ (Onset of rains in Southern Malawi in 2013)	2013	Highlights flood impacts (was a disaster by then) and solutions to curb disaster floods. Science contradicts with local knowledge on a historical devastating flood called ‘Napolo’.
‘Kufunika Kwa Nsungwi’ (Importance of bamboos)	2012	Video highlights importance of selling baskets from Nsungwi (local bamboos) as a coping strategy against climate change. Informal learning pathways are also mentioned.
Bilharzia	1991	Awareness creation on bilharzia, testing and treatment. Video also highlights deforestation as a challenge to fishers smoking fish.
Doctor Allan Chiyembekeza Visit to Lake Chilwa	2015	Video highlights importance of weather monitoring (Stevenson Screen, Water Discharge) for anticipatory adaptation learning and planning
Farmers’ Right to Seed: Experiences from Malawi	2018	Highlights contradictions between local knowledge practices and modernity related to seed supply and production chains. Exchange visits and seed fares are highlighted as important informal learning pathways to learn about local crops. Community seedbank to local multiply seed are important to maintain local seed
Farmers’ Right to seed: experiences from Guatemala	2018	Highlights importance of local seeds on livelihoods and culture; increasing access to local seed and the role of women. Community radios are mentioned in the video as important for disseminating local knowledge. Other informal learning pathways highlighted include agrobiodiversity fares, seed fares and social networks.

Table 4-9: Newspapers and reports reviewed

No.	Newspaper/Report	Year
1	Daily Times: Reforestation of Zomba Mountain Underway	1996
2	Nation Publications: Downpour destroys property in Phalombe	1996
3	Daily Times: Phalombe disaster: Residents uncertain of their future	1991
4	Daily Times: Drought affected farmers urged to plant fast maturing crops	1997
5	Nation Publications: Locust go on the rampage	1996
6	Nation Publications: Women and Deforestation	1996
7	Go for irrigation to achieve the Malawi Growth and Development Strategy	2008
8	Offsetting the dilemma in climate change fight	2012
9	Adapting to climate change through adoption of conservation agriculture and drought-tolerant crop varieties in the Lake Chilwa Basin	2013
10	Building Capacity for Climate Change Adaptation in West and Southern Africa: End of Project Report	2010
11	Gender mainstreaming in the Lake Chilwa Basin climate change adaptation programme training report	2011
12	Joint Monitoring and Evaluation Report of the Lake Chilwa Basin Climate Change Adaptation Programme	2016
13	Lake Chilwa lake Water Monitoring Report	2012
14	Lake Chilwa Basin Climate Change Adaptation Programme Annual Reports	2011-2014
15	Livelihoods in the Lake Chilwa Basin	2013
16	Uncovering human social networks in coping with Lake Chilwa recessions in Malawi	2017
17	A Lake without Water: Livelihood coping strategies during the Lake Chilwa water recessions in Malawi	2016
18	Coping with the Double Crisis: Lake Chilwa Recession and the Great Depression on Chisi Island in Colonial Malawi, 1930–1935	2017
19	Utilizing Local Knowledge for Climate Change Adaptation A Case Study of the Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP), Malawi.	2012
20	Climate proofing local development gains in rural and urban areas of Machinga and Mangochi, Malawi: A Field Report on Social and Economic Activities at Mposa, Machinga	2013
21	When and what to plant: The challenges to farmers of shifting onset of rainfall in Domasi Extension Planning Area, Machinga District in Malawi	2013
22	Rural Livelihoods, Environmental Sustainability and Climate Change in Malawi: An Annotated Bibliography	2013
23	Consolidated participatory vulnerability assessments of areas targeted by Civil Society Network on Climate Change (CISONECC) in Malawi	2017
24	The Nyasa Times	2017
25	Malawi fears hunger as Lake Chilwa dries	2012
26	Machinga District Disaster Occurrence (2008-2017)	2017
27	List of scientists who disagree with the scientific consensus on global warming	2018
28	The History of the Level of Lake Chilwa The History of the Level of Lake Chilwa	2014

Data collected during the initial consultations and field assessments along with that obtained through document analysis provided mirror material for the **change laboratory workshops** that commenced in October 2017.

4.4.4 Change Laboratory Workshops

A change laboratory workshop is defined by Virkkunen and Newnham (2013, p. 15) as “formative intervention method for developing work activities by the practitioners in collaboration with researcher-interventionists. It is a tool kit for envisioning, designing, and experimenting with new forms of work and a social setting in which this can be done”. The process of designing change laboratories and experimenting solutions follows orderly sessions, one building on the other. For my research, eight sessions were conducted each lasting two to three hours. Each session had schedule of events prepared in advance jointly with my research team and discussed with women for their inputs before sessions started. Presented below (Table 4-10) is a sample schedule for session one

Table 4-10: Change laboratory session one plan for Domasi and Nsanama EPA

CHANGE LABORATORY SESSION		1/DOMASI AND NSANAMA EPAs
DATE:		
RESEARCHER/INTERVENTIONISTS TEAM MEMBERS: Mr. Gibson Mphepo, Ms. Elida Mateketa and Ms. Bernadette Zimba		
SESSION PURPOSE: Equip participants with knowledge about change laboratory intervention processes		
TO DO LIST FOR THE SESSION <ul style="list-style-type: none"> • Prepare video packed with contradictions – local versus modern farming practices • Prepare questions from the video to stimulate discussions • Sheet introducing Change Labs and the 7 expansive learning stages • Sheet introducing the notion of activity system • Prepare a disturbance diary • Arrange for a video camera • Task for session 2: Data sheets to record historical profiles of informal learning practices and coping strategies 		
Time	Minutes	Activity
9:00	20	<ul style="list-style-type: none"> • Introducing change labs: What is a change lab and how does it differ from other approaches? • Explanation of the expansive learning cycles (sessions) and their timing agreed with women • Question and answer session on change labs and expansive learning • Nomination of minute taker and board scribe • Identify an object of both the local and modern farming practices
9: 20	90	<ul style="list-style-type: none"> • Show a video on when and what to plant as the first stimulus followed by question and answer session. The video will be segmented into 20 minute parts and participants can ask questions on each segment.
10:50	10	Introducing the task for next session: Historical data sheets and activity systems triangle

A sample disturbance diary for the first session for Domasi Extension Planning Area is presented below.

- One participant (Rose Yusuf) sent her daughter to represent her because she was attending a funeral. (The daughter was not knowledgeable about the research).
- Some participants came in late as they come from distant places.
- Since we were meeting at the rice scheme/ Agriculture offices, we were disturbed by people advertising their rice on that day.
- The meeting did not start at the appointed time as other people who were not selected also showed up thus we needed to ensure that they left.
- Margret Mbulaje, one of our participants, came with a toothache so she at some point participated in a limited way.
- Some people were making a noise outside the workshop room.
- Some participants were giving answers that were parallel from the questions asked and this made the session longer.
- The session was much longer than expected as it started at 09:15 and ended at 12:15 since some women took a long time to respond to some of the questions asked.

A diary such as the one above was important because it helped me to adjust my approach for the subsequent sessions.

4.4.4.1 Change laboratory sessions in detail

Session one: Questioning

Questioning means criticizing some aspects of the current practice, plan or wisdom. For this research, the bone of contention was between modern and local farming practices. Women were given space to question their own local farming practices in relation to modern ones. The session started with briefing participants about the change laboratory workshops and the seven expansive learning stages, outlined in section 1.7.2.8, namely questioning the existing system, analyzing the situation with reference to empirical and historical domains, modelling (that is looking at causalities to local farming practices and proposing local solutions), examining the model through testing, implementing the new model, reflecting on the whole process and finally consolidating. Specifically, participants were informed that for the local farming practices to transgress the current hegemonies, the learning journey through the seven stages

would be loop-like (i.e. non-linear). To illustrate the seven stages visually, I redrew and translated into Chichewa (official language in Malawi) Engeström's (2016, p.59) seven learning actions (Figure 4-1).



Figure 4-1: Seven stages of expansive learning

After the briefing, a scribe (Eneles Mponda) was nominated from the group to take notes on behalf of the other participants. Following the notion of double stimulus (Vygotsky, 1978), I showed a video on farming versus climate change as **first stimulus**. As pointed out in Table 4-8, the video highlights contradictions between science and indigenous knowledge systems in determining the onset and reliability of rains for planting. Participants were asked to highlight what they had learnt from the video with a particular focus on contradictions between science and local knowledge. Because the video was very long (1 hour 5 minutes), it was shown in segments of 20 minutes, allowing participants to comment and ask questions at the end of each segment. Segmenting the video was done to minimise memory loss that is associated with longer learning periods.

At the end of session 1, participants were provided with data capture tools on how informal learning, various local farming practices and coping strategies have evolved across the years from 1943 to 2013. Back home, they were requested to ask elders and other villagers on how informal learning had evolved across the years using a scale of 0, 1 and 3 that was agreed upon with the participants (0 = no evidence of informal learning, 3=significant learning). The same scaling was used to capture data on coping strategies and local farming practices. For instance, if people had not used sawdust as a coping strategy in a particular year, they would record 0 and if use was widespread, they would record 3. Some of the years in the data sheets had known drought incidences while others were normal rainfall years according to records and this was done to see if drought was a catalyst of informal learning. Taking the example of sawdust, if it was recorded as being used in 1949 (a known drought year) and not in 2010 (normal rainfall), I would conclude that drought was catalysing learning. The historical information generated was used in session 2 (Analysis). Women were also provided with an activity systems triangle which was explained to them in advance in terms of what instruments, subject, rules, community, division of labour, object and outcome mean. Each of the six elements was explained to participants through examples. The data capture sheets and the triangle acted as **second stimulus** (see Appendix 6)

Session two: Analysis

Analysis session asked and answered a general question: “What are the causes and conditions that create this problematic (questioned) aspect of the activity, what is its origin?”(Virkkunen & Newnham, 2013, p. 84). The main purpose of this session was to identify inner contradictions in the current local farming activity system and trace the roots of these problematic situations through historical analysis.

Session 2 started with a recap of what happened during session 1. The facilitation team also asked about lessons women learnt during the data collection process for the assignment they were given during the first session. A common difficulty was finding information back in 1943, one of the years in the data sheet.

I also presented on a flip chart key contradictions (modern versus local knowledge systems) summarized from the video shown in session 1 and asked participants to comment on my summaries and suggest causes for the contradictions, especially those relating to neglect of local farming practices in general. I then presented a list of local farming practices from focus group discussions as **mirror** information and asked participants to comment and add any other

local farming practices that might have been omitted. Some of the mirror data came from the same women since some had participated in focus group discussions. Over ten local farming practices were identified from each of the two EPAs. Noting that modelling all the identified local farming practices would not be realistic given the time, it was agreed that only three practices be selected for further analysis. The three local farming practices were selected through voting based on their potential to address climate change and uplift peoples' livelihoods through the expansive learning process. Another criterion was ability of the participants to implement the chosen local farming practice on their own after the new model is developed. Each of the three practices was described in terms of the six elements of an activity system. **Primary** and **secondary contradictions** were being identified within a node and between nodes respectively as the discussions proceeded.

Session three: Modelling

Virkkunen and Newnham (2013, p. 50) regarded modelling as “constructing an explicit, simplified model of the new idea, a germ cell, that explains the problematic situation and offers a perspective for resolving and transforming it.” For my research, it meant co-generating solutions to local farming contradictions identified in session 2 above.

During the second session, time was inadequate to complete identification of the contradictions to each of the three selected local farming practices and so session 3 continued with identification of more contradictions. It later transpired that some women also wanted discussions on contradictions affecting the other remaining local farming practices. Moving forward, the discussions were then extended to the remaining practices as requested by the women. However, these discussions were not as rigorous as the selected three in terms of analyzing contradictions for each of the six nodes of the activity system. While contradictions were identified, solutions were also suggested, and these propositions later constituted a *transformation of an old activity system to a new one* (a new model) after further discussions and consultations with other stakeholders besides women. Furthermore, during this session, there was prioritization of informal learning pathways on local farming practices in general and specifically on the three practices selected in session 2. Prioritization was done by first brainstorming informal learning pathways that can potentially help to create more awareness about local farming practices and these included radio, television, newspaper, drama, preaching, demonstrations, trials, learning visits, word of mouth, loudspeaker announcements, songs and poetry. Then voting followed to identify top priority pathways that would also be part of the development of a new object of activity.

It transpired that participants were struggling to come up with contradictions for some of their local farming practices and so the session was repeated another week where I provided some **mirror information** from various documents I had read on each of the local farming practices under consideration.

Session four: Modelling (continued)

Mirror data that I obtained from document analysis and focus group discussions on contradictions for each of the local practices under consideration was presented and participants were asked to comment if the stated contradictions occurred in their areas. Solutions were suggested for each of the contradictions against each farming practice. Contradictions and model solutions suggested formed the basis for session 5, scenarios.

Session five: Scenarios

There are numerous scenario building methods, to such an extent that some futurists have described scenario development techniques as ‘methodological chaos’ (Martelli, 2001, quoted by Amer et al., 2013, p. 26). Some methods are simplistic, yet others are complex. In terms of data requirements, some are qualitative and others quantitative. There are three major schools of techniques for the development of scenarios (namely intuitive logics, probabilistic modified trends (PMT) methodology and the French approach of La prospective (Bradfield et al., 2005, pp. 799-801).

The first one, intuitive logic, has received most of the attention in the scenario planning literature (Bradfield et al., 2005, pp. 799-800). This technique now dominates scenario development in many countries (ibid.). The technique assumes that decisions are based on a complex set of relationships among the economic, political, technological, social, resource, and environmental factors (Huss & Honton, 1987, p. 21). Intuitive logics approach does not use any mathematical algorithms or statistical inferences and is therefore simple and applicable to local communities. This technique is qualitative and largely relies on the knowledge, commitment, credibility and communication skills of the scenario team members (ibid.). The second technique, probabilistic modified trends (PMT) is quantitative while the third, the French approach of La prospective is a combination of the two. For this study, I adopted the intuitive technique because it is simple and applicable to rural women who participated in my study, all of whom had never received any secondary school education.

Another important decision I had to make before developing scenarios was to choose between normative and exploratory scenarios. Berkhout et al. (2001, p. 11) defined normative scenarios

as “those built on positive or negative visions of the future and explore pathways of change and decision points that might lead to them”. ‘The future’, Berkhout et al. (1996) continued, is figured as a **single state** and the capacity of social agents to make the changes necessary to move towards this **predetermined** state. This approach therefore mirrors traditional objective-based planning in which milestones are set and actions listed, the positivist approach, in my view.

Exploratory scenarios posit alternative socio-economic conditions and an attempt was made to construct plausible representations of the future, pictured through the elaboration of multiple alternative states to stimulate action. While normative scenarios are positivist in nature, exploratory scenarios stress the importance of adaptation to new circumstances. There are four key assumptions of exploratory scenarios as follows:

1. The future cannot be described as a persistence of past trends. It can be shaped by human choice and action.
2. The future cannot be foreseen but exploring the future can inform the decisions of the present.
3. There is not only one possible future. Uncertainty and ignorance call for a diverse set of futures (scenarios) mapping a ‘possibility space’.
4. Developing scenarios involves both rational analysis and subjective judgement. It therefore requires interactive and participatory methods. Users of scenarios must participate in their generation and evaluation.

For my research, I chose exploratory scenarios because the local farming practices, a subject of my study, cannot unfold in ‘one state’ of being only perfect, for instance.

Having decided to use intuitive and exploratory scenario development techniques, I then employed a method by Blyth (2005, pp. 5-6) which outlines further steps in constructing scenarios. These steps are presented in Table 4-11 that follows.

Table 4-11: Progressive development of intuitive and exploratory scenarios

Step	Description	How I applied this to my study
1	Formulate the topic or issue of importance to the audience	Detailed literature review was conducted, and local farming practices and informal learning were chosen as matters of concern since they are neglected in the study area
2	Identify the driving forces of change	Focus group discussions and document analysis were conducted to identify key drivers of drought, dry spells, local farming practices and informal learning
3	Group or cluster change drivers into a meaningful and more manageable key set of variables	I used Nvivo, a qualitative data analysis tool to cluster drivers. Clustering was done through development of nodes which are 'containers' of related material in one place (Hilal & Said, 2013, p. 184) [See section 3.5 (data analysis for more details about Nvivo)]
4	Rank the variables in terms of their relative importance to or impact on the topic and their relative uncertainty or predictability. From the ranking, two drivers or critical uncertainties (UNEP, 2002) are chosen as a primary focus of the scenario creation process.	The ranking was done through discussions during session five of the change laboratory workshops
5	Develop the scenarios, drawing on the critical uncertainties	This was done through discussions during session 5 of the change laboratory workshops
6	Test the scenarios to ensure that they are distinct from each other	This was done during a feedback session to rural women who developed the scenarios. A validation workshop was also done for 'extended peer community' review (D'alis & Kallis, 2015, p. 217)

Source: Adapted from Blyth (2005, pp. 5-6)

Session five was split into four distinct workshops: scenario briefing; identification of critical uncertainties; scenario plotting; and scenario naming.

a. Scenario briefing

Participants were briefed on what scenarios are and why to develop them. Figure 4-2 below was used to explain the scenario concept.



Figure 4-2: An illustration of how the current state might inform the future

In Figure 4-2, the first picture to the left represents a hypothetical loop learning journey from point A to point B. However, there are question marks at the end indicating that we do not know how A will unfold at B. The middle picture depicts a straight river (*mtsinje*). Using the notion of the past and present trends informing the future, participants were asked about the likely course of the river – continue straight, turn right or turn left. The last picture illustrates a winding road (*mseu*) and again participants were asked to state the likely direction of the road– whether it will wind to the right, left or go straight.

b. Identification of Critical Uncertainties

I used the Wilson Matrix (Amer et al., 2013, p. 34) to identify two critical uncertainties that are already defined in section 1.7.2.4. The matrix ranks all factors against two dimensions: potential impact and probability of occurrence (Chavula et al., 2017, p. 839). Below I show how I adapted Wilson Matrix for my study.

- a. A scale of 0 to 3 was agreed upon with women participants. For uncertainty, 0 = highly certain and 3 = very high uncertainty. For importance, 0 = not important and 3 = very high importance.
- a. For each driver identified during focus group discussions in turn, we plotted on the chart using X-Y axis. Uncertainty (*Mlingo wa chikayiko*) was X-axis while importance (*Mlingo wa kakhuzidwe*) was Y-axis (see Figure 4.3). The further the dot on the X axis,

the greater the uncertainty on how that driver will develop. Likewise, the further the dot on the Y axis, the more significant is the impact of the driver.

- b. Identify the drivers that have the highest importance and uncertainty, and these were our critical uncertainties.

Figure 4-3 summarizes the process that was followed to identify the two critical uncertainties.

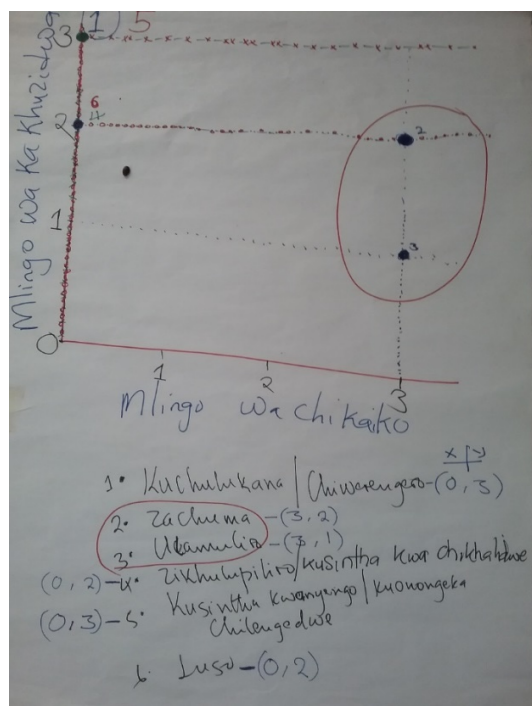


Figure 4-3: Plotting drivers on X-Y axis at Domasi EPA

In Figure 4-3, 1 = Human population (*Kuchulukana*), 2 = Economy (*Zachuma*), 3 = Governance (*Ulanuli*), 4 = Social change (*Zikhulupiliro*), 5 = Climate change and environmental degradation (*Kusintha kwa nyengo/Kuonongeka kwa chilengedwe*), 6 = Technology (*Luso*)

The procedure above generated the following combinations (Table 4-12).

Table 4-12: X-Y axis points for all the drivers considered in the scenario development

Driver	Degree of uncertainty	Importance	X-Y Axis Combination
Human population	0	3	(0,3)
Economy	3	2	(3,2)
Governance	3	1	(3,1)
Social change	0	2	(0,2)
Environmental degradation and climate change	0	3	(0,3)
Technology	0	2	(0,2)

From these combinations, economy and governance were the two critical uncertainties to determine the future of local farming practices within the next 30 years from 2017 at Domasi. Interestingly, similar results were obtained for Nsanama EPA and for Malawi in general (Chavula et al., 2017). Economy was described in terms of economic policies, sector-based production, infrastructure development, markets and prices, international cooperation and consumption patterns. Governance was defined by the following parameters: political will, democratic dispensation, decentralization, public awareness and environmental education, community participation and rule of law. These descriptors formed reference points when developing storylines of the scenarios (see Chapter Six).

c. Scenario plotting

I used the 2x2 matrix approach to generate four quadrants (representing four local farming practices scenarios). Costs for this approach are minimal and it is also a simple plot requiring only two variables (Pillkahn, 2008, p. 364), therefore ideal for the rural women subjects of my study. Amer et al. (2013) provided two other approaches, namely standard and maximum. The standard approach requires 3-8 variables while the maximum requires more than 8 variables, too complex for rural women. Plotting the two critical uncertainties generated four scenarios as follows:

Scenario one: Good Governance and Good Economy

Scenario two: Good Governance but Poor Economy

Scenario three: Good Economy but Poor Governance

Scenario four: Poor Economy and Poor Governance

The four scenarios above are described in detail under Chapter six.

d. Scenario naming

When developing scenarios, Bowman, Bradley, Masrani and McKiernan (2013, p. 746) suggested that we create **catch, memorable** and **evocative names** that quickly convey the crucial changes in the business environment. The catch or evocative names are tied to a scenario to guide subjects critical thinking in describing the scenario. For example, Chavula et al. (2017) used the name 'hyena' as an evocative name to describe the worst possible state of the environment (first stimulus) in Malawi. The sound or sight of a hyena portrays a bad omen and may be equated to the second stimulus of the double stimulation model because it stimulates

critical thinking among the subjects. For example, upon seeing a picture of a hyena, the subjects may decide to mobilize resources to avoid total collapse of the environment, that is, trying to avoid the ‘hyena’ situation. In this vein, **evocative** names were suggested for each of the four scenarios above in Chichewa, the official language in Malawi. In all the scenarios, more than three names were suggested, discussed and the final name was selected through voting among the women participants.

e. How the key drivers unfold under each scenario

The facilitation team drew on a flip chart and explained to women that key drivers under each of the four scenarios may change in four ways: increase, decrease, stay constant or oscillate. The increase or decrease could also be steep (significant change) or gradual (small change) and the angles to the arrows could vary accordingly. The next step after explanations was to look at each driver in turn and determine the direction of change in the next 25 years which was our benchmark for the scenarios. Results of this exercise are presented in Chapter Five.

f. Some challenges met in scenario development

It is worth stating that this was the first time in the history of Malawi that local communities were engaged in scenario development and therefore there were some challenges. The first challenge was related to translation of key terms in scenario discourse. The most difficult terms to translate were ‘critical uncertainty’, ‘level of uncertainty’ and ‘level of importance’. The facilitators (myself, Elida Mateketa and Joan Chilufya) took turns explaining the terms in Chichewa until such a point when some women within the group could articulate the terms. Another challenge was plotting on X-Y axis the key drivers to identify critical uncertainties. The first X-Y plot was problematic but subsequent plots were quite easy for the women since some of them could do the plotting (e.g. Dorothy John (Figure 4-4) and Zione John (Figure 4-5) from Nsanama and Domasi EPAs respectively).



Figure 4-4: Dorothy Meya (Nsanama EPA) doing the X-Y plots



Figure 4-5: Zione John (Domasi EPA) doing the X-Y plots

The third challenge relates to determining how key drivers would change especially under the two scenarios of good economy versus poor governance and good governance versus poor economy. It took protracted discussions among participants themselves but also with facilitators to agree on the directional changes. As with identification of critical uncertainties, there were some fast learners and who later co-facilitated the session (e.g. Mary Amon, Rose Mulewa, Zione John and Hilda Stand) and a short video was produced. The women found it easy to determine directional change of key drivers for the best- and worst-case scenarios.

Session six: Examining the model through validation workshops

Two validation workshops were conducted, one in each of the study sites. The main purpose of the workshop was to create space for various stakeholders to “provide extended facts” (Ravetz, 2004, p. 352) to preliminary research results particularly new model solutions, including scenarios, that women suggested.

The workshop drew participants from the political arena (Members of Parliament and Ward Counsellors), various faith communities (e.g. Muslims and Christians), government departments (such as Forestry, Health, Community Development, Social Welfare, Local Government), NGOs (e.g. One Acre Fund), community groups (e.g. Youth networks, Civil Protection Committees, Radio Listening Clubs and drama groups). During the workshops, representatives of women who participated in the research made presentations and answered questions from stakeholders. For each of the two workshops, one woman presented on general contradictions affecting all local farming practices and proposed solutions, another woman presented on contradictions relating to individual farming practices while the last one presented on scenarios. Overall, the results were accepted as a true reflection of the local farming practices. At both workshops, participants commended the research for its potential in promoting local farming practices. Although most of the findings were accepted, some solutions suggested by women were challenged at the workshop. For example, at the Domasi workshop, women suggested that preaching sermons (as an informal learning pathway) should focus only on salvation but the faith leaders present were against these suggestions. At Nsanama EPA, participants also suggested more solutions to local farming absences. For example, formation of a youth WhatsApp group and local seed multiplication were only mentioned by workshop participants and not women subjects during change laboratory sessions. The suggestions provided by workshop participants were later included as additional key findings of my study.

Session 7: Testing the new model solutions

Under change laboratory interventions, ‘testing new model solutions’ refers to “the **feasibility** of the new model and to the relationship between the new model and the current activity system (Virkkunen & Newnham, 2013, p. 98). Participants carry out ‘thought experiments’ as opposed to positivist research typified by replications, randomization, statistical sample size determination. Modelling the new solution is a continuous process of developing an idea for a new model, producing versions and modifications of the original ideas and examining them until an acceptable model has been reached.

During focus group discussions, change labs and validation workshops, participants suggested over 20 solutions to address challenges affecting their local farming practices. Considering time available (<1 year) to get results from the tests, a meeting was convened with women to choose which solutions to try for some results before the year end using the criteria below (Table 4-13) jointly developed with women.

Table 4-13: Criteria for selection of model solutions to be tested

Criterion	Explanation	Model solutions selected for testing based on this criterion
Uniqueness	While some of the solutions suggested were ‘business as usual’ in nature and therefore not potentially transformative, others were exclusive to few individual members of the community	<ul style="list-style-type: none"> • Use of ripe ‘<i>makumbuka</i>’ banana peels to enhance decomposition (Domasi) • Use of ripe ‘<i>sukari</i>’ banana peels to eradicate native bamboos to create more land for cultivation (Nsanama) • Youth WhatsApp group to promote local farming practices (first of its kind in the study sites) (Domasi and Nsanama)
Frequency a solution was mentioned	Where a solution was suggested by more than five participants (according to NVivo word count), it was regarded as ‘frequent’ implying that that solution was important in promoting local farming practices	<ul style="list-style-type: none"> • Demonstration gardens planted with local crops for seed multiplication processes and learning (Nsanama) • Women dominated social networks (Domasi and Nsanama)
Cost implications	Some suggested solutions would be costly to implement and therefore not sustainable at community level	All the above solutions plus social networks and informal gatherings especially those dominated by women
Reaching out many	Mass media, both print and electronic are expensive but reach many within a short space of time	Radio and television (Domasi)
Quick wins	These are solutions whose results can be realised within a year (own definition)	All the above solutions

It is worth stating that for each of the criteria indicated in Table 4-13, success indicators were developed jointly with women and other local community members who participated in the research in the later stages. For example, for the WhatsApp group, membership was one of the variables to monitor and this was done by recording new members joining or old members leaving the group. Positive, negative and innovative ideas to promote local farming practices were also monitored. Likewise,, for the demonstration plots, farmers expressing interest to join were recorded accordingly. Regarding banana tests, a comparison was made in decomposition rates (as defined by local communities themselves) between plant materials subjected to banana peels and those that were not.

4.4.4.1 Methods and processes for individual tests

a. WhatsApp group

As pointed out in Table 4-13, two youth WhatsApp groups were formed, one in each of the two study sites. Nsanama group was established on 12 April 2018 and the Domasi one on 25 July 2018. For identification purposes, Nsanama chose the name '*Patsogolo ndi Ulimi wa Makolo*' (Forward ever with local farming practices) and the group aim was to promote local farming practices through all possible means including drama and research. The Domasi group was wanted to focus on research more specifically as suggested by its name 'Young Farmer-Researcher (YFR)'. The reason the two groups were established on different dates is that the WhatsApp idea first originated at the Nsanama validation workshop. The idea to form a similar group at Domasi EPA was proposed by Mr. Moses Komwa during the first review meeting organized by Nsanama group members themselves on 14 June 2018. The suggested approach at this meeting was to invite some youth members from Domasi to be members of Nsanama group. A separate WhatsApp group was then formed in the Domasi EPA in consultation with the AEDC (head of Domasi EPA). During the first meeting held on 25 July 2018 when the group was constituted, three Nsanama youth administration members were also invited to inspire fellow youth members on promotion of local farming practices.

For both study sites, this was the first time youth WhatsApp groups were established specifically to promote local farming practices. It was also apparent that youth WhatsApp groups focusing on local farming practices did not exist anywhere else in Malawi at the time this thesis was developed, thus confirming UNESCO's concerns on the "dearth of evidence-based research on mobile learning and the need to grow a body of evidence" (Isaacs, 2012, p. 8).

The process I followed in formation and monitoring progress of the two groups is summarized in Table 4-14.

Table 4-14: Process followed in setting up and monitoring the WhatsApp group

Step	Description	Notes
1	WhatsApp idea	The suggestion to establish a youth WhatsApp group was given by Ignacio Phiri during a validation workshop at Nsanama Teacher Development Centre (TDC), Nsanama EPA, on 17 January 2018. For Domasi EPA, the idea was suggested by Moses Komwa, AEDC Nsanama EPA.
2	Meeting with ‘seed’ youth members	Explained key challenges in local farming practices and how WhatsApp approach may help to address them. We agreed to use an ‘edutainment’ approach that combines learning with entertainment to create awareness about local farming practices and stimulate some action among the youth.
3	Weekly topics on local farming practices	For Nsanama EPAs, the youth that attended the first meeting suggested that I provide initial discussions points, but the youth were also allowed to contribute at any time. For Domasi, the group administrators provided topics of discussions though I also often came in to provide support and further guidance.
4	Quiz/achievement tests on local farming practices	On a monthly basis, I asked questions relevant to local farming practices to assess learning taking place.
5	Reflecting on the process	A meeting was convened on 28 August 2018 and 7 November for Nsanama and Domasi groups respectively to reflect on the whole process guided by the following question: What were the successes? What were the challenges faced? What are the next plans?
6	Learning expressions	From the WhatsApp messages and the speeches from the two review meetings, I extracted learning expressions such as comments, innovative ideas, commitment to take action, taking action.

Source: Adapted from Blehch (2016, p. 121)

b. Setting up the *makumbuka* banana experiment at Domasi EPA (12 April 2018)

For this experiment, Malita Osten, one of the participating women in my research, identified a section of her land that is colonized by the hard-to-decompose ‘*nansongole*’ grass (Figure 4-6) under the ‘*kuojeka*’ (crop residue incorporation) local farming practice.



Figure 4-6: Nansongole grass

To set up the experiment, ripe banana peels of *makumbuka* were spread linearly within *nansongole*, followed by cutting down of *nansongole* and then covering with soil using a hoe (Figure 4-7). The whole process was led by the knowledge custodian (Rose James).



Figure 4-7: *Nansongole* grass (left), banana peels spread within *nansongole* (centre) and covered with soil (right)

Three 4-metre ridges were subjected to this process. Another set of three was set as a control where without ripe banana peels. For interest, three more ridges were subjected to peels of *sukari banana* claimed to eradicate native bamboos in Nsanama EPA.

To determine decomposition, the knowledge custodian informed us that the colour of *nansongole* grass would change from green to dark, the grass will become softer and eventually break down into smaller pieces. There should be no new *nansongole* grass sprouts from ridges subjected to *makumbuka*. After 190 days, the ridges were checked for any indications of *nansongole* decomposition and eradication.

c. Setting up the *sukari* experiment, Nsanama EPA (5 April 2018)

For Nsanama, the main bamboo stand was cut leaving stumps, digging out shallow holes next to the selected stump root system, placing 5-10 pieces of ripe banana peels into the hole and covering with soil (Figure 4-8). According to Ms. Thalala, the knowledge custodian, the specific size and depth of the hole is defined by the amount of the banana peels to be put in.



Figure 4-8: Setting up the *sukari* banana test, Nsanama EPA

To be effective in ‘killing’ bamboo roots, the peels had to be buried when the soil was moist in March 2018. Furthermore, when the experiment was set up, Ms. Thalala recommended that any new bamboo sprouts should be cut off as soon as they appear, again to speed up the eradication process. If the colour of the root system changes from khaki (Figure 4-9) to dark, this would be a sign of the roots dying.



Figure 4-9: The colour (khaki) of the root system during set up of experiment

d. Electronic and Print media

In response to the women's suggestion to increase radio and television coverage as a way of promoting informal learning of local farming practices, I engaged with Malawi Broadcasting Corporation, which captured the story of *mphanje*, one of the local farming practices at Domasi EPA. The *mphanje* was chosen for recording because it is a unique local farming practised at only one location in Domasi EPA. According to my personal experience working in the study sites (as described in section 1.2), the practice has not been covered by either print or electronic media for at least eight years. Therefore, it seemed worth recording and broadcasting for more people to learn about this local farming practice.

e. Social networks

Women-dominated social networks exist in various forms at the study sites and these include faith based, natural resource based, income generation based, general support and care, edutainments, and agriculture focused networks.

During session 8 of the change laboratory workshops in which we reflected on the results of the validation workshops, we agreed that each woman should promote local farming practices through their existing networks. For those women that did not belong to any network, we

agreed that they should use any existing opportunity to create awareness about local farming practices and to stimulate action.

A workshop to reflect on how women had performed individually or through their social networks was held on 11 and 18 September for Domasi and Nsanama EPAs, respectively. Women presented progress thus far since the meetings on 8 and 13 February for Domasi and Nsanama EPAs respectively when they were assigned roles.

f. Diversity blocks for learning and seed multiplication

The idea of local seed multiplication at community level is a key component of a community seed bank, defined by Vernooy et al.(2017, p. 318) as “a locally governed and managed, mostly informal, institution whose core function is to maintain seeds for local use”.

The process of seedbank establishment and management required rigorous training and capacity building of farmers on participatory variety selection, seed storage and marketing, among others. It takes at least two years before local communities can manage a seedbank on their own. Therefore, for this research, it was agreed among the research team and women that we only establish a diversity block, consisting of various local crops selected by farmers themselves. Land, labour and manure were provided by local farmers themselves. This time, participating farmers did not only include the study subjects (women) but also other villagers including the youth. This inclusive approach would potentially widen learning about local farming practices.

Local seed varieties to be included in the block were identified using a four-cell analysis which is “a technique to assess the richness (or abundance) and evenness (or distribution) of local crop diversity in farming communities” (Vernooy, Bhuwon & Bessett, 2017, p. 40). The assessment helped me to categorize local crops into four cells namely: crops grown by many (>300) farmers and on large areas (>1 acre); crops cultivated by many farmers but in small areas; crops grown by few farmers but on large areas and finally crops grown by few farmers and in small areas. A fifth cell was added to encompass local crops that are rare or extinct in the area.

In Nsanama EPA, two diversity blocks were established, one at Makuluni Irrigation Scheme (GVH Chipojora) and another at Namisisi Irrigation Scheme (GVH Sinja). In both sites, the following crops requested by local communities during the four cell-analysis phases of the expansive learning process were planted.

- a. Maize: Seven local cultivars were planted, namely *bantam*, *kanjerenjere*, *kafula woyera*, *kafulawa yellow*, *alinafe*, *Lilongwe*, *nakachiswe* and *mkananyani*
- b. Groundnuts: Four cultivars were planted, namely *chalimbana wofiira*, *chalimbana wakhaki*, *manipinta* and *kasawaya wakuda*

Since the crops were sown during the dry season, farmers had to irrigate.

At Makuluni, besides maize and groundnuts, the farmers also cultivated indigenous vegetables namely *chikopa*, *bonongwe* and *nkhwani*. At Namisisi, farmers added cucumbers to the block.

The land for establishment of the blocks belonged to two women who participated in my research. For Makuluni, Esnat Biziwick provided her land, while for Namisisi, it was Halima Sailesi. Labour was provided by community members that were directly involved in the management affairs of the diversity blocks.

4.5 Data Processing and Management using NVivo 11

Qualitative research, like mine, is widely accepted across a wide range of social sciences. This kind of research “describes phenomena based on the point of view of the informants, discovers multiple realities and develops holistic understanding of the phenomena within a particular context” (Said & Hilal, 2013, p. 181, quoting Gordon & Ross-Gordon, 2007). It provides what Woodsong, MacQueen, Guest and Namey (2005, p. 1) called “information about the human side of an issue”. Qualitative research generates huge amounts of text-based data that are hard and time consuming to analyze and “bring order and structure” (Said & Hilal, 2013, p.181). My research also generated large amounts of text-based data mainly from focus groups discussions, change laboratory workshops, document analysis, observation studies and Lake Chilwa Basin unpublished reports and I could potentially face similar difficulties in analysis.

Since the qualitative data are text-based, the coding is an important part of the analyzing process. Codes are defined by Miles and Huberman (p. 2007) as “tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study”. Coding involves pursuing related words or phrases mentioned by the interviewees or in the documents and putting them into nodes which represent themes, topics, concepts, ideas, opinions or experiences (QRS International, 2017, p. 24).

Before using the NVivo, coding was done by hand as follows:

1. Use coloured pen to sort information and then cut and categorize the data.

2. Photocopy each transcript on different coloured paper (i.e. interviewee 1 on red, interviewee 2 on blue and so on.) and then cut out pertinent phrases from the script using a pair of scissors and arrange them into clusters. Researcher could also use the highlighting function in the word processor to highlight the text he or she is interested in, once more a different colour for each interviewee and then bring them together in an electronic file.

The tasks above were time-consuming. Fortunately, QSR has developed computer based qualitative data collection software called NVivo that simplifies the analysis process. NVivo eases analysis of qualitative data in five ways as follows (Said & Hilal, 2013, p.182)

1. Manage data by organizing several jumbled data documents. That includes interview transcripts, surveys, notes of observations and published documents.
2. Manage ideas in order to understand the conceptual and theoretical issues generated in the course of the study.
3. Query data: by posing several questions of the data and utilizing the software in answering these queries. Results of queries are saved to allow further interrogation.
4. Modeling visually by creating graphs to demonstrate the relationships between the conceptual and theoretical data.
5. Reporting by utilizing the data collected and the result found to formulate transcript reports about the study conducted.

The process of organizing data using NVivo can be summarized as follows (Figure 4-10)

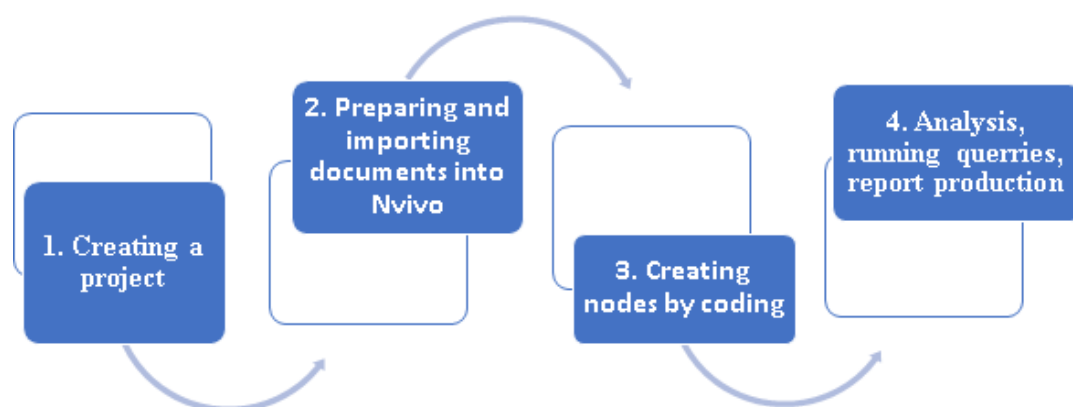


Figure 4-10: Essential NVivo steps I followed

4.5.1.1 How I adapted the above essential steps in organizing my data

Step 1: Creating a project

I used the title of my research ‘Climate change, drought and inter-seasonal dry spells, and rural women’s informal learning towards adaptation in the Lake Chilwa Basin, Malawi’ to create an NVivo project.

Step 2: Preparing and importing documents into NVivo platform

I firstly created a ‘source folder’ within NVivo (i.e. a folder that contains imported documents). In my case, these documents included transcripts from focus group discussions, change laboratory workshops, observation studies, Lake Chilwa Basin unpublished reports, published reports, scanned newspaper articles and any other materials that I felt were relevant to my study (see Table 4-8 and Table 4-9 for sample documents).

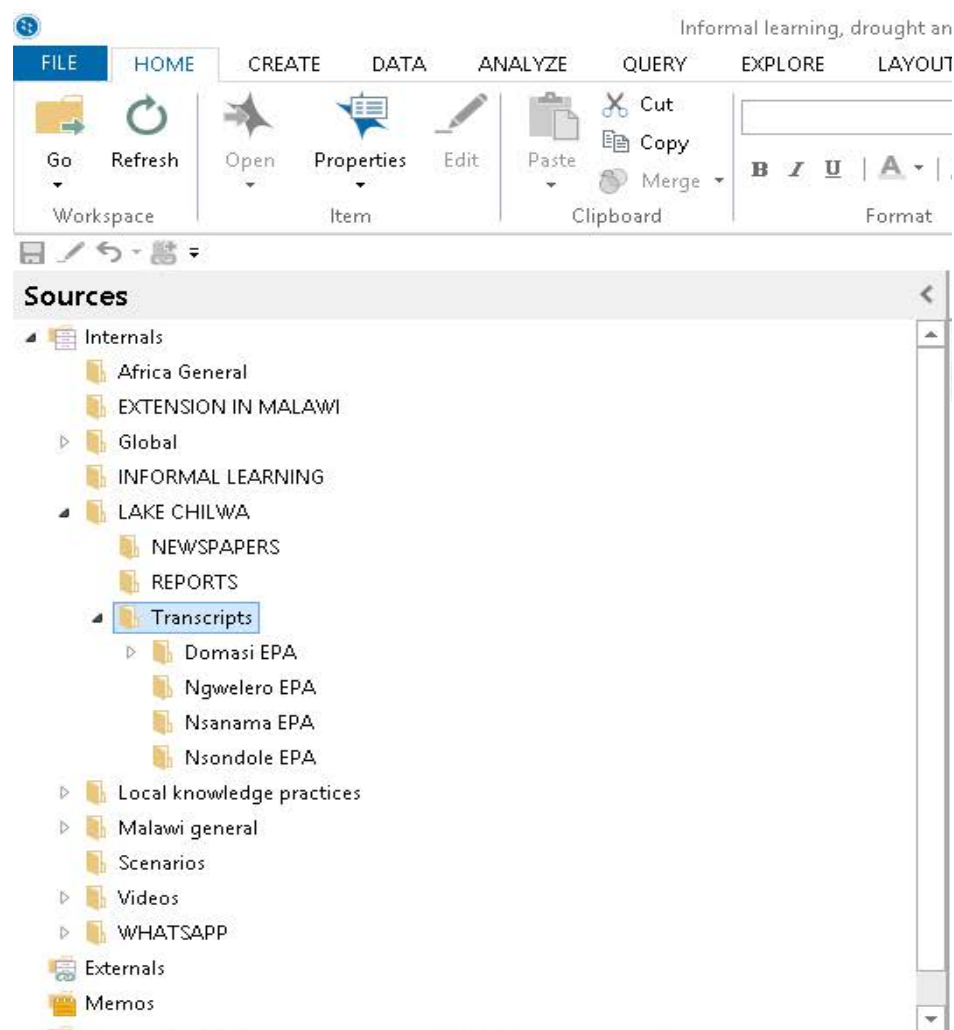


Figure 4-11:Screen shot of sample documents I uploaded on Nvivo platform

Step 3: Creating nodes by coding

For research that follows inductive approaches, nodes are developed after data has been collected. The researcher only develops themes after data has already been collected. In some cases, the process of creating nodes can be predetermined (Stuckey, 2015, p. 7). Predetermined coding may derive from the interview guide or list of research questions, or from use of a theoretical framework, which reflects an abductive approach to making inferences (Gyöngyi & Spens, 2005, pp. 135-138)

In my case, I used a ‘predetermined’ abductive approach since I had research questions in advance to guide data collection processes. For example, one of my research questions was about the potential of expansive learning to promote local farming practices with step 3 as modeling solutions. So, I had to create a note in advance labeled ‘model solutions’. Reading each document in turn, I came across several model solutions against manifestations of contradictions. The model solutions such as setting up demonstration plots, documentation of local farming practices constituted child nodes to the parent node (*model solutions*) (Figure 4-12). Child nodes were being developed as I read each document in turn and transferring relevant quotations into an appropriate child node. Besides the model solutions node, I also created three other parent nodes, namely current informal learning channels, expressions of learning (agency development) and manifestations of contradictions.

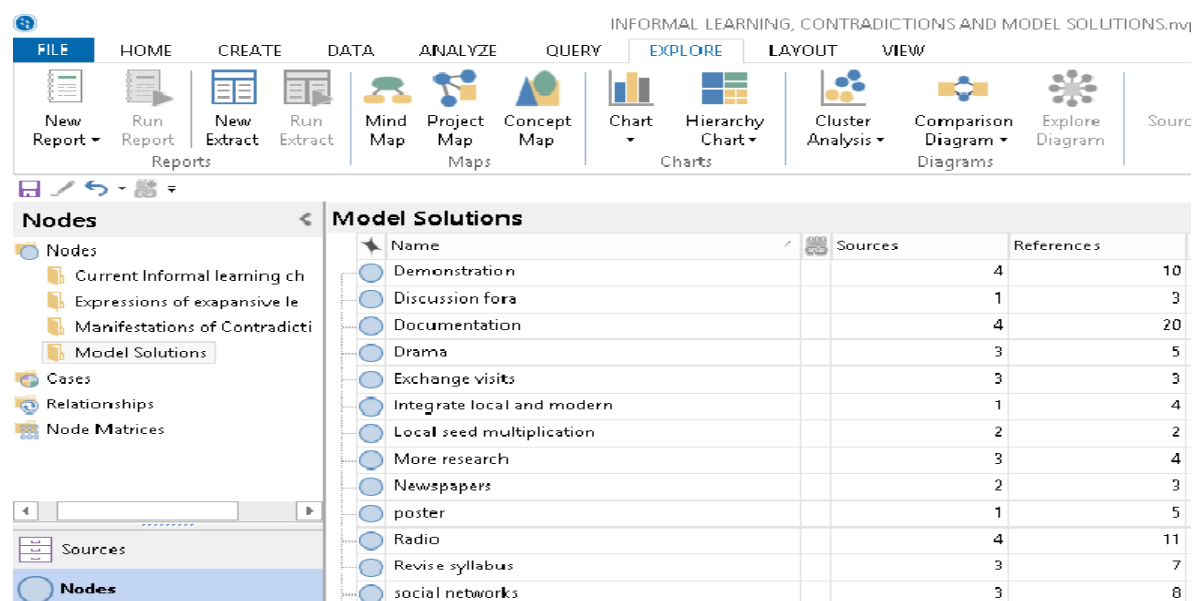


Figure 4-12: ‘Model solutions’ (parent node) and its 13 child nodes

Step 4: Running queries and report production

NVivo has several functions under step 4 but I did not use all of them because some were irrelevant to my study. For me, the most important was determining the density of each of the child node as a surrogate measure of the frequency an issue was spoken or written in case of document analysis. For example, from Figure 4-12 , ‘documentation’ had the highest density of 20 (labeled as references in this figure) meaning that it was the most commonly suggested solution.

4.5.1.2 How I used data processed through NVivo

Data processed through NVivo software helped me to structure Chapter Five (Analysis of contradictions relating to local farming practices) and Chapter Six.(Double stimulation and solution modelling - learning from the future using local farming practice scenarios).

Relating to Chapter Five, I present a screen shot (Figure 4-13) showing manifestations of contradictions, eight child nodes. Each child node contains quotations from either documents I read or interviews with women and other participants I consulted in this study. Some of these quotations have been included in contradictions described in Chapter Five.

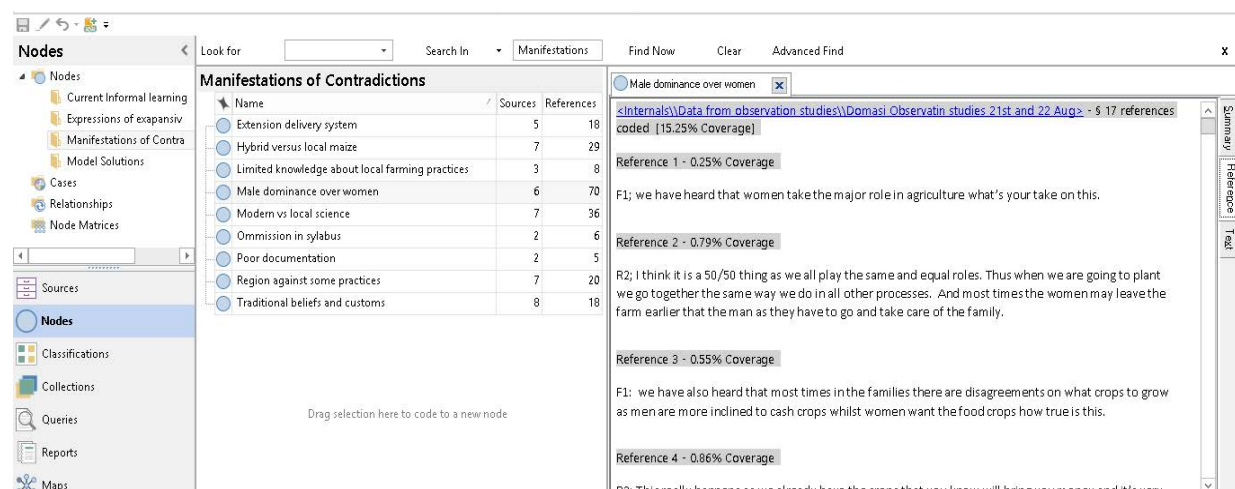


Figure 4-13: Screen shot highlighting parent node manifestations of contradictions, the nine child nodes and quotations from ‘male dominance over females’ child node

Likewise, for Chapter Six (Double stimulation and model solutions), I selected quotations from each of the 13 child nodes and used some the quotations to provide evidence of my data sources for the model solutions (see Figure 4-12). For the scenario component of the same chapter, I selected some quotations by women describing each of the four scenarios they had developed.

These direct quotations provided proof of data sources. Figure 4-14 that follows shows scenario node with the work case scenario child node expanded to highlight quotations.

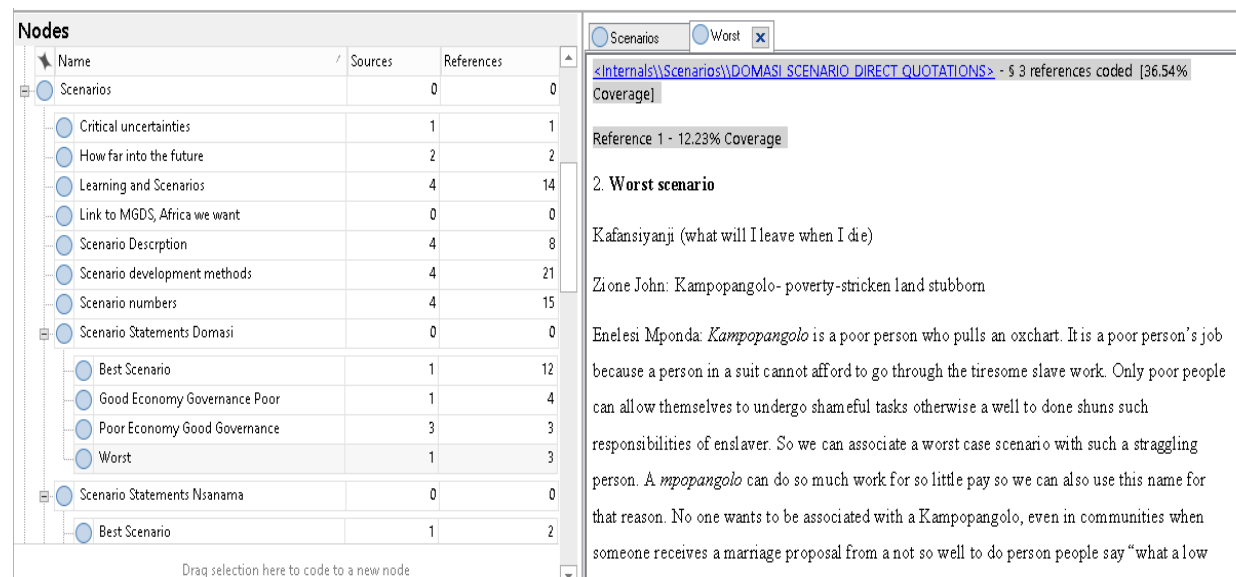


Figure 4-14: Screen shot showing scenario parent node with 'worst' case parent node expanded

4.6 Data Analysis

In addition to structuring Chapters Five and Six, data organized using NVivo software was also subjected to analysis using layered approaches and power relations described in detail below.

4.6.1 Layered analysis

A layered analysis is a step-by-step process of understanding a situation from the lower level to a higher level (mature stage) or "from one-to-one player to team collaboration" (Stone & Veloso, 1998, p. 168). For my research, this meant understanding sequential learning from questioning (session one – lower level) to modelling session (eight – higher level). For analysis purposes, I divided the eight stages into three analytical phases: questioning and analysis; scenarios and modelling; and testing the model solutions. The mirror data constituted the fourth level of analysis. In terms of the actual sequence of analysis, I started with mirror data analysis collected before change laboratory workshops to provide double stimulation materials as aide-mémoires to women during change labs for them to respond reflectively. The second stage analysis (questioning and analysis) provided data for modelling and scenario building exercises. The third stage, modelling and scenario analysis provided data testing the model solutions. The final phase of analysis (testing model solutions) helped me to evaluate emergence of higher levels of agentive expressions within the learning analysis cycle suggested by Haapasaari et al. (2012). For Haapasaari et al. (2012), committing to take action or taking

concrete actions are the highest agency expressions in the learning cycle meaning development of the learner's mind is maturing. Taking Bateson (1972) learning levels (see section a), the higher-level agentive expressions may be synonymous with a learner reaching level III while questioning may be equated to level 0 or I solutions) .

4.6.2 Power relations

In social science and politics, power is the ability to influence or outright control the behaviour of people. According to Webb (2000, p. 5), there are two basic concepts of power, namely: power as capacity (potential), that is one's ability to produce change; and power as exercised (actual) concerning one's doing or saying something, and changing or trying to change a situation. Power exists in every society. Within each society, there are power relationships and biases inherited from the past and ingrained in social structures and knowledge systems (Moncrieffe, 2004, p. 27). These relationships and biases have a 'regular form' and constrain society members from doing the action differently (Webb, 2000, p. 3). This 'regular form' is indicative of "the way of doing X being socially authorized and having a set of rules for the proper performance of X". The 'regular forms' constitute a 'set of rules' that maintain a regime of appropriate modes of performance. Compliance to these rules gives assurance to others that one is co-operative and/or submissive.

With respect to women who are subjects of my study, and in relation to the Zone of Proximal Development (ZPD), I would say they have "the capacity to produce change" in agriculture but they cannot fully exercise this power in their respective households because the prevailing culture generally favours men in decision making processes. In the agriculture sector, a focus of my study, the Women Empowerment in Agriculture Index (WEAI) is one of the tools to measure the degree of women's empowerment, their agency and inclusion in farming (Ruth, Amber, Agnes, Quisumbing, Meinzen-Dick, Greg & Ana , 2013, p. 3). The index was initially developed as a tool to reflect women's empowerment that could result from the US government's Feed the Future Initiative, which commissioned the development of the tool. In agriculture, the tool specifically measures the role and extent of women's engagement in the agriculture sector in five domains: decisions about agricultural production; access to and decision-making power over productive resources; control over use of income; leadership in the community; and, time use.

The five domains are described by Ruth et al. (2013, p. 7) as follows: the first domain, **'decisions about agriculture production'** refers to sole or joint decision-making about food

and cash crop farming, livestock and fisheries, and autonomy in agricultural production, with no judgment on whether sole or joint decision-making was better or reflected greater empowerment. The second, **‘access to and decision-making power over productive resources’**, concerns ownership of, access to, and decision-making power about productive resources such as land, livestock, agricultural equipment, consumer durables, and credit. The third domain of **‘control over use of income’** relates to sole or joint control over the use of income and expenditure. Domain four **‘leadership in community’** refers to leadership and decision-making positions in society. **‘Time use’**, which is last domain, concerns the allocation of time to productive and domestic tasks and satisfaction with the time available for leisure activities.

Analyzing power relations using the WEIA index requires quantitative data collected through rigorous surveys. My research was mostly qualitative, but the five domains of this index still guided the process of analyzing contradictions related to power relations between men and women in local farming practices.

4.7 Ethics, Validity and Trustworthiness

4.7.1 Validity and trustworthiness

All field work done by a single field worker invites the question ‘Why should we believe it?’ (Bosk, 1979, p. 193) and this is particularly an issue in qualitative research (Maxwell, 1992, p. 283). Validity is about making research results credible, useful and legitimate. Validity enhances internal coherence among the components of the study, the integration of events being studied in their social context and use of data for assessing the conclusions (Maxwell, 2012).

To enhance validity, credibility and trustworthiness of the study, researchers have an option to use a wide range of strategies (Maxwell, 2009; Merriam, 2009; Strewing & Stead, 2001). Below, I highlight some of the strategies and how I adapted them to my study.

4.7.1.1 Triangulation

According to Maxwell (2009, p. 245) triangulation is “collecting of information from a diverse range of individuals and settings using a variety of methods”. It is the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings. The term derives from surveying, where it refers to the use of a series of triangles to map out an area. There are four basic types of triangulation (Bryman, 2001, p. 245):

- a. **Data triangulation** which means gathering data through several sampling strategies or methods, so bits of data collected at different times and social contexts, as well as on a variety of people, are gathered.
- b. **Investigator triangulation**, which entails use of more than one researcher in the field to gather and interpret data. For instance, in my study, there were five team members and each one compiled short notes that were later shared during reflection meetings.
- c. **Theoretical triangulation**, which implies use of more than one theoretical position in interpreting data. For example, using CHAT and Critical Realism (CR) theories in a particular social learning study.
- d. **Methodological triangulation** or the use of more than one method for gathering data. This is the most common meaning of the term ‘triangulation’.

For this study, I used **data triangulation** and **methodological triangulation**.

Relating to data triangulation, I used different participants as sources of data drawn from the two activity systems of local farming practices and extension delivery which formed the basis for expansive learning. These participants included agriculture extension workers in the two EPAs, the media (radio, television and print), LEAD fellows, Access Agriculture (who uploaded our video onto their website after asking some questions), Biodiversity Conservation Initiative (who helped in design of the four-cell analysis methods) and other community members (e.g. youth, faith leaders, traditional leaders, radio listening club members, lead farmers). At an international level, key highlights of the study were presented the ‘Seedbeds of Transformation: The Role of Science with Society and the SDGs in Africa’ conference that took place at Port Elizabeth (South Africa) from 9-11 May 2018. The questions which delegates asked and the comments made about our presentation helped rethink research results, where necessary.

The study was co-designed through local government structures involving DEC members as already pointed out in section 4.2.1. Co-designing helped to ensure that data generated is reliable and useful to the production and review of district development plan. Furthermore, different sources of data that I used in this research included document analysis, interviews, change laboratory workshops and observation studies and all served the purpose of triangulation.

4.7.1.2 Respondent validation, member checking and participant reflexivity

To ensure data validity within women subjects, I mirrored data collected before Change Laboratory workshops to the participants. Furthermore, before a change laboratory session commenced, there were recaps and question and answer sessions on the previous session. I also conducted two feedback sessions and one review workshop involving women subjects per EPA. This process helped women to reflect on their own results. It also helped me to rule out the possibility of misconstruing what participants said and/or did, as well as identifying my own bias of what I observed (Maxwell, 2009; Merriam, 2009).

4.7.1.3 Researcher reflexivity

Reflexivity means that the researcher reflects continuously on how his/her actions, values, and perceptions can affect the research setting, collection of data and analysis (Lambert & McSherry, 2010; Creswell, 2003). In qualitative research such as this study, researchers are influenced by their personal biographies, values, biases, interests, and worldviews to interpret the world they are researching (Cohen et al., 2011). The notion of reflexivity suggests that researchers should acknowledge and disclose their own selves in the research, seeking to understand their part in, or influence on the research (ibid., p. 225).

As a researcher, I had to motivate women to actively participate in this study. To do this, I relied on the notion of catalytic validity (Brown & Tandon, 1978; Reason & Rowan, 1981) which represents the degree to which the research process orients, focuses, and energizes participants toward knowing reality in order to transform it. As will be seen in Chapters Seven and Eight, agency was built among women, that is expansive learning had taken place. Women had learnt ‘what was not there yet’ (Engeström, 2016) and this is attributed to the way researchers motivated women to speak their minds. After each session of the change laboratory workshop, researchers reflected on the data generation process and on the results achieved. During the reflection meetings, researchers searched for “discrepant evidence and negative cases”. Researchers, led by me, rigorously examined discrepant data to assess whether it was plausible and should be retained to modify the conclusions. Drawing on Wolcott (1990), researchers should be constantly aware of any pressures to ignore data that does not fit their initial conclusions.

4.7.1.4 Long-term involvement of the participants

As pointed out in section 1.2, I have interacted with local communities in the study sites for more than nine years (2008-2017) under the Lake Chilwa Basin Climate Change Adaptation Programme and the Building Capacity for Climate Change Adaptation in West and Southern Africa Project. Therefore, it was easy to engage with the women and obtain reliable information because of the relationship built before. Furthermore, during data collection process of this study, I interacted with women for 12 weeks, a period long enough to strengthen cordial relationships further. Continuous engagement with my study subjects offered an opportunity for me to collect substantial data about local farming practices and informal learning and this improved data representativeness and reliability.

4.7.1.5 Rich data

I conducted intensive and long-term interviews with women subjects. The data generated by women were later subjected to ‘validation’. I audio taped and in some cases video-taped discussions with the people. Recorded information contained direct quotations from those I interacted with. With these data collection processes, the data collected was ‘rich’. It was “detailed and varied enough to provide a full and revealing picture of what is going on” (Maxwell, 2013, p. 126).

4.7.2 Ethics and the role of the intervention researcher

For Schwartz (2001), ethics constitutes rules of behaviour that provide researchers with codes of conduct for researching in a morally defensible way.

The confidentiality of information delivered by research participants and the anonymity of respondents was respected and considered. Before commencement of the interviews, I had to ensure that women as well as democratic principles were respected at all costs. Women subjects were asked the following three key questions:

- Would you be willing to participate in this research voluntarily?
- Would you like to have your personal identities (names, tribe and education levels) publicized, or do you prefer confidentiality?
- Would you be comfortable if I take and publish your pictures, audio and videos?

To respond to these questions, researchers and women co-developed two pathways: women would keep their eyes closed and raise a hand if they were agreeable to a particular question

or, keep their eyes closed without raising their hand, signaling objection to a question. Researchers also co-developed a mechanism with women on how evidence would be recorded for future reference. Since most of the participants could not speak English, the written consent forms (see section 4.2.2) were read in Chichewa (official language). It was agreed that if a woman was in agreement with written consent information as read by one of the research assistants, each participant would sign or thumb print against their names on the participants list that also included the village each participant came from. Results of this exercise revealed that all the women subjects gave positive responses to the three questions and either signed or thumb-printed against their name (see Appendix 4a and 4b). I also shared the pictures with the women to check that they were happy they were used in this study.

4.8 Conclusion

My research focus is informal learning under local farming practices amongst women subjects. From the above methods and processes, a co-engaged expansive learning space was created. Throughout the journey, there were some ‘fast’ learners within the participants who would later explain to other participants using Yao, another popular language within the study sites apart from Chichewa. In some cases, women provided unique solutions to certain challenges facing local farming practices. The use of ripe banana peels to enhance decomposition is a case in point where only one woman at Domasi (out of 15) and two at Nsanama were aware of this method. Others had to learn, informally, from the three women.

As a methodological process, expansive learning actions for this study are summarized in Figure 4-15 below.

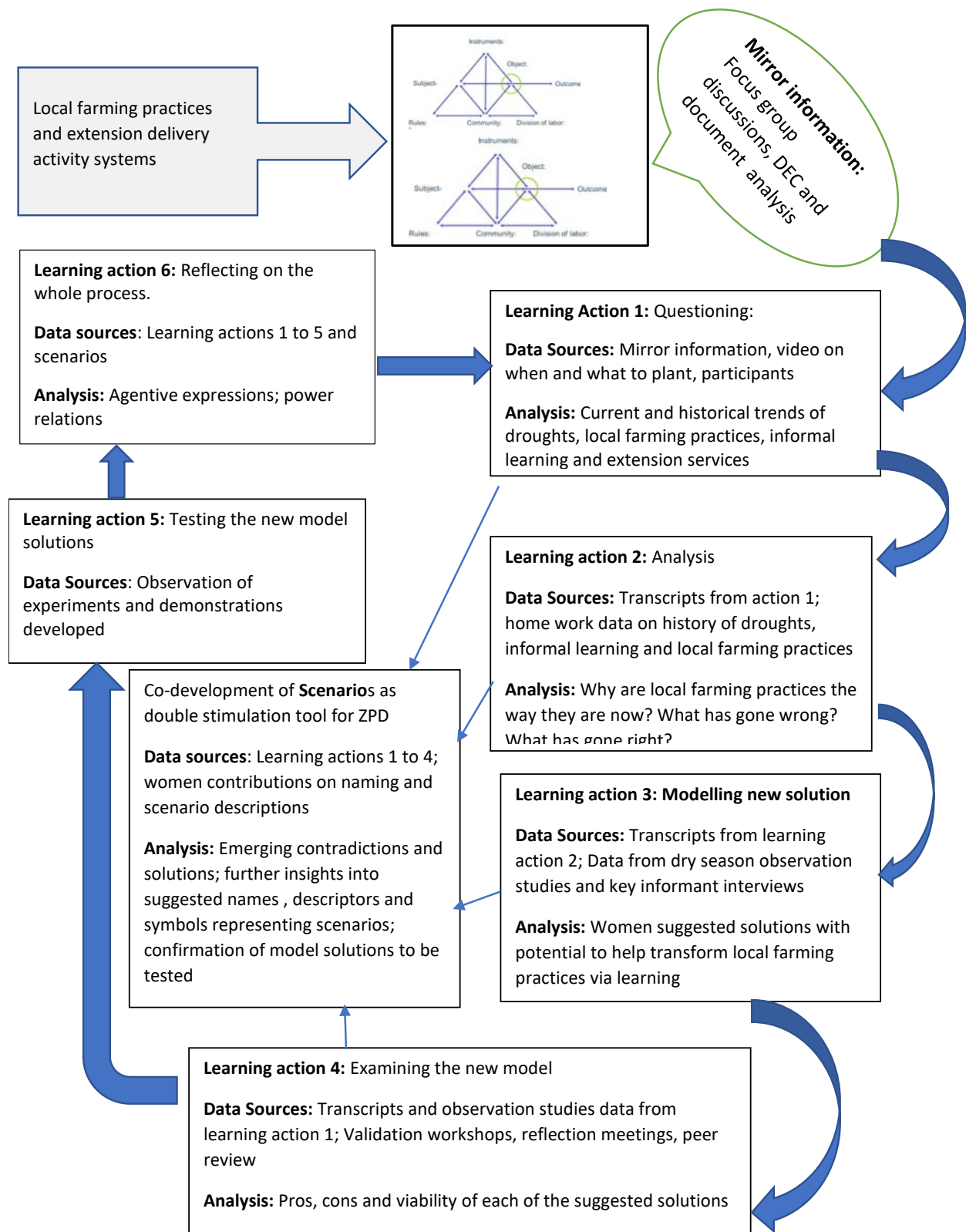


Figure 4-15: Summary of how I adapted Engeström's (2016) learning actions to my study

CHAPTER 5: ANALYSIS OF CONTRADICTIONS RELATING TO LOCAL FARMING PRACTICES

5.1 Introduction

This chapter starts by discussing the interactions among local farming practice activity system and other activity systems at the study sites namely agricultural research institutions, seed production and marketing, formal education sector and extension delivery. Of these, the chapter pinpoints extension delivery system as one that strongly links with local farming practice activity system. The chapter then provides further details about elements of the two activity systems in terms of their cultural historical attributes. Towards the end of the chapter, surfacing contradictions are outlined and discussed.

5.2 Interaction between Local Farming Practice Activity System and Other Activity Systems

Based on Chiotha et al. (2018) and my own experience of working in the two study sites, the local farming activity system interacts with extension delivery, seed production and marketing, research and formal education activity systems to meet an object of food and income security. Such interactions resonate with third generation CHAT described in section 3.5.3. Of these activity systems, the extension delivery system is the one that directly and strongly interacts with the local farming activity system at the two study sites. The other activity systems, seed production and marketing, research and formal education activity systems, operate through the extension delivery system. The interactions among these activity systems can be summarized as follows in Figure 5-1.

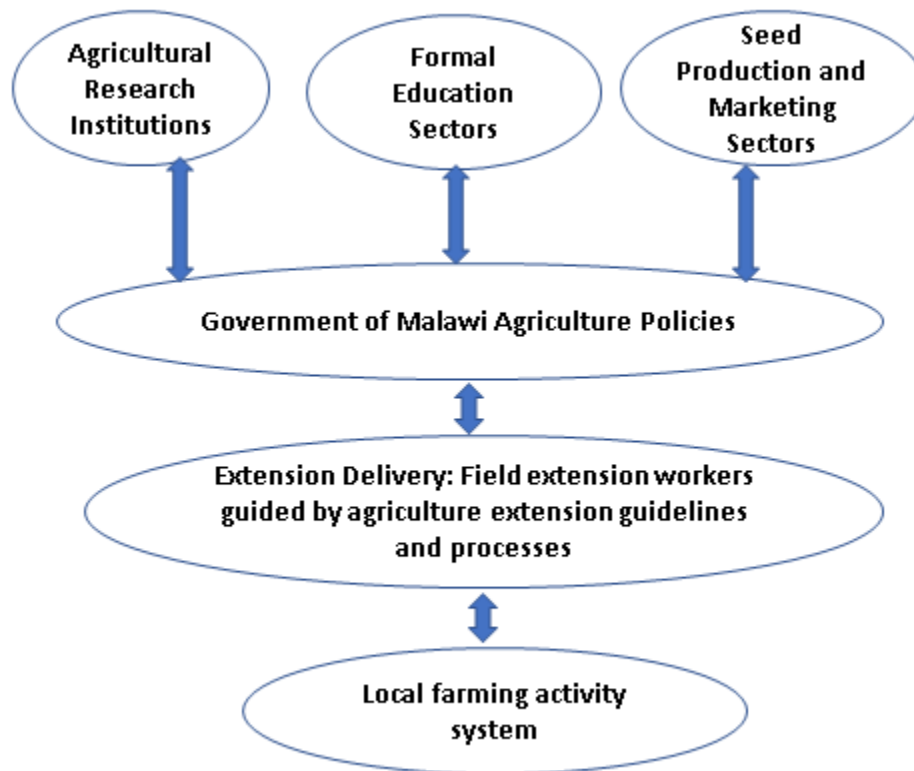


Figure 5-1: How local farming practices interact with other activity systems
Source: Author

As shown in Figure 5-1, the Government of Malawi Agriculture policy development process mutually interacts with agriculture research institutions, formal education sectors and seed production and marketing sectors and the extension delivery system that impacts directly on local farming practices. Because of such a strong interaction between local farming and extension delivery activity systems at the two study sites, I have provided a comprehensive description of these two systems under sections 5.3 and 5.4. As discussed in session 1 of the change laboratory workshops (see section 4.4.4), the performance of the local farming practices was questioned and analyzed mainly with reference to the modern farming practices promoted via extension delivery systems. An important basis for analysis was history of extension services, local farming practices and informal learning and this is in line with CHAT principles described in Chapter Three. Questioning and analysis focused on cultural historical details **within and between individual elements** of the local farming activity system rather than the whole system because this would make analysis of primary and secondary contradictions problematic. In sections 3.5.3.5 and 5.4.1.9, I have provided a summary of the two activity systems and the elements that were questioned and later analyzed.

Questioning and analysis within and between individual elements of the local farming activity system unveiled 19 contradictions that I have grouped into four: government structures, systems and norms, traditional systems and norms, region and traditional beliefs, and unclassified.

Just before concluding the chapter, I have included a section on ‘*further engagement with women*’ through two approaches; testing model solutions via practical demonstrations selected based on criteria indicated in Table 4-13; and, co-development of scenarios whose basis were contradictions and model solutions.

5.3 Agriculture Extension Activity System in Malawi

5.3.1 History of Agriculture Extension in Malawi

The Department of Agricultural Extension Services (DAES) in the Ministry of Agriculture, Irrigation and Water Development (MAIWD) is by far the largest extension provider in Malawi reaching over 60 % of the rural farmers (Simpson, Heinrich , & Malindi, 2012, p. 5, Ragasa & Niu, 2017, p. 27). The goal of the agricultural extension program in Malawi is to assist farmers to achieve and maintain self-sufficiency in food production and income generation through promotion of improved technologies.

Malawi has undergone several transformations in its agricultural extension system in the past 100 years (Table 5-1:) ranging from coercion, that forced farmers to follow recommended practices, where those that did not comply were either fined or jailed (Green, 2009, p. 263).to the passage of the National Extension Policy in 2000. The mission of this policy is “*to provide pluralistic, demand driven extension services and to promote equalization and coordination in service provision in order to achieve food security at household level thereby reducing poverty.*” (Nankhuni, 2016, p. 1, citing GoM, 2000). The policy is one of the most advanced public sector planning documents that strongly recognizes the role of multi-voicedness in promoting extension services (Simpson et al. 2012, p. 4). The National Agriculture Policy reinforces aspirations of the National Extension Policy in policy statement 3.1.1 ‘*Promote innovative and high-quality agricultural extension and advisory services involving both public and non-state extension service providers*’ (GoM, 2016, p. 13). Table 5-1 summarizes key events in the history of extension services in Malawi.

Table 5-1:Key events in the development of agriculture extension system in Malawi

Year(s)	Event	Description	Key challenges faced
1908	Department of Agriculture established	To oversee all agricultural related activities in the country	Hampered by staff shortages.
1920s-1930s	First period of agriculture extension in Nyasaland	Coercive extension by colonialists aimed at promoting production of cotton and tobacco in Central and Southern parts of the Nyasaland Protectorate (Malawi now); Establishment of commodity programmes notably the British Cotton Growing Association (BCGA) which was granted monopoly rights over the local trade in cotton; special focus was on soil erosion control and this marked the beginning of conservation paradigm.	Lack of capital hampered cotton and tobacco production; extension work focused on dissemination of information and not on education.
1932	Board of Agriculture Established	Aim was to continue promoting farming methods, control soil erosion, deforestation and over grazing.	The board lacked effective strategies to implement since it had vague ideas about local environments. Needs assessment were not done.
1933	Establishment of Native Agriculture Committees	Native Authorities were expected to spread extension messages to the villages. This was to be done by training chiefs and the village headmen at the Jeanne's Training Centre at Domasi in Southern Malawi.	Extension work still focused on dissemination of information and not education.
1946	Launch of Village Land Improvement Schemes	The scheme consolidated land holdings and concentrated villages for targeted extension services.	The scheme was not successful and was closed in 1962; peasant farmers were blamed for the failure because they ' <i>drink too much beer</i> ' (Green, 2009, p. 263) though the root cause was weakness of the extension advice given.
1950	Launch of the Master Farmers' Scheme	The aim of the scheme was to identify and support individual farmers who were selected according to their willingness to follow the regulations and advice concerning agricultural methods. The farmers received preferential extension	Just like the Village Land Improvement Scheme, the Master Farmer's Scheme was also not successful as initially hoped and was also closed in 1962; the 'would-be' follower farmers were jealous of the Master

		education, credit and market information hoping that these 'progressive' farmers would act as role models for others. The scheme was directly linked to the question of developing a new form of cash-oriented peasant class.	Farmers because of preferential support they received.
1980s	Training and Visit System	The system followed transfer of technology model (Figure 5-2) where researchers developed technologies that formed a basis for intensive day-long training (weekly or fortnightly) of extension agents. Each extension agent was then assigned farmers to visit on fixed dates and times to deliver extension messages emanating from the training.	The system was too expensive to manage; emphasis on personal contact of the extension worker with a few selected farmers resulted in exclusion of almost all other extension methods and aids; The existing village leadership and village institutions were neglected; was a top-bottom approach.
1980s	Block Extension System (BES)	While the training and visit system focused on contacting individual farmers, BES emphasized on group and area approaches. Farmers under the BES got multiple extension messages (e.g. on crop production, health, climate change) needed to improve their overall wellbeing. This is unlike the Training and Visit System that delivered messages on crop production alone.	The BES, just like the earlier other extension systems that existed before it, was also characterized by top-down approaches and was not successful. BES emphasized transmission of national interests to the disadvantage of farmers' individual interests.
1980s	Proliferation of private and non-governmental organizations that also provided Agriculture Extension	Most of the NGOs started as relief organizations to assist refugees from the Mozambique civil war.	Very few NGOs and private sector firms coordinated their extension activities with the Department of Agricultural Extension Services.
2000	National Agriculture Extension Policy Developed	To promote demand driven and pluralistic extension system. Surfacing of the bottom-up approaches.	Limited understanding of the agricultural extension policy especially the principle of demand driven extension services by farmers.
2006	Establishment of the District Agricultural	A way of decentralizing extension services, the current	Limited knowledge among stakeholders regarding the

	Extension Services System (DAESS)	system described in more detail below.	concept of DAESS; Poor coordination among various extension providers continued; hampered by extension staff shortages and finances; NGOs are particularly skeptical of government-led coordination initiatives, as they perceive them as attempts to tap NGO resources. Extension services are mostly delivered by men and thus there is a gender imbalance in provision of extension services. The more disadvantaged groups (women, the poor, less education) have limited access to extension services; low adoption of many of the technologies.
--	-----------------------------------	--	---

Source: Masangano, Chiwasa, Kambewa, Kakwera, Chimombo, Marriam and Gausi (2016), Green (2009)

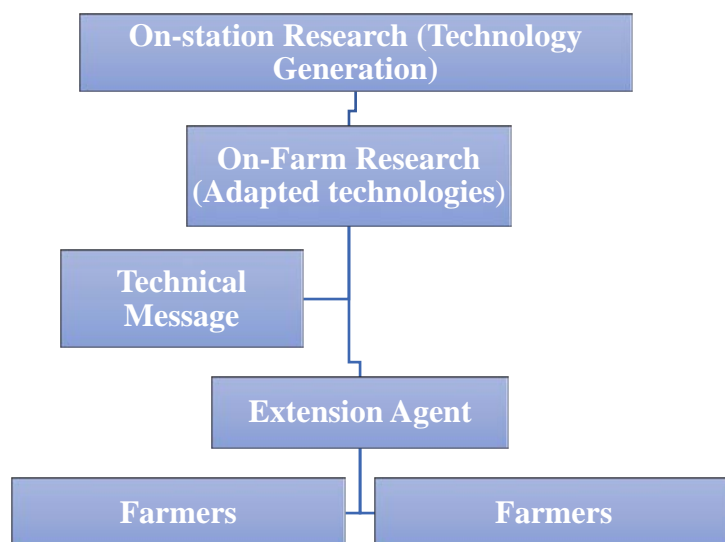


Figure 5-2: Transfer of Technology Model

5.3.2 Description of the current agriculture extension system at national level

3.5.3.1 Actors (subjects) of extension delivery system

As stated in the history of extension services in Malawi (Table 5-1:), the 2000 National Agriculture Policy was developed to decentralize extension services. To make the policy operational, a District Agricultural Extension Services System (DAESS) was initiated. The overall objective of DAESS is to empower farmers to demand high quality services from those that are best able to provide them.

In Malawi, the governmental extension system is organized around a four-level administrative hierarchy: national, division, district and extension planning area (EPA). At the national level, the Department of Agriculture Extension Service (DAES) is led by a director, who is assisted by deputy directors responsible for Extension Methodology and Training Services (EMS), Agricultural Gender Roles Extension Support Services (AGRESS), Food and Nutrition (FN) and Agricultural Communications and Agribusiness. At the division level, which is the second hierarchical level, the Ministry of Agriculture, Irrigation and Water Development established Agriculture Development Divisions (ADDs). There are 8 ADDs each one headed by a program manager assisted by chief and assistant chief agricultural extension officers and principal subject matter specialists (Animal Health, Crop Development, Fisheries, Irrigation and Water Development, Land Resource Conservation and Management, Planning). DAES activities at each of the 28 districts of Malawi are led by district agricultural development officers (DADO), their assistants and subject matter specialists (SMS). At the lowest level, the ministry established 187 EPAs, structures that directly interact with rural farmers. An EPA is headed by AEDCs s already stated in section 4.2.1 (Approval). The AEDCs directly supervise agricultural extension development officers (AEDOs).

a. District level extension structures

To effectively coordinate extension services at district level, three structures were established namely District Agriculture Committee (DAC), District Agricultural Extension Coordination Committee (DAECC) and District Stakeholder Panel. These structures are explained below.

i. District Agriculture Committees (DAC)

DAC is a sub-committee of the District Assembly consisting of elected members of the assembly. The District Agricultural Development Officer (DADO) provides secretarial services. Key functions of the committee include but are not limited to: recommending to the District Assembly on policy making decisions regarding the governance of agricultural extension services delivery in the district; supporting the District Assembly in consolidating and promoting local agricultural institutions and public participation; promoting infrastructural

and economic development through the formulation, approval and execution of local agricultural development plans; assisting the District Assembly in mobilization of resources for governance and agricultural development; recommending to the District Assembly in making of bye-laws for the good governance of agricultural activities in the district; ensuring equity in the district agricultural extension service provision; supervising, monitoring and evaluating development activities in the district; initiating locally funded agricultural self-help activities; and encourage communities to participate in agricultural self-help activities .

ii. District Agricultural Extension Coordination Committee (DAECC)

DAECC consists of all heads of agriculture technical departments namely Animal Health, Crop Development, Fisheries, Irrigation and Water Development, Land Resource Conservation and Management, representatives of Non-Governmental Organizations (NGOs) that provide extension services at district level, micro-financing institutions, private sector, input suppliers and Farmer Based Organizations. Key roles of the DAECC include setting up standards for the delivery of extension services; registering extension service providers at district level; liaising with and advising the District Agriculture Committee on matters relating to agricultural extension; planning agricultural extension service at the district level; coordinating provision of agricultural extension services at the district level; harmonizing approaches in extension service provision and delivery; lobbying for agricultural extension services within and outside the District Assembly; and linking agricultural extension service providers and farmers to the District Assembly.

iii. District stakeholder panel DSP

DSP is a platform where farmers and extension service providers plan and coordinate their activities. It serves as a medium for dialogue between farmers and service providers where farmers are expected to present their demands for extension services and the service providers plan on how to respond to such demands. DSP is composed of representatives of various categories of farmers (Small Holder Food Security, Semi-Commercial and Commercial), farmer organizations and various agricultural extension service providers at the district level. The DADO plays a facilitating role in the DSP.

b. Community Based Extension Structures

At community level, there are two structures directly in contact with farmers namely Area Stakeholder Panel and Village Agricultural Committees described below.

i. Area stakeholder panel (ASP)

ASP is a platform of farmers and stakeholders in agriculture development at traditional authority (TA) level. It is a sub-committee of the area development committee (ADC) that is responsible for coordinating all development endeavors at area level. Membership of ASP consists of representatives of different categories of farmers, farmer organizations and all actors in agricultural sector at area level. Some of the roles and responsibilities of the ASPs include linking the interests of farmers and those of the service providers. providing a forum for farmers to express their demands; consolidating and articulating farmer demands; ensuring that quality response is provided to farmer demands; and coordinating agricultural development activities according to the demands coming from the communities.

ii. Village Agricultural Committees (VAC)

Ideally, the ASP is the lowest structure. However, in some cases, decentralized structures are established at group village headman (GVH) or village (VH) level. These include structures include village agricultural committees (VACs) at GVH or VH levels and model villages at VH level. Village Agricultural Committees are sub-committees of Village Development Committees spearheading development at village level.

3.5.3.2 Tools for extension delivery system in Malawi

DAES uses a number of strategies and methods to deliver agricultural extension programs (Tahseen, Moyo , & Mandaloma, 2014, p. 9) the main ones being extension worker, lead farmer, peer farmer, farmer field school, model villages, clusters (of communities), farmer organizations (clubs, cooperatives and associations) and multi-media agricultural campaigns.

The FFS approach is an innovative, participatory and interactive adult learning approach that emphasizes problem solving and learning by doing or discovery-based learning. It is a “school without walls” and is composed of groups of farmers (20-30) who meet regularly during the growing seasons to experiment as a group with new production options. The approach emphasizes group observation, discussion, analysis, presentation, and collective decision making and actions. The basic component of FFS is setting up of a Participatory Comparative Experiments (PCE), commonly referred to as Participatory Technology Development (PTD), whereby the farmers put the FFS concept into practice. A PCE can be developed using subjects of agriculture, livestock, forestry, agroforestry, livelihoods and others. The process of analyzing problems, testing and adopting practices most suitable farming practices helps

farmers to internalize the advantages of the improved agricultural practices (Abebe, Kasim, Bizun, Lencho, Husein, Gamadi, Desisa, Kabade and Taddesse, 2017)

Extension messages developed by the Department of Agriculture Extension Services target primarily three categories of farmers: (1) **smallholder food security farmers** whose main aim is food security from own farm. These farmers are characterized by limited resource endowments (land, labour, capital), low bargaining power and limited assets; (2) **smallholder semi-commercial farmers** who are skilled in specialized enterprises such as dairy farming, tobacco, paprika, piggery and broiler production. These farmers are easy to mobilize and are also able to demand and pay for certain services; (3) **commercial farmers** who operate on a large scale, have entrepreneurial skills and market-oriented production; self-sustaining and able to hire goods and services; can easily access both local and export markets.

Extension services delivery to these farmer categories is guided by several tools (**instruments**) which also act as rules since they confine extension workers on what to do. The most common tools are Guide to Agriculture Production (GAP) (2012), the District Agricultural Extension Services System (DAESS): Implementation guide (2006); Agriculture Extension Field Diary (AEFD) (2016) and Lead Farmer Extension and Training Guide on Sustainable Agriculture 2014.

The GAP and Agriculture Extension Field Diary both provide an opportunity for the extension workers to develop and implement work plans for carrying out specific extension activities based on Malawi's agricultural calendar. Both guides contain information on how to implement various extension methods such as field days, demonstrations, gender and HIV/AIDS mainstreaming. DAESS guidelines provide information on how various decentralized extension delivery structures can be established and perform their functions.

Lead Farmer Extension and Training Guide on Sustainable Agriculture was developed by the Development Fund of Norway, one of the renowned development partners in Malawi. The guide defines lead farmers as *'self-motivated individuals who are willing to share knowledge and skills with other farmers, have specialized in SA technologies and are implementing at least three of them of which one is on a 0.2 to 0.4 ha of land'*. The guide suggests that lead farmers should be trained on Sustainable Agriculture on 8 modules: Soil and Water Conservation; Manure; Agroforestry; Conservation Agriculture; Intercropping and Crop

Rotation; Integrated Weed Management; Pest and Disease Control; Farmer-to Farmer Extension; Facilitation and Leadership Skills.

3.5.3.3 Extension service delivery specific to case study sites of my research: realities and actualities

a. Main actors

The main actors of agriculture extension at the two study sites of Domasi and Nsanama EPAs are AEDCs, Agriculture Extension Development Coordinators (AEDOs) and lead farmers. The current AEDCs of the two EPAs are graduates from Lilongwe University of Agriculture and Natural Resources. They both took a course on general Agriculture Extension. AEDOs are assisted by lead farmers to deliver extension messages to other farmers in a section which consists of 10 to 15 villages. The main functions of lead farmers are to train other farmers, prepare and manage demonstration plots, mobilize farmers for meetings and disseminate information. They also receive extension service demands from farmers and forward the same to the AEDOs. Ideally, field assistants are expected to link AEDOs to the lead farmers and vice versa but all the positions were vacant by 2018. The lead farmer approach saves time for the AEDCs and AEDOs. Some of the lead farmers do so much work on behalf of AEDOs to such an extent that they sometimes boast of being very knowledgeable and equal to government extension staff, which is not necessarily true (Knut & Jere, 2014, p. 84)

For effective learning, each EPA establishes model villages where multiple modern farming practices such as cultivation of hybrid crops, primarily maize under irrigation or conservation agriculture are promoted. Within a village, there could be clusters of farmers each promoting a particular innovation. For example, there could be a cluster of livestock or conservation agriculture farmers. These clusters may eventually graduate to cooperatives later.

Some of the local farming practices such as local maize cultivation, use of traditional weather forecasts and *mphanje* (*slash and burn*) are not a package within the model village set up. However, some, like manure making, multiple cropping and *kuojeka* (crop residue incorporation) are included in the model villages. Farmers are also encouraged to use traditional pest and disease control measures as part of an integrated pest and disease control measure. Alex Dizinga, one of the key informants and AEDC for Domasi EPA illuminates as follows: *‘We encourage farmers to use their traditional pest and disease control measures such*

as ash or neem. Their measures are lesser harmful to the environment than pesticides (Personal communication, 14/08/2018).

The extension message delivery approach at the two EPAs is mostly through direct contact with farmers via training and supervision though occasionally multi-media agricultural campaigns such as use of mobile van, radio, TV are used. Message delivery through folklore such as folk, songs, folk tales, riddles, proverbs and traditional tools is rare.

Extension delivery system at the two EPAs is hampered by staff and financial constraints. Furthermore, as Alex Dizinga, AEDC for Domasi EPA indicates, most of the new technologies are lowly adopted even by lead farmers. In his own words, Alex states:

Some of the technologies we introduce are rejected by farmers. For example, under sasakawa sowing system which recommends one maize seed per planting station, some farmers sow more than two seeds per station. This is because they are used to their traditional farming system of three seeds per station. Furthermore, when more than one seeds germinate per station, some seedlings are transplanted. It is like a nursery. In fact, some of those rejecting new technologies include lead farmers themselves who are supposed to be role models (Personal communication, 14/08/2018).

Besides the government extension system in the two EPA, there are some NGOs providing similar services namely One-acre Fund, Leadership for Environment and Development (LEAD), Plan Malawi, Total Land Care, Climate Proofing Project and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Some of these NGOs such as One-acre Fund recruit their own lead farmers while others such as LEAD use existing lead farmers recruited by the Government. According to the two AEDCs interviewed, none of these NGOs is promoting local maize cultivation, traditional weather forecasts and *mphanje*. Although NGOs provide additional extension support, collaboration with Government Extension workers is generally poor. Extension system delivery approaches used by some of these NGOs conflict with those provided by the Government extension system. Moses Komwa, a key informant and AEDC for Nsanama EPA substantiated this claim as follows:

NGOs operating in Nsanama EPA are approved by the District Executive Committee, but I am wondering how they manage to beat the Government system and use own contradictory extension approaches. We have on several occasions reported this

anomaly to the District Agriculture Development Office (DADO) who sits on DEC meetings, but the problem continues (Personal communication, 08/11/2018).

3.5.3.4 Tools guiding extension approaches at the two EPAs

Extension delivery system at the two EPAs is guided by the same national guidelines mentioned in section 3.5.3.2: Guide to Agriculture Production; the District Agricultural Extension Services System (DAESS) Implementation guide (2006); Agriculture Extension Field Diary (2016); Lead Farmer Extension and Training Guide on Sustainable Agriculture (2014). Recently in 2018, an AEDOs Guide to Agriculture Extension was produced to provide further direction in extension approaches considering emerging challenges such as Fall Army Worm outbreaks.

3.5.3.5 Summary of the EPA based agriculture extension activity system

Using the notion of activity system that constitutes six elements of tools, subject, community of others, division of labour, rules, object and outcome as pointed out in Chapter Three (section 3.5.2.1) the extension delivery system described above can be summarized thus (Figure 5-3).

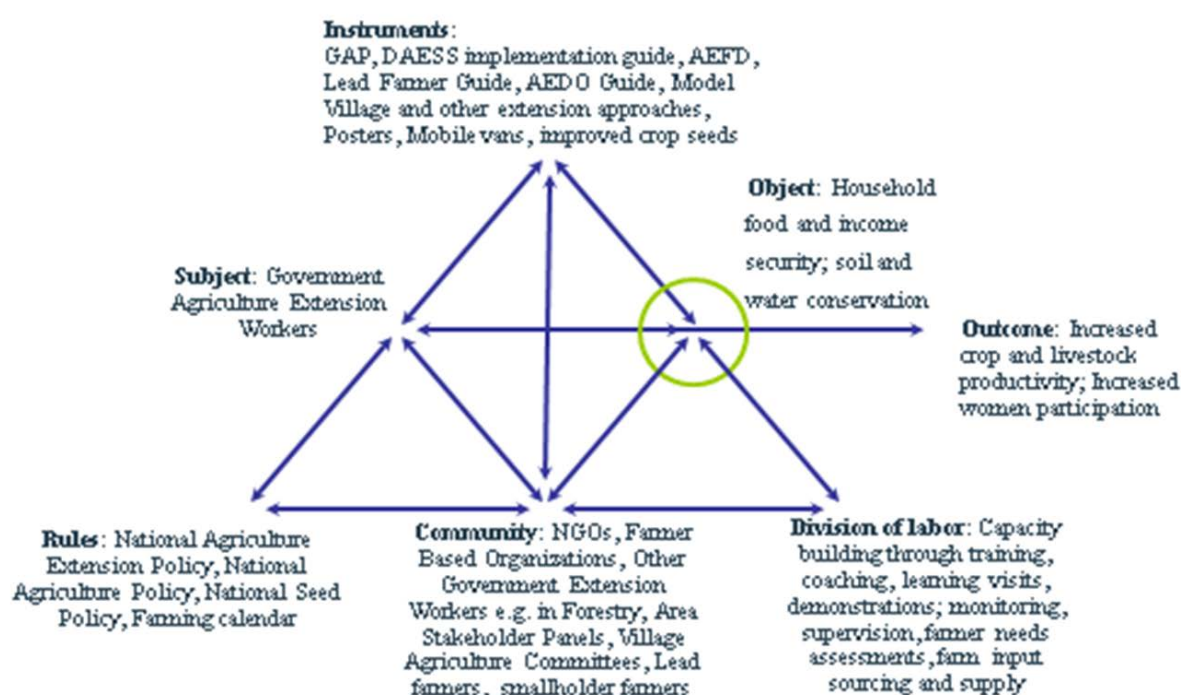


Figure 5-3: Extension Delivery Activity System

5.4 Local Farming Practice Activity System

Local farming practices and informal learning processes in Malawi were introduced in Chapter Two of this thesis in a more generalized form. This chapter gives thick descriptions of local farming practices identified in the two EPAs and the associated informal learning pathways. The chapter goes further by illuminating the way informal learning processes were catalyzed by drought and dry spells over the past 100 years from 2017.

Most of the local farming practices identified through focus group discussions and change laboratory workshops across the two case study sites are the same ones as those presented in Chapter Two. The only difference are the specific details on how each practice is understood by farmers at the study sites. Most of the practices I identified were common to both EPAs but there were also some variations. For example, Whitman manure was unique to Nsanama EPA while *mphanje* and '*mkamwini wa changu*' were exclusive to Domasi EPA. For both EPAs, the top five priority local farming practices that women felt would potentially improve their food and income security were *kuojeka* (*crop residue incorporation*), multiple cropping, livestock manure, traditional insect pest control measures and traditional rainfall forecasts.

Table 5-2 shows results of the voting process by women participants to prioritize local farming practices associated with local maize cultivation, the essential idea of my research.

Table 5-2: Prioritization of local farming practices

No.	Name of the local system	Preference (out of 15 women)	
		Nsanama EPA	Domasi EPA
1	'Kuojeka' (Crop residue incorporation)	15	14
2	Livestock manure	12	15
4	Whitman manure	10	N/A
5	Traditional insect pest control measures	9	8
6	Traditional rainfall forecasts and determination of planting time	6	12
7	Multiple cropping	13	15
7	Human waste manure	0	3
8	Traditional maize storage	5	6
9	Traditional soil nutrient detection techniques	1	6
10	' <i>Mkamwini wa changu</i> ' (literally means the fast husband)	N/A	0
11	<i>Mphanje</i>	N/A	7

Note: N/A means this specific local farming practices was not mentioned by women in that EPA

5.4.1 Specific features of local farming practices at Domasi and Nsanama Extension Planning Areas

5.4.1.1 Local maize cultivation

The general description of local maize in terms of its advantages and disadvantages over improved cultivars given in Chapter Two also applies to the two EPAs. There were also additional cultivars that I identified at the two case study sites such as Beira and Bantam. Other additional aspects specific to the case study sites are on the history of the various local cultivars, estimate of area cultivated and number of households involved (Table 5-3).

Table 5-3: Local maize cultivars in Domasi EPA

Cultivar	When was it noticed?	Area cultivated, and number of households involved (based on four cell-analysis)			
		Large area/Many Households (HHs)?	Many HHs/Small areas?	Few HHs/Large areas?	Few HHs/Small areas?
Kanjerenjere	Early 1950s	No	No	No	Yes
Lilongwe	1949	No	No	No	Yes
Chisowa	Late 1950s	No	No	No	Yes
Nakachiswe	Late 1950s	No	No	No	Yes
Bantam	Early 1960s	No	No	No	Yes
<i>Chamakolo</i> ^a	Historical	Yes	No	No	No
Beira ^b	1949	No	No	No	No

Note: *Chamakolo*^a is the historical and original local maize cultivar.

As stated in section 3.5.2.1 of Chapter two, local maize has been in existence time immemorial, but it is very unlikely that it is pure considering uncontrolled cross pollination that occurs between maize from adjacent fields. *Beira*^b originated from Beira, one of the cities in Mozambique but since the late 1960s, the cultivar is no longer cultivated in the area. ‘Large area’ was co-defined with participants as >0.5 ha and ‘many households’ as >73 per village.

According to Table 5-4, except for ‘*chamakolo*’ none of the seven local maize cultivars was reported to be cultivated on a large area by many households. Instead, most of the cultivars were reported to be cultivated by few households on small areas. No cultivar was reported as being cultivated by many households in small areas or few households in large areas. With respect to when the cultivar was noticed in the area, most of the cultivars were noticed in the 1950s.

Table 5-4: Local maize cultivars in Nsanama EPA

Cultivar	When was it noticed?	Area cultivated, and number of households involved (based on four cell-analysis)			
		Large area/Many Households (HHs)?	Many HHs/Small areas?	Few HHs/Large areas?	Few HHs/Small area?
Kanjerenjere	Early 1950s	No	Yes	No	No
Lilongwe	1949	No	No	No	Yes
Chisowa	Late 1950s	No	No	No	Yes
Nakachiswe	Late 1950s	No	Yes	No	Yes
Chamakolo	Historical	No	Yes	No	No
Nagalare	Late 1960s	No	No	No	Yes
Mkananyani	Early 1950s	No	No	No	No
Kabutu/Kafula	Early 1950s	No	No	No	No
Beira	1949	No	No	No	No
Bantam	Early 1960s	No	No	No	No

Note: For Nsanama EPA, ‘large area’ was co-defined with participants as >1 acre and ‘many households’ as >60 per village. Beira is also no longer cultivated in Nsanama EPA just like Domasi. Four cultivars were mentioned as scarce in Nsanama EPA and these are *Nagalare*, *Mkananyani*, *Kabutu/Kafula* and *Beira*.

From

Table 5-4, it is clear that none of the nine local maize cultivars was reported as being cultivated either by many households on large areas or few households on large areas. Majority of cultivars were reported to be cultivated by few households in small areas, just like in Domasi EPA.

Most local maize varieties cultivated by farmers in Domasi and Nsanama EPAs were described by women in terms of maturity period, kernel color and height. Presented below is a discussion between the youth and women during a review workshop (14/08/2018) at Domasi EPA to assess workability of the two model solutions. During the discussions, local maize cultivars were described as follows:

Lawrence Matewere (Youth): *'As a young person, I only know kanjerenjere local maize cultivar because my grandmother cultivates it. Can I be enlightened on the other local maize cultivars so that I shine as a more knowledgeable youth later?'*

Eneles Mponda: *'Kanjerenjere is early maturing cultivar. Maize of the ancestors grows tall. Its kernels are shiny. For Lilongwe, the kernel is yellow in color. Chisowa kernel is purple in color and can be found dotted in ear cob of the ancestors, Lilongwe and kanjerenjere. Nakachiswe is also early maturing. Those mending bicycle tyre use the corncob to clear away dirt from the puncture instead of using sandpaper. The kernel can easily be removed from the corncob. The corncob is spiny and can prick.'*

Roseby Duwe: *I want to shed some light on chisowa. In Chichewa language, 'sowa' means outcast or 'lame' (kupunduka). Chisowa is a 'lame' kernel within normal kernels in a corncob. Chisowa is produced when normal kernels are sown in poor soils.*

Description of a 'lame' kernel as 'sowa' seems to be unique in the study area dominated by the Yao speakers. In Central Region of Malawi, which is dominated by Chewas, a 'lame' kernel in vernacular language would be described as 'yopunduka' while in the Northern Region, dominated by Tumbukas, it would be 'yakupendera' or 'ya Chilima.'

Hawa Richard (youth): Do we have a distinct cultivar called *nakachiswe*? If we sow the kernel, shall we yield pure *nakachiswe*?

Hilda Stand: Yes, we have a distinct cultivar called *nakachiswe*. If you sow *nakachiswe* kernel you will indeed harvest *nakachiswe* and not Lilongwe. The corncob appears as if it has been eaten by termites (*Chiswe*) and hence the name *nakachiswe*.'

For both Domasi and Nsanama Extension Planning Areas, before the model solutions were tested, the most promising local maize cultivar to achieve food and income security of the farmers under drought and dry spells was '*Kanjerenjere*'. Ismael Kaunda, administrator of the Nsanama youth WhatsApp group substantiates my statement during WhatsApp progress review meeting held on 21st August 2018 as follows:

.... China has progressed well economically and socially because it has relied on traditional farming practices. The Government of Malawi should be aware that it is not only hybrids that mature early. There are also early maturing local maize cultivars such as *Kanjerenjere*. Why can't the government use technologies such as irrigation to boost production of such early maturing local maize Cultivars?

5.4.1.2 Multiple Cropping

Multiple cropping is highlighted as one of the local farming practices to be promoted by extension workers in the Guide to Agriculture Production (GAP), which is one of the tools extension workers use to guide crop and livestock production processes as already pointed out in section 3.5.3.2. This fact was corroborated by the AEDCs of Domasi and Nsanama during key informant interviews as elaborated below:

Researcher: *‘I have read the guide to Agriculture Production and other tools that you use. I see that you promote mixed cropping. Can you shed some more light on this?’*

Response: *‘Yes, we do promote mixed cropping. Even when I was doing my Diploma Course at Natural Resources College, mixed cropping was one of the courses I took. As I promote it in Nsanama EPA, I realize there is more I need to learn about mixed cropping.’*

Researcher: *‘Can you elaborate on the need to learn more about mixed cropping.’*

Response: *‘What I mean is that there are new crops being bred out there and some local crops that farmers used to mix in the past are no longer existing. Population is increasing. Soil is degraded. Politics is changing. So, I think we need to move with changing time in mixed cropping.’*

Local maize is mixed with several cultivars of other local crops mostly legumes (Table 5-5).

Table 5-5: Local crops commonly mixed with local maize in Domasi and Nsanama Extension Planning Areas

No.	Cultivar Name	Sub-species	Status (as reported by farmers during four cell-analysis)
1	Nandolo (Pigeon peas)	White (Woyera)	Available
		Red (Wofiira)	Available
		Multicolored	Available
2	Khobwe(Cowpea)	Nantulumba (White)	Scarce and no longer cultivated
		Long white	Available
		Long red	Available
3	Mtedza (Groundnuts)	Ndola: Large and white in colour	Scarce and no longer cultivated
		Chalimbana a. Wotamba (Spreading) b. Khaki	Khaki chalimbana is scarce and no longer cultivated

		<i>Kandona</i> (With tiny white seeds)	Available
		<i>Chimbuwira</i> (With tiny seeds usually 3 per pod)	Available
		Manipinta	Scarce and no longer cultivated
4	<i>Chinangwa</i> (Cassava)	Nakalasi a. Red b. White	White Nakalasi is scarce and no longer cultivated
		<i>Nchilingano</i> (Sweet)	Available
		<i>Nyambi</i> (Bitter)	Available
		<i>Magaligawo</i> (Sweet)	Scarce and no longer cultivated
		<i>Mpwapwa</i> (Sweet)	Scarce and no longer available
		<i>Sawoni</i> (Short and Sweet)	Available
		<i>Masankhwi</i> (Blackish and bitter)	Scarce and no longer cultivated
5	<i>Mapira</i> (Sorghum)	<i>Kapire</i> (Red)	Available
		<i>Nandonji</i> (Early maturing)	Available
		<i>Mbalwe</i>	Available
		<i>Nyenga</i>	Scarce and no longer cultivated
		<i>Lelembi</i> (White)	Available
6	<i>Kalongonda</i> (Vervet bean)	White (<i>woyera</i>)	Available
		<i>Wakuda</i> (Black)	Available
		<i>Nakafisi</i> (Yellow seeds)	Available
7	<i>Nkhunguzu</i> (Hyacinth beans)	<i>Namakunyewa</i>	Available
		<i>Nakaphalare</i>	Available
		<i>Ntchelero</i>	Available
8	<i>Nseula</i> (Cow pea)	<i>Waukulu</i> (large and spreading))	Available
		<i>Waung'ono</i> (small)	Available
9	<i>Mphonda</i>	<i>Ndembomanyanya</i> (Tall with striped seeds)	Scarce and no longer cultivated
		<i>Short with round seeds without stripes</i>	Available
		<i>Kamoto</i> (Yellow)	Scarce and no longer cultivated
10	<i>Maungu</i> (Pumpkins)	<i>Chindondoli</i>	Scarce and no longer cultivated
		Pumpkin	Available

11	<i>Nkhaka</i> (Cucumber)	<i>Nkhaka</i> (Cucumber)	Available
12	<i>Mapombe</i> (Gourd)	<i>Wobiriwira</i> (Green with large seeds)	Available
		Yellow	Available
13	<i>Chitowe</i> (Sesame)	<i>Chitowe</i> (Sesame)	Available

From the list of local crops presented in Table 5-5, the top five crops commonly mixed with maize according to the farmers who participated in the four-cell analysis are pigeon peas, pumpkins, groundnuts, velvet beans and cassava. The planting materials for these crops are mostly sourced by women while more expensive inputs such as fertilizers are sourced by men. Women in both EPAs claim they are more knowledge than men in what crops to mix and how. An extract from the 4th focus group discussion at Nsanama EPA substantiates this statement.as follows:

Facilitator: *‘Mixed cropping is one of the local farming practices. Is this practiced in your area. If yes, how was it introduced? What is the role of women?’*

Elistina Mkanamwano: *“Yes, mixed cropping is practiced in our area and some of the crops in the mixture are drought tolerant. In the past, ancestors had some crops that were early maturing, and they would plant to avert drought. One examples of such crops is ‘kawasala’. It is a Yao term meaning “you shall not die.”*

Facilitator: *‘What is the role of women in mixed cropping and cultivation of drought tolerant crops?’*

Mary Amon: *‘Women have a major role in choosing crops to mix. Women have more advanced knowledge than women of crops to mix in a particular field. A man can choose a single crop without considering other crops. A woman then comes in and chooses other crops some of which are early maturing. A woman is more concerned with food security issues than a man, hence inclusion of early maturing crops in the mixture.’*

5.4.1.3 Traditional Insect pest control measures

In the two case study sites, women said they use several traditional insect pest control measures most of which have already been reported in Chapter Two. However, there were some practices unique to Domasi and Nsanama Extension Planning Areas.

Presented below are examples of traditional insect pest control measures from the focus group

discussions at Domasi and Nsanama EPAs:

Researcher: *‘What are some of the traditional insect pest control measures in your area?’*

Zaidati Jali (Domasi EPA): *‘When there was an outbreak of stalk-borers, traditional leaders used to mobilize their subjects to control the problem. Each household member in the area affected by the pest contributed some food usually ‘nsima’, relish and traditional beer. Concerned community members would then wash their hands and eat together to symbolize solidarity. The eating was followed by mass movement of the villagers to the stalk borer affected fields where they sprinkled the water they used to wash their hands while singing a song in chorus ‘Iwe kapuchi thawa!’ (Stalk borer, run away from our fields). The system was working but ‘chizungu (Westernization) has destroyed it.’*

At Nsanama EPA, stalk-borer control was explained by **Halima Sailesi:** *‘An outbreak of stalk-borers was controlled by cutting a few infected maize plants, place them at crossing paths or roads. We believed whoever comes first at the cross-roads would take the stalk-borer with him/her.’*

Hajira Tambala (Nsanama EPA): *‘To control Fall army worms and stalk-borers, we pour solution of sugar or soup of fish to the maize funnel. The solution or soup attracts ants which later attack the worms or stalk borers after depleting the initial attractants.’*

Extension workers at both EPAs encourage farmers to use traditional insect pest control measures. The measures are nonetheless not a top priority by extension workers in part because they do not fully understand them. During key informant interviews (14/08/2018), Mr. Alex Dizinga, AEDC for Domasi EPA had this to say:

Researcher: *‘As an extension worker, what is your role in traditional insect pest control measures?’*

Response: *‘Traditional insect control measures fall under a category of integrated pest management or cultural control methods that we promote as extension workers. Traditional measures are more environmentally friendly than manufactured pesticides.’*

Researcher: *‘I have read some publications that in other countries like Kenya, farmers are trained on how to prepare and apply herbal based pest control measures. For example, in case of neem, farmers are trained on how to mix neem with other ingredients like ash. They are also trained on application rates. Do you also train farmers in Domasi EPA?’*

Response: *‘No we do not train farmers on traditional practices. They use their own*

intelligibility. However, I think LEAD should help in training since you are pioneering this research in Domasi. I also do not fully understand effectiveness of these traditional practices, frankly speaking.'

5.4.1.4 Traditional Weather Forecasts

Local communities at the two study sites use similar traditional rainfall forecast indicators as those presented in Chapter Two. When a video on when and what to plant was shown to women as first stimulus during the first stage of the expansive learning actions, participants were later asked to state their preference between forecasts those provided the Department of Meteorological Services and their own traditional ways. Women's' preferences between scientific and traditional weather forecasts are summarized below:

Researcher: *'Last week, we showed you a video where scientists, policy makers, extension workers and farmers were discussing scientific and traditional means of forecasting onset and reliability of rains for planting. What is your preference between the two and why? Can you raise your hand those of you supporting traditional means or scientific methods?'*

Response: *All the 15 women at both Domasi and Nsanama EPAs rose their hands in support of traditional practices.*

Researcher: *'Why have you all raised your hands in support of traditional practices?'*

Joyce Wailesi: *'It is because the Department of Climate Change and Meteorological Services 'Yalowa China' (Their systems have gone Chinese way, associated with poor quality services in Malawi).*

Rose James: *'Our traditional ways of 'calling' and forecasting onset of rains is more reliable than that provided by the Government (Boma). For example, in the olden days, when there was a dry spell, chiefs mobilized their subjects, prepared traditional beer and conducted prayer sessions at designated hills or caves and the rains would come. I think a certain reverend from the video we saw last week also alluded to such ancestral prayer sessions.'*

Women's preference of traditional weather forecasts at Domasi and Nsanama EPAs is consistent with what I stated under section 2.2.1.5 of Chapter Three. The extension workers in both EPAs seem supportive of forecasts provided by Department of Climate Change and Meteorological Services but they are also at a dilemma on whether to totally reject or support traditional practices. Alex Dizinga from Domasi EPA stated as follows during key informant

interviews:

Researcher: *‘From the discussions I had with women, they mostly support their traditional ways of predicating onset and reliability of rainfall. How do you advise your farmers relating to this subject matter?’*

Alex Dizinga: *‘The Ministry has not yet approved use of traditional weather practices by farmers. There is need for more research. There have been several cases when farmers come to my office saying, ‘after the rains we dug the soil using a small hoe and we have concluded that moisture in the soil is adequate for sowing seeds, can we proceed sowing.’ I am usually in a fix with such questions. If I say ‘yes’ go ahead and sow your seeds, the farmer will blame me if the seed fails to germinate. Even with scientific rainfall forecast, some farmers have blamed me that I give inaccurate information. With such double binds, I allow farmers to make their own judgment.’*

5.4.1.5 Soil fertility enhancement techniques

Farmers in both EPAs mostly use livestock and compost manure to improve soil fertility and extension workers aggressively promote this. As frequency and magnitude of drought and dry spells increase in the Lake Chilwa Basin, coupled with increased demand for livestock manure as the human population increases, farmers have learnt to process and use new types of manure. Some notable examples of these newer types of manure include bat droppings, human waste and Whitman. Bat droppings are excavated from caves where bats hide while human waste manure is obtained from old pit-latrines. Whitman manure is produced by a blind farmer at Nsanama EPA and is unique to Nsanama EPA. During a dry season observation studies visit I made to Mr. Whitman; he described his manure as follows:

Researcher: *‘We have been discussing with women on local farming practices over the past four months and they mentioned your manure. Can you elaborate on Whitman manure?’*

Edward Whitman: *‘First, I want to inform you that I am a blind person since birth. I commend women that introduced me to you. I was inspired to make this manure because of the increasing frequency of droughts noticing that chemical fertilizers burn the soil and they do not conserve the much-required moisture during droughts or dry spells. Whitman manure is my own idea. To make the manure, I mix 25 kilograms of livestock manure with 20 kilograms ash, 20 liters water, 1 teaspoon yeast and 1 teaspoon sodium bicarbonate. I then enclose the mixture in plastic paper for 1-2 weeks with regular monitoring to check decomposition and manure*

maturity. I use the manure as both a basal as well as top dresser. As you can see, I use ash as an ingredient, but ash comes from burning vegetation and this make me uncomfortable. People might blame me that I am encouraging deforestation through burning. I am now experimenting on ash alternative, but I cannot tell you more now for fear that people might steal my ideas before results of my test are out' (29/08/2018).

5.4.1.6 Mphanje (slash and burn)

Due to increasing human population in Machinga, my study district, opening new gardens (*mphanje*) following typical cyclical slash and burn patterns as explained in Chapter Two is also no longer possible at the study sites. Consequently, farmers have modified the traditional slash and burn agriculture. They have maintained the same name of '*mphanje*', though the name no longer carries the typical meaning of opening a new garden as it used to be. The same garden is cultivated year after year but on rotational basis with cucumbers, maize and rice as main crops planted. Some of the plant residues they incorporate are sourced from outside the main cultivation area because they are becoming scarce.

During dry season observation studies involving Malawi Broadcasting Corporation, a local radio station in Malawi, Elizabeth Mbulaje one of the women subjects of my study explained *mphanje* as a practice that involves cutting and heaping grasses, burying with earth to create a mound, slow burning the buried grass for 3-4 days, sowing seeds primarily cucumbers and maize, harvesting, consumption and marketing.



Figure 5-4: The Mphanje making process

The '*mphanje*' has multiple benefits to local communities as follows:

- a. Cucumbers are harvested around November to February while maize is harvested around April to June. Thus, the modified '*mphanje*' is used as a coping strategy against drought and dry spells that have increased in frequency and magnitude. Clearly, climate change, especially extremes of drought and floods are catalyzing informal learning.
- b. Burning kills weed seeds and this reduces labour for weeding.
- c. Burning also releases plant nutrients through ash, thus saving cost of chemical fertilizers.
- d. During the rainy season, local communities harvest more crabs (a delicacy) than in areas not exposed to the practice.

It is perhaps because of such multiple benefits that Rose Saidi, a lady in her late 70s categorically refused stopping mphanje (01/10/2017)

[...I cannot stop mphanje because it supports my family's livelihood. My children are well supported in education through sales of cucumbers harvested from the mphanje. Modern farming practices such as conservation agriculture (*Mtayakhasu*) cannot compete with mphanje. It is impossible for me to let go of this local farming practice. So be assured that people's hearts lie with mphanje no matter what. And if I plant maize on the mphanje field, it will flourish more than in a garden with applied with chemical fertilizers due to the ashes'] (see Figure 5-5).



Figure 5-5: Local maize on mphanje (right) and without mphanje but applied with chemical fertilizers

Besides the elders, youth at Domasi EPA also support *mphanje*. The conversation below supports this claim:

Emmanuel Thuwala (MBC): *'We have heard from older farmers on their view about Mphanje, what about the youth, do you also practice mphanje? If you do, are there any benefits you would like to share with us?'*

Isaac Chamanda: *'...I have also been practicing mphanje and I can date it back to the time I was in school. It was through mphanje that I was financially able to go to school.'*

Emmanuel Thuwala: *'So do you own your own piece of land or there is a share allocated to you?'*

Isaac Chaminda: *'Yes, I have my own land now. My mother does her own mphanje on her land and I do mine.'*

5.4.1.7 Informal learning as a tool to create and sustain knowledge of these local farming practices

There are several informal leaning pathways under local farming practices that I identified in my research (Figure 5-6). According to this figure, the most common pathway is oral transmission presented as “mouth” in this figure. Other common pathways include trials, observation, social networks such as women social groupings (e.g. village banks), faith-based networks such as Dorcas (Seventh Day Adventist Church), ‘*amayi a mvano*’ (Church of Central Africa Presbytery—CCAP), *Kaswida* and *Dawa* (Muslims). According to this figure, mass media (electronic and print) are seldom used as learning pathways and this is quite unfortunate considering that mass media is one of the most powerful tools in awareness creation (Tsirizeni, et al., 2018, p. 257).

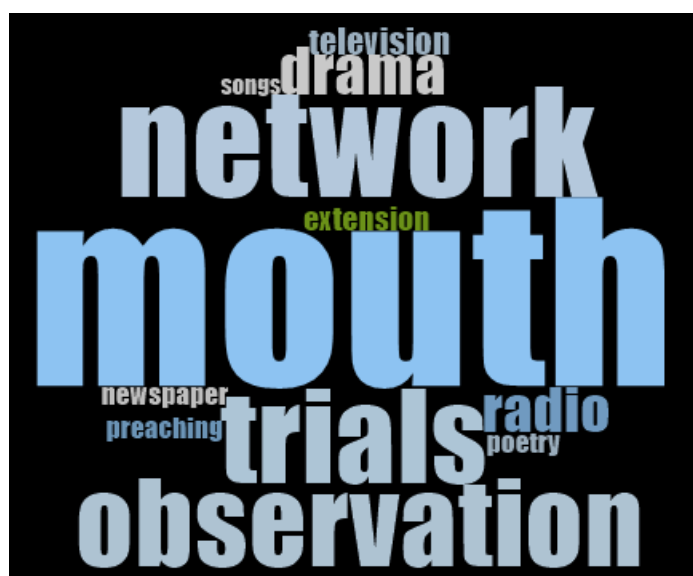


Figure 5-6: Common informal learning pathways under local farming practices

5.4.1.8 Drought as a catalyst to informal learning via the above pathways

One of my research objectives was to find out how drought and dry spells catalyze learning, hence this sub-item. My research has generated evidence that drought is a catalyst for informal learning at the two case study sites. Presented below are informal learning points influenced by drought that I found in my study

a. **Informal learning relating to development and use of Whitman manure (Nsanama EPA)**

During a field visit to Mr. Edward Whitman on 29/08/2017, I asked about the source of inspiration for developing and using Whitman manure. Edward informed me that

.... chemical fertilizers are a quick source of soil nutrients as we all know. But when dry spell strikes, chemical fertilizers burn the soil. Consequently, using my own initiatives guided by God, in the year 2012, I decided to make Whitman manure to fight drought. Whitman manure, unlike chemical fertilizers is like a sponge and even under dry spell conditions, a farmer can still harvest some maize.

b. Trials to cultivate Irish Potatoes in a new environment (Domasi EPA)

In Malawi, the most suitable areas for Irish Potato cultivation are highlands receiving annual rainfall amount of between 1000 to 1600 mm. Zaidati Jali, one of the women participants of my study, was found trying to cultivate Irish Potatoes in lowland areas of Domasi EPA that receive 800-900 mm of rainfall annually. Clearly, Irish Potatoes are not suitable for this area. When the research team visited Zaidati at her Irish Potato field, she was asked about the origin of her ideas and why she was the only one in the area cultivating Irish Potatoes by then. In her response, Zaidati said

.... yes, I am the only one in this area. I am doing this on trial basis so that if I am successful, other farmers can do the same. The wetland you are seeing here is normally cultivated to rice. Due to dry spells, the rice is not doing well. That is why I decided to try cultivating Irish potatoes which require less water than rice.

From this quote, Zaidati was motivated by drought to engage herself into this trial.

c. Learning to cope with extreme drought and dry spells

Local communities use several coping strategies to offset negative impacts of droughts and dry spells in the Lake Chilwa Basin. Presented in Tables 5-6 and 5-7 are common coping strategies provided by women but also sourced from various documents that I read.

Table 5-6: Informal learning and coping strategies during drought episodes, Domasi Extension Planning Area

Coping method	Coping methods and frequency of use (0 = not used; 1= slightly used, 2, moderately used, 3 = frequently used)																Totals
	'43	'45	'49	'50	'65	'67	'70	'73	'80	'90	'95	*02	*12	*13	*15	*17	
Cassava leaves	0	0	3	3	1	1	2	2	3	3	3	1	1	1	2	2	28
Reduced meals	0	0	3	3	0	0	0	0	0	0	0	3	0	0	0	0	9
Wild Yam	0	0	3	0	0	0	0	0	0	0	0	3	0	0	0	0	6
Banana Tubers	0	0	3	0	0	0	0	0	0	0	0	3	2	2	1	0	11
Wild grass seeds	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	9
Migration	0	0	3	0	0	0	0	0	2	0	0	3	1	1	1	0	11
Sale of household properties	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	9
Piece work	0	0	3	3	0	0	0	0	3	0	0	3	1	1	2	0	16
Family ties	0	0	3	0	0	0	0	3	0	0	3	0	2	2	0	0	13
Prostitution	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	3
Theft	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	3	9
Maize Bran	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0	9
Rice Bran	0	0	3	0	0	0	0	0	0	0	0	3	0	0	0	0	6
Charcoal sales	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3	3	12
Totals	0	0	33	9	1	1	2	5	20	3	7	36	7	10	9	8	148

Tables 5-6 and 5-7 show that there have been new coping strategies informally learnt during drought and dry spell episodes. For example, banana roots, a mixture of crushed unripe mangoes and juice cola are new coping strategies learnt informally under the 1949 drought described by (Munthali, et al., 2003, p. 12) as the most severe drought in Malawi ever.. Mango plus juice cola as a coping strategy has only been informally learnt and practiced in Nsanama since 2002 one of the recent severe drought periods according to women interviewed. For the past 6 decades, the year 1949 had the greatest number of coping strategies used implying more of informal learning during the same year.

Table 5-7: Informal learning and coping strategies during drought episodes, Nsanama Extension Planning Area

COPING STRATEGY	Coping methods and frequency of use (0 = not used; 1= slightly used, 2, moderately used, 3 = frequently used)															TOTAL
	'43	'49	'50	'65	'67	'70	'73	'80	'90	'95	*02	*12	*13	*15	*17	
Sawdust	0	2	0	0	1	0	0	0	0	1	2	1	1	1	0	10
Saw dust/ rice bran mixture	0	2	0	0	0	0	0	0	0	0	2	1	0	1	0	7
Cassava leaves	1	3	1	1	1	1	1	2	1	1	2	1	1	1	0	18
Reduced meals	1	3	1	1	1	1	1	1	1	1	1	2	1	2	0	17
Crushed unripe mango/juice cola mixture	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	5
Wild Yam	1	3	1	1	1	1	1	1	1	1	1	1	1	1	0	15
Wild grass seeds	1	3	1	1	1	1	0	0	0	1	1	1	1	1	1	14
Migration	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	14
Sale of household items	0	2	1	1	1	1	1	1	1	2	2	2	2	2	1	19
<i>Ganyu</i> (Piece work)	1	2	1	1	1	1	2	2	2	2	2	2	2	2	2	26
Family ties	2	3	2	2	2	2	2	2	2	2	2	1	2	2	1	28
Prostitution	0	0	0	0	0	0	0	1	1	1	2	2	3	3	2	16
Theft	0	1	0	0	0	1	1	1	2	2	3	2	3	3	2	21
<i>Mkokabwato</i> (<i>Creeping plant</i>)	1	1	1	0	1	1	1	1	1	1	1	1	1	2	1	15
Early girl child marriage	0	0	0	0	0	0	0	1	1	1	2	3	3	3	2	16
Bird and mice hunting	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Maize Bran	1	2	1	1	1	1	1	1	1	1	2	2	2	2	2	23
Rice Bran	0	1	0	0	0	0	0	0	1	1	2	1	1	1	1	10
Charcoal sales	0	0	0	0	0	0	0	0	1	1	2	3	3	3	3	16
Village Banks	0	0	0	0	0	0	0	1	1	1	2	3	3	3	3	16
Fish sales	2	1	2	2	1	2	2	2	2	2	2	2	2	2	2	27
TOTALS	14	32	14	13	14	15	16	19	20	25	38	32	32	37	25	347

As a way of triangulation, a field visit was made to GVH Chipile to learn more about banana roots ground into flour in place of maize flour to cook *nsima* from Joyce Wailesi (Domasi EPA), one of my study subjects (Figure 5-7).



Figure 5-7: Banana root processed into flour

A summary of the key discussion points between researcher and Joyce Wailesi relating to use of banana root flour is presented below:

Researcher: *‘Following up on the focus group discussions that we had with you recently, we would like to see and learn more about the banana root flour as a coping mechanism.’*

Joice Wailesi: *‘...OK let me bring the samples (Figure 5-7). As you can see, the first step is to dig the roots followed by peeling, slicing and then drying on the sun. After drying we pound and sieve the flour, ready to prepare nsima. This nsima tastes bitter as such it is better eaten with okra as relish to ensure rapid swallowing. We use the flour only on very extreme cases of drought and hunger.’*

Researcher: *‘How did you learnt about this?’*

Joice Wailesi: *‘In 1949, when I was a young girl by then, there was severe drought and hunger. My grandmother used banana root flour to prepare nsima and we all survived. In 2000 and 2002, there was another severe drought and hunger and then I recalled what I learnt from my grandmother in 1949. I then decided to use the same to save my family from hunger. I have also taught my daughter (‘Mayi Silivia’) how to use this coping method.’*

Clearly, from the above discussions, drought influenced use and learning to use banana root flour as an alternative to traditional maize flour. The discussions with James Wailesi also highlight intergenerational learning to cope with drought

5.4.1.9 Summary of the Local Farming Practices Activity system

The discussion on local farming practices and the associated informal learning pathways at the two study sites can be summarized as follows using the notion of activity system (Figure 5-8).

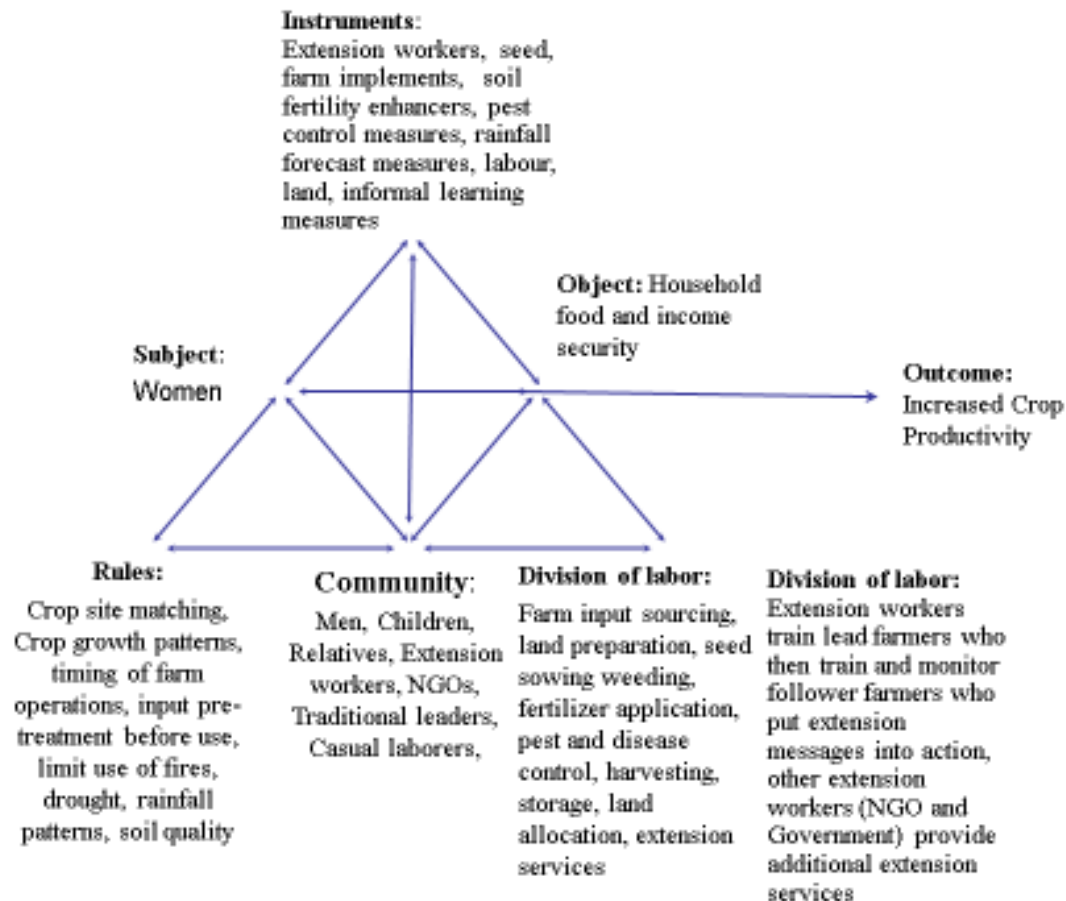


Figure 5-8: Local Farming Practices Activity System

As Figure 5-8 depicts, the local farming practice activity system, which is my central activity system, shares the same object of ‘household food and income security’ as that of the extension delivery activity system (Figure 5-3).

5.5 Surfacing Contradictions

Chapter Two of this thesis has sections on ‘*the future*’ of each local farming practice. The ‘future’ was defined in terms of two dimensions: local community preference and the challenges each practice faces. These challenges are manifestations of the contradictions. For this study, I identified several manifestations of contradictions specific to my study sites. These manifestations helped me to identify and analyse contradiction. Analysis of contradictions for my research was based on four guiding questions as follows (Uden, 2007, p. 98).

- What are the dynamics that exist between the components of the activity system?

- Are there inconsistencies within the needs of various components of the activity system?
- What are the interrelations that exist within the components of the system?
- How have these relationships changed over time?

Based on these questions I identified and grouped contradictions into four broad categories: Malawi Government structures, systems and norms, traditional structures and norms, religious and traditional beliefs and unclassified.

5.5.1 Malawi government structures, systems and norms

Malawi Government structures, systems and norms act as both enablers and source of contradictions. For this section, I will only focus on contradictions with reference to institutional rigidity, inequities, political and social discrimination and marginalization of local farming practices via the influence of westernization as claimed by one of the women during the first change laboratory workshop: *‘Proliferation of modern farming methods such hybrids is causing loss of local farming methods such as local seeds.’*

During the validation workshops at Nsanama EPA, one of the participants seemed to support the woman’s concerns as follows: *‘. The major threat to our local farming practices is ‘azungu’ (white men). The white man might be testing crop cultivars on us but who knows, it could be those cultivars they gave to monkeys that later died.’*

This message appears quite strong, highly charged, confrontational and is a manifestation of a dangerous or fatal contradiction (Harvey, 2014, pp. 124-126) to local farming practices brought about by *‘azungu*.

Presented below are contradictions in the local farming activity system in relation to Malawi Government structures, systems and norms that I identified.

5.5.1.2 Primary contradictions

i. Between hybrid and local maize seed (Instrument level)

Malawi launched a National Seed Policy in 2018 *‘for enhanced growth of the local seed industry to ensure farmers’ access to **improved** varieties and seeds’* (p. 3), thus effectively sidelining the informal seed sector dominated by local networks. There will also be *‘integration of improved seed topics in Education Curriculum’* (GoM, 2018, p. 3&10) and this is likely to influence youth understandings of local seed. Extension workers too are more supportive of

hybrids than local cultivars as explained below by one of the participants during a validation workshop in Domasi EPA (21/12/2017): *‘In most cases, extension workers teach us about modern farming practices. Why is it that in your research you are proposing an integrated approach of modern and traditional farming practices?’* At Nsanama EPA, Jealous Matandika shares same the view as that of Bakali: *‘I continue cultivating local maize on my own. I do not receive any extension advice.’* (17/01/2018)

The choice between local and hybrid maize seed is a dilemma for local communities because both hybrid and local maize have advantages and disadvantages as claimed by various individuals I interacted with during my study:

‘I should not lie to you, I stopped growing local maize long way back when I had only one child, because hybrid maize yields better than local maize. I grow local only on a few ridges because the fresh maize tastes better than local’ (FGD, Ngwelero EPA).

‘As of me I grow local maize in one field and hybrid maize in another field. Since I am a single woman and I fear I may not find pesticides to apply to the hybrid maize and in that instance the local maize will provide me some food to eat’ (FGD, Ngwelero, EPA).

‘I grow different maize cultivars including hybrids. Hybrids are high yielding but heavily infested by fall armyworms. With Kanjerenjere, a local maize cultivar, I harvest even without applying fertilizer. I will never stop local maize cultivation. During storage, my local maize is less attacked by weevils. And, I have one acre of hybrids cultivated in front of my house for extension workers to appreciate. As for local maize, I cultivate it behind my house’ (Validation workshop, Nsanama EPA).

‘Extension workers promote hybrids. They should be engaged actively if we are to succeed in local farming practices’ (Makuluni Diversity Block Progress Visit).

‘There are plenty of people interested in local maize across the 13 villages. In the 1940s, we had flourishing local maize cultivars, but we were told by extension workers to plant this and not that and local cultivars suffered’ ((Makuluni Diversity Block Progress Visit).

Fall army worm, stated by one of the participants during validation workshop, was one of the major pest outbreaks in the Lake Chilwa Basin during the previous five years threatening maize production (Chilima et al., 2018, pp. 186-187). This is one of the insect pests that thrives under dry conditions (Prasanna et al, 2018 p. 2). Because of the economic impacts of this emerging insect pest, I will shed some more light on it.

The claimed maize defenses against insect pests may be due to several physiological factors including concentration of lignin, a major component of plant cell walls. Increased lignin concentration is correlated with increased resistance against fall armyworm (de Lange, Balmer, Mauch-Mani and Turlings, 2014, p. 335). Because of its slow growth, local maize cultivars accumulate a higher concentration of lignin than hybrid and should therefore be more resistant to fall armyworm as claimed by local communities. However, as Prasanna, Huesing, Eddy, Peschke and Virginia (2018, p. 46) noted, '*there are presently no Africa-adapted maize cultivars with scientifically validated resistance to fall armyworm.*' Therefore, local community claims that local maize is less preferred by fall armyworms than hybrid needs further investigation.

Rural farmers dilemma on hybrid versus local is fomented by their own choice of local maize and the bias of extension workers on hybrid maize.

ii. Between existing scientific weather forecast and local forecasts (Tools)

During the first change laboratory workshop, where I showed a video on '*farming versus extreme weather pattern*' that highlights indigenous and scientific methods of determining onset and reliability of rainfall as first stimulus, one of the questions asked was '*what have you learnt from the video?*' A participant from Domasi EPA answered:

.... Some people were supporting use of traditional rainfall forecasts. I remember someone talking about bird nests facing in a certain direction as useful to elders to predict onset of rains. Someone from the government talked a lot about scientific ways though I was not getting what he was saying in some cases. But I think the speakers were just **verbally fighting**' (my emphasis)

The conflict between modern and local science is well documented. For example, in his publication '*they don't know what they are talking about*', Ramisch (2014), among various issues he wrote about, highlighted that '*scientists observe farmers as not very good researchers*'. In a typical blame game style, farmers also rebuked researchers as '*political, secretive, selfish, unreliable and that their new technologies are not helpful*'.

iii. Between using slow acting traditional ways of eradicating nuisance plants and using quick acting but expensive and environmentally unfriendly ways – the case of native bamboos and *nansongole* (Tools)

In my study, I identified two unique but slow traditional ways of eradicating nuisance plants in farming land. Below, I discuss these ways further.

Under a local farming practices known as '*kuojeka*' (crop residue incorporation), farmers face several problems including slow decomposition of plant residues leading to a corresponding slow release of plant nutrients. Fortunately, there were two women (out of 15) at each of the two study sites who shared their experiences on how to deal with slow decomposition using peels of ripe *makumbuka* and *sukari* banana cultivars to eradicate *nansongole* and native bananas respectively. Presented below is a discussion between researchers and women during session 2 of the change laboratory workshops relating to the subject matter.

Researcher (Domasi EPA FGD): *'You said some plants such as nansongole are difficult to decompose, how do you currently speed up decomposition of this grass under 'Kuojeka' farming practices?'*

Respondent: *'My grandparents used to spread ripe banana peels on top of 'nansongole.'*

Respondent: *'The banana Agness Charles is referring to is 'makumbuka' which was also used to cure severe headaches. My grandparents used to collect 'makumbuka' ripe banana peels from the markets. The peels were then spread over 'nansongole' grass to speed up decomposition.'*

Researcher: *'Who else is aware of this technique?'* (No one raised a hand at Domasi)

Respondent: *'I have never heard of this technique and I think we are really learning now.'*

Researcher (Nsanama EPA FGD): *'At Domasi EPA, two women informed us that they use peels of 'makumbuka' banana to speed up decomposition of 'nansongole.' Are you aware of this technology?'*

Women in chorus (at Nsanama EPA) *'...that is for Domasi EPA. The practice does not occur here.'*

Respondent: *'I heard from my grandmother that placing peels of ripe 'sukari' banana eradicates native bamboos.'*

Researcher: *‘Who else is aware of the technology mentioned by Mary Amon?’* (Only one woman, Halima Sailesi raised a hand, and this was an indicator of knowledge gap).

The discussions above show that knowledge about use of ripe *‘makumbuka’* and *‘sukari’* banana peels to enhance decomposition seemed rare and unique to few women. During validation workshops that involved over 80 participants, none of the participants raised a hand when I asked, *‘which one of you is aware about these techniques?’*. This further indicated uniqueness of this local knowledge practice to a few community members.

The use of *sukari* to eradicate native bamboos created a conflict of motives explained below.

iv. Conflict of motives between basket weavers and subsistence farmers

From the 2012 video *‘Kufunika kwa Nsungwi’* (importance of bamboos), that I reviewed in this research, one of the basket weavers in Salifu Village, T.A. Mulumbe (Zomba) stated that *‘bamboos are an important source of raw materials for weaving baskets, roofing and construction of granaries. We face several challenges in our weaving business. Bamboos are becoming scarce and we source them from distant places.’* According to one of the women speakers in the video, *‘the baskets made are either sold directly or exchanged with maize at Lundu during drought.’* In this way, baskets serve the purpose of coping during drought.

The root of this conflict is the human population which has historically been increasing in Malawi leading to reduced land holding sizes and increasing demand for bamboos and other natural resources.

v. Which one to document: modern farming practices and local farming practices (Community of others)

Literacy rate in Machinga District where I conducted my research is 41 % and is second from Mangochi which has the lowest rate at 34.1 % (NSO, 2012, p. 23). Because of such low literacy levels, documentation of local farming practices by farmers themselves is low. During the analysis stage of expansive learning at Nsanama EPA one of the participants said, *‘we memorize and keep in our head.’* As pointed out already in the first contradiction, the government and extension workers do not support some local farming practices such as local maize cultivation and *‘mphanje’* and they are in a dilemma on whether to document both modern and local farming practices. Other institutions working in the Lake Chilwa Basin seem to have a similar dilemma on which practice to document. More often, however, the documentation is skewed towards modern farming practices. For example, recently in 2018, LCBCCAP published a book on building socio-ecological resilience but the role of local

farming practices to build the intended resilience is not well documented in the book. The same LCBCCAP produced several radio programmes and the focus was on modern farming methods such as early warning signals by the Department of Climate Change and Meteorological services and climate smart agriculture technologies.

vi. Between the levels of youth involvement in modern farming practices and local farming practices (Community of others node)

Young people are a critical constituency in Malawi since they form more than half of the total population, estimated at 17.5 million (NSO 2018), with potentially significant implications for future trajectories of growth and development. Their active involvement in the agriculture sector is therefore critical for sustainable development of the sector in Malawi. It is apparent from my study that some young people are more interested in modern farming practices than local ones. The discussions below give some evidence of my claim:

Researcher: *‘What is threatening local farming practices?’*

Respondent: *‘The country has gone China. The youth are saying local farming practices are for the elderly and not for them, but I tell them that the nsima you take is cooked on traditional three-stone fireplace and not on four or two.’*

Respondent: *‘Nowadays, the youth are misbehaving to the extent that they rubbish local farming practices. They forget that the best nsima comes from local maize.’*

The apparent negative perception of the youth to local farming practices is partly also rooted in the weak inclusion of the local farming practices in education curricular as the discussions below reveal:

Researcher: *‘Why are the youth not supportive of local farming practices?’*

‘...I think it is both peer learning from friends as well as what they learn at school. My fellow women, do you think a teacher can teach about traditional ways of praying for the rains?’ (Change laboratory session 2, Nsanama EPA).

‘In the past, few people went to school. Nowadays, many people go to school and the new syllabus has brought in scientific things which have disturbed local farming practices,’ (Focus Group Discussions 2, Domasi EPA).

Elsewhere, Christianity is blamed for youth rebellion in indigenous practices. For example, in Bolero, a rural growth centre in Northern Region of Malawi, a traditional spiritual leader blames Christianity as fomenting rebellion among the youth when he said *‘I was in the process of initiating my son as a priest of the shrine, but he is lost into evangelical churches. He is no longer cooperating. He considers the shrine evil’* (Murphy et al., 2016, p. 110). Some youth consider that they will be looked down upon as inferiors if they learn indigenous knowledge at school. To substantiate this claim, a youth member at Chinduza Village in Malawi downgrades indigenous knowledge when he said *‘I do not have any interest in indigenous knowledge because it is inferior and if I learn it in school, I will not appear like I am educated’* (Kayira, 2013, p. 112).

Historically, the Malawi Government Policies have not been conducive to youth involvement in the agriculture and other livelihood sectors (Chinsinga & Chasukwa, 2012, p. 72).

...Young people are not treated and targeted as a distinct category needing attention in either the Poverty Alleviation Programme (1994); Vision 2020 (1998); the Malawi Poverty Reduction Strategy (2001); or the Malawi Growth and Development Strategy (2006). Young people do not even appear in the sections on cross-cutting issues dominated by gender, HIV/AIDS, environment and technology.

5.5.1.3 Secondary contradiction

a. Between traditional rainfall forecasting methods (instrument node) and time of planting (rule node)

In the video shown during the first change laboratory workshop, a participant from World Vision International suggested an integration of scientific and traditional weather forecasts to determine time of planting. In his own words, this participant said:

....my grandfather took me out into the field and asked, have you seen these ants? They are running away from heat in the soil. Within seven days we are expecting rain and it indeed happened. So, we should not totally ignore indigenous knowledge. Rather it should be integrated with scientific weather forecast by Department of Meteorological Services and Climate Change.’

The suggestion by Esau to integrate traditional and scientific weather forecasts suggests that there are doubts on reliability of either of the two methods (traditional and modern) functioning alone. The farmer is therefore faced with a dilemma.

5.5.1.4 Tertiary contradictions

a. Between the old local farming activity system with weak research and the new system with strong research component (Instrument node)

There is an increasing interest to understand indigenous practices including those in agriculture. In other words, new knowledge is being introduced into the existing local farming activity system. For example, in responding to the question on reasons behind threats to local farming practices and its limited inclusion in the school syllabus, one woman from Nsanama EPA during the second change laboratory workshop said:

...I think we lacked research such as this one. There was no one to investigate the challenges that surround omission of local farming practices in school syllabus. But now we can see that organizations are looking into local practices and how they are essential to us. We can see how this was not the case before hence local farming practices were not popularized. Researchers help to let the contemporary agricultural world understand how and why local farmers relied and benefitted on indigenous knowledge. Such information helps build outreach to necessary ministries in advancement of local farming practices. And the education sector comes in to put such knowledge into the syllabus so that students learn and benefit from such documentation. All this is possible when the researchers interact with local farmers and teach us.

However, the new knowledge in local farming practices appears to be causing tensions between the old and the new local farming activity system. For example, during the validation workshop at Nsanama EPA, one participant, during question and answer session, highlighted a potential tension between local and modern science:

...I think deeply about the conversations taking place here. Why were modern farming practices introduced yet there were already local practices existing? Why was hybrid maize introduced? There was research done and hybrid was recommended. We are now doing another research. It seems the house here is for local farming practices at least based on what I make from the discussions taking place. We will confuse local farmers.

b. Between the new and old with and without youth WhatsApp respectively as an informal learning pathway

As already pointed out in contradiction 5.5.1.9 vi, the youth have historically not been actively engaged in local farming practices either due to their own negative perceptions or oppressive Government of Malawi policies and strategies. Consequently, this research tested the

workability of using WhatsApp, a recent innovative communication approach (Blehch , 2016, p. 119) to promote local farming practices involving the youth as already indicated in section 4.4.4.1. Despite the successes registered by the youths through WhatsApp (see section 7.2.2.1), there were also emerging conflicts that I identified with this new approach as follows:

c. Conflicting messages between the youth in WhatsApp group and extension workers

The historical extension messages seem to be so deeply rooted that any new information creates conflict and contestations. For this research, I also discovered conflicts between the messages developed by the youth and those developed by extension officers. During progress review meeting of Domasi WhatsApp group, the group discussions presenter said *‘We and the extension workers bring contradictory messages to farmers. More often, the farmers listen to advice from extension workers because they are educated, they bring starter pack and they also come on motorcycles.’*

d. Between the traditional face to face approach and virtual extension delivery system via WhatsApp

WhatsApp usage may potentially reduce face to face traditional contact with the farmers by extension workers leading to undesirable results. As stated by one of the participants during review workshop of the WhatsApp group at Nsanama EPA, *‘...WhatsApp usage may potentially result into farmers cheating that they are acting, yet the reality might be the opposite’*. This is a tertiary contradiction between the traditional extension delivery system and virtual methods (mediation tools) via WhatsApp recently created in 2009. It is a dilemma between the two approaches.

e. Differing perceptions about usage of WhatsApp between the youth and the elderly

WhatsApp is a recent development to elders who are used to historical learning methods that include word of mouth, observation and trial as already stated in section 4.4.4.1 a. Therefore, they *‘consider use of WhatsApp by the youth as a ‘play game’ and therefore they may potentially reject outcomes of the WhatsApp conversations even if positive’* (Domasi WhatsApp Progress Review meeting).

5.5.1.5 Quaternary contradiction

Between research processes (mediating tools) newly introduced into local farming practices and the existing research ones in the extension delivery activity system

Another conflict between modern and local science I found in my study relates to a ‘*mphanje*’. During recording of the ‘*mphanje*’ farmers by Malawi Broadcasting Corporation, the AEDC of Domasi EPA was asked by the producer to comment and he said that

...it is true, these farmers are practicing mphanje. It is however surprising because we have been discouraging farming practices that involved burning like mphanje. The reason we advise against such practices is because we believe the fire destroy the living organisms that enhance decomposition in the soil. They insist this burning makes the land fertile, but we believe this fertility is short-lived. As extension workers we encourage these farmers to have a vision and plan rather than destroying the very organisms that improve soil structure. But since they say this practice really benefits their lives, I think we might as well learn from them through this research.

5.5.1.6 Implications of ignoring westernization/modernity threats on local farming practices

From the above discussions, the greatest threat to local farming practices are modern farming practices such as hybrids, biased documentation towards modern practices and limited research into local farming practices. Therefore, if this contradiction is not adequately addressed, it might become dangerous (Harvey, 2014, p. 124-126) and potentially wipe out local farming practices which offer important sources of food security beyond that produced via hybrids.

5.5.2 Traditional structures and norms that oppress women

...But women do not have authority comparable with that of men, and this is underlined by the fact that although they may act as heads of households, they can never qualify for the position of head of a group of households..... At each stage of her life a woman falls within the shadow of male authority. When unmarried, it is the authority of her father and her brothers; when married, it is that of her husband; and when widowed or in old age (if never married), it is that of her sons (Denbow & Phenyó , 2006, p. 163).

Denbow and Phenyó (2006) further noted that African women are the most oppressed group of people on earth although such a claim is difficult to substantiate in a scientific manner. Denbow and Phenyó further argued that African women do tend to be poorer, of lesser social status, more vulnerable to disease, and shorter-lived than their female counterparts elsewhere in the world. Furthermore, though women and men have both distinct as well as shared roles

and responsibilities as coequals, in most cases, *‘women are but a mirror image, a relatively powerless reflection of their male counterparts’ (Ibid)*

At my case study sites, I found similar contestations as above. These contestations have been presented as contradictions in four out of 5 domains of the WEIA index (see section 4.6.2) namely: domain 1, decisions about agriculture production; domain 2, access to and decision-making power over productive resources; domain 3, control over use of income and domain 5, time use.

5.5.1.7 Domain one: Decisions about agriculture production

I identified two secondary contradictions (between subject and community of others) under this domain: **conflict between mixed cropping preferred by women and monocropping preferred by men; and, conflict of motives between man’s preference of cash crops and women preference of food crops**

Relating to the first contradiction under this domain, researcher-women interactions below shed some more light:

When asked, *‘what can you say about men in relation to local farming practices,’* women during focus group discussions in Domasi and Nsanama gave several responses. Overall, the responses pointed to *‘...men as dominating decision-making processes in local farming practices.’* As one of the women stated at Nsanama EPA, the main reason for this is that *‘men do take themselves superior over women as they claim that during creation, they were the first to be created seconded by women. They claim that their job is just to recommend.’*

Below are further explanations of the domineering nature of men on domain 1 stated by women during the discussions:

‘Some men prohibit us from mixing crops though we have more advanced knowledge on which crops to mix in a particular field than them. They want a monoculture of maize.’

In response to such conflicts, some women take bold decisions against their husbands:

‘I took the challenge to start the practice of ‘Sasakawa’ though my husband was prohibiting me. Even other people did not understand what I was doing. My husband even left the whole farming work to me since I had chosen a new farming strategy and I even bought fertilizer on my own but when I harvested more maize my husband followed suit the next growing season.’

Relating to the second contradiction '**Conflict of motives between the subject (women) and community of others men**' under domain 1, I discovered that in deciding which crops to plant, men's first choice are cash crops as indicated in the following speech by one of the women during focus group discussions at Domasi EPA '*..There is always conflict between the husband and the wife, where the wife wants to grow maize and the husband insists on growing rice because there are more profits in the rice than in maize production*'

Men's focus on cash crops is not unique to my study sites since similar results were reported by Edward and Thompson (2013) for Muhiyo and Monjomo Villages (Mulanje District) in Malawi where more men (15.5 %) than women (4.2 %) were engaged in tobacco production, the major cash crop in the country (Ibid, p. 39). For Mitole EPA (Chikwawa District), Tasokwa, Nyariki, Mkwambisi and Kogi-Makau (2011, p. 4) reported a similar situation '*more women than men engage in subsistence agriculture as a source of food, growing mainly food crops; while men grow cash crops, such as cotton*'. Likewise, for Mali, men focused on growing cotton, a '*significant source of income*' while women '*take a much more diversified agricultural production, spreading their effort across crops*' (Edward & Thomson, p. 27).

5.5.1.8 Domain two: Access to and decision-making power over productive resources

Regarding domain 2, I identified one secondary contradiction between subject and community of others: **access to and control of resources providing direct and short-term benefits versus those resources supplying indirect and long-term benefits**

In this study, I discovered that men have more control over livestock that provide immediate benefits especially after sales while women control land. This is an interesting finding considering that at the two study sites, the marriage system is matrilineal where the husband leaves his home and stays at the wife's village as '*mkamwini*'. One would expect women controlling livestock as well. Focus group discussions extracts shown below shed some more light on my findings on domain 2:

Researcher: '*What role do you take in livestock production?*'

'As for me the man takes full responsibility over the goats that we raise' (Domasi EPA). It is the same case with cattle (again Domasi EPA): '*here, the cow is regarded as belonging to the man but when the man dies some relatives leave the cows in the hands of the woman.*'

Researcher (asking the AEDO): '*During focus group discussions with women, they claimed*

that men's participation in agriculture is low. What is your comment on this claim?'

In relation to control over land resources, an interview with AEDO (Domasi EPA) revealed that women may have control over land under the '*Chikamwini*' matrilineal marriage system: *'I conducted some interviews with men and they told me they are not active in farming and development because their wives tell them that they have no control over land resources since they are not official residents of the village where they marry. They are frustrated, and they cannot do any meaningful development for fear that anytime they might be chunked out from the woman's home.'*

According to Mutangadura , (2004, p. 7), the matrilineal marriage system is practiced in more than 50% of Malawi. There are two types of matrilineal marriage systems, "chitengwa" or virilocal and the "chikamwini" or uxrilocal. Under 'chitengwa' when the husband dies, the wife is chased away from the village of marriage and she loses her land rights. Under 'chikamwini', if the wife dies, the husband is chased away from the village of marriage and he loses his land rights.

5.5.1.9 Domain five: Time use

For domain 5, I identified one primary contradiction which occurred at division of labour node: **agriculture more of a burden to women than men**. My research results confirmed literature that women spend more time in agriculture than men. During the analysis phase of expansive learning at Domasi EPA, men were blamed for being '*.... difficult and less active in maize cultivation and agriculture generally.*' During validation workshops and observation studies, one of the questions I asked was: *'from the conversations with women, I have gathered that women contribute more labour in agriculture than men, what is your opinion?'* Below, I present data validating claims that women contribute more labour in agriculture than men:

'Yes, that is very true in fact women are the ones that are always in the forefront and this includes attending the developmental meetings. Women are more interested in agriculture than men because they are the ones who really know household challenges. For example, a man may be at a tearoom enjoying whilst his family has no food, but a woman will always think more about the household welfare first than her own' (Lead farmer, Domasi EPA)

'Yes, it is true that women lead in farming practices because they are the ones who stay at home, taking care of the children while men are usually too mobile going into cities and other places.' (Validation workshop, Nsanama)

While most people interviewed supported women's claims, some, like Group Village Headman Phetembe of Nsanama EPA had a contradictory view:

'In my area, both men and women contribute equal amount of farming labour. It is just that the population of women is higher than men in Malawi giving a wrong impression that women are more active since they are seen frequently.'

Overall, from the responses above, it can be confirmed what women said during focus group discussions and change laboratory workshops.

5.5.1.10 Implications of low levels of women empowerment in agriculture at the two study sites

The implications of low levels of women empowerment in agriculture is summarized by Ruth, Amber, Agnes, Meinzen-Dick, Greg and Ana (2013, p. 1) as follows:

.... closing the gender gap in assets—allowing women to own and control productive assets— increases both their productivity and their self-esteem. A woman who is empowered to make decisions regarding what to plant and what (and how many) inputs to apply on her plot will be more productive in agriculture. An empowered woman will also be better able to ensure her children's health and nutrition, in no small part because she is able to take care of her own physical and mental well-being.

As already pointed out in section 1.7.2.5 women are main agents of change. Therefore, if they are not empowered to make farming decisions, the local farming practices may fail to be radically transformed for the betterment of local people's livelihoods in general.

5.5.3 Religion and traditional beliefs

Tackling climate change requires coordinated efforts by various categories of stakeholders including faith leaders. However, some religious beliefs are in opposition to climate change adaptation and mitigation efforts. Some religious belief systems even deny existence of climate change (Haluza-DeLay, 2014, p. 2). For my case study sites, an example of a religious belief which clashes with climate change adaptation is pig manure whose use was a bone of contention between Christians and Muslims. Regarding traditional beliefs, use of human waste manure was a source of tension within existing cultures. Presented below are contradictions I found in my study relating to these subject items.

a. Primary contradiction

Between using human waste manure to improve soil fertility and other types of manure (instrument node)

Moyo (2010, p. 145) argues that indigenous knowledge is developed and reworked to suit the specific environment, needs and priorities of the farmers. At both Nsanama and Domasi EPAs, time in memorial, farmers have been using livestock manure mainly from goats, cattle and chicken to improve soil fertility and this is the origin of the contradiction about use of human waste manure which is one of the ‘developed or reworked’ traditional knowledge systems. Presented below are discussions between the researchers and subjects on the subject matter:

Researcher: *‘What types of manure do you use in your gardens?’*

Respondent: *‘...as of me I have a relative that uses fecal manure from a pit latrine. She has two pit latrines. She opens a hole of one pit latrine, adds ash and then closes it from use. When this pit latrine is closed, she uses the other. Later, she then closes the latrine she has been using to which she adds ash. The process goes on and on in a rotational manner. The pit latrines are shallow and so it is easy to excavate human waste ready to be applied to her garden. She sometimes also mixes human waste manure with fertilizer. She gets bumper yield out of this.’*

Researcher: *‘What if we bring this human waste to you, will you accept it?’*

Respondent: *‘I can use the manure. It is just that I do not have the capacity to build two pit latrines.’*

Researcher: *‘How many will choose human wastes in an instance where cattle manure and human wastes have been brought to you?’*

Response: *All women raised their hands for cattle manure in both study sites. None of the women raised their hands at Nsanama and only 3 out of 15 women raised their hands for human waste manure at Domasi.*

Researcher: *‘Why are you reluctant to use human waste manure?’*

Respondent (Domasi): *I have a question, do you mean that when fecal manure has been applied like to cassava, cassava tubers will feed on it? (Implying that if we eat cassava tubers, we are essentially eating them contaminated with faeces)*

Respondent (Nsanama): *‘...defecation is a private process. People do not do it in the open. It would be unheard of to dig out human waste manure and allow children to handle feces of*

their parents. I have also witnessed marriage breakages after a woman used human waste manure because the husband considered her as an unclean woman.'

User of human waste manure (observation studies): *"...when I use human faeces as manure, a lot of people laugh at me saying 'ndine wozerezeka' (I am crazy/mad) such that at first I would even do it in hiding. And I cannot collect fecal manure from other people's pit latrines because they will think I want to bewitch them and even use their toilet manure for black magic. When I applied human waste/goat manure mixture, I yielded more maize than those who applied chemical fertilizers during the 2015 drought."*

Negative perceptions about use of human waste as fertilizer is not new to my study site. For example, Mariwah and Dranger (2011, p. 8) who conducted a study titled 'Community perceptions of human excreta as fertilizer in peri-urban agriculture in Ghana' found that 61 % of the farmers interviewed were also not willing to use it on their own crops or consume crops fertilized with human excreta.

b. Secondary contradiction

Between use of manure from a clean animal versus that from unclean animal (Instrument and community of others)

In Leviticus 11 verses 2 to 8 of the Holy Bible, clean and unclean animals have been described as follows:

The LORD said to Moses and Aaron,² "Say to the Israelites: 'Of all the animals that live on land, these are the ones you may eat:³ You may eat any animal that has a divided hoof and that chews the cud.⁴ " 'There are some that only chew the cud or only have a divided hoof, but you must not eat them. The camel, though it chews the cud, does not have a divided hoof; it is ceremonially unclean for you.⁵ The hyrax, though it chews the cud, does not have a divided hoof; it is unclean for you.⁶ The rabbit, though it chews the cud, does not have a divided hoof; it is unclean for you.⁷ And the **pig**, though it has a divided hoof, does not chew the cud; it is unclean for you.⁸ You must not eat their meat or touch their carcasses; they are unclean for you.

The above verses prohibit believers from 'eating' and 'touching' carcasses of unclean animals that includes pigs. The verses are silent on rearing of pigs and using its manure, putting farmers in a dilemma on whether to accept or deny pig manure. For Muslims, Allah (Qur'an, 5:3) says

he has *'Forbidden to you (for food) are: dead meat, blood, the flesh of swine.'* Again, the focus is *'do not eat swine meat or pork.'*

In my study, I also came across mixed perceptions (dilemmas) about use of pig manure especially among Muslims and Seventh Day Adventists at the two study sites (see discussions below):

During focus group discussions, one woman (Domasi EPA) did not mince words about her reluctance to use pig manure: *'I cannot use pig manure because pig rearing is prohibited according to my religion, Islam'*. Another woman, in support of the first said *'...Muslims in my area cannot eat mustard applied with pig manure.'* However, two other Muslim women said there is no problem using pig manure.

During validation workshops, one of the Sheiks at Domasi EPA did not give a clear guidance on whether to keep pigs and use their manure or not:

'follow your heart. If it says keeping pigs and using their manure does not conflict with your religion, then follow suite.' This Sheikh is putting farmers in a dilemma. At Nsanama EPA, another Sheikh was quite clear on whether to keep or use pig manure:

'In Islam, day and night, pigs should not be seen within your household' but he agrees with the first Sheikh *'regarding use of pig manure, Muslims are free to use.'*

A member of the Seventh Day Adventist Church present at the Nsanama validation workshop opposes rearing, eating or even using pig manure:

'there are several species of livestock that we can keep including chicken, goats, cattle and sheep. Only a few species like pigs are prohibited. So, do not keep animals that the Bible prohibits and do not use their products' and these products include manure.

From the discussions above, it appears Muslims have no problem using pig manure while Seventh Day Adventists do.

5.5.1.11 Implications of neglecting religious and traditional beliefs

Neglecting contradictions related to religion and traditional beliefs and customs may potentially lead to reluctance by community members to learn more about human waste and pig manure as adaptation measures to drought and dry spells. Nonetheless, the potential of

region and traditional beliefs to culminate into dangerous contradictions is low according to the data above.

5.6 Unclassified Contradictions

Apart from the contradictions discussed above, I also found one other contradiction: **Lake Chilwa droughts as real threats or a singularity phenomenon not worth our attention** which is not tied to any of the three categories.

As already discussed in section 1.7, Lake Chilwa has histories of drying and the people who depend on the lake are *'well adapted to the cycles'* (Njaya et al., 2011, p. 2). It is this kind of *'well adaptedness'* or *'numbness'* (Gifford, 2011, p. 291), that triggers some individuals to think drought is not evidence of climate change in the Lake. Such individuals include Ayyuz (a commentator) who questioned a Nyasatimes report that *'pride comes'* to Lake Chilwa when it refilled in 2017 after a dry spell. In his own writing, Ayyuz asks, *"Pride returns to Lake Chilwa? No, I am coming from this area and know everything about this foundation, according to our ancestral history, this lake dries and restores itself without support from government or any organization."*

Several people share the same views with Ayyuz and these include Traditional Authority Mkumbira of Chisi Island of the Lake who said he has witnessed 7 dry episodes of the Lake Chilwa (from the 1996 Video 'Lake Chilwa Dry'). Dr. John Wilson (2014), a renowned fish ecologist who has over 30 years' experience in the Lake Chilwa also feels the same when he wrote that it was *'completely false'* (Wilson, 2014, p. 42) to attribute the drying of Lake Chilwa in 2012 due to man-made global warming. Although there is climate change skepticism about Lake Chilwa, Jørstad (2012) noted that women themselves feel drought and dry spells are becoming more problematic now than before in the basin.

While climate change is denounced by many people because of its negative impacts, other people like Andrew Daudi, Head of the United Nations Millennium Villages Project in Malawi (2012) felt we should not be so much concerned because: *'even if Lake Chilwa dries, the land could be put to good use through farming and road construction. Certain insects that attack crops would disappear once that lake dries up.'* Daudi's feeling is that we should turn climate change impacts into an opportunity.

The discussions above point to the fact there is a dilemma on whether drought is evidence of climate change in the Lake Chilwa basin or not. Neglecting problem of environmental

numbness may have negative implications on efforts to tackle climate change. In my view, if people are environmentally ‘*numb*’ or habituated, they will be reluctant to learn and act because they are used to the problem. With reference to climate change adaptation in the Lake Chilwa Basin, such numbness can potentially derail adaptation efforts to address drought and dry spells. Tackling environmental numbness may be problematic especially if it is deeply internalized in peoples’ minds.

5.7 Summary of Contradictions and Suggested Solutions

I identified a total of 19 contradictions in this research and these formed the basis for development of model solutions.

Contradiction 1: Between hybrid and local maize seed cultivation (Instrument level).

Suggested Solutions: See Table 5-8 about prioritization of informal learning pathways for the top 3 local farming practices by women during session 3 (Modelling). See also solution to contradiction 6 on demonstration gardens from other people I consulted. Additional solutions were extracted from the discussions below:

Researcher: *‘If we want local farming practices to succeed, we should develop and disseminate powerful messages. How can you develop such messages apart from the ones highlighted in the WhatsApp conversations since the group started?’* (Review meeting with youth WhatsApp Group, Domasi EPA)

Response one: *‘We will set up demonstration plots: If you teach, people should also see. You teach people to stop drinking but you drink, people will not take it seriously.’*

‘.... Many people are interested in cultivation of kanjerenjere, an early maturing local maize cultivar. However, the seed is scarce. Organizations should think of setting up demonstration gardens where kanjerenjere can be multiplied,’ (GVH Patete, validation workshop Nsanama EPA)

Contradiction 2: Between existing scientific weather forecast and local forecasts (Instrument).

Suggested Solutions: Integrating modern and scientific methods as discussed below (also applicable to contradictions three and 12):

Researcher (Session one): *‘From the video, a participant from World Vision International said science and traditional weather forecasts should be integrated. What is your opinion?’*

Response one: *‘Yes, they should go together. Neither of the two is perfect.’*

Response two: *‘Yes, they should go together. Where there are modern practices there should also be tradition.’*

Validation workshop (Domasi EPA)

Question from one of the participants: *‘In your presentation, you have indicated that indigenous knowledge and modern farming practices should be integrated, why did you decide like that?’*

Response from one of the women: *‘In case of manure and traditional crop pest and disease control measures, we do not know application rates. From mixed cropping, we have observed some new crop pests and we do not know how to deal with them. Some of our traditional knowledge practices such as a song on ‘stalk-borer’ (kapuchi!) or use of sand to control stalk borers do not work at all. It is for this reason that we want scientists to help you.’*

Contradiction 3: Between using slow acting traditional ways of eradicating nuisance plants and using quick acting but expensive and environmentally unfriendly ways –the case of native bamboos and *nansongole*

Suggested Solution: Integrating modern and scientific methods just like contradiction 2 above.

Contradiction 4: Conflict of motives between basket weavers who need the bamboos for basketry and farmers who want more land to cultivate arable crops.

Suggested solutions

Researcher (During observation studies): *‘You are eradicating bamboos in your garden to create land for maize cultivation, but some people need the same bamboos for weaving baskets. Are you not creating conflicts?’*

Response: *‘No, I don’t think so. I am only doing this in my own garden. If I do this in someone else’s land, then that is a problem.’* So, the solution here is to avoid people’s fields.

Contradiction five: Between documentation of modern farming practices and local farming practices (Community of others).

Suggested solutions: Radio and Television Programmes (Table 5-8). Additional solutions relating to documentation can be extracted from the discussions with women below:

Researcher: *‘One of the threats we identified was poor documentation of local farming practices. If the knowledge custodians pass away, this knowledge will be lost forever. How can we avoid this?’*

Responses from Change Laboratory Session three

Response one: *'I feel like people who come to teach us scientific methods must also learn our indigenous knowledge before they teach us their ideas. They must write the traditional knowledge in files and assess the similarities with their scientific knowledge.'*

Response two: *'Researchers should ask people about indigenous farming practices and record accordingly. They should also include poems in books.'*

Response three: *'I think if villagers, chiefs and teachers can enforce that those who write schoolbooks should also write on traditional ways of farming so that children can read and be assessed on that during examinations.'*

Response four: *'Books should be written so that our youths and other people read. The books should dwell on history and advantages of local farming practices. The books will ensure local knowledge is not changed anyhow.'*

Response five: *'Traditional leaders should have an inventory of local farming practices.'*

Researcher: *'You have suggested that books be written but this will only be useful to those who can read. How do we help those who don't read?'*

Response one: *'The books should have pictures so that those who do not write can learn through pictures.'*

Contradiction 6: Between the levels of youth involvement in modern farming practices and local farming practices (Community of others node).

Suggested solutions: Set **demonstration plots** at school as stated by the Primary Advisor during validation workshop at Nsanama EPA: *'In the olden days we had plots for agriculture practical but now the same pieces of land have been grabbed for cultivation by others including teachers due to population increase.'*

More solutions can be extracted from the discussions below:

During Validation Workshop, Nsanama EPA

Researcher: *'Are there any more additions on how we can address contradictions presented by women?'*

Response one: *'...Let us also encourage the youth because they hold tomorrow's future. They should be in the forefront'*

Response two: *‘Mine is a comment. A lot of things have been mentioned about informal learning pathways. We can use also ITC such as WhatsApp for the youth and website.’*

During session three (Modelling)

Researcher: *‘How can you solve the problem of limited inclusion of local farming practices in school syllabus that is partially blamed for fomenting resistance from the youth on local farming practices?’*

Response: *‘... We can pass through chiefs and headmasters and then go to Primary Education Advisor (PEA) to tell him or her that villagers want indigenous knowledge to be taught at schools. The PEA can take our issues to higher authorities for consideration.’*

Contradiction 7: Between traditional rainfall forecasting methods (instrument node) and time of planting (rule node).

Suggested Solutions: More Extension involvement as suggested by GVH Patete during validation workshop at Nsanama EPA: *‘Unless there is Extension Effort, local farming will never progress. Local farming practices are existing because of our own resistance.’*

Contradiction 8: Between the old local farming activity system with weak research and the new system with strong research component (Instrument node).

Suggested Solutions: Document research findings

Contradiction 9: Conflicting messages between the youth in WhatsApp group and extension workers.

Suggested Solutions: Contradiction emerged after model tests, so no solutions were proposed by women.

Contradiction 10: Between the traditional face to face approach and virtual extension delivery system via WhatsApp.

Suggested solutions: Contradiction emerged after model tests, so no solutions were proposed by women.

Contradiction 11: Differing perceptions about usage of WhatsApp between the youth and the elderly.

Suggested Solutions: Contradiction emerged after model tests, so no solutions were proposed by women

Contradiction 12: Between research processes newly introduced into local farming practices and the existing research ones in the extension delivery activity system.

Suggested Solutions: Integrate traditional and modern sciences as in contradictions 2 and 3 above.

Contradiction 13: Between mixed cropping preferred by women and monocropping preferred by men.

Suggested Solutions: Many of the solutions suggested by women focused on enticing behaving well and making a man happy all the time which what is normally done. However, there was a unique solution suggested: *'we should do trials and men can learn later from the trials.'*

Contradiction 14: Between man's preference of cash crops and women preference of food crops.

Suggested Solutions: As in contradiction 13 above except for the trials.

Contradiction 15: Access to and control of resources providing direct and short-term benefits versus those resources supplying indirect and long-term benefits.

Suggested Solutions: As in contradiction 13 above except for the trials.

Contradiction 16: Agriculture more of a burden to women than men

Suggested solutions: We found it difficult to resolve because of the inherent feminine roles such as childcaring.

Contradiction 17: Between using human waste manure and other types of manure for crop production (instrument node).

Suggested Solutions: Awareness creation.

Contradiction 18: Between use of manure from a clean animal versus that from unclean animal (Instrument and community of others).

Suggested Solutions: We found it problematic to suggest solutions on religious beliefs.

Contradiction 19: Lake Chilwa droughts as real threats or a singularity phenomenon not worth our attention.

Suggested Solutions: The frequency of droughts in the Lake Chilwa Basin: ‘*In 2012, the Lake dried and recovered in 2013 but not fully. We can see that since 2013, the lake has been drying every year...due to climate change compounded by environmental degradation,*’ (Sosten Chiotha in the 2018 Video, the Lake is Drying). There is thus need to create awareness (Tsirizeni et al., 2018, p. 260).

Table 5-8: Suggested solutions to contradictions one and five, baseline status and desired levels of informal learning for the top three local farming practices (*kuojeka*, livestock manure and mixed cropping).

Pathway	No. of women who learnt or heard someone learn through this pathway (Average of 3 top farming practices)		Desired future usage (Average of 3 top farming practices)	
	Domasi (n=14)	Nsanama (n=15)	Domasi (n =14)	Nsanama (n =15)
Radio	7	2	12	14
TV	0	1	1	14
Newspaper	1	0	0	0
Drama	4	0	7	14
Poster	0	0	3	14
Demonstration plots	0	0	12	15
Learning Visits	2	7	2	14
Women dominated social networks	2	9	5	15
Trials	9	0	11	14
Word of mouth	10	14	13	14
Loudspeaker announcements	1	0	11	14
Songs	0	0	8	13
Preaching	0	0	0	5

5.8 Further Engagement with Women

The above list of contradictions and suggested solutions formed the basis for further engagement with women on the following expansive learning processes: scenario development (Chapter Six), testing model solutions (Chapter Seven). For scenario development processes, model solutions will represent the **best scenario** of local farming practices while contradictions and their causes will represent **worst case scenarios**, as such, the scenarios also model the ZPD of the women’ farming practices (See section 3.4).

5.9 Conclusion

While Chapter Two was a generalization of local farming practices, this chapter has been very specific by elaborating how these practices are described at the two study sites. The centre piece of this chapter was identification of contradictions on local farming practices. The various contradictions identified in this chapter seem to have their roots from the history of extension delivery system in Malawi and traditional customs and norms. Most of the contradictions fall under a broad category of Malawi Government structures, systems and processes.

CHAPTER 6: DOUBLE STIMULATION AND SOLUTION MODELLING - LEARNING FROM THE FUTURE USING LOCAL FARMING PRACTICE SCENARIOS

6.1 Introduction

This chapter describes the process of co-development and use of scenario's as a double stimulation tools (aide memoir) in the expansive learning process to guide critical thinking, further analysis of emerging contradictions and modelling solutions for the emerging activity of the local farming practices. Four scenarios have been discussed in this chapter ranging from the worst, middle of the road to the best. In relation to Bateson's (1972) learning levels (see section 3.6.3.3 a), the worst-case scenario may represent level 'I' learning while the best case, the women's' motive of their local farming practices, is level 'III'.

The focus of this chapter is on importance of story lines and metaphors as culture-based learning stimulants following Vygotsky's (1978) semiotic learning perspectives. These storylines and metaphors have been described for four scenarios that were developed: good governance and good economy; good governance and poor economy; good economy and poor governance; poor economy and poor governance [see session 5 of the change laboratory workshops (scenarios), sub-sessions c and d]

The chapter winds up with a conclusion which shows that most metaphors developed center on a child, followed by a woman and lastly a man. Regarding symbols, animals like cattle, snake and sheep were more frequently used than other features such as vegetation.

6.2 Describing the Four Scenarios using Evocative Words and Symbols

As stated in session 5 c of the change laboratory workshops, four scenarios were developed. The generalized conceptualization of these scenarios is presented in Figure 6-1.

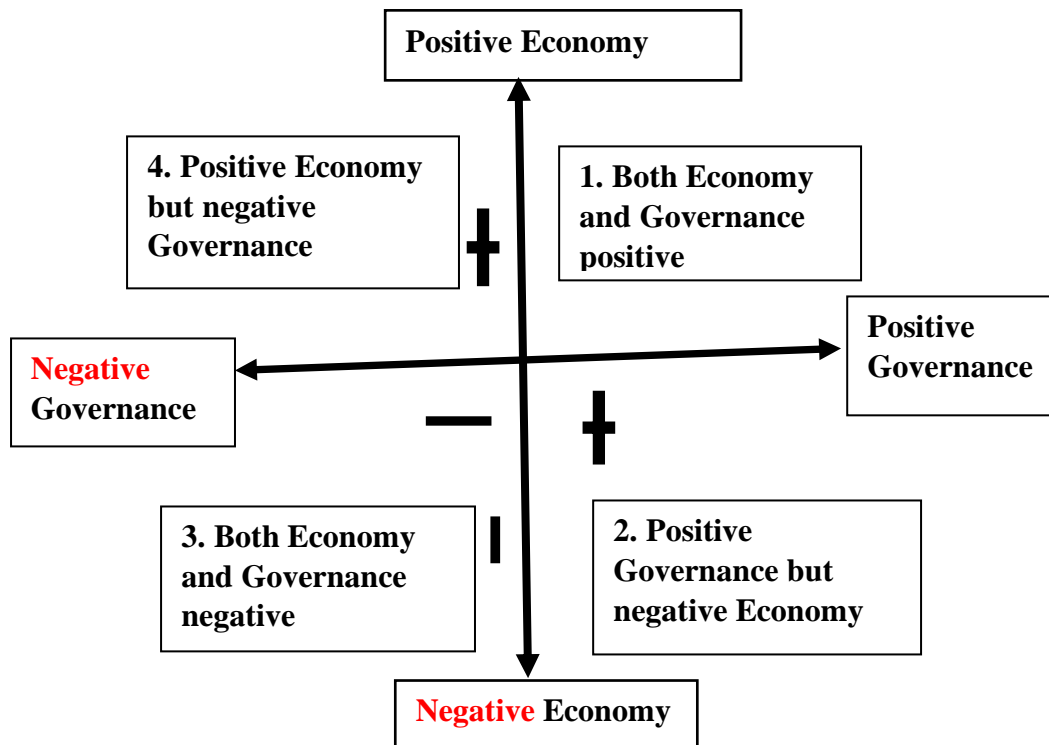


Figure 6-1: Generalized conceptualization of the four local farming practices scenarios.

The four scenarios above mirror the concept of ZPD introduced in Chapter Three, section 3.6.1.2. To elaborate further on how these scenarios, resonate with the concept of ZPD, I reflect Engstrom's, 2015 (p. 138) reformulation of ZPD: *'It is the distance between the present everyday actions of the individuals and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions.'*

The *'present every day actions'* represented limited knowledge of the individual farmers to promote local farming practices at the worst-case scenario (poor economy and poor governance) of local farming practices. *'The historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions'* is represented by *'mature'* knowledge of farmer collectives at the best-case scenario (good economy and good governance). Middle of the road scenarios (good economy-bad governance; good governance-poor economy) represent the transition phase of the ZPD

from worst to best case scenarios. The middle of the road scenarios '*could be termed the buds or flowers of development rather than fruits of development*' (Vygotsky, 1978, p. 86) for base case scenario, in my study.

According to Berkhout et al. (2001, p. 7), scenarios should be written in the form of **absorbing, convincing stories** that describe a broad range of alternative futures relevant to an organization's success. Stories are important because normally, human beings learn to think in the narrative or story mode but comparatively few become competent in logico-scientific mode. In fact, in Africa, most of the knowledge culture is delivered in story form (Mutonyi, 2016, p. 947).

The logico-scientific mode according to Mutonyi (2016) distances itself from feelings and concerns of people and this is the mode mostly advocated by natural scientists to develop formal, logical proofs or theories that explain how the natural world works. On the contrary, the narrative mode provides space for the participants to co-author and craft the stories in a creative context because it is through emotional connection rather than pure reasoning (i.e. deep and analytical thinking), that the legitimacy of stories is established (Bowman et al., 2013, p. 746). As discussed in section d, scenarios should be described by using thought provoking names. The use of stories and names are among Vygotsky's (1978) semiotic means of '*learning and interpreting the world*'. Vygotsky (1978), through his socio-cultural theory postulated that semiotic means are culture specific. Taking a learning lens, by culture specificity, Vygotsky (1978) meant that each tool should be used in a culture where it can effectively enhance learning. For example, *Ingoma* is a cultural dance among the Ngoni's while *Gule wamkulu* is for the Chewa's in Malawi. In this case *Ingoma* would be an effective learning tool for the Ngonis just like *Gule wamkulu* for the Chewas.

6.1.1 Scenario one: Good Governance and Good Economy

This is the best possible scenario for the local farming practices in the next 30 years from 2017. Under this scenario, local farming practices will radically be transformed leading to improved living standards even under a changing climate. In this future, current conditions and trends will be enhanced (Amer et al., 2013). The *current conditions* related to this study include omission of local farming practices in education curricula, limited research on local farming practices, continued government neglect of local farming practices, high human population, poor economy and poor governance to mention a few manifestations of contradictions. Under

the best-case scenario, these *current conditions* will favor local farming practices since model solutions will have been suggested and implemented.

6.1.1.1 Domasi EPA

a. Catch words for scenario one: Good Governance and Good Economy

Suggested catch words for the best-case scenario, Domasi EPA were discussed as follows:

Researcher: *‘For the best-case scenario, what catch words can you suggest?’*

Eneless Mponda: *‘When the nation is running smoothly in terms of good governance and good economic status, we can say that it is a land of mkaka ndi uchi’ (milk and honey).*

Zaidatu Jali: *‘When we say the country is running smoothly, it is when at least 80% of the population is living a happy life and the 20% are struggling.’*

Zione John: We can say a scenario of *Mponda matiki*’ (a very rich person)

Hilda Stand: *‘I think we can say freedom. If we relate it to farming, I think when we can have a say and find good market for our harvest then it deserves to be called land of freedom. We will not necessarily need to be wealthy as those at the top but as long as we have good harvests and market, then it’s a perfect scenario.’*

Zione John: *‘Another good name is mwayi wa nzama.’*

Eneles Mponda: *‘When our local farming practices are performing well, we can say we have reached level of mwana alirenji’ (a child shall not cry)*

According to the discussions above, there were four catch words suggested by woman at Domasi EPA for scenario one. After voting, *‘mwana alirenji’* (why should a child cry when there is plenty) emerged as the most preferred word.

b. Symbols for scenario one: Good Governance and Good Economy (Mwana alirenji)

Brainstorming symbols to represent *‘mwana alirenji’*, went as follows at Domasi EPA:

Researcher: *‘What symbol can we use to represent best case scenario?’*

Enelesi Mponda: *‘I would suggest we draw a circle divided into three to four sections to represent the elements that show that things are going very well in a country. For instance, we can have a section to contain livestock, another a field, then bank notes, something like that.’*

Zione John: *‘On livestock section, a chicken is suitable because it is a symbol for being welcoming. When we receive visitors, we kill and cook a chicken for them so that they feel welcomed. We can include various crops in the field section to represent mixed cropping.’*

Researcher: *‘Are there any more suggestions?’ (silence). Ok in this case then, let us just go by the symbol suggested by Eneles Mponda.’*

From the discussions above, only one symbol was suggested to represent the best-case scenario at Domasi EPA.

6.1.1.2 Nsanama EPA

a. Catch words for the best-case scenario

Brainstorming for catch words for the best-case scenario at Nsanama EPA went as follows:

Researcher: *‘Today we will discuss catch words and symbols to stand for prosperous local farming practices when both governance and economy are good. What words can stand for prosperous local farming practices?’*

Rose Mulewa: *‘We can say a future of mkaka ndi uchi’ (milk and honey)*

Elistina Mkanamwano: *‘I think mwana alirenji (why should a child cry) would be the best catch word because there will so much food that a child will not cry for food.’*

Emma Chalaka: *‘We can also say that our local farming practices will be okhathamira and okhazikika’ (prosperous and stable).*

Halima Sailesi: *‘Why can’t we say ‘uchembere wabwino?’ (safe motherhood)*

Emma Chalaka: *‘Another good word is mtendere (peace) because we will be happy since we will have sustainable income and food secure.’*

Esnat Bizwick: *‘Amayi yawawa yakulya chenene’ (aYawo language meaning a woman who has plenty food)*

According to the discussions above, there were five catch words suggested for the best-case scenario at Nsanama EPA. Through the voting process, ‘mwana alirenji’ was the most preferred thought-provoking word.

a. Symbols for scenario one: Good Governance and Good Economy (*Mwana alirenji*)

Brainstorming symbols to represent ‘mwana alirenji’ went as follows at Nsanama EPA:

Researcher: *‘What picture can be in line with mwana alirenji which is our best-case scenario?’*

Dorothy Meya: *‘I suggest ng’ombe’ (cow).’*

Ednar Richard: *‘What about a ‘khasu’ (hoe) because this is what we use for cultivation.’*

Emma Chalaka: *‘No, we cannot use a hoe because it symbolizes poverty. Using a hoe is laborious but I agree with cattle because when we sell it, we will become rich.’*

Dorothy Meya: *‘We can use cow because it offers multiple benefits. Selling cow generates money, a cow is a source of milk and the same cow can be a source of manure, also when we slaughter it is a source of relish. Moreover, a bull which is also cattle can be used to farm in our garden.’*

Researcher: *‘Any other suggestions?’*

Rose Mulewa: *‘We should use cows. Have you ever heard that a goat is used to pay lobola? It is only cattle that is used for this purpose. So, let us use a cow.’*

Grace James: *‘If we mention cow, will the government help us? It won’t because it will think we are already in a good state’.*

Rose Mulewa: *‘This research is to help us have a vision about our local farming practices. Some of us may die even before realizing the cow scenario but surely others will reach that future. It does not mean that if we use a cow, then the Government of Malawi won’t help us because a cow is only a symbol but does not represent actualities.’*

From the above discussions, a ‘cow’ was ultimately agreed upon as a symbol to represent the Mana alirenji at Nsanam EPA.

6.1.1.3 Summary of scenario one: Good Economy and Good Governance

Relating to a metaphor that best describes scenario one, women in both study sites settled for the name ‘Mwana alirenji’ symbolized by a cow at Nsanama and a pie chart consisting of equal portions of livestock, crops and cash at Domasi. ‘Mwana alirenji’ is, a common Malawian expression and it means ‘there is nothing a child can cry for when food is plenty’. (Utembe et al., 2010, p. 85). In line with the general understanding of the metaphor, at the study sites,

‘Mwana alirenji’ was described thus: we will have bumper yield especially from mixed cropping. Markets will be readily available for our local produce. Everything to do with the wellbeing of families will be in order and malnutrition will be eradicated (Zione John, session 5).’

At Nsanama EPA, *Mwana alirenji* was symbolized by a cow,

‘because a cow offers multiple benefits. Selling a cow generates money, a cow is a source of milk and the same cow can be a source of manure. When slaughtered, it is a source of relish. Furthermore, a cow can be used for lobola under a patrilineal system of marriage’ (Dorothy Meya, session 5).

The use of a cow as a status symbol is not new. The same symbol was used by Chavula et al. (2017, p. 842) for the Malawi environmental related scenarios to depict a prosperous nation. The Boston Consulting Group (Ringland, 1998, p. 17), one of the institutions that pioneered use of scenarios to help make decisions on which business sector to invest in, used the notion of *cash cows*. According to the Group, cows grow slowly but they have superior market position. The Group argued that cows *‘generate far more income than they need for growth. Milk them!’*.

Generally, the use of animal symbols has a long history in the African culture. Their major uses *‘have been to embody roles that identify with the best or the worst in human behaviors such as jealousy, arrogance, treason, and lust (Okumu, 2000; quoted by Mutonyi, 2016, p. 945).* They may also symbolize cleverness, pride, bravery, courage, or love. Use of animal symbols provide humor to the story. As Mutonyi (2016) noted, when the main characters in a story are human beings, irony and humor are lost. That does not mean that scenarios should only make use of animal symbols because of their humor. Other symbols can be used so long they are comical in nature while drawing people’s attention at the same time

For Domasi EPA, the pie chart that represented *Mwana alirenji* means that from local farming practices (predominantly crop and livestock production), adequate income will be generated to enhance livelihoods. As Zaidati Jali (one of the participants under session 5) remarked, that the local farming practice will be *‘a self-contained room’*, that is, it will meet most if not all livelihood needs.

Based on the suggested model solutions in section 5.7 of Chapter Five, under *Mwana alirenji* scenario,

- There will be demonstration plots and more trials for local crops.
- The youth, extension workers and the general public will be fully aware about and supportive of the local farming practices.
- There will be robust research on traditional knowledge systems and results well shared.
- There will be a diversity of history and poetry books on local farming practices to avoid misinterpretation/omissions/modifications by the future generations. Among other aspects, these books will highlight the importance of IKS and how to use it.
- Education curricular will adequately cover local farming practices.
- Chiefs will develop and keep an inventory of local farming practices in their areas for learning purposes.
- Learning through word of mouth will continue but there will also be more learning through increased use of the radio, social media such as WhatsApp.
- The Government of Malawi will be fully supportive of local farming practices by developing conducive seed policies and encouraging extension workers to engage fully in the practice.

Science and local knowledge will be integrated for a win-win-situation between modern and local farming practices.

6.1.2 Scenario two: Good Economy but Poor Governance.

This scenario is synonymous to what Dator (2002, p.10) called ‘*mid-way scenario*’ or ‘*middle of the road*’. Under this scenario, there will be prosperous economic growth but poor governance that will result in dictatorial tendencies forcing the local farmer to be forced to learn more about and adopt modern farming practices. The security of local farming practices will be at stake. The future under this scenario will seek to arrest growth in local farming practices. Overall, *‘farmers will have no say on their local farming practices. They will just follow farming rules and regulations as dictated by those bringing project to communities because they will have financial muscle’* (Rose Mulewa, session 5, Nsanama EPA).

6.1.2.1 Domasi EPA

a. Catch words for scenario two: Good Economy but Poor Governance

To come up with catch words for scenario two at Domasi EPA, the discussions went as follows:

Researcher: *‘What catch words can you suggest describing ‘good economy but poor governance’ scenario?’*

Zione John: *‘I propose ndanena ndanena’, which literally means my decision is final. No one can undermine my speech because I am in authority. This word resonates with dictatorship leadership styles.*

Hilda Stand: *‘How about kanga ndiwamba’, which means a greedy person who wants all good things for him/herself.*

Rose James: *‘This metaphor has its origin. Once upon a time, a greedy person came to his family and found that during a meal the only relish were vegetables. Seeing this, the man took fish from his pocket and said to himself ‘I will roast it myself and share to no body.’ The word kanga means ‘mine’ and ‘wamba’ means roast. So, for this metaphor, the greedy man is saying fish is mine (kanga), I will roast (wamba) it and consume it alone.*

Zaidati Jali: *‘A kanga ndi wamba has no concern for others but only cares about his own welfare.’*

Zione John: *‘Wosanunkha kanthu fits the description of this scenario. What this means is that in terms of farmers, they have no say on their work. They just follow what is being told in terms of rules to do with farming as long as they are offered financial assistant.’*

Hilda Stand: *‘I want to give history behind the metaphor wosanunkha kanthu . ‘In polygamy, when there are two wives and one asks for something from the husband but he rejects her, yet the other woman asks for the same thing and is granted, we can say the one who got rejected has no favor from her husband at all and he is biased against her thus the woman ‘Sanunkha kanthu’ to literally translate to ‘she does not have a scent.’*

Zione John: *‘Similarly, with farming extending the example given by Hilda, the first woman who gets rejected represents the local farming practices whereas the woman who has favor from the husband is the modern way of farming. The government, like the husband, does not promote local farming practices so much that farmers are discouraged from following it. Yet the modern practices are advancing because the government promotes them.’*

From the above brainstorming exercise, three thought provoking words were suggested to represent scenario two for Domasi EPA. After voting, ‘wosanunkha kanthu’ was the most preferred metaphor.

b. Symbols for Scenario two: Good Economy and Poor Governance (*wosanunkha kanthu*)'

At Domasi EPA, brainstorming symbols to represent 'wosanunkha kanthu' scenario, went as follows:

Researcher: *'Can we now suggest suitable symbols for 'wosanunkha kanthu' scenario?'*

Zaidatu Jali: *'We can have a flag to represent our area, divide it into two sections of which one part is larger than the other. The bigger portion will depict modern farming and the smaller part representing local farming practices. We can put an X on the smaller portion of the flag to show lack of support to local farming practices and tick mark on the larger portion to show Government's preference for modern farming practices.'*

Joice Wailesi: *'There should be distinguishing features in each portion. The big portion should have a tick and maize at distant planting stations and the small portion should have an X with maize planted close together. The symbol should also depict maize mixed with other local crops.'*

Stella Alick: *'Because a flag is an ideal symbol to identify a group of people, an association for Instance Muslims have a special flag with a half-moon on it with Arabic words written and we can see that it is Muslim just by looking at it. Even traditional healers are identified by their particular flag with maybe a cross or something that when given directions it is mentioned for instant identification.'*

Researcher: *'Are there any more suggestions? (silence). Ok in this case then, we will use the symbol suggested by Zaidati.'*

From the above researcher-women interactions, for scenario two, women of Domasi EPA agreed to use a flag to represent 'Osanunkha kanthu' (that is local farming will 'not smell a thing'). The flag would be divided into two portions:

- i. A larger portion with any modern farming practice (e.g. Conservation Agriculture), marked with tick.
- ii. A relatively smaller portion with maize under mixed cropping marked with a cross.

The choice of a flag with two portions was justified by Zaidati Jali and Stella Alick who noted that since Muslims and traditional leaders are identified by respective flags, so too can both local and modern farming practices be identified by a symbol, a flag in this case. Under this

scenario, modern farming practices will be a top priority while local ones will continue being neglected since they will ‘*not smell a thing*’. The local farmers’ interests will be swayed around by politicians to fit leadership of that time.

6.1.2.2 Nsanama EPA

a. Catch words for scenario two: Good Economy but Poor Governance

For Nsanama EPA, catch words for scenario two were suggested as follows:

Researcher: ‘What metaphor can represent the scenario of *poor governance and good economy*? We already discussed elements of governance and economy and these should guide us in thinking about an appropriate metaphor?’

Hajira Tambala: ‘*Ulimi osokonekera*’ (Farming has no direction). ‘*I have chosen this metaphor because the Government is confusing us with hybrid seeds. They bring this cultivar this year and the next year they bring another one and so on.*’

Rose Mulewa: ‘*I would go for dziko lashupa*’, that is the country is too unbearable to live in.

Esnat Bizwick: ‘*If governance is poor then we can say our farming is faced with the problem of ‘ulamuliro wankhanza*’, that is dictatorship.

Researcher: ‘Elsewhere, the metaphor *chonchobe* (so-so) was used to depict poor governance and good economy. What other words can you suggest/.’

Halima Sailesi: ‘*Nanga nkutani*’, a Desperate and oppressive situation resulting from poor governance.

Ednar Richard: ‘*We should think a head. Let us forget about bad things that happened to our local farming practices in the past and just plan ahead. I suggest zagwazatha*’, let bygones be bygones.

From the above discussions, six catch words were suggested by women at Nsanama EPA for scenario two. After voting, women settled for ‘*nanga nkutani*’ a proposition made by Halima Sailesi.

b. Symbols for scenario two: Good Economy but Poor Governance

Symbols to represent ‘*nangankutani*’ scenario were suggested as follows at Nsanama EPA:

Researcher: ‘Can we now suggest suitable symbols for ‘*nangankutani*’ scenario?’

Mary Amon: *'I choose 'nkhosa' (sheep) because it is submissive.'*

Elistina Mkanamwano: *'Yes, let us go for sheep because even when it is being slaughtered it does not cry and kick us like a goat.'*

Grace James: *'How about mulamba (Catfish) because some people eat it while others reject it. So, it is in the middle and it fits our scenario which is also neither good nor bad but midway.'*

Researcher: *'Any more suggestions (silence). Ok silence means consent but let us now choose between the two metaphors?'*

Between sheep and catfish, women chose sheep to represent 'nangankutani' scenario.

6.1.2.3 Summary of Scenario two: Good Economy but Poor Governance

Women at Domasi EPA preferred the metaphor 'wosanunkha kanthu' (Our local farming practices will not smell a thing) to other metaphors suggested. Nsanama women, on the other hand, settled for 'Nanga nkutani' which relates to a desperate and oppressive situation resulting from poor governance. Local farmers will be unable to exercise their agency to promote local farming practices.

While Domasi opted for a flag to represent scenario two, Nsanama chose a sheep to represent 'nangankutani' because a sheep *'is submissive. Even when it is being slaughtered it does not baa and resent like a goat'* (Elistina Mkanamwano). Furthermore, a sheep cannot defend itself and when it is lost, it will be unable to find its way home again. Other animals were made with instincts that can help them find their way back but not a sheep. Under the metaphor of a sheep, local farmers will be unable to defend their local farming practices because of oppressive governance. Like a sheep, the farmer will be confused, not knowing which way to follow to unleash the potential of local farming practices in addressing climate change and meeting livelihoods. Like a sheep, the local farmers will continue living in their social groups bound by culture, probably hoping for a positive change in governance that might ultimately lead to radical transformation of the local farming practices.

6.1.3 Scenario three: Good Governance but Poor Economy

Like scenario two, this is also a 'middle of the road' type in that it has both positive and negative tenets in it. Unlike scenario two, the source of trouble is **poor economy** since governance is good.

6.1.3.1 Domasi EPA

a. Catch words for scenario three: Good Governance but Poor Economy

The discussions below show researcher-women interactions in suggesting catch words for scenario three: Good Governance but Poor Economy:

Researcher: *'We have given nick-names and symbols to scenarios 1 and 2, can we do the same for scenario three? Let us start with brainstorming catch words.'*

Zione John: *'I suggest 'kafansiyanji', what shall I leave behind when I die.'*

Hilda Stand: *'Kafansiyanji can also be in relation to one's legacy. For instance, if one died without having anything to their name, their name would be easily forgotten because they had nothing that people would refer to in remembrance. They will have gone to the grave leaving nothing behind.'*

Stella Alick: *'I suggest kandapatuwe', which means 'scratch the skin until white marks show up.'*

Researcher: *'Stella, can you explain this metaphor in detail?'*

Stella Alick: *'There are some people who are too poor to afford bathing soap or body lotion. These people wash their bodies without soap and they also do not apply any lotion to their skin. Consequently, their skin becomes brittle and scaly. When they scratch their skin, white marks (scratches) become clearly visible.'*

Rose Beduwe: *'Let us consider using 'masikini', which means a poor person.'*

Malita Osten: *'I have heard some people saying that a poor person is called 'kampopangolo' so we can use this metaphor.'*

Researcher: *'Can you shed some more light on this metaphor? I know that 'kupopa' is pumping a tube and 'ngolo' is an oxcart but what is the relationship to our scenario?'*

Eneles Mponda: *'Kampopangolo is a poor person who guides bulls pulling an oxcart. It is a poor person's job because a person in a suit cannot afford to go through the tiresome slave work. A mpopangolo can do so much work for so little pay. No one wants to be associated with a kampopangolo. When someone receives a marriage proposal from a not-so-well to do man, people say what a prospective husband, even that kampopangolo.'*

The voting process of the four suggested catch words resulted into choice of *'kafansiyanji'* as the best metaphor describing scenario 3. *Kafansiyanji* differs from *'mpondamatiki'*, a rich

person, who will leave behind plenty of wealth for relatives and friends to inherit after his/her death.

b. Symbols for scenario three: Good Governance but Poor Economy

Brainstorming symbols to represent ‘*kafansiyanji*’, was done as follows at Domasi EPA:

Researcher: *‘We have agreed to nickname scenario three as ‘kafansiyanji’ but what would be an appropriate symbol.’*

Zaidati Jali: *‘We can use pockets of a man turned inside out to represent ‘kafansiyanji.’ This is because one of the ways men show that they do not have money is to turn their pockets inside out and the person who wanted that money gets the message outright.’*

Mercy Kauye: *‘As for us women, we open our wallets as a sign of cash strap so we can also consider using this symbol.’*

Researcher: *‘Any more contributions?’* Silence

From the two symbols indicated suggested through the discussions above, women voted for pockets of a man turned inside out, because, according to Zaidati Jali, *‘a man is a bread winner at home and therefore this symbol is a good indicator of an impoverished society overall resulting from unproductive local farming practice’*

6.1.3.2 Nsanama EPA

a. Catch words for scenario three: Good Governance but Poor Economy

Catch words for scenario three (Poor Economy and Good Governance) were identified as follows:

Researcher: *‘Can you mention metaphors to depict good governance but poor economy.’*

Mary Amon: *‘Ali ndi mwana agwiritse’ (Hold on to your child tight) is a good metaphor I think.’*

Rose Mulewa: *‘Another word is pafa bulu’ (a bull will die)*

Researcher: *‘What does pafabulu mean?’*

Rose Mulewa: *‘When we say pafabulu, it means there are two ‘bouncers’ or very powerful and relentless looking men engaged in a fierce fight and we expect one of them to die. In short, it means things will not end well.’*

Emma Chalaka: *‘We can use watsala watsala’ (Don’t remain behind, strive to be a winner).*

Dorothy Meya: *‘This word is also used in a situation in which some farmers plant with the first rains while others wait. So, as farmers, we should plant with the first but also reliable rains if we are to succeed in farming and avoid remaining behind.’*

Elistina Mkanamwano: *‘Can we also provide words in other languages?’*

Researcher: *‘Yes you can but it should be a language that people in your area will understand since these scenarios are being developed for your use in the first place. In the report that we will compile, we will also explain all the catch words you suggest so don’t worry so much about the language you use.’*

Elistina Mkanamwano: *‘Ok I suggest mafukala, an Arabic word which means someone who is very poor.’*

Halima Sailesi: *‘Mafukala is not a metaphor because it is simply an Arabic word.’*

Elistina Mkanamwano: *‘I do not agree with that. Here, we are choosing words that can draw people’s attention. So, when people hear about mafukala which is a strange word to most people, they will be excited to find out more.’*

Grace James: *‘I think what most people understand is masikini which also means a very poor person and not mafukala so I suggest we use masikini.’*

Researcher: *Can someone state the difference between ‘mafukala’ and ‘masikini’.*

Mary Amon: *Masikini is anybody who does not walk (physically challenged) and does not do any productive work. Mafukala, on the other hand, works and grows crops but does live in poverty.’*

Ednar Richard: *When we don’t get enough money from our local farming practices, it means we will be food insecure, will have poor houses and will not dress well. In this case, I suggest ‘tikusowa’, which means lack of basic needs.*

Researcher: *‘Let us agree on one expression.’*

There were five catch words suggested by women at Nsanama EPA for scenario three. Of these, the most preferred was *mafukala*.

b. Symbols for *mafukala*

Only one symbol was suggested by Dorothy Meya: A woman looking disappointed as she sells farm produce to a buyer that has manipulated the scale to cheat. The rest of the women agreed with Dorothy's suggestion.

Women at Domasi EPA opted for '*kafansiyanji*' (what shall I leave behind when I die) as the best metaphor describing scenario3. *Kafansiyanji* was represented by a man whose pockets were turned inside out, a sign of no money in the pocket. Nsanama EPA chose *mafukala*, an Arabic word referring to a person in abject poverty and therefore failing to procure farm inputs. A related word to '*mafukala*' is '*masikini*' which was also suggested as a metaphor. Women voted for *Mafukala* because a '*masikini*' is a completely helpless person, not engaged in any productive works which is an extreme case. On the other hand, a '*mafukala*' does productive work such as cultivation but still lives poor.'. *Mafukala* was represented by a picture of a disappointed woman selling farm produce through a weighing scale that has been manipulated by the buyer to cheat.

Under *kafansiyanji* and *mafukala* respectively, local farming practices will not generate adequate revenue for the local farmer due to several reasons including lack of farm inputs compounded by rampant corruption and bribery especially during sales of farm produce, thus trapping a local farmer in a vicious cycle of poverty. Under this scenario, there will be no reliable markers.

6.1.4 Scenario four: Poor Economy and Poor Governance

Under scenario four, economy will be dismal and so too will be governance. This is the worst-case scenario or 'edge of disaster' as (Hicks, 2012, p. 50) had put it. Human population and other drivers will change to unmanageable levels leading to corresponding increase in environmental degradation and global warming, further adversely affecting local farming practices such as *mphanje* that do well under small populations.

6.1.4.1 Domasi EPA

a. Catch words

Discussions to identify catch words for scenario four (Poor Economy and Poor Governance) went as follow for Domasi EPA:

Researcher: 'Can you suggest catch words to represent the worst-case scenario?'

Zione John: *'We can say that our local farming practices resemble anamalira (mourners).'*

Hilda Stand: *'We can say jiko ya achilenge meaning a country of poor people. This is Sena language from where I come from, Nsanje district.'*

Malita Austen: *'Why can't we say our local farming practices are at the level of masikini?'*

Zione John: *'Masikini are people with a tendency of always begging. They may not be impaired as such, but they are always asking for assistance in everything. In addition, we can nickname the worst-case scenario as kapunthabuye', extremely poor, who cannot manage to grow crops and raise money to buy food.*

From the four suggested catch words, *anamalira* was the most preferred.

b. Symbols for scenario four: Poor Governance and Poor Economy

Brainstorming session to identify symbols to represent '*anamalira*' is summarized below for Domasi EPA:

Researcher: *'What symbol can we use to represent anamalira?'*

Eneles Mponda: *'A picture of a woman with a typical facial expression of one in grief, like a mourner in a funeral.'*

Zaidatu Jali: *'The woman should have her hands covering her face.'*

Malita Austen: *'We can draw a pregnant woman and a child besides her showing they are in poverty. We can add text under the drawing to describe the situation.'*

Zione John: *'We can also add an empty plate on the side. To touch on poor governance, we can draw a family experiencing injustice.'*

Hilda Stand: *'We can draw a thatched house to show there is need for development in an area since grass thatched house is a sign of poverty in our area.'*

Rose Yusuf: *'A crocodile can be a symbol, or even bees because they sting.'*

Rose James: *'A face tells a story. One can tell that there is happiness when they see a happy face, likewise one in sorrow, the facial expression can inform you of what their heart feels even if they fake a smile. So, I think a sorrowful face of a woman can be an ideal image to represent anamalira as the worst scenario. When someone sees such a picture from a distance, it interprets trouble.'*

Eneles Mponda: *'I think a lion is better suited for that scenario. No one wants a lion around them, it symbolizes danger and death. The worst-case scenario is dangerous.'*

Zaidati Jali: *'We can use fire as a symbol of anamalira.'*

Malita Osten: *"I agree with fire, it is very visible either by smoke or flame. If we use animal symbols, that may be nice because animals can hide, for example bees can be bunched up in a tree or a snake can be camouflaged within leaves or stems. However, a fire is a visible symbol to many people. This means many people will be able to 'see' problems in our local farming practices and those of good will may take action."*

Zaidati Jali: *'I also support use of fire as a symbol. This is because, where there is fire, there is trouble, hunger, sicknesses and so on. When we say the land is on fire, we mean there are multiple problems.'*

Zione John: *'To make it more compatible with the name anamalira, I think we should have a picture of a person in sorrow looking at a fire at a distance. A sorrowful person looking at a distant fire tells a story about the problem being faced in our local farming practices.'*

From the suggestions outlined above,, women decided to use a proposal suggested by Zione John and supported by Maita Osten: use of fire.

6.1.4.2 Nsanama EPA

a. Catch words

Suggested catch words for scenario four (Poor Economy and Poor Governance) were identified as follows at Nsanama EPA:

Researcher: *'Which words can we use when both governance and economy are bad?'*

Emma Chalaka: *'I suggest dziko losauka', which means the country is poor.*

Rose Mulewa: *'Dziko lawola', that is the country has rotten.*

Researcher: *"Let us not give sentences. Instead, we should just give punchy and catch words that can arouse attention. Elsewhere, the word 'wafa wafa' was used to depict the worst-case scenario."*

Esnat Biziwick: *'Thanks sir. That is a good word and I think we can use it for our scenario though it has come from you.'*

Hajira Tambala: *“If we look at impact of food insecurity in our families, it is children who suffer most. I think we can use the word ‘ali ndi mwana agwiritse’”, or hold on to your child and take care of him/her.*

Ednar Richard: *‘How about chekacheka?’ (there is danger, therefore, run for your life)*

Halima Sailesi: *‘Mwana akana phala’, literally meaning ‘the child is refusing to take porridge.’ Depicts a situation where a child is in a life-threatening sickness to the extent that he/she refuses to eat any food.*

The voting process for the words suggested above resulted into choice of *‘ali ndi mwana agwiritse’* to represent the worst-case scenario at Nsanama EPA.

b. Symbols for scenario four: Poor Governance and Poor Economy (*‘ali ndi mwana agwiritse’*)

Brainstorming for symbols to represent *‘ali ndi mwana agwiritse’*, for Nsanama EPA went as follows:

Researcher: *“What picture or symbol can you come up to mean ‘ali ndi mwana agwiritse’.”*

Ednar Richard: *‘A snake.’*

Dorothy Meya: *‘A lion.’*

Grace James: *‘A woman with children that are starving.’*

Elistina Mkanamwano: *‘A woman with children that are starving should also show angry faces.’*

Esnat Biziwick: *‘We have to draw a diagram showing an angry man and woman with hungry children surrounding them.’*

Emma Chalaka: *‘A witch.’*

Rose Mulewa: *‘I think a witch will not apply to issues of farming we are talking about. How do we draw a witch? Of course, the word represents evil.’*

Researcher *‘I think we have discussed a lot; can we now vote for one symbol?’*

After the voting process women of Nsanama EPA choose a lion to represent *‘ali ndi mwana agwiritse’*.

6.1.4.3 Summary of the 4th scenario: poor governance and poor economy

This scenario was described as ‘*ali ndi mwana agwiritse*’ at Nsanama Extension Planning Area. Coincidentally, the same metaphor was used by Chavula et al. (2017, p. 849) for the Malawi environmental outlook report. ‘*Ali ndi mwana agwiritse*’ is a popular Chewa metaphor in Malawi usually stated when problems are wicked and therefore ‘*pafunika kulimba nazo*’ (need for perseverance under troubled waters) according to Rodgers (2016, p. 13). The word ‘*mwana*’; means a child and this proverb suggests that children should be accorded first class care under such situations because they are vulnerable to shocks. That a child should be given priority care under troubled situations is corroborated by Dorothy Meyya (session six) as follows: ‘*when there is acute hunger, a woman who has little flour will first cook porridge for the child (mwana) so that the child survives*’. The origin of this proverb, according to Dorothy Meyya, is that once upon a time, there was acute hunger and ‘*dogs fed on children as an alternative food. Some of the children were sold as a coping strategy. So, it is important to hold on to your child under troubled conditions.*’

‘*Ali ndi mwana agwiritse*’ is represented by a lion, one of the most feared big five animals in the wild. When a lion roars or is sighted in a village, the first to be protected, following ‘*ali ndi mwana agwiritse*’ metaphor, is a child (*mwana*). Chavula et al. (2017, p. 841) used a hyena while Ringland (1998, p.17) used a dog for the worst-case scenario. Both are among dangerous animals particularly to a kid (*mwana*).

While Nsanama opted for ‘*ali ndi mwana agwiritse*’ for the worst-case scenario, Domasi chose ‘*anamalira*’ which was aligned with local farming practices as follows:

‘*anamalira are weeping women during a funeral. We can associate this with sufferings related to local farming. For instance, if one’s crops have been infested with diseases or pests then low yields are inevitable and the farmer weeps over such loss. In other cases, one may have high yields but have no market which is also a loss, so the farmer is in sorrow. As such, the concept of mourning has been extended to other problems and not just death in a sense*’ (Malita Osten)

A funeral represents an extreme troubled situation and that is why women will cry for loss of their local farming practices. ‘*Anamalira*’ was represented by pictures of a crying woman looking at fire ahead of her. Since ‘*fire is very visible even at a distance either by smoke or flame*’ the impact of the worst-case scenario on local farming practices will be felt by many



local farmers. Under this scenario local farming practices will be ‘dead’, and women will mourn because there will be so much hunger ‘inflicting pain’ in communities.

Based on the contradictions indicated in section 5.5 of Chapter Five, under ‘*anamalira*’ or ‘*ali ndi mwana agwiritse*’,

- Local farming practices will not be included in school syllabus.
- The Government of Malawi will put harsh policies against local farming practices.
- The youth, extension workers and other stakeholders will be unsupportive of local farming practices.
- Research will be biased towards promotion of modern farming practices.
- Any attempt to raise awareness of local farming practices through the radio, television, posters, demonstration, social networks and other informal learning pathways will be thwarted by government machinery.
- Most of the local crop varieties will either become rare or extinct.

6.3 Summary of the Four Scenarios with Catch Words and Symbols

Table 6-1: Catch words and symbols for Domasi EPA

Scenario	Descriptor	Symbolized	Justification for the symbol
Economic Prosperity and Good Governance	Mwana Alirenji (What could a child cry for. The metaphor is associated with abundance). This will be the best expected scenario where local farming practices will meet most of our basic needs.		In farming, wellbeing status of any person will be dependent on crops and livestock for consumption and sale. Cash realized from sales will meet other human needs such as housing.
Poor Economic Growth and Poor Governance	Anamalira (Mourners) during a funeral. While the term typically relates to mourners during a funeral, women at Domasi felt the term can now equally be applied to extreme misery due to dismal performance of their local farming practices.		A huge fire burning is seen by many people at a distance. It represents destruction, trouble and pain. During ‘ <i>anamalira</i> ’ local farming practices will be eradicated, thus inflicting maximum trouble and pains to local farmer worth mourning.



<p>Good governance but poor economic prosperity</p>	<p>Kafansiyanji (What shall I leave behind when I die? This is typical of a poor person who has nothing leave behind for children and relatives to inherit after his/her death.</p>		<p>If pockets are turned inside out, it means there is no money in that pocket, a sign of poverty. Under this scenario, wealth distribution will be unequal having few individuals doing well. Local farming practices will not generate the required income due to lack of inputs and farmers will have nothing to leave behind for their kids.</p>
<p>Economic prosperity and poor governance</p>	<p><i>Osanunkha kanthu</i> (Local farming will ‘not smell a thing’ under poor governance). The metaphor typically relates to someone that is neglected and does not matter in society.</p>		<p>A flag is an identity symbol. Under this scenario, farming practices will be identified by modernity and local. Modern farming practices will be a top priority while local ones will continue being neglected (They ‘will not smell a thing’). The local farmers’ interests will not be put into consideration but will be swayed about to fit current leadership,</p>

Table 6-2: Catch words and symbols for Nsanama EPA





Scenario	Descriptor	Symbolized	Justification for the symbol
Economic Prosperity and Good Governance	<i>Mwana alirenji</i> (The metaphor means there is plenty and could a child cry under such circumstances). This is the best expected scenario where local farming practices will meet all our basic needs.		A cow provides multiple benefits: Food, Income, Manure. A cow may give birth to a bull that will help in transportation ridging and ploughing.
Poor Economic Growth and Poor Governance	<i>Ali ndi mwana agwiritse</i> (Hold your kids tight or they will be devoured). This is the worst possible scenario of the local farming practices.		A lion is regarded as a fierce animal. It may devour even our young kids when hungry, therefore, hold our kids tight.
Good governance but poor economic prosperity	<i>Mafukala</i> (An Arabic word meaning a person in abject poverty). The local farming practices will not be performing to the optimum level due to poor economic growth.		Disappointments are usually a result of poverty exacerbated by corrupt practices.
Economic prosperity and poor governance	<i>Nanga nkutani</i> (Desperate and oppressed). The local farming practices will not be performing to the optimum level due to poor governance.		A sheep never 'complains' even under death threats. So even if poor governance oppresses local farmers, they will still be humble like a sheep.

Table 6-3: Summary of key drivers and how they will unfold under each scenario at Domasi EPA

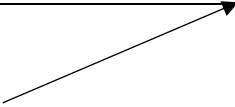
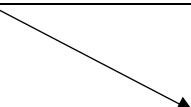


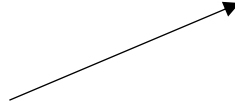
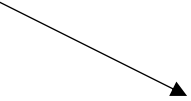


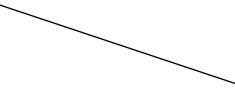



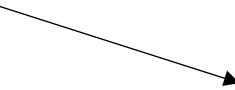


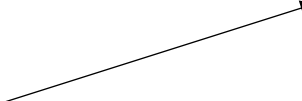
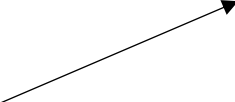
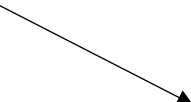


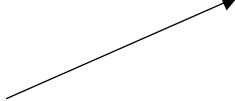
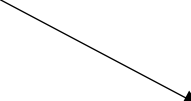


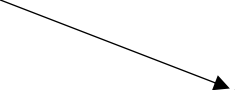



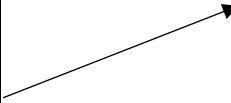
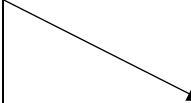

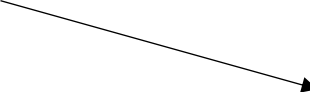
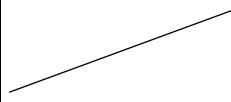
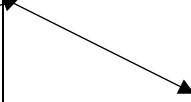
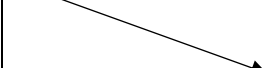





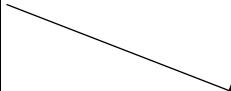
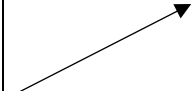


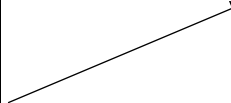
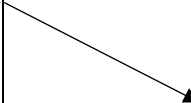
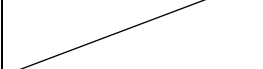

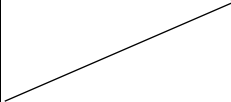
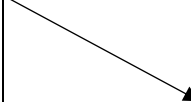


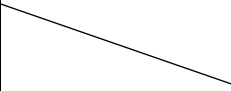



Driver	Mwana alirenji	Anamalira/	Wosanunkha Kanthu/Mafukala	Kafansiyanji/ Nangankutani
Governance				
Economy				
Climate Change				
Environmental Degradation				
Social Change				
Technology				
Human Population				

Table 6-4: Summary of key drivers and how they will unfold under each scenario at Domasi EPA

Driver	Mwana alirenji	Ali ndi mwana agwiritse	Mafukala	Nangankutani
Governance				
Economy				
Climate Change				
Environmental Degradation				
Social Change				
Technology				
Human Population				

6.4 Summary of the Role of Scenarios as Double Stimulation Tools for the Emerging Activity

In section 5.7, I provided a summary of the contradictions and suggested solutions. Contradictions represent a problematic situation (first stimulus) about local farming practices. This situation is essentially worst-case scenario or ‘*anamalira*’ and ‘*ali ndi mwana agwiritse*’ for Domasi and Nsanama EPAs respectively. The proposed solutions represent the best possible future of the local farming practices, that is ‘*mwana alirenji*.’

To realise the motive (best possible scenario), the subject uses mediating artefacts in form of **catch or evocative words** and signs (e.g. animal drawings). These are second stimulus which promote thought and action. For example, hearing or reading about the metaphor ‘*anamalira*’, may provoke a person to question, analyse and critically think about the problem space potentially resulting into some action.

For my study, the whole notion of scenarios is a double stimulation for the emerging local farming activity system. According to UNEP (2002, p. 320),

By exploring an array of possible future scenarios, today’s decision-makers can get a clearer picture of what tomorrow might bring in terms of human well-being and environmental security and what the impact of their decisions is likely to be. And they can determine more accurately what it would take — and what they can do — to create a more desirable future.

Though the above quote relates to environmental scenarios, but it is equally applicable to local farming practice scenarios developed under this study. These scenarios have implications in the way stakeholders including the government plan for and adjust farming practices to potentially favour local farming practices. For example, if local farming practices are to be transformed from ‘*anamalira*’ to ‘*mwana alirenji*’, there may be needed to address some key contradictions and the starting point may be enabling policy formulation by the Malawi Government. Such policies may highlight inclusion of indigenous knowledge practices in education curricula. In this case, scenarios will have acted as double stimulants to strategy development by the Government of Malawi to address contradictions facing local farming practices.

Scenarios described in this chapter played a critical role as double stimulation tools to help select final list of model solutions to be tested (see Chapter Seven).

6.5 Summary of how I adapted Vygotsky's Double Stimulation Tool using Scenarios

In section 3.6.1.4, sub-section 'e', I introduced the concept of double stimulation tool whose main dimensions were described as follows:

- a. Apparatus 1: Formation of a decision to act in a certain way by means of axillary motive (See 'c', below).
- b. Conflict of stimuli: The subject is confronted with two conflicting stimuli.
- c. Conflict of motives: The two conflicting stimuli are converted to motives that continue conflicting one another. According to Sannino, 2015 (p. 10), quoting Vygotsky, 1978, *'the key conflicts at play in the formation of wilful actions are nor conflicts between stimuli, but between motives.'* At this phase, the subject is in a *'state of paralysis'* (confused, dilemma) and *'at the mercy of motives'* (Sannino, 2015, p. 10). *'At the mercy of motives'* means that the motives have the power to regulate the subject's behaviour.
- d. Axillary motive: The subject choses one of the two conflicting stimuli that is significant to him/her and converts it into an axillary motive. The subject decides to use the *'state'* of a certain tool to help him/her realise the motive.
- e. Real conflict of motives: The *'state'* of the tool materializes, and the subject connects it with the motive, prompting final decision to be made.
- f. Closure: Having made the final decision, the subject *'closes'* the decision-making process.
- g. Apparatus 2 (Decision implementation): the subject implements the decision made in step 'f'. That is, he/she moves from abstract (decision forming) to concrete (implementation).

Table 6-5 is a summary of how I adapted Vygotsky's double stimulation model to my study.

Table 6-5: Scenarios used as double stimulation tools.

Situation from conflict of motive	Tools of second stimuli and their evolutionary phase in the Vygotsky model of double stimulation	Results and evolutionary phase of second stimuli in the Vygotskian model of double stimulation	Sample excerpts from data
Action paralysis; modern farming practices more preferred by the Government of Malawi than local practices; business as usual resilience building actions		Women at mercy of conflict of motives between promotion of local farming practices and modern ones	<i>'...Agriculture textbooks put more emphasis on hybrid maize than local'</i> (Head Teacher, Pulka Full Primary School validation workshop Domasi EPA).

Apparatus 1: Decision Process: Conflict of motives	A question on contradictions associated with local farming practices overall; a blank table with a column local farming practices and another column on contradictions	A list of contradictions associated with local farming practices overall and individual local farming practices	<p><i>There are several processes threatening local farming practices, and these include changes in extension delivery system and development of technologies are contributing to loss of local farming practices</i> (Steve Gonani, Extension Officer, CLW session 2, Domasi EPA)</p> <p><i>Local crops are late maturing and therefore not meeting food security especially in times of climate change. That is why we promote improved crop varieties</i> (Alex Dizinga, Extension Officer, CLW session2, Domasi EPA).</p>
	A question on why scenarios and how to describe them	Enhanced understanding of the role of scenarios for action planning of local farming practices	<p><i>My name is Mary Amon, scenarios are important for development of our farming practices. For example, my household cultivates rice. Based on trends of yield across years, we can plan to reserve some rice as a safety measure, or we might even plan to build a house</i> (session 4, scenario briefing Nsanama EPA).</p>
	Conversion of stimulus to auxiliary motive (Phase 3)	Draw symbols and describe each scenario using catch words	<p><i>'We used two drivers of governance and economy to plot four scenarios of good governance and good economy, poor governance and poor economy, good economy and poor economy, good economy and poor governance. Describing each scenario using the two drivers will be lengthy. Therefore, we decided to use metaphors. For those who cannot read or write, we decided to represent scenarios with symbols</i> (Zione John, Validation Workshop, Domasi EPA)</p> <p>To avoid loss of local farming practices</p> <p><i>'books should be produced but they should have pictures to help those who do not read'</i> (Hilda Stand, CLW session 2, modelling)</p>

	‘Real’ conflict of stimuli (Phase 4a)	Symbols and catch words representing each scenario drawn	See sections 6.2
	Closure of conditioned connection (4 b)	Drawings and catch words stimulate women’s thought processes to select final list of model solutions to be tested	‘...The third scenario of governance and good economy will be represented by a sheep with a metaphor ‘ <i>nangankutani</i> ’ (showing desperation). When the politicians including honorable members of parliament and ward counselors present here look at this picture, it will trigger thoughts, questioning and action planning.’ (Rose Mulewa, Validation Workshop, Nsanama)
Apparatus 2	Activation of the conditioned connection (see Chapter Seven7)	“ Decision implementing ” apparatus: Volitional action: demonstration plots, print and electronic media, women’s social networks, using ripe banana peels of <i>makumbuka</i> and <i>sukari</i> to enhance decomposition (Chapter Seven)	In response to the question, which local solutions can we test and get results by December 2018 <i>‘Considering that local farming practices are severely threatened, I think the best way for others to learn is to set up demonstration plots of local maize but Mr. Mphepo should source seeds that we cannot find in Nsanama EPA</i> (Elistina Mkanamwano, planning for next steps after the validation workshop, Nsanama EPA). We would like to learn more about ‘ <i>makumbuka</i> ’ banana peels claimed to enhance decomposition of <i>nansongole</i> grass that renders our land unproductive (Stella Alick, planning for next steps after the validation workshop).

6.6 Conclusion

This chapter focused on description, using catch words and symbols, of four scenarios of: good economy and good governance (best scenario), good governance but poor economy, good economy but poor governance. From the suggestions given by women during change laboratory workshops, a wealth of knowledge about metaphors and symbols to describe events exists in Domasi and Nsanama EPAs. Furthermore, the similarities in some of the catch words suggested by women such as ‘*mwana alirenji*’ to depict the best-case scenario suggests commonality of the such metaphors in the two EPAs. Among men, women and children, most of the metaphors were developed around children, followed by women and then finally men.

This shows that women in both EPAs are more concerned about the welfare of the children particularly with reference to food security. The symbols suggested by women mostly related to ‘animals’ such as cattle, sheep, snake, catfish.

The discussions about local farming practices in this chapter provide hope as well chaos for local farming practices and the associated informal learning pathways. The hope or chaos will largely depend on how key drivers of local farming practices will change over time and how such changes will be addressed especially by the Government of Malawi.

CHAPTER 7: CAN IT WORK?

NEW MODEL SOLUTIONS UNDER A MICROSCOPE

7.1 Introduction

This chapter articulates results of assessing *workability* of five model solutions suggested during change laboratory and validation workshops conducted in the two case study sites. The chapter vindicates the concept of ascending from abstract to concrete (Virkkunen & Newnham, 2013, p. 44). Taking model solutions as '*learning resources*' I was essentially addressing two questions (1) '*can learning through testing of these model solutions potentially transform local farming practices?*' and (2) '*is the model solution feasible/practicable in the two study sites?*' The model solutions discussed in this chapter are electronic and print media, demonstration plots planted to local crops, social networks, ripe banana peels of *makumbuka* and *sukari* to enhance decomposition of nuisance plants. For each test, I have included agentic (learning expressions) by the women subjects of my study as well as other community members I consulted (relational agency) showing how transformative agency emerges in expansive learning.

7.2 Model Solutions Tried Out

7.2.1 Makumbuka and Sukari Banana tests

As indicated in section 4.4.4.2a, there were claims that ripe banana peels of '*makumbuka*' enhance decomposition of a hard to decompose grass called '*nansongole*' under the *kuojeka* local farming practice in Domasi EPA. *Nansongole* is a nuisance grass whose new shoots sprout as thorns that pierce the feet of local farmers. It is a colonizer grass that renders land less productive to arable farming, thus indirectly contributing to food insecurity that is exacerbated by drought and dry spells in the Lake Chilwa Basin. Similar claims were at Nsanama EPA that *sukari banana* peels hasten eradication of native bamboo also blamed for colonizing land for cultivation of arable crops according to the women that participated in the change laboratory workshops.

7.1.1.1 Agentive (Learning) Expressions

a. Initial learning during experimental set up

For both sites, learning about the two technologies by ‘community of others’ was detected right during the days the experiments were set. At Domasi EPA, participants were asked the question ‘are you aware that *makumbuka* banana peels can enhance decomposition of *nansongole*. Only one person (Lackson Mtambo, Figure 7-1) out of 25 villagers present said he was aware and had even used *makumbuka* to eradicate ‘*nansongole*’ in his field



‘... I am aware of this technology. I learnt this from my grandparents. If you check my gardens, there is no ‘*nansongole*’ because I used this method. The grass was eradicated within a year’ (Lackson Mtambo)

Figure 7-1: Lackson Mtambo (right) with Elida Mateketa (left) burying *makumbuka*.

A similar question was asked at Nsanama site. In a chorus, over 15villagers available during the time the experiment was set up including group village headman Ngithiwa (Figure 7-2) responded that ‘no, we have never heard of this technology’. The explanations by Ms. Thalala (the knowledge custodian) during the briefing session just before the experiment was set up therefore provided a ‘spot’ informal learning about use of ‘*sukari*’ to eradicate native bamboos. That the villagers present, including the local leaders, were not aware of the ‘*sukari*’ technology was quite shocking considering that Ms. Thalala was a villager within their own village. The reasons for keeping this knowledge parcel as a secret to Ms. Thalala remain unclear.



‘... we just observed that the bamboos had been eradicated in Ms. Thalala’s garden but couldn’t know the trick she used’ (GVH Ngithiwa)

Figure 7-2: GVH Ngithiwa

b. Results from three sets of ridges under *makumbuka* trial

As stated in the methodology section 4.4.4.1 b, three sets of ridges were identified and used to ‘test’ workability of *Makumbuka* and *Sukari* to eradicate ‘*nansongole*’ grass. Results indicated that the control plot (without *makumbuka*) had the largest number of *nansongole* sprouts (average of 5 new shoots per 30 Cm²). Furthermore, there were several leaves and stems seen undecomposed in the control plot. The ridges subjected to *sukari* had an average of 2 sprouts. There were no sprouts in ridges subjected to *makumbuka*. These results confirm the capacity of *makumbuka* to decompose and eradicate *nansongole*. However, there is need for a robust scientific study to thoroughly understand how this works.

Following these results, there were further ‘commitments to act’ by villagers who were present when we were checking state of decomposition. For example, Dorothy Ajosa, a woman who was not among 15 women that participated in the change laboratory workshops said ‘*I have learnt about the power of makumbuka on nansongole. I will relay the message to my colleagues who complain about nansongole in their gardens.*’ Zione John, a woman who participated in change laboratory workshop said ‘*I do not have nansongole in my garden but there is another type of grass (tcheka) that is also very difficult to decompose. I will try using makumbuka.*’

The results also highlighted superiority of some of the traditional practices over modern methods as stated by **Rose James** (change lab participant): ‘...*Scientist have tried applying chemicals to eradicate nansongole, but they have failed. These findings give more substance to a metaphor ‘it is impossible to change from three stove cooking place to four or two’. Traditional knowledge will always be a winner*’. A three-stone cooking fire is traditional way of cooking at the study sites. A two or four stone is equated to modern farming practices. This

metaphor was also the title of a drama composed by Hilda Stand after the ‘modelling solutions’ (see Table 7-3).

b1: Surfacing challenges associated with *Makumbuka* test

There was one main challenge emanating from the results of this test: *Makumbuka banana can eradicate all the nansongole grasses but this type of banana is now very scarce* (**Rose James**).

c. Results from *sukari* banana trial

After digging out bamboo root systems of both control and experimental plots, we did not observe any colour differences as claimed by the knowledge custodian that the root system treated with *sukari* ultimately becomes black, a sign of decomposition. However, this is probably because time period was too short (8 months) to observe the desired color change since the time frame to see such changes normally ranges from 18 to 24 months according to the knowledge custodians.

Nonetheless, there were indications that *sukari* banana peels had started acting on the root system. The roots from the experimental plot were dry and could easily break when we tried to bend them. Those from the control plot were still alive, soft and could easily bend without breaking.

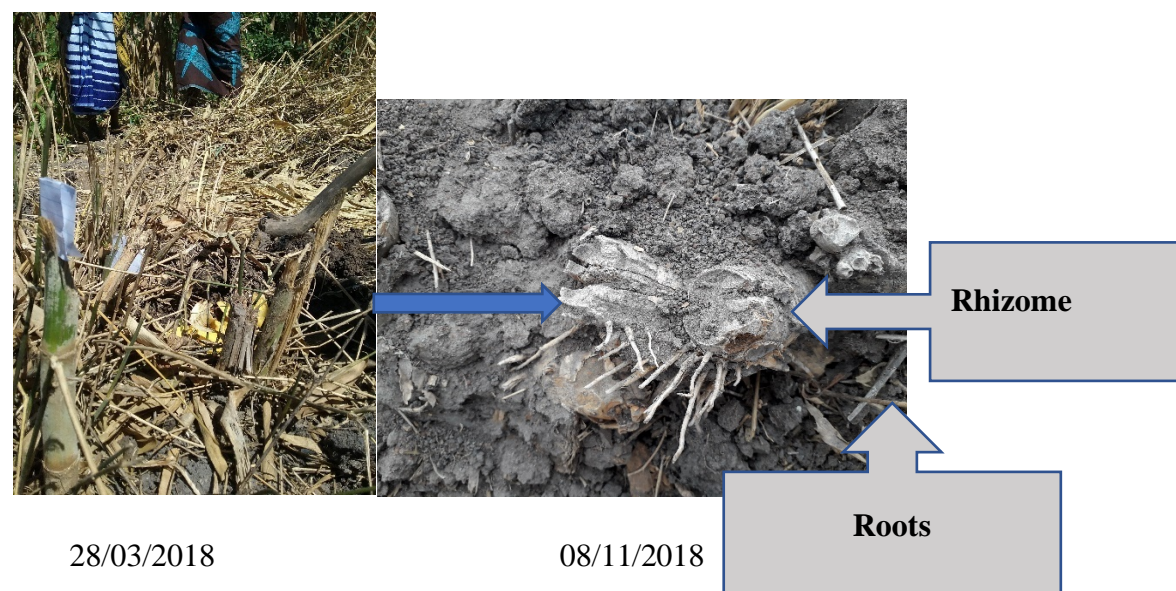


Figure 7-3: Changes in root and rhizome appearance after sukari banana test

Mary Amon, on behalf of the knowledge custodian who had passed away two weeks before we visited the experimental site, shed some more light on the effect of *sukari* banana on native bamboos as follows:

.... on 15th June 2018, we visited the site with Elistina Mkanamwano. We observed that there were new shoots from both control and experimental plots. The shoots from the plot we applied *sukari* banana peels were weak (*onyentchera*) while those from plot without the peels were vigorous (*amphamvu*). We removed the sprouts from both plots and today, we can clearly see that the shoots from the experimental plot are even weaker than what we observed on 15th June. You can also see that the new shoots look scorched and drying as if slightly burnt by fire in the *sukari* treated plot.

The simple experiment above has given an indication that *sukari banana* peels can potentially desiccate and hasten decomposing of bamboo roots. There are several factors which might have influenced the above results, and these include soil moisture content, temperature, humidity, age of the bamboos the time the experiment was set and available soil fauna such as earthworms and termites which also promote decomposition of plant residues. Just like the ‘makumbuka’ test, there is also need for conducting further scientific studies on the practice before a firm recommendation can be made to upscale use of *sukari banana* peels to speed up decomposition of the bamboos.

7.1.1.2 Sukari and Makumbuka banana trials as potential informal learning pathways to transform local farming practices

The draft 2018 Malawi Housing and Census report indicates that the population of Malawi is about 17.5 million and increase of 35 % from the 2008 population size (National Statistical Office, 2018) This increase will significantly reduce average landholding size for arable farming. Local solutions such as the ones presented in this section will create more land for cultivation of crops including local. This will potentially result into upscaling of local farming practices which is also a form of transformation.

7.2.2 Electronic and print media

As outlined in the methodology section 4.4.4.1 d, electronic and print media tested for their potential to transform local farming practices via learning included WhatsApp, video, television and newspapers.

7.2.2.1 WhatsApp

There are various ways through which learners can access learning resources and these include direct face-to-face interactions with the instructor and through social media. One such media platform that is gaining popularity is WhatsApp (Bouhnik & Deshen , 2014, p. 217).

Created in 2009 (Blehch , 2016, p. 119) WhatsApp is a mobile instant messaging (MIM) technology. WhatsApp provides online users with the ability to send and receive a variety of media, such as images, videos and audio. WhatsApp is one of the most popular MIM platforms with more than 1.2 billion active users per month (Pimmer, Mhango, Francis , & Mzumara, 2017, p. 4). Contrary to short message services (SMS) which incorporate point-to-point communication, instant messaging also enables group conversation (*Ibid*). The groups are essentially discussion forums considered as ‘effective tools for training’ by researchers in the field of collaborative and cooperative learning (Gillingham & Topper, 1999, p. 312). The discussions also provide opportunities for learners to interact socially with those more knowledgeable on a subject item. The interactions may lead to learning.

a. Nsanama WhatsApp Group

i. Learning expressions

Nsanama youth group started with 20 members in April 2018 but by October the same year, there were 47 members (Appendix eight), an indicator of increasing interest among the youth to promote local farming practices. From plenary presentations during the reflection meeting of the group, I asked a question on what the youth have learnt and the following emerged as key learning points by the group members advantages of local maize such as pest resistance and longer lasting flour compared to hybrids; types of local maize cultivars; traditional weather forecasts; WhatsApp is a fast way of learning; the quiz questions included in the discussions stimulated the youth to learn more about local farming practices.

Below, I provide further evidence on the interactions between the more competent members of the group and the novice. The more competent members shared their experiences about local farming practices while the novice learnt.

• Learning about advantages of local maize over hybrid

‘...Local maize has two main advantages: the flour lasts longer than that of hybrid. It is also resistant to insect pests’ (WhatsApp message of 18/04/2018; time 19:19; mobile +265.....2401)’

- **Learning about local maize cultivars**

‘The first maize variety I have learnt about is kanjerenjere, the second one is Lilongwe and the third one is kapwepwe.’ (WhatsApp message of 18/04/2018; time 19:16; mobile +265.....2401).

‘...Kanjerenjere is in two types: one with red cob and another with yellow cob. Other local maize varieties are called local without a specific name, nakacheche whose cob has spines, bantam, chisowa whose kernels are red and mkana nyani’, (WhatsApp message of 18/04/2018; time 20:39; mobile +265.....2401).

- **Learning about traditional rainfall forecasts**

‘...The elders say, that when it is very hot in September and October it is a sign of looming rains in the right quantities for crop production’, WhatsApp message of 20/04/2018; time 07:49; mobile +265.....3994)

‘...I heard that if ants are busy collecting and storing food in their holes, that year there would be acute hunger’ (WhatsApp message of 20/04/2018; time 07:58; mobile +265.....2401)’

‘...My parents also told me that if there are plenty of ants moving around, then in that year, there will be good planting rains’ (WhatsApp message of 20/04/2018; time 10:07; mobile +265.....2401)’

‘...Also, if we see monkeys frequently leaving their natural habitats to our villages, then that year there will be little rainfall’ (WhatsApp message of 20/04/2018; time 10:09; mobile +265.....3346).

‘...If tree leaves sprout after first shedding them, it is a sign of looming rains’(WhatsApp message of 20/04/2018; time 10:18; mobile +265.....2401).

ii. **A summary of transformative agency expressions**

Based on the work of Heikkilä and Seppänen (2014), transformative agency (learning) expressions for the Nsanama WhatsApp youth group were extracted from the WhatsApp messages and speeches during presentations at the review meeting. The results are presented in Table 7-1.

Table 7-1: Agentive expressions from WhatsApp messages presented during the review meeting held on 28 August 2018

Agency expression	Evidence from the WhatsApp group interactions
Resisting change	Not found in the data
Criticizing the current activity and organization.	<p><i>‘....Modern farming practices are only enriching few individuals such as seed companies.’</i></p> <p><i>‘.... Local communities should be fully consulted before policies are framed because here in Malawi the problem that we have is the government that just develops policies without consulting farmers. ...government is pulling down local agriculture through its policies.’</i></p> <p>(This point also appeared in WhatsApp message of 10/06/2018; time 08:20 –mobile +265.....24 01)</p>
Explicating new possibilities or potentials in the activity.	<p><i>‘.... Hastings Kamuzu Banda’s policies were promoting local farming, and this improved the economy and food security of Malawians.’</i></p> <p>(Hastings was the first Head of State in Malawi from 1964-1994)</p>
Envisioning new patterns or models in the activity.	<p><i>‘....setting up seedbanks of local crops in all the three regions of Malawi.’</i></p> <p><i>‘....production of booklets on local farming practices.’</i></p> <p><i>‘....production of radio programmes on local farming practices.’</i></p>
Committing to take action	<p><i>‘....Conduct drama on local farming practices’</i></p> <p><i>‘....Set up demonstration plots’</i></p> <p><i>‘....Add policy makers on youth WhatsApp group’</i></p> <p><i>‘....Meet policy makers to garner support for local farming practices’</i></p> <p><i>‘.... Attend to those inviting us to teach them about local farming practices at Chiwalo (which is one of the Traditional Authorities in Machinga District)’</i></p> <p><i>‘....force the government to promote local farming practices. To do this, we should firstly have membership across the country to have a stronger voice; secondly, write a letter to the government or hold peaceful demonstration all over the country’</i> (WhatsApp message of 22/05/2018; time 21:28 - mobile+265..... 24 01).</p> <p>To force the government to revise its policies, the youth should be able to answer some questions:</p> <p><i>‘What is motivating you to do this instead of focusing on more important issues?’</i></p> <p><i>What is the benefit of what you are doing to Malawians?</i></p> <p><i>What is your personal benefit out of this?</i></p> <p><i>How many people will see benefits out of what you are doing?</i></p> <p><i>In relation to drought, how will local farming practices help to build peoples’ resilience?</i></p> <p><i>Who has sent you to do this?</i></p> <p><i>What will you do if the government rejects your efforts?</i></p> <p><i>What will you do if the government supports your cause?</i></p> <p><i>What strategies have you put in place to promote local farming practices?’</i></p>
Taking actions	Not found in the data

iii. Surfacing challenges associated with use of WhatsApp

While WhatsApp usage among Domasi youth resulted into positive outcomes as already pointed out in section ‘i’ the approach was associated with new forms of challenges, potential and actual. During group discussions and plenary presentations, the youth identified the following challenges: need for a smart phone with reliable internet both of which are expensive for the rural youth; need for identity cards and ‘*lack financial support*’ (Also in WhatsApp message 04/08/2018; time 21:16; mobile+26553 58); off-topic discussions such as using the platform to announce job openings and religious events and weddings as indicated in the extracts below:

18/05/2018; time 18:57; mobile24 01: *‘Sorry to ask you this question, is Allah really first in your life? If yes, then stop all what you are doing now and send this message to 12 people and see what Allah will do tomorrow for you. Allah loves you and believe me after 7 days your wish will come to you but if you ignore it, you will be on your own for 7 years. Please do it with faith because it works!’*

30/04/2018; time 16:48; mobile +265..... 33 66: *‘. Try eating nsima with beans as relish, then eat fresh boiled maize, then drink local beer (thobwa), and then finally eat sweet potatoes and boiled eggs. You will wake up active the following morning’*

b. Domasi WhatsApp Group

As already indicated in section 4.4.4.1, Nsanama WhatsApp group was formed to promote local farming practices through all possible means. Domasi group, on the other hand, chose to conduct basic research on the local farming practices.

i. Learning Expressions

Domasi Young Farmer-Researchers group started with 20 members (Appendix nine) and by November 2018, the number had not changed. This was by design. The group decided to monitor its progress before allowing more members to join in. Along the way, 3 members left the group, but these were immediately replaced. During the review meeting held on 7th November 2018, one of the group members (Grant Lazaro) stated that there is high interest for other youth members to join the group. This observation is like Nsanama, and this suggests increasing interest among the youth to promote local farming practices.

Since the group was formed, members of the group had learnt about: *mphanje*, one of the local farming practices (WhatsApp messages of 2018/07/26 by +265 02 20 and +2656041

60 41) ; names and descriptions of local maize cultivars such as Lilongwe, *kanjerenjere*, bantam and *nakachiswe* (WhatsApp message of 2018/07/31 by +265.....time 84 89); names and descriptions of local cassava cultivars such as *manyokola* and *mchilingano*. (WhatsApp messages of 2018/08/07 by +265..... 38 47 and +26560 41) ; differences between hybrid and local maize cultivars.

Taking an example of popcorn, WhatsApp group members differentiated hybrid from local maize as follows:

2018/08/14; time 13:30 –mobile: +265.....63 32: *‘Colleagues, is popcorn local or hybrid maize?’* 2018/08/14; time 15:01; mobile..... 63 32: *‘This is a question worth investigating.’*

2018/08/14; time 15:13; mobile +265 60 41: *‘It is hybrid. The word ‘popcorn’ is English. We do not have a Chichewa name and so this is hybrid, no doubt.’*

2018/08/16; time 20:47; mobile+265..... 63 97: *‘Popcorn is hybrid. It differs from local maize in that its kernels are very tiny while those of local are large. Furthermore, the kernel of popcorn expands and puffs up when heated while that of local maize does not.’*

2018/08/16, 20:18 - +265 884 61 84 89: *‘Guys, Oh gosh! Popcorn is not hybrid because it was not produced through crossbreeding according to my research.’*

It is clear from the discussions above that members ultimately learnt that popcorn is a local maize variety based on the technical definition of hybrid maize given by +26584 89 and supported by literature, for example, Karababa (2006). Apart from classifying popcorn as local, Karababa (2006) also noted that Popcorn contains almost entirely hard starch. Popcorn has a very hard pericarp and outer layers of endosperm, which permit the internal pressure and temperature to rise high enough to pop.

Regarding the groups’ main purpose of conducting research on local farming practices, some members reported achievements as follows:

Dalitso James: *‘.... I was trying to find a farmer who is hiding cultivation of local maize away from the site of extension workers, but I did not manage to find one.’*

Elliot Ndaona: *‘.... I did research on local cultivars of cassava. There was a certain cultivar of cassava that I have been seeing but not knowing what it was. My grandmother informed me it was manyokola and I had put my conversation with my grandpa on WhatsApp group.’*

Harold Kasonga: *‘....I have done four research works. Firstly, I chatted with a certain grandpa who was cultivating local maize with yellow cob. I asked about why she was cultivating local maize and my grandpa informed me about the benefits of local maize including less weevil infestation. She also categorically refused to abandon local maize cultivation even if given free hybrid seed and other inputs to entice him.’*

I also enquired from my own mother how she ensures that local maize vigor is maintained. She informed me that she selects healthy looking cobs from which she selects the middle kernels.

I also did research on sorghum. I learnt that historically, there was a certain cultivar whose seeds could fall due to force of gravity as soon as they are ready to be harvested. Farmers knew that the sorghum is ready for harvesting if they saw this. I had put this on WhatsApp.

I downloaded the definition of hybrid and I discovered that popcorn is not hybrid because there was no crossing in its production

Joyce Mtambalika *‘....I also did research but did not put in the group because my mobile LCD got burnt. I did research on Manyokola and Chilingano cassava cultivars. With the advent of drought and dry spells, I discovered that Manyokola leaves are drying off while Chilingano is doing quite well.’*

ii. A summary of agentive (learning) expressions

Results from WhatsApp messages and speeches during the review meeting revealed some learning expressions (Table 7-2) in four out of six agentive expressions described by Heikkilä and Seppänen (2014).

Table 7-2: Agentive expressions from the WhatsApp messages and speeches during the review meeting held on 7 November 2018

Agency expression	Evidence from the WhatsApp group interactions
Resisting the change	No evidence from the data
Criticizing the current activity and organization.	<i>‘....Extension workers are in the forefront promoting hybrid and we find it difficult to convince farmers. Many farmers listen to them because they have diplomas, degrees, ride motorcycles and they entice them with inputs’ (Hawa Richard)</i>
Explicating new possibilities or potentials in the activity.	No evidence from the data
Envisioning new patterns or models in the activity.	To promote local farming practices, Martha Milimbo , during plenary presentations of the group discussions proposed the following: <ul style="list-style-type: none"> a. <i>‘....demonstration gardens should be established.’</i> b. <i>‘....play drama, sing songs, show videos, show pictures.’</i> c. <i>‘.... use edutainment approaches that include comedies, songs, drama, videos, photos and audios</i> d. <i>‘.... convince extension workers to promote local farming practices.’</i> e. <i>‘.... hold regular meetings to share ideas.’</i>
Committing to actions.	<i>‘...Let us add one more male to our WhatsApp administration to make it 2 females and 2 males. I suggest Madalitso James because he is active in the group. He can steer the group to do more research’ (Martha Milimbo).</i> <i>‘...We conduct research, share information but we have not yet done any practical action on the ground’ (Grant Lazaro)</i>
Taking actions.	Three youth members claimed to have conducted some basic research on local farming practices

iii. Surfacing challenges

Since its formation on 25th July 2018, it was reported during the review meeting that the group faced four challenges as follows: WhatsApp administrators were not aggressive in providing research topics for the group; the group has never met on its own since it was formed; persistent black outs of Electricity Services Commission of Malawi (ESCOM) power supply made it difficult to charge mobile phones. Thus, there is need for power banks.

c. The potential of WhatsApp as an informal learning pathway to transform local farming practices

Although Nsanama group was first to be established, there were no practical actions extracted from the messages or speeches during review workshop. Domasi EPA, on the other hand reported some actions. The enthusiasm by both groups seem to be fading at least based on average number of daily interactions taking place during the first 30 days when the groups were formed and 30 days of December 2018. It would appear the youth had very high expectations (e.g. t-shirts) at the beginning which my research did not meet. However, there is still great potential for the youth to transform local farming practices because there are some members who are still very committed and continue interacting to learn *‘what is not there yet’*. Furthermore, while other members are leaving the group, new members are joining.

7.2.2.2 Television, videos and newspapers

There is evidence that newspaper coverage, radio programmes, television broadcast and a video produced from the *mphanje* recording generated keen interest among prospective scholars.

a. Mphanje video

In Domasi EPA, a video on *‘mphanje’* (<https://www.agtube.org/en/content/mphanje>) captured and broadcasted by the Malawi Broadcasting Corporation inspired Dr. Patrick Phiri to engage an undergraduate student (Ruth Mphande) from Lilongwe University of Agriculture and Natural Resources to do a comparative study on the impacts of *‘mphanje’* and conservation agriculture (CA), a modern farming technology, on levels of soil PH, organic matter, nitrogen, potassium and phosphorus in Domasi EPA in 2018. Presented below is an email from Patrick to Professor Sosten Chiotha (Director of LEAD) relating to the subject matter:

‘Dear Sir,

Am Patrick Phiri, working with Heifer International Malawi as the Project Officer, we (You and Me) have been on several meetings to do with climate change, resilience programs and other related meetings. And I hugely admire your work and achievements.

I was lucky to watch you on MBC television one other day where Mr. Gibson Mphepo who is doing PhD at Rhodes University was having focus groups Discussion with Farmers of Traditional Authority Mposa in Machinga about Mphanje Type of Farming. I was fascinated to know more about this project.

I shared the concept to Ruth Mphande a Fourth Year, BSc Environmental Management Student at Lilongwe University of Agriculture and Natural Resources and was keen to know more about it and make it her BSc Project in partial fulfillment of First-Degree program.

I therefore write this email to seek guidance to you whether she can proceed with her decision to do a project on Mphanje vs Conservation agriculture. And if yes, I would like to introduce her to you and Mr. Mphepo so that she can have contacts with you as she does her Project.

Looking forward to hearing from you soon.

Kind regards,

Patrick Phiri'

By September 2018, the student had completed her research, a thesis was written and shared with me since I was co-supervising her informally. Results of this study showed that soil PH was highest at the *mphanje* site followed by CA site and lastly control; organic matter content, nitrogen, phosphorus and potassium levels were highest at the *mphanje* site and least at control plot. Ruth concluded her study findings as follows:

From this research, it is evident that both *mphanje* practice and Conservation Agriculture have an impact on physical and biological properties of the soil, however *mphanje* is the most efficient technology compared to conservation agriculture. Therefore, there is a need to introduce *mphanje* and other good indigenous practices in the new technologies.

b. Newspaper article

A newspaper article in the Nation Publications (dated 20th September 2017) along with the *mphanje* video above 'gave so much insight' to a Master of Development Studies student at Chancellor College (Khadija Milazi) who later developed her proposal on '*factors that determine the adoption of traditional farming practices among small holder farmers in Zomba and Machinga districts in Malawi.*' In developing her proposal, Khadija sourced some ideas from the newspaper and video as shown in email below written to me on 13 November 2017.

'Dear sir,

I am Khadija Milazi, a Master of Development Studies Student at chancellor college. I visited you earlier this month at lead premises as I am interested in traditional or local farming practices and I want to investigate the determining factors of reverting behavior.

I want to appreciate your assistance and the video you gave me; it gave me so much insight. I drafted my proposal and it came back with some comments and one of them was saying I should not quote a newspaper (the Nation 20th September 2017) but get a proper source. I hope in your free time you shall be able to assist me. Thank you.

Sincerely,

Khadija.'

c. Television, videos and newspapers as potential informal learning pathways to transform local farming practices

One of the contradictions highlighted in Chapter Five is 'between documentation of modern farming practices and local farming practices.' One way to improve on documentation is to conduct research and publish findings. Tests of television, video and newspaper in this research generated enthusiasm from research scholars. The results will add to the existing knowledge base and potentially contribute to evidence-based policy reviews and praxis that may ultimately lead into transformation of local farming practices.

7.2.3 Social networks

7.2.3.1 Domasi EPA Social networks

Six out of 15 women reported taking some action to transform local farming practices using their social networks (see Table 7-3). There was also evidence that learning through the social networks is crossing boundaries beyond the network members. For example, neighbours spied on a trial plot to examine the potential of cultivating sweet potatoes to reduce abundance of the hard to decompose *Nansongole* grass, set by Zione John, one of the women participants in my research. In her own words, Zione said that the neighbors '*saw that where we grew sweet potatoes, there is less nansongole while where we just did kuojecha (crop residue incorporation), there was plenty of grass.*'

a. A summary of transformative agency expressions from Domasi social networks

From reports presented by women during the review meeting, learning expressions were identified in two agency expressions of resisting change and taking action (Table 7-3). There

was no evidence in the following agency expressions: criticizing the current activity and organization; explicating new possibilities or potentials; envisioning new patterns or models; and committing to actions.

Table 7-3: Agentive expressions from speeches made by women, Domasi EPA

Agency expression	Evidence from the speeches	Notes
Resisting change	Hilda Stand (Drama): <i>‘....Yes I played a drama whose title was Sitingasinthe kuphikira mafuwa atatu kukhala awiri kapena anayi (It is not possible to change from three stone to two or even four-stone cooking fire). I am a member of Malawi Congress Party (MCP), and I used the MCP meeting to play my drama.’</i>	A three-stone cooking fire is traditional way of cooking at the study sites. A two or four stone is equated to modern farming practices which Hilda Stand is rejecting in her drama.
Taking actions	<p>Eneles Mponda (Chiyembekezo Women’s Club): <i>‘.... I have been creating awareness on fellow women in the club about local farming practices and there has been some action. We made manure, we identified two pit latrines belonging to two women as source of human waste manure after learning from fellow women in in this group.’</i></p> <p>Roseby Duwe (Haliakim Muslim Group): <i>‘.... I asked my fellow women about their last season’s observation regarding fall armyworm attack between hybrid and local maize. They are ready to be interviewed further by yourself for verification of what I am telling you here.’</i></p> <p>Zione John (Pilirani Care group): <i>‘.... We discuss nutrition issues and during one of the sessions, I taught them about ways of enhancing decomposition of nansongole using makumbuka ripe banana peels and sweet potato cultivation. We had set up a trial plot in my garden.’</i></p> <p>Zaidati Jali: <i>‘....People are saying it is not possible to irrigate local maize. I have challenged them by cultivating local maize under irrigation for learning purposes.’</i></p>	There is a consensus among women and other community members that local maize resists fall army worm attack. By her question, Roseby wanted to create awareness about resistance of local maize to fall armyworm to fellow farmers.

b. Surfacing challenges from Domasi social networks

While fulfilling their roles in trying to transform local farming practices, some women faced resistance from other community members. From what, Hilda Stand and Rose James said, I extracted two challenges related to the choice between local farming and modern farming practices.

When Hilda Stand was trying to promote local farming practices through drama, some women questioned the rationale saying ‘*..why should we go back to traditional farming practices, yet we have well performing modern farming practices that give us more income than traditional ones?*’

There are many factors that determine farmers choice of modern and local farming methods. One of these factors is poverty highlighted by Rose James who faced opposition from the well-to-do families while she was speaking in favor of local maize cultivation and *kuojeka* (crop residue incorporation) as a source of soil fertility. According to Rose, ‘*...the better off women said kuojeka is tedious and local maize gives low yields. They also said they can easily source chemical fertilizers and hybrid seed*’.

The opposition Rose faced resonates with the findings of Holden and Fisher (2012) who conducted their research in Malawi on ‘*Can Adoption of Improved Maize Varieties Help Smallholder Farmers Adapt to Drought? Evidence from Malawi.*’ The two researchers found that ‘*farmers with good access to fertilizer expressed a strong preference for high yielding maize varieties, while those with poor fertilizer access most commonly mentioned a preference for varieties having reasonable yields without fertilizer application*’ (Holden & Fisher, 2012, p. 10).

7.2.3.2 Nsanama EPA social networks

Eight of the fifteen women reported some progress in creating awareness and taking action to promote local maize cultivation. From the reports that women gave, it appeared more farmers than before would prefer cultivating local maize because it was less attacked by fall army worm in the 2016/2017 growing season. The extracts below support my claim:

Rose Mulewa: ‘*....they have agreed to more local maize after observing that hybrid was severely attacked by fall army worm in the previous growing season.*’

Elistina Mkanamwano: *‘...in my area, people are saying they will now go to the market to buy Kanjerenjere (a local maize cultivar) and not hybrid because hybrid is very vulnerable to fall army worm.’*

Mary Amon: *‘...people said, last year we observed less fall army worm attack on local maize compared to hybrid. They said they managed to harvest something from local and very little from hybrid. I am sure that this year a lot of people will cultivate local because of the experiences of fall army worm attack last yea.’*

Grace James: *‘...Local maize is resistant to ants and fall army worms because the leaves are sturdy while leaves of hybrid are weak.’*

a. Summary of agentic expressions from Nsanama EPA Social networks

From the speeches given by women, there was evidence of commitment to take action and doing practical actions (Table 7-4).

Table 7-4: Commitments and practical actions taken by women from Nsanama EPA

Agency expression	Evidence from the speeches
Committing to actions	<p>Halima Sailesi: <i>‘...we will multiply local crop seeds in individual demonstration plots that we have set up.’</i></p> <p>Esnat Bizwick: <i>‘...we managed to harvest some local maize from seed Mr. Mphepo sourced for us. We request Mr. Mphepo to buy the maize so that can distribute to households that expressed demand for the see.’</i></p> <p>Esnat Bizwick: <i>‘...the youth are also looking for local maize seed to set up their own demonstration plots and we will support them’</i></p>
Taking actions	<p>Rose Mulewa: <i>‘...I have facilitated formation of drama groups and composition of songs. One of the dramas highlights high vulnerability of hybrid maize to fall army worms compared to local maize. We do comedies again to promote local farming practices. We invite you sir to come and watch the dramas and listen to our songs about local farming practices.’</i></p> <p>Hajira Tambala: <i>‘...For us, we agreed to grow local maize using irrigation, but it was hard to pump with a treadle pump. I talked to my fellow women in my group of Ziwiya on how we can promote local maize cultivations. Each one of us has an individual plot to act as demonstration plots.’</i></p> <p>Emma Chalaka: <i>‘...In my group everyone is happy that I have reminded them about local maize cultivation which was being threatened with hybrid proliferation. Even the traditional leader is encouraging his subjects to cultivate more local.’</i></p> <p>Mary Amon: <i>‘I interacted with Red Cross members in my village. Members cultivated local maize under irrigation with manure as source of soil fertility. Unfortunately, most of the maize died due to drought.’</i></p>

b. Emerging challenges from Nsanama social networks

From progress reports of the various social networks, four challenges were identified: theft of fresh maize at Namisisi diversity block resulting in some late maturing local maize being harvested prematurely; the demand for local maize is so high and farmers seek further support from my research; inadequate water supply for irrigation purposes; misconceptions about the origin of fall army worm: *‘...I attended a meeting at Nsanama Teachers’ Development Centre and the facilitator said that fall army worm infestation was blamed on free maize that was distributed for food but people eventually sow the seeds. Hence outbreak of fall armyworm’* (Rose Mulewa)

7.2.3.3 Social networks as potential informal learning pathways to transform local farming practices

Social networks are central in unifying different stakeholders to successfully deal with socio-ecological problems and dilemmas (Nagoli & Chiwona-Krlyum, 2017, p. 135). Nagoli further argues that networks bond people by bridging their diverse norms to promote mutuality. Thus, social networks can potentially transform stubborn cultures by reciprocal mobilization and allocation of key resources, and, by conflict resolution, especially in managing common pool resources (ibid.).

From both Tables 7-3 and 7-4, through their networks, women had taken action towards transformation of local farming practices amidst some challenges which can easily be managed. As the saying goes, action speaks louder than words, these results give hope that these networks can potentially transform the neglected local farming practices at the study sites.

7.2.4 Diversity blocks

As indicated in section 4.4.4.2 (f) two diversity blocks planted to different local cultivars of crops selected by farmers themselves were established in Nsanama EPA one at Makuluni and another at Namisisi under irrigation.

7.2.4.1 Makuluni Diversity Block

a. Agentive (learning) expressions at Makuluni Diversity Block

Being the first-time local maize was cultivated under irrigation in the area, the diversity blocks initiative generated curiosity and got the support of government extension workers, traditional

leaders and other community members and this is a gesture for possible upscaling and sustained cultivation of the local crops, primality maize. Table 7-5 highlights key learning points from speeches given by various speakers when I visited the block on 1st October 2018

Table 7-5: Summary of agentive expressions, Makuluni Diversity Block

Agency expression	Evidence from the speeches
Resisting the change, new suggestions or initiatives. Directed at management, coworkers or the interventionist.	Not found in the data.
Criticizing the current activity and organization. Change oriented and aiming at identifying problems in current ways of working	GVH Chipojora: ‘....In the 1940s, we had local cultivars, but we were told to plant this and not that and local cultivars suffered.’
Explicating new possibilities or potentials in the activity. Relating to past positive experiences or former well-tried practices.	Not found in the data.
Envisioning new patterns or models in the activity. Future oriented suggestions or presentations of a new way of working.	Mustafa Bauleni: ‘Extension workers promote hybrids. They should be engaged actively if we are to succeed in local farming practices.’
Committing to actions. Committing to take concrete, new actions to change the activity. Commissive speech acts are tied to time and place.	Cleverson Chakhulura: ‘....continue working with us. We have 13 village heads, and all require demonstration plots of local crops.’ Esnat Bizwick: ‘LEAD should buy seed for us and we will distribute to other farmers in the area including the youth....we will also develop a plan on how to promote local maize cultivation in our area in close collaboration with extension workers.’ Dorothy John: ‘.... we will encourage all surrounding villagers to follow suit’ Cleverson Chakhulura: ‘....There are a lot of people who envy what we are doing here to an extent that we were even getting worried with such enthusiasm because it could potentially lead to theft of our fresh local maize before drying. Is this maize going to dry? We asked ourselves. Neighboring villagers could not believe their eyes that local crops can be cultivated using irrigation because this is the first time in this village.’
Taking actions. Reporting having taken consequential actions to change the activity in between or after the laboratory sessions.	Cleverson Chakhulura: ‘We are gathered here on a demonstration plot where we have been working since May 2018.’ Cleverson Chakhulura: ‘.... The AEDC advised us to incorporate crop residues in the area identified and fortunately, soon after incorporating residues there

	<p>were some rains that added more moisture to enhance decomposition of the residues we incorporated.'</p> <p>Cleverson Chakhulura: '....With advice from the AEDC, we labelled all plots planted with local maize. We were surprised that some local maize cultivars mature in less than forty days. The AEDC advised us to record sowing date, tasseling date and any abnormality to the crops.'</p> <p>Cleverson Chakhulura: '.... The AEDC gave us MK500.00 to look for nakachiswe local maize seed which managed to source though a bit late. Nakachiswe is also early maturing and we also recorded everything.'</p> <p>Esnat Bizwick: 'We were identified to participate in research. We managed to mobilize villagers to be engaged in this demonstration garden. We have learnt a lot.'</p> <p>Cleverson Chakhulura: '....Though the piece of land belonged to Esnat Bizwick, it was identified in close collaboration with GVH Makuluni and Village Headman Manga'nda. Our group village headman had keen interest in the diversity block to the extent that he used to monitor progress by consulting us but also by field inspection. During their routine meetings, traditional leaders have been warning their subjects that there will be penalty for any offence committed in relation to the diversity block. People feared the warning and, as you can see, not even a single theft incidence happened.'</p>
--	---

b. Surfacing challenges at Makuluni diversity block

Mr. Everson Chakhulura, an executive member of Makuluni Irrigation Scheme, mentioned one challenge associated with promotion of local crops grown in the diversity block and this was to do with mobility: '*...there is a problem with anything we do. LEAD should provide transport to ease mobility to distant places require our services. For example, people from Mbala invited us to teach them about local crops cultivation using irrigation but we had mobility challenges. We have 13 village heads, and all require demonstration plots of local crops, but we cannot manage*'.

7.2.4.2 Namisisi Diversity Block

a. Agentive (Learning) Expressions at Namisisi diversity block

Just like at Makuluni Irrigation scheme, cultivation of local crops under irrigation at Namisisi had the attention and support of the general public and traditional leadership. It was interesting to note that the AEDC was not frequently mentioned as a promoter of local farming at this scheme, yet it falls under the same Nsanama EPA which he is heading. Table 7-6 below highlights key learning points extracted from the speeches given during my visit to the site on 1st October 2018.

Table 7-6: Summary of agentive expressions, Namisisi Irrigation Scheme

Agency expression	Evidence from the speeches
Resisting change, new suggestions or initiatives.	No evidence from the data
Criticizing the current activity and organization.	Stein Lucius, Chairperson, Towe youth Club (WhatsApp member) who attended a training session organized by GTZ in the area said <i>‘The trainers grouped crops into local and hybrid. The trainers overemphasized profits from hybrid, but I asked the trainers about their reasons for over-emphasizing hybrid maize cultivation. I schooled the trainer on benefits of local maize including pest and disease resistance.’</i>
Explicating new possibilities or potentials in the activity.	No evidence from the data
Envisioning new patterns or models in the activity.	Usman Mamu (Lead farmer): <i>‘I forgot one thing. Can we have at least three more demonstration plots in Khuzumba agriculture section this growing season?’</i>
Committing to actions.	<p>Usman Mamu (Lead farmer): <i>‘From now on, I have decided to increase hectarage planted to local maize Hybrid came in through a bait system. ‘You plant hybrid and get some fertilizer.’</i></p> <p>Grace James: <i>‘Local farming practices will benefit many people. I will continue creating awareness about Kafula as mthetsanjala’ (literal: hunger eradicator)</i></p> <p>Hajira Tambala: <i>‘.... We should continue promoting local maize cultivation because we have good lessons learnt from this demonstration.’</i></p>

	<p>Village Headman Matipa <i>‘When you will be hunting for Kafula seed, remember the chief because I have plenty of land.’</i></p> <p>Halima Sailesi: <i>‘At first, few people came here because they thought it was a project for scheme people. Later, we discovered many people asking us questions about what we were doing. We informed them that if they want to learn about local maize under irrigation, they should come to our scheme for us to teach them.’</i></p> <p>Halima Sailesi: <i>‘We expect more people to cultivate local maize after learning from this plot. People are asking me for seed of kafula because it is early maturing. I tell them that I will inform Mr. Mphepo to source more seed for them.’</i></p> <p>Village Headman Matipa: <i>‘....I have welcomed multiplication of local crops in my village.’</i></p>
Taking actions. Reporting having taken consequential actions to change the activity in between or after the laboratory sessions.	<p>Sherifa Wisiki: <i>‘I am a newcomer in the journey of transforming local farming practices. I was inspired by Hajira Tambala,’ (one of the participants in my research).</i></p>

b. Challenges Namisisi Diversity Block

While Makuluni participants stated one challenge (mobility), at Namisisi Scheme, three challenges emerged from the discussions: failure to cope with high demand for *kafula* seed; need for solar irrigation pumping system to replace tedious treadle pump that they were using; and construction of a da. Quotations below show challenges emerging from diversity block learning approach at Namisisi:

Usman Mamu, Lead Farmer: *‘....Before we close, I have a question. Demand for kafula seed will be too great. After harvesting kafula from this this demonstration plot will the seed be adequate for all of us? We will just fight over this small seed supply.’*

Halima Sailesi: *‘...At Namisisi scheme, we are hard working. We just hear from the radio about solar pumps, can you consider us so that we produce more local maize as our friends at Makuluni who used gravity fed irrigation system have harvested more?’*

GVH Matipa: *‘...We also request your office to add more treadle pumps. We also request for dam construction across the same river that supplies water to the demonstration plot.’*

7.2.4.3 Diversity blocks as potential informal learning pathways to transform local maize cultivation

From Table 7-5 and Table 7-6, the most common agentive expressions were ‘*commitment to take action*’ and taking ‘*practical action*’. I consider these two expressions as main indicators of the will of the concerned subjects to transform and build sustainability of local maize cultivation. The remaining four agentive expressions are simply precursors of learning in my view. They portray more tenets of abstract than concrete.

From the two diversity blocks, women and other community members managed to harvest some maize which they later shared among themselves for upscaling. Eighty-eight community members received local maize seed harvested from the two diversity blocks. Of these, 70 were women 17 men and one was a young man representing Nsanama WhatsApp group that was also established to transform local farming practices. The diversity blocks were managed by 40 community members but during sharing of the seed, 48 new community members also benefitted from the seed supply. The head of Nsanama EPA also received seeds of *kafula* and a demonstration plot was established(Figure 7-4) at the EPA headquarters for learning and possible upscaling. Clearly, there are multiplier effects (expansion) from 15 women who brought the idea of demonstration gardens for local crops to 88 community members who eventually received the seed (see Figure 7-5 and Appendix 7a: Names of community members who received local maize seed for upscaling).



Figure 7-4: Demonstration garden of *kafula* local seed at Nsanama EPA Headquarters initiated by the AEDC



Figure 7-5: Sharing local maize seed harvested from diversity block in Katundu Section, Makuluni Diversity Block

7.3 Conclusion

This chapter has demonstrated the potential of the selected model solutions to build collective and relational agency relating to local farming practices and informal learning. For all the tests, time seemed to be too short to generate meaningful conclusions about the full potential of each test to transform local farming practices via informal learning. However, some of the model solutions offer greater opportunity to co-create collective and relational agency. Of all the model solutions tested, demonstration/diversity blocks appear to be the best in terms of co-creating such collective and relational agency.

CHAPTER 8: CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This chapter is summary of key findings of my research with reference to the four research questions indicated in section 1.6. The chapter also provides recommendations targeting various stakeholders including myself, research institutions, policy makers, training and capacity building institutions and the general public.

8.2 Have Research Objectives been met?

With respect to the four research questions, my study results show that they have been successfully answered. Below I give details of how these questions have been addressed through this study.

8.2.1 What past and current informal learning processes have been catalyzed by drought and dry spells associated with maize production?

Based on three key areas of informal learning experience namely learning resources, learning processes and learning context (Dondi & Holmes, 2004, pp. 29-30) my study identified several informal learning resources and processes specific to the two case study sites (learning context) associated with local maize production and other local farming practices. Learning resources cover availability of competent learning actors; effective tools for the access and use of resources; and awareness of learners about the subject matter. Learning processes are defined by two spheres as follows: co-development and application of transparent learning methods and documentation of learning processes and outcomes. Learning context captures relevance of learning results, supportive learning environment and learners' identity.

Examples of informal learning resources that I identified in this study include word of mouth, women dominated social networks, trials, observation and drama. Most of these learning approaches also existed in the past. However, the study found that for some approaches, the purpose and frequency of use have been modified considering extreme weather events. The study also found evidence of generational learning taking place through the above approaches. In generational learning, the novice (or youth) learnt from the experienced ones, mostly adults.

There is clear evidence from my research results that drought and dry spells catalyze learning (see section 5.4.1.8). For example, where extremes of droughts and dry spells occurred, local communities at the study sites either increased frequency in using historical coping strategies or learnt about completely new coping strategies. For instance, in 1949, Malawi was faced with

one of the worst drought time immemorial and this is the year that saw local communities learning to use new coping strategies such as use of saw dust and banana root flour in place of maize flour to prepare *nsima*, staple food in Malawi. New coping strategies included consumption of a mixture of juice cola and unripe crushed mango (see Tables 5-6 and 5-5). While some of the coping strategies that were learnt addressed food insecurity directly (e.g. eating *nsima* from banana flour), some strategies were indirect (e.g. self-directed learning to produce Whitman manure during drought leading to higher maize yield and hence more *nsima*). These results mean that local communities continuously learn to cope to new stressors. The results also confirm the existence of lifelong learning (LLL) which is the '*continuous building of skills and knowledge during one's life, that occurs through experiences faced lifetime*' (Laala, 2011, p. 3).

My results agree with the unpublished data from a research project entitled 'Attaining Sustainable Services from Ecosystems through Trade-Off Scenarios (ASSETS)' implemented by LEAD SEA from 2012 to 2015. ASSETS data also show that learning about new coping strategies emanated from food insecurity resulting from poor harvests on account of unreliable rainfall including droughts and dry spells. A quote by Macpherson Chatama (2013) from Mtuluma Village, one of the sample villages substantiates this claim:

[In cases where hunger is more severe like in 1948, 2001, and 2002 especially when the cause is drought, participants reported more other coping strategies they use in such cases. Some of those coping strategies as reported by participants are eating wild yams - mipama, digging up banana tree roots to make flour, making flour from sawdust, mixed with maize brans and corn bran, making flour from a certain type of okra and in rare cases as of recent times, being assisted by non governmental organisations]

Like my findings, ASSETS dataset also shows that new coping strategies have been learnt since the last two decades. From Mpheta Village, Cecilia Mazombwe (2013) said:

There is a difference because in the past things were better off as people were able to grow enough maize for food, hence not adopting many coping strategies. Nowadays the rains start and end anytime hence disrupting the growing season which also interferes with the amount of crops to be harvested. Consequently, a lot of people nowadays learn and adopt a lot more coping strategies.

My results also confirm what Phalira et al. (2018) wrote:

In a similar vein, following the drought of 2012, the programme organized television broadcasts, press releases and consultative meetings with district councils, Department of Disaster Management Affairs, Ministry of Natural Resources, Energy and Mining and other stakeholders to inform, effectively plan and prepare for the effects of the Lake Chilwa recession and a cholera outbreak.

In other words, the 2012 drought acted as a catalyst for Lake Chilwa Basin Climate Change Adaptation Programme to organize informal learning resources to plan and prepare for the anticipated negative impacts of the drought.

Drought as a catalyst to learning is not unique to Lake Chilwa. It was also reported by (Djoudi and Brockhaus (2011) in northern Mali when persistent drought lead to drying of Lake Faguibine. Drying of this lake catalyzed learning in local communities dependent on livestock and forests in a number of ways (Figure 8-1:). This figure compares livelihood before drying and after drying by men and women separately. It is clear from this figure that drought catalyzed learning in men and women in different ways. For example, when the fishery industry was negatively affected by drought, women learnt to make charcoal as a survival strategy while men were prompted to keep small livestock which are more resilient to droughts than crops.

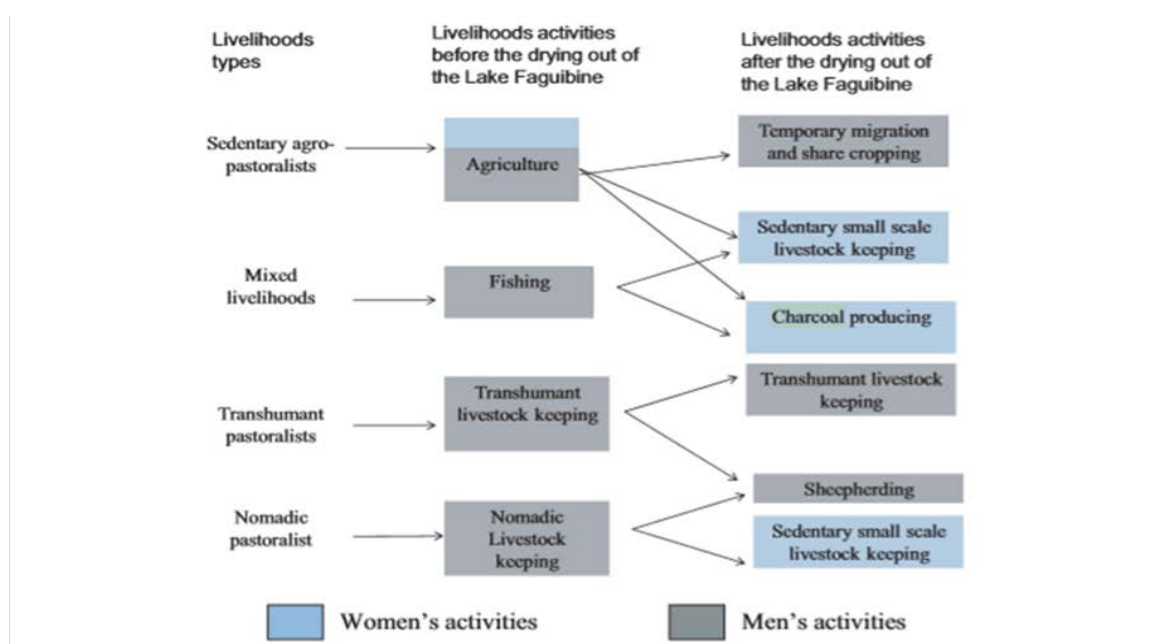


Figure 8-1: An example of how drought catalyzes learning in different ways among men and women, the case of Lake Faguibine, northern Mali

In Australia, Jakku et al. (2016) answering the research question of ‘*what conditions and processes **influenced** the outcome of the Peanut Company of Australia’s PCA response?*’

discovered that continuation of drought conditions ‘has caused us to accelerate a review of how to address the agricultural risks which affect the company’ (p. 10). In response to drought, PCA developed a clear vision and strategy to address this extreme event..

8.2.2 What are the past and contradictions to adaptation learning processes for maize production under stressors of drought and dry spells?

This study identified more than 30 challenges presented as contradictions (see section 5.5, Chapter Five) and over 10 opportunity spheres that can be exploited to promote local farming practices through informal learning processes. I identified 19 contradictions the majority of which fall under the category of Malawi Government structures, systems and processes that seem to favor modern farming practices at the expense of local ones (see Chapter Five). A classic example is that of the National Seed Policy (2018) which aims at promoting hybrid seeds, thus sidelining the local seed supply system. Modern farming practice promoted by the Government of Malawi and local farming practices that exist because of farmers own power may be considered a dangerous contradiction (Harvey, 2014, p. 124-126) or a critical conflict (Kaatrakoski, Littlejohn, & Nina , 2017, p. 603).

Most of the contradictions identified in this research trace their origin to the history of the extension delivery system in Malawi (see section 5.3.1, Chapter Five). This research also discovered that traditional customs, beliefs and norms are another major source of local farming practice challenges, especially relating to decision making processes on which crops to mix, control over resources and conflict of motives between husband and wife on cash versus food crops. Relating to beliefs, Jørstad, 2012 (p 90) also found that beliefs and misconceptions about climate change pose as adaptation learning barriers. To substantiate this **claim**, Jørstad used an extract from the Nation Publications Newspaper which read as follows: ‘*In most African communities, dry spells are spiritual issues. People do not regard them as a problem caused by the changing climate but the expression of the wrath of gods. Among the Ngonde in Karonga, when a dry spell falls, people go to the shrine to plead forgiveness from the gods.*’ In this instance, such local communities may feel that there may be no need to **learn** to adapt or develop new practical actions, instead, **prayer** suffices.

Among the various contradictions to resilience building, the most worrisome is the absence of learning tool (Tschakert and Dietrich, 2010, p. 3). My study also identified absences relating to such tools. For example, at the study sites, there was no evidence of WhatsApp and diversity blocks cultivated with local seed as learning tools to promote local farming practices (See sections 7.2.2.1 and 7.2.4, Chapter Seven). Forward-looking learning and decision-support

tools under a changing climate and other wicked problems are needed more than ever (*Ibid*). A resilience perspective on adaptation emphasizes learning, self-organization, and flexibility as crucial ingredients for navigating complex feedback mechanisms, thresholds and system changes (Berkes et al., 2003 quoted by Tschakert and Dietrich, 2010, p. 3)). While people learn to adapt to climate change and build socio-ecological resilience, one of the greatest challenges is to assess how and when people learn to manage change, absorb shocks, take advantage of new opportunities, adjust, or completely alter their lives and livelihoods (*Ibid*). In my study, I developed tools that help communities envision the changes that may be possible via scenarios as double stimulation tool enabling their learning and agency for self-directed changes (Chapters Six and Seven).

Besides, social barriers, this study also identified new opportunities most of which relate to further research on some of my findings. These opportunities have been presented under section 8.5 (recommendations)

8.2.3 What are likely future scenarios relevant to informal learning processes considering the current adaptation drivers and pressures in maize production under extremes of dry spells?

This research identified six key drivers of adaptation learning processes namely governance, economy, climate change, environmental degradation, social change, technology and human population. Of these drivers, the most critical in terms of determining the future of local farming practices were identified as governance and economy. Based on these drivers, four scenarios were developed: good governance and good economy (best case scenario); good economy but poor governance (middle of the road); good governance but poor economy (middle of the road); and finally, poor economy and poor governance (worst case). The four scenarios I developed with women in my study resonate well with the concepts of zone of proximal development, Vygotsky (1978) and Bates (1982) learning levels of 0, I, II, III and IV. Since level 0 entails no learning taking place, it was not applicable to my research since the time I engaged women, there was already some learning taking place that I discovered during collection of mirror data. Therefore, for this research, the worst-case scenario represented learning I and the best case represented learning III considering that learning IV is rarely achieved in one's lifespan according to Bates (1978). The difference between these two extremes of learning is the zone of proximal development for local maize cultivation and other local farming practices.

Each of these four scenarios was given catch words to evoke critical thinking among various stakeholders about local farming practices. For example, the worst-case scenario at Domasi EPA was nicknamed ‘*anamalira*’ (mourners during a funeral). Anyone reading this name as it relates to local farming practices may ask questions about the name and such questioning may stimulate further learning and action. Apart from catch words, each scenario was assigned a symbol, again to stimulate learning following Vygotsky’s (1978) conceptualization of learning through use of tools. The four scenarios co-developed with women served as double stimulation tool leading to development of transformative agency such as *committing to act* or *acting* as reported in Chapters Six and Seven. Such actions are expected to contribute to building socio-ecological resilience at the two case study sites and Lake Chilwa basin in general because of social capitalism tendencies (bonding and bridging) taking place in the basin. Such commissive acts have the potential to transform local farming practices. The four scenarios will continue playing the role of double stimulation to other community members including policy makers to act.

In the Lake Chilwa Basin, and this may also be the case in Malawi, this was the first-time local communities were engaged in development of scenarios following a systematic method that I used for my research. Consequently, I met some challenges that slowed down progress in developing scenarios. The key challenge was translating some key terms in scenario development discourses such as *critical uncertainties* and *levels of importance*. Three researchers present during scenario development took turns explaining key scenario terms until such a time when some of the women could explain issues to slower learners within the group.

Because of their catalytic nature, scenario development methods that I used in this study may be considered generative. Inspired by Aristotle, Adrienne and Nuthall (1992, p. 1) described generative methods as ‘*appropriate methods of investigation*.’ Hanington (2007, p. 1) described these methods as ‘*particularly unique*.’ A generative method is a more focused effort targeted at a **deeper understanding** (own emphasis) of user needs and desires, and concept development through participatory design activities. Generative methods are characterized by active participation and co-design of creative learning tools. These methods provide space for participants project their thoughts, feelings and desires through ambiguous **visual stimuli**, and as constructive techniques, providing design elements for users to manipulate in guiding concept development. Scenario development methods fit description of generative methods. ‘*Deeper understanding*’ of the issues surrounding local farming practices started with the exploratory phase. This phase was followed by questioning current climate change adaptation

practices relating to local farming practices, then the rest of the expansive learning actions 2 to 7. Throughout learning actions 1 to 7 of the expansive learning actions, women were given opportunity to freely express their feelings and thoughts through several ways including asking questions, co-designing learning tools (e.g. using catch words and symbols for scenarios) and reflecting on the processes.

8.2.4 How could expansive learning processes in informal learning settings potentially help rural women maize farmers progress from incremental to transformational adaptation practices?

Expansive learning following third generation CHAT was the hub of my research. The aim of expansive learning for my research was to enable women *‘shift from vulnerable people as passive victims of climate change to active agents who shape change.’*

From the data I collected, there is evidence that expansive learning took place particularly in the following criteria: transformative agency, learning about new local innovations, increased self-confidence, more active participation, understanding of the origin and causes of problems affecting local farming practices. For me to detect signs of expansive learning, I drew on criteria developed by Heikkilä and Seppänen, 2014 (p. 8), Virkkunen (2013, p. 166-167) and Dondia and Holmes (2004, p. 24). Presented in Tables 8-1 and 8-2 are summaries of the evidence that expansive learning took place during my study.

Table 8-1: Evidence of expansive learning and transformative agency by women at Domasi EPA

Expression	Evidence	Session/Notes
Criticizing	<p><i>'I am on the side of Rev. Malasa who said if we follow scientific ways of forecasting rain, we will get confused. We should use our own knowledge. We should not listen to scientists when they say rain will come on this date and not that?' (Eneles Mponda)</i></p> <p><i>'...I am against scientific means. In the olden days when the Department of Climate Change said rains will come 15th October the rains indeed came around that date, but the case is different now. They forecast rain but you find it is sunny on that day. We should follow our own traditional ways.'</i> (Zione John)</p>	Session one when a video highlighting farmers dilemma on when to plant was shown to women as first stimulus.
Resisting	Hilda, through drama says there is no way three-stone cooking fire (representing local farming practices) will change to two or even four stone (representing modern farming practices)	Session eight: Testing the model
Explicating	<p><i>'...People get bored in Church or mosque if preaching is packed with environmental issues.'</i> (Roseby Duwe)</p> <p><i>'...Same people hear on the radio, poster, drama etc. It is a waste of time to include again during preaching. We should use other channels.: Furthermore, the preacher has short time to preach and therefore should just focus on Salvation, but environmental issues should be discussed at separate forum.'</i> (Zaidati Jali)</p> <p><i>'...When applying manure, we do not know the right applications. Also, for outbreak of diseases under mixed cropping, we need scientists to help us with the right pesticide application rates.'</i> (Eneles Mponda)</p> <p><i>'...There is need for research to help us on which crops to mix.'</i> (Stella Alick)</p> <p>Explanation about the whole process of scenario development from selection of critical uncertainties to naming of four scenarios using catch words and symbols for those who cannot read (Zione John)</p>	<p>Responding to a comment during validation workshop on why women were not in favor of preaching to include local farming practices <i>'yet Holy Books give us authority to take care of the environment?'</i></p> <p>Responding to a question on why women felt local knowledge systems should be integrated with scientific ways</p> <p>Explanation done during the validation workshop. Professor Sosten Chiotha, one of the workshop participants was surprised <i>'I was not expecting a woman from a rural area to explain scenarios in such a concise manner'</i></p>

Envisioning	See descriptors of best-case scenarios of local farming practices under section 6.1.1 (Chapter Six)	Session five: Scenarios:
Committing to take action	Setting up informal learning approaches such as demonstration plots	Session four: Modelling
Taking Action	Action taken was mainly through awareness creation about the importance of local farming practices though in some cases there were some concrete actions (see Table 7-3).	Session eight: Testing the model

Table 8-2: Evidence of expansive learning by women at Nsanama EPA

Expression	Evidence	Session
Criticizing	<p><i>‘...I agree with the speakers who said we should use traditional means of rainfall forecast.’ (Halima Sailesi)</i></p> <p><i>‘Chemical fertilizers have burnt the soil. In the olden days, our elders used to do plant residue incorporation (kujeka) which did not burn the soil.’ (Elistina Mkanamwano)</i></p>	Session 1 when a video highlighting farmers dilemma on when to plant was shown to women as first stimulus.
Resting Change	<p><i>‘...Based on my experience, traditional means are more accurate than scientific ways. Last year, I disregarded rainfall forecasts by the Department of Meteorological Services, but I followed grandmother’s advice who used abundance of mango flowers to forecast rain. Those who followed forecast by Department of Meteorological Services had their crops wilting due to dry spell that came later in the year but by that time my maize was already mature.’ (Hajira Tambala)</i></p>	Session 1 when video was introduced as first stimulus.
Explicating	<p><i>‘...Yes, marriages can break. During monthly periods or even childbearing, the cleansing materials such as cotton wool is thrown into the toilets. Using human waste manure means bringing back home the unwanted monthly period cleaning materials (some like clothing not still well decomposed). Some marriages broke last year because the wife excavated human waste manure from old pit latrines and the husbands were not happy at all. Husbands labeled their wives as unclean.’ (Rose Mulewa)</i></p>	Responding to a question on how use of human waste manure can break marriages.

	<i>'...We did not say let us abandon hybrids. We should combine. Hybrids give higher yields. There is dry spell now and hybrids suffer more while local withstands.'</i> (Edna Richard)	Responding to a concern by one of participants during validation workshop <i>'that Seems the house is for local farming practices at least based on the way discussions are going on here'</i>
Envisioning	See descriptors of best-case scenarios of local farming practices under section 6.1.1 in Chapter Six.	Sessions 3 and 4: Modelling:
Committing to take action	Three women committed to take further action through local maize seed multiplication and to distribute local maize seeds other farmers including the youth. (See Table 7-4.) Three women committed to take further action through more awareness creation on local maize cultivation based on lessons learnt from the diversity block	Session eight: Testing the model Field visit to Namisisi Diversity Block.
Taking Action	Action taken was mainly through awareness creation about the importance of local farming practices though in some cases there were some concrete (practical actions). (See Table 7-4.)	Session nine: Reviewing progress on social networks

From Tables 8-1 and 8-2, under informal learning settings of this study, there were some positive outcomes such as increased self-confidence and self-esteem joint transformative agency ('our activity'); wider involvement of other local community members besides women (more active citizenship); expanding participation of the youth and community leaders; and finally, engagement of the EPA heads in the management and upscaling of the demonstration plots planted with local crops. According to Dondi and Holmes (2004, p. 24), some of the expansive learning outcomes such as changes in personal life and quality of life are long-term (>10 years) while others such as increased self-confidence are short-term (<5 years). Data collection for my research was done mainly within a year and therefore my outcomes were short-term in nature.

8.3 Transformation Adaptation and the Role of the Model Solutions to Potentially Transform Local Farming Practices

In section 5.7, I identified 19 contradictions and solutions were suggested for each contradiction to stimulate further action by the women who participated in my research as well as other stakeholders. Some of the suggested solutions were tested and the tests were successful. The tests involved other villagers besides the women subjects involved in the research, thus expanding the learning to other community members including the youth and traditional leaders who support the research initiative. Sample quotations below substantiate my claim:

...I thank LEAD because of this initiative. People in my area are very supportive. They are saying this research should not end here but generate fruits even for the next generations. People could not believe their ears that for the first time, there is an institution trying to promote local farming practices (Grace James, Nsanama EPA progress review workshop 8thNov 2018)

...As for me, I was responsible to do drama, but I have not done one because of too many commitments that I have e.g. attending to Plan Malawi meetings because I hold a position. That aside, there is huge demand for local maize cultivars, and I can count more than 200 individuals, but I have been rejecting them because we do not have enough seed. People are complaining about this and they claim that I favored some. Currently, there are 50 active members from 20 but stumbling block is quantity maize seed that they require. Even our GVH wants seed especially kafula' (Halima Sailesi, Nsanama progress review workshop 8thNov 2018).

By '*expanding learning to other community members*' some of the model solutions co-developed and tested are '**germ cells**' or catalytic activities. A germ cell is expansive since it '*opens up rich and diverse possibilities of explanation, practical application and creative solutions*' (Sannino et al., 2016, p. 6). It ascribes to the notion of ascending from the abstract to the concrete. Going further, when the learners generate novel implementations and extensions of the germ cell, they are ascending to the concrete. A **germ cell**, according to Sannino et al. (2016, p. 6), does not come naturally, rather, it is discovered and modeled by the participants during formative intervention research processes. From my study, the following three ideas (abstract) fit the concept of 'germ cell':

1. The first idea (abstract) is the development of scenario into four possibilities of the future (see Chapter Six). Each of these futures will potentially generate multiple activities. For example, the worst-case scenario may stimulate policy praxis and implementation of the policy to transform local farming practices.
2. A second example of a germ cell from my study was a suggestion by women to improve usage of electronic and print media to transform local farming practices (see section 7.2.2). As indicated in section 7.1.2.2 a, the Malawi Broadcasting Corporation produced a video on '*mphanje*' one of the local farming practices. The video generated keen interest from two students who conducted further research on local farming practices. Results from the two research projects may catalyze further action such as policy review and/or formulation as already pointed in section c.
3. The third example was the idea to establish diversity blocks (section 7.2.4). As highlighted in section 7.2.4.3, the idea to establish diversity blocks came from 15 women. However, over 30 other local communities participated in the management of the diversity blocks. Local maize seed from diversity blocks was shared to eighty-eight community members with an aim of upscaling cultivation of the local maize seeds. The most common agentic expressions related to diversity blocks were '*commitment to take action*' and '*taking action*', thus further asserting my claim that community members who received the seed will likely upscale production. After upscaling production, some of the seed may be sold to generate income for multiple purposes. Some of the germ cell solutions were also potential transformation adaptation options.

In the Lake Chilwa Basin, this is not the first-time germ cells have been identified. For example, the Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP) established radio listening clubs as a form of citizen journalism to empower local communities to record key events in their areas. The clubs were formed to meet four objectives: sensitizing the community on climate change and sustainable use of the environment; spearhead community-led environmental management and development activities; initiate and promoting sustainable climate change adaptation measures for the community; and, provide a platform for the marginalized poor to use the creative power of media to act as a communication tool for social change. The clubs managed to meet these objectives (Chiotha et al, 2018) but they also catalyzed change. For example, in 2012, Chikala radio Listening Club recorded a documentary on impending red locusts. The documentary was aired on CHANCO Community Radio and later the Malawi Broadcasting Corporation prompting the Minister of Agriculture and Food

Security and the United Nations Food and Agriculture Organization (FAO) to visit the site to carry out an assessment. The assessments confirmed threat of red locusts leading to mobilization of resources for a rapid response of aerial insecticide spray.

While acting as germ-cell activities, some solutions can also be regarded as **transformation adaptation options** (emphasis myself) of the '*enlarged scale or intensity in the same area*' type as opposed to radical (completely new) or upscaling (boundary crossing) type (Jakku et al., 2016). For example, use of WhatsApp and local maize seed diversity block have shown to be potential tools to transformation adaptation for the local farming practices.

8.4 New Knowledge Claims

This study focused on three research areas: firstly, limited studies on informal learning and local farming practices, secondly, weak understanding of contradictions on local farming practices and; and, lastly, gaps on historical, present and future learning for adaptation in the Lake Chilwa Basin (see section 1.3). It is in these three areas that this research generated knowledge in two categories namely methodological processes and findings.

Relating to methodological processes, this study has been the first in the Lake Chilwa Basin to test, use and **further develop** expansive learning process involving women to try to transform local under drought and dry spell episodes under rural settings. Sandwiched within expansive learning processes was co-development of scenarios as double stimulation tool that stimulated thoughts to co-develop models' solutions, some of which were successfully tested. Currently, there is no documented evidence of scenario development methods being co-developed and applied to rural community settings with notable successes amidst some challenges as well. Other methods, not yet developed and applied to local farming practices at the study sites before include use of WhatsApp social media platform, how to accelerate decomposition of hard-to-decompose nuisance plants that colonize cultivation land, the four-cell analysis to historicize and classify local crop seeds based on number of households cultivating a particular crop cultivar over a given area of land.

Relating to '**findings**', the study has discovered new knowledge not reported before. In the first place, the study has found that women possess rich and unique local knowledge about their local farming practices. For example, use of *makumbuka* and *sukari* banana sheaths to enhance decomposition of *nansongole* and bamboos respectively is knowledge that has not been documented.

The study has found that it is possible to transform local farming practices via informal learning approaches and this too is a unique discovery at the study sites. Furthermore, the study has identified local crop seeds that existed before but are now rare or even extinct. For example, a local maize seed called '*mkananyani*' (monkey refuser) has been documented only through this research. For the first time in the history of learning research in Lake Chilwa, four local farming practices scenarios have successfully been developed and used as double stimulation tool under local settings.

With respect to contradictions, this study has also contributed to new knowledge. For the first time, local farming practice contradictions have been systematically analyzed and solutions proposed. Some of the solutions were tested and the tests, such as establishment of a diversity block of local farming practices, have been unique in the study area, generating exceptional findings presented as agentive expressions, a sign of learning by women subjects.

8.5 Recommendations

Recommendations presented in this thesis target different stakeholders including myself as a researcher, research institutions and policy makers.

8.5.1 *Myself*

Use of CHAT and the associated expansive learning processes such as scenario learning as a form of double stimulation involving rural women is unique in Malawi as already pointed out. Therefore, there is need to publish the methods for potential wider application. There is also need to conduct sessions on expansive learning, double stimulation and the informal learning approaches I developed through this study including the four cell-analysis used to categorize local crop cultivars into four classes of many households (cultivating) small area, many households large area, few households large area and few households small area; potential the role of WhatsApp, diversity blocks, electronic and print media and other learning approaches to transform local farming practices. The contradictions affecting local farming practices may in part be attributed to lack of an institution to coordinate local farming practices and informal learning in Malawi. I therefore suggest setting up such an institution that will act as a link between local communities, Government of Malawi, academic institutions and other stakeholders.

8.5.2 Research Institutions

My research has uncovered six potential areas requiring further investigation by various research institutions (Table 8-3).

Table 8-3: Suggested research topics relating to local farming practices

#	Potential research area	Possible research questions
1	Local maize is more resistant to fall army worms than hybrid maize.	Does local maize resist fall army worms? How do various local maize cultivars vary in their resistant to fall army worms? If indeed local maize resists fall army worms, what are the key enabling characteristics of local maize?
2	Local maize withstands drought and dry spells better than hybrid maize.	Does local maize withstand drought and dry spells? How do local maize cultivars vary in their resistance to drought and dry spells?
3	Ripe banana peels of <i>makumbuka</i> and <i>sukari</i> eradicate <i>nansongole</i> grass and native bamboos.	What is the chemical composition of ripe banana peels of <i>makumbuka</i> and <i>sukari</i> that enable such processes? How do these chemicals interact with target plants?
4	Effectiveness of various traditional crop inspect pest and diseases.	How long does a traditional practice take to completely eradicate a particular insect pest under varying environmental conditions such as temperature? What would be the most effective application rates? Which stage of insect pest (egg, larva, pupa or adult) can be effectively targeted by a given traditional practice?
5	<i>Mphanje</i> and its socio-ecological impacts?	What are the physical and chemical compositions of the soil under <i>mphanje</i> versus other farming practices such as conservation agriculture? There were claims by women that <i>mphanje</i> saves labour, but how much labour is saved and how does labour demand compare with other farming practices?
6	Traditional early warning signals claimed to be more accurate and reliable than forecasts provided by Department of Climate Change and Meteorological Services	How do traditional early warning signals function to forecast rainfall? Can traditional early warning signals be relied upon?

8.5.3 Training and capacity building institutions

While waiting for results from proposed research topics (Table 8-3) relevant institutions can still proceed with training and capacity building sessions in selected local farming practices. This recommendation is premised on realization that there is limited knowledge about local farming practices in various stakeholders including extension workers. Local communities themselves also require training on topics like application rates of their traditional substances to control insect pests

8.5.4 Policy makers

My findings highlight limited inclusion of some local farming practices in the education curriculum. First it was women who observed this gap in the education curricular during change laboratory workshops, but this was validated by primary education advisors from the two study sites. Therefore, Ministry of Education, Science and Technology should strive to balance modern farming practices and local ones such as cultivation of various local maize cultivars in the education curricular especially in agriculture. However, such an action by Ministry of Education requires policy support and it is in this regard that I suggest review of relevant policies to capture more of local farming practices since this research has unearthed potential of these practices to build local people's resilience against climate change impacts. For example, at a demonstration plot in Makuluni (Nsanama EPA), *kafula* maize matured in about 40 days thus the cultivar provides a good coping mechanism in that it cushions local communities against food shortage before the main harvest. This study has discovered that extension delivery system is at the helm of most contradictions affecting local farming practices.

8.5.5 All other concerned stakeholders

Results have shown that local farming practices are generally not well documented, and they may be forgotten on the way. Therefore, it would be worth making local farming practices more visible by producing and disseminating more radio, television and radio programs, publishing more books, booklets, posters on local farming practices both in English and vernacular.

The study has confirmed that women are the major victims of social and climate injustices. For example, with respect to decision making process in the agriculture sector, men are generally more dominant than women (see section 5.5.2.). All concerned stakeholders should confront this inequality through several approaches including introduction of mandatory quotas (e.g. 50:50 campaigns) to ensure greater gender balance in decision making positions. Stakeholders should raise awareness about and mainstream gender in their programs. They should promote strategies for adaptation through inclusive and consultative processes to give equal participation to both men and women exposed to climate change related risks.

This research has stimulated demand for local maize cultivars especially *kafula*, *bantam* and *kanjerenjere* (see Tables 7-5 and 7-6). Therefore, local seed multiplication under community seedbank arrangements should be considered to meet the increasing local demand.

8.6 Conclusion

This chapter has summarized key results of my research and provided recommendations that require further action. The most crucial recommendation is policy review to ensure local farming practices and the associated informal learning processes have legal backing in Malawi.

Often, in using expansive learning theory, the focus for formative interventionist researchers is to expand learning for the subjects. Likewise, for this study, my main aim was to expand learning for the women subjects to develop their transformative agency in local farming practices via informal learning. While women subjects expanded their learning, I have just discovered that my knowledge was expanding as well. In other words, expansive learning was also taking place within myself, leading to development of personal transformative agency. For example, under section 8.5.1, I have suggested a recommendation to myself, that is, I am '*committing to take action*', which is one of the transformative agency expressions. Furthermore, while women and myself were expanding their learning, little did I know that other community members such as traditional leaders and the youth will also have their agency developed as well.

This was the first time for me to use the concept of expansive learning and I believe I adapted the concept quite well in my study since my research objectives were all met. The tool allows for synergy with other approaches. For instance, in my study expansive learning framework worked well with scenario development methods.

I can only conclude that expansive learning framework is an excellent universal tool that can be adapted to many situations. For example, the tool allows the researcher to decide on whether to **question** (learning action 1) the whole activity system under study or specific elements of the activity system. Even with specific elements, the tool gives room to a researcher to decide on which elements should a researcher focus on. For my study, the elements to be focused were determined through discussions with women during the first change laboratory session. While flexibility is a good thing, but too much of it might dilute the expansive learning framework and that is where, researchers need to be a bit careful. I suggest that researchers need to address the question "how much flexibility can be allowed?"

With so many advantages associated with expansive learning, that I have seen in my study, I recommend the concept to other potential formative intervention researchers.

REFERENCES

- Cole, M., & Scribner, S. (1978). Introduction. In M. Cole , V. John-Steiner , S. Scribner, & E. Souberman, *Vygotsky, Mind in Society. The Development of Higher Psychological Processes* (pp. 6-7). Cambridge: Harvard University Press.
- Nath, A. J., Brahma, B., Lal, R., & Das, A. K. (2016). *Soil and Jhum Cultivation*. Milton Park: Taylor & Francis.
- Abate, T., van Huis, A., & Ampofo, J. K. (2000). Pest Management Strategies in Tropical Agriculture: An African Perspective. *Annu. Rev. Entomol.*, 45, 631–659.
- Abebe, W., Kasim , M., Bizun, K., Lencho , M., Husein , M., Gamadi , H., . . . Tadesse, S. (2017). *Implementation Guide for Farmer Field Schools (FFS)* . Tokyo: JICA.
- Abercrombie, N. H., & Turner, B. S. (2006). *The Penguin dictionary of sociology (5th ed.)*. London: Penguin.
- Abrahams , Y. (2014). Moving forward to go back: Doing Black feminism in the time of climate change. *Agenda*, 28(3), 45-52.
- Adrienne , A.-L., & Nuthall, G. (1992). A Generative Methodology for Classroom Research. *Educational Philosophy and Theory*, 24(2), 29-55.
- Agrawal, A. (1995). Indigenous and Scientific Knowledge: Some Critical Comments. *Indigenous Knowledge and Development Monitor (IKDM)*, 3(3), 3-6.
- Agrawal, A. (2008). *The Role of institutions in Adaptation to Climate Change*. Washington DC: World Bank.
- Ajani, E. N., Mgbenka, R. N., & Okeke, M. N. (2013). Use of Indigenous Knowledge as a Strategy for Climate Change Adaptation among Farmers in sub-Saharan Africa: Implications for Policy. *Asian Journal of Agricultural Extension, Economics & Sociology*, 2(1), 23-40.
- Alexander, P., Nabalamba, A., & Mubila, M. (2011). The Link Between Climate Change, Gender and Development in Africa. , 12,. *The African Statistical Journal*, 12, 119-140.
- Allen, I., Chiotha, S. S., Kalowekamo, F., & Trudel, M. (1996). *National Environmental Education and Communication Strategy, 1996–1999*. Lilongwe: Ministry of Research and Environmental Affairs.
- Altieri , M. A., & Koohafkan, P. (2008). *Enduring Farms: Climate Change, Smallholders and Traditional Farming Communities*. Penang: Third World Network.
- Altieri , M. A., & Nicholls, C. I. (2017). The adaptation and mitigation potential of traditional agriculture in a changing climate. *Climatic Change*, 140, 33-45.
- Alvåsen , K. (2007). *Farmers’ perceptions and handling of livestock manure in urban/peri-urban areas of Kampala, Uganda*. Uppsala: Swedish University of Agricultural Sciences .

- Amer, M., Daim, T. U., & Jetter, A. (2013). A review of scenario planning. *Futures*, 46, 23-40.
- Arche, M., & Bhaska, R. (1998). General Introduction. In A. C. Norrie, *Critical Realism. Essential Readings* (pp. 9-24). New York: Routledge.
- Aya, D. Y., Desta, S., Gebru, G., Kinyangi, J., Recha, J., & Radeny, M. (2015). Opportunities and challenges of indigenous biotic weather forecasting among the Borena herders of southern Ethiopia. *SpringerPlus*, 4(1), 1-11.
- Baker, L. (2006). Observation: A Complex Research Method. . *Library Trends*, 55(1), 171-189.
- Baloi, A. (2017). *Exploring transformative social learning and sustainability in community based irrigation scheme contexts in Mozambique*. Grahamstown: Rhodes University.
- Baltes, B. P., Rees, H. W., & Nesselroade, J. R. (1977). *Life-span developmental psychology: Introduction to Reserach Methods*. Monterey: Brookes/Cole.
- Barrios, E., Delve, D., Bekunda, M., Mowo, J., Agunda, J., Ramisch, J., . . . Thomas, R. J. (2006). Indicators of soil quality: A South-South development of methodological guide for linking local and technical knowledge. *Geordema* 135, 248-259.
- Bateson, G. (1972). *Steps to an ecology of mind*. New York: Ballantine Books. New York: Ballantine Books.
- Berkhout, F., Hertin , J., & Jordan, A. (2001, May 24). Socio-economic futures in climate change impact assessment: using scenarios as 'learning machines'. Norwich, East Succex, UK: Tyndall Centre for Climate Change Research.
- Bhaskar, R. (1975). *A Realist Theory of Science*. Hassocks, England: Harvester Press.
- Blehch , A. (2016). *The Impact of Whatsapp mobile social learning on the achievement and attitudes of female students compared with face to face learning in the classroom*. Educational Technology. Medina: Taibah University.
- Blunden, A. (2011). *An Interdisciplinary Theory of Activity*. Haymarket Books. ISBN 9781608461455. Chicago: Haymarket Books .
- Blyth, M. (2005). *Learning from the future through scenario planning*. London: Shell Foundation.
- Bosk, C. (1979). *Forgive and remember. Managing medical failure (First ed)*. Chicago: Chicago University Press.
- Bouhnik , D., & Deshen , M. (2014). WhatsApp Goes to School: Mobile Instant Messaging between Teachers and Students. *Information Technology Education: Research*, 13, 217-231.
- Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health*, 27(3), 281-291.

- Bowman , G., Bradley , M., Masrani , S., & McKiernan , P. (2013). Storytelling and the scenario process: Understanding success and failure. *Technological Forecasting & Social Change*, 80, 736-748.
- Bradfield, R., Writ, G., Burt, G., Cairns , G., & Van Der Heijden, K. (2005). The origin and evolution of scenario techniques in long range business planning. *Futures*, 37, 975-812.
- Brookfield, H., & Padoch, C. (1994). Appreciating Agrodiversity: A Look at the Dynamism and. *Environment*, 36(5), 31-45.
- Brown, L. D., & Tandon, R. (1978). Interview as catalysis in a community setting. *Journal of Applied Psychology*, 63(5), 197-205.
- Bryman, A. (2001). *Social research methods. USA: Oxford University Press*. Oxford: Oxford University Press.
- Buchanan, J. (1885). *The Shire Highlands (east and central Africa) as colony and mission. William Blackwood and Sons, Edinburgh and London*. Edinburg and london: William Blackwood and Sons.
- Burt, G., & van der Heijden, K. (2003). First steps: towards purposeful activities in scenario thinking and future studies. *Futures*, 35 , 1011–1026.
- Byers, B. A., Cunliffe, R. N., & Hudak, A. T. (2001). Linking the conservation of culture and nature: A case study of sacred forests in Zimbabwe. *Human Ecology*, 29(2), 187-218.
- Carvajal-Escobar, Y., Quintero-Angel, M., & Garc'ia-Vargas, M. (2008). Women's role in adapting to climate change and. *Advances in Geosciences*. 14, 277-280.
- Carvajal-Escobar, Y., Quintero-Angel, M., & Garci'a-Vargas, M. (2008). Women's role in adapting to climate change and variability. *Advances in Geosciences*, 277-280.
- Castellanos-Navarrete , A., Tittone, P., Rufino, M. C., & Giller, K. E. (2015). Feeding, crop residue and manure management for integrated soil fertility management – A case study from Kenya. *Agricultural Systems*, 134 , 24-35.
- Chaiklin, S. (2003). The Zone of Proximal Development in Vygotsky's Analysis of Learning and Instruction. In A. Kozulin, B. Gindis, V. S. Ageyev, & S. M. Miller, *Vygotsky's Educational Theory in Cultural Context* (pp. 39-64). New York: Cambridge University Press.
- Changming, D., & Hill, C. E. (1996). The Current State of Empathy Research. *Journal of Counseling Psychology*, 261-274.
- Chavula, G., Zambezi, F., Tsirizeni, M., Mmangisa, M., Ntupanyama, Y., & Gondwe, K. (2017). Exploring the Future of Malawi's Environment Using Scenarios Approach. *Scientific Research Publishing*, 8, 837-856.
- Chen, J.-H. (2006). *The Combined Use of Chemical and Organic Fertilizers and/or Biofertilizer for Crop growth and Soil fertility*. New Taipei: National Chung Hsing University.

- Chilima, C., Soko, M., Pemba, D., & Phiri, G. (2018). Insect outbreaks in the Lake Chilwa Basin. In S. Chiotha, D. Jamu, J. Nagoli, P. Likongwe, & T. Chanyenga, *Socio-Ecological Resilience to Climate Change in a Fragile Ecosystem* (pp. 181-193). New York: Routledge.
- Chinsinga, B., & Chasukwa, M. (2012). Youth, Agriculture and Land Grabs in Malawi. *IDS Bulletin*, 43(6), 67-76.
- Chiotha, S. S., Jamu, D., Nagoli, J., Tembo, C., & Likongwe, P. (2018). *Socio-Ecological Resilience in a Fragile Ecosystem. The case of the Lake Chilwa Basin, Malawi*. New York: Routledge.
- Chiotha, S. S., Phalira, W., & Mphepo, G. Y. (2011). *Scientific Validation of Traditional Early warning Signals for droughts and floods in Chikhwawa and Nsanje Districts, Malawi*. Blantyre: Goal Malawi.
- Chiu, D. K., Wang, M., Popescu, E., Li, Q., & Lau (Eds), R. (2012). *New Horizons in Web Based Learning*. New York: Springer.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education (7th ed.)*. London: Routledge, Taylor and Francis (7 ed.). London: Routledge, Taylor and Francis.
- Cole, S. M., Kantor, P., Sarapura, S., & Rajaratnam, S. (2014). *Gender-transformative approaches to address inequalities in food, nutrition and economic outcomes in aquatic agricultural systems*. Penang: CGIAR Research Program on Aquatic Agricultural Systems.
- Corno, L. (1994). Student volition and education: Outcomes, influences and practices. In D. H. Schunk, & B. J. Zimmermann (Eds.), *Self-regulation of learning and performance. Issues and educational applications* (pp. 229-254). Hillsdale NJ: Erlbaum.
- Creswell, J. W. (2003). *Research Design: Qualitative, quantitative and mixed methods approaches* (2nd ed.). London: Sage.
- Cromwel, E., Kambewa, P., & Mwanza, R. (2001). *IMPACT ASSESSMENT USING PARTICIPATORY APPROACHES: 'STARTER PACK' AND SUSTAINABLE AGRICULTURE IN MALAWI*. London: Agricultural Research & Extension Network.
- D'Alisa, G., & Kallis, G. (2015). Post Normal Science. In G. D'alisa, F. Demaria, & G. Kallis, *Degrowth. A vocabulary for a new era*. (p. 252). New York: Routledge.
- D'alis, G., & Kallis, G. (2015). Post-Normal Science. In G. D'Alis, F. Demaria, & G. Kallis, *Degrowth: A vocabulary for a new era* (pp. 217-220). London and New York: Routledge.
- Dator, J. A. (2002). *Advancing Futures. Future Studies in Higher Education*. London: Libray of Congress.
- David, P. (2011). *Weather Lore and Proverbs*. Ottawa: Canadian Meteorological and Oceanographic Society.

- Davidson, J. L., Jacobson, C., Lyth, A., Dedekorkut-Howes, A., Baldwin, C. L., Ellison, J. C., . . . Smith, T. F. (2016). Interrogating resilience: toward a typology to improve its operationalization. *Ecology and Society*, 21(2), 1-15.
- Davydov, V. V. (1990). *Types of Generalization in Instruction: Logical and psychological problems in the structuring of school curricula*. Reston: Reston, VA: National Council of Teachers of Mathematics.
- Dawoe, E. K., Quashie-Sam, J., Isaac, M. E., & Oppong, S. K. (2012). Exploring farmer's local knowledge and perceptions of soil fertility and management in the Ashanti Region of Ghana. *Geoderma*, 96-103.
- de Lange, E., Balmer, D., Mauch-Mani, B., & Turlings, T. C. (2014). Insect and pathogen attack and resistance in maize and its wild ancestors, the teosinte. *New Phytologist*, 204, 329–341.
- Denbow, J., & Phenyio, T. C. (2006). *Culture and Customs of Botswana*. London: Greenwood Press.
- Djoudi, H., & Brockhaus, M. (2011). Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali. *International Forestry Review*, 2, 123-135.
- Dondi, C., & Holmes, B. (2004). *Quality Guide to the non-formal and informal Learning Processes*. Mumbai: MENON Network EEIG.
- Duncana, A. J., Bachewe, F., Mekonnen, K., Valbuena, D., Rachierd, G., Lule, D., . . . Erenstein, O. (2016). Crop residue allocation to livestock feed, soil improvement and other uses along a productivity gradient in Eastern Africa. *Agriculture, Ecosystems and Environment*, 228, 101–110.
- Edward, C. R., & Thompson, M. C. (2013). *Gender and Climate Change in Agrarian Settings*. New York: USAID.
- Edwards, A. (2005). Relational Agency: Learning to be a resourceful person. *International journal of education research*, 43(5), 168-182.
- Edwards, A. (2005a). Let us get beyond community and practice: The many meanings of learning by participation. *The Curriculum Journal*, 16(1), 49-65.
- Elia, E. F., Mutula, S., & Stilwell, C. (2014). Indigenous Knowledge use in seasonal weather forecasting in Tanzania: the case of semi-arid central Tanzania;. *South African Journal of Libraries and Information Science*;; 80(1), 1-26.
- Elia, E. F., MutulaStilwell, Chr, S., & Stephen, C. (2014). Indigenous Knowledge use in seasonal weather forecasting in Tanzania: the case of semi-arid central Tanzania. *SA Jnl Libs & Info Sci*, 80(1), 18-28.
- Engeström, Y., & Miettinen, R. (1999). Introduction. In Y. R. Engeström, *Perspectives on activity theory* (pp. 1-18). Cambridge: Cambridge University Press.

- Engestrom , Y., & Sannino , A. (2011). Discursive manifestations of contradictions in organizational change efforts A methodological framework. *Journal of Organizational Change Management*, 24(3), 368-387.
- Engeström, Y. (1987). *Learning by expanding: An activity theoretical approach to developmental research*. . Orienta-Konsultit: Helsinki.
- Engeström, Y. (1999b). Expansive visibilization of work: An activity-theoretical perspective. Computer Supported Cooperative Work. Special issue on a web on the wind. *The structure of invisible work*, 8(1), 63-93.
- Engeström, Y. (2001). Expansive learning at work: Towards an activity theoretical re-conceptualisation. *Journal of Education and Work*, 14(1), 133-156.
- Engestrom, Y. (2015). *Learning by Expanding. Second Edition. An Activity Theoretical Approach to Developmental Research*. London: Cambridge University Press.
- Engeström, Y. (2016). *Studies in Expansive. Learning what is not there*. Cambridge: Cambridge University Press.
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review*, 5, 1-24.
- Engestrom, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research*, 5, 1-24.
- Ensor , J., & Harvey, B. (2015). Social learning and climate change adaptation: evidence for international development practice. . *WIREs Clim Change*, 6(10), 509–522.
- Erenstein, O., Samaddat, A., Teufels, N., & Michael, B. (2011). The Paradox of Limited Maize Stover Use in Indias Smallholder Crop-Livestock Systems. *Expl Agric volume*, 47(4), 677-704.
- Fahey, L., & Randal, R. M. (1998). *Learning from the future: Competitive Foresight Scenarios*. New York: John Wiley and Sons, Inc.
- Fern, E. (1982). The use of focus group discussions for idea generation : effects of group size, acquaintanceship and modertaion on response quality and quantity. *Marketing Research*, 19(1), 1-13.
- Flick, U., von Kardorff, E., & Steinke, I. (2004). *A Companion to qualitative research*. London: SAGE Publications.
- Foot, K. (2014). *Cultural-Historical Activity Theory: Exploring a Theory to Inform Practice and Research*. Washington: University of Washsington.
- Frederick , K. N. (2016). Strategies for dealing with sin in relation to poverty. *Stellenbosch Theological Journal*, 2(2), 273-294.
- Garcí a de Jalo ´n , S., Silvestri , S., & Granados, A. (2015). Behavioural barriers in response to climate change in agricultural. *Reg Environ Change*, 851-865.
- Gass, R. (2012). *What is transformation? And how it advances social change*. California: Social Tranformation Project.

- Getz, K. A. (2002). *Informed Consent Process. A Survey of Subjects Assesses Strengths and Weaknesses*. Unknown: Unknown.
- Gifford , R. (2011). The Dragons of Inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*, 66(4), 290-302.
- Gillingham , M. G., & Topper, A. (1999). Technology in teacher preparation: Preparing teachers for the future. *Journal of Technology & Teacher Education*, 7(4), 303-321.
- Gliessman, S. R., & Garcia, R. (1981). The ecological basis for the application of traditional agricultural technology in the management of tropical agro-ecosystems. *Agro-Ecosystems*, 7, 173--185.
- Global-Global. (2014). *Respondent-Driven Sampling: A Resource Guide for Steering Committee Members*. Unknown: PEPFAR. Retrieved from <https://www.nastad.org/sites/default/files/Appendix2-6-RDS-Resource-Guide.pdf>
- GoM. (1996). *National Environmental Education and Communication Strategy*. Lilongwe: Ministry of Research and Environmental Affairs.
- GoM. (2010). *The National Agricultural Policy. Promoting agricultural productivity for national food security and economic growth and development through value chain development*. Lilongwe: Ministry of Agriculture and Food Security.
- GoM. (2013). *Malawi's Strategy on Climate Change Learning*. Lilongwe: Ministry of Environment and Climate Change Management.
- GoM. (2013). *National Climate Change Investment Plan*. Lilongwe: Ministry of Environment and Climate Change Management.
- GoM. (2016). *National Agriculture Policy*. Lilongwe: GoM.
- GoM. (2018). *National Seed Policy*. Lilongwe: GoM.
- GoM, . (2017). *The Malawi Growth and Development Strategy*. Lilongwe: Ministry of Finance, Economic Planning and Development.
- GoM, x. (2011). *Guide to Agricultural Production and Natural Resources Management in Malawi*. Lilongwe: GoM.
- Green, E. (2009). A Lasting Story: Conservation and Agricultural Extension Services in Colonial Malawi. *Journal of African History*, 50(2), 247-267.
- Gronemeyer, R., Fink , M., & Metzger, J. (2015). *Maize and malnutrition in Malawi. A study of the socio-economic causes of unbalanced food cropping in Dedza and Salima Districts*. Lilongwe: Gesellschaft für Internationale Zusammenarbeit (GIZ).
- Grzywacz , D., Stevenson , P., Mushobozi , W., Belmain , S., & Wilson, K. (2014). The use of indigenous ecological resources for pest control in Africa. *Food Sec.*, 6, 71-86.
- Gyöngyi , K., & Spens, M. K. (2005). Abductive reasoning in logistics research. *International Journal of Physical Distribution & Logistics Management*, 35(2), 132-144.

- Haapasaari, A., & Hannele Kerosuo. (2015). Transformative agency: The challenges of sustainability in a long chain of double stimulation. *Learning, Culture and Social Interaction*, 4, 37-47.
- Haluza-DeLay, R. (2014). *Religion and Climate Change: Varieties in Viewpoints and Practices*. Alberta: The King's University College.
- Hanington , B. M. (2007). *Generative Reserach in Design Education*. Hongkong: International Association of Societies of Design Research.
- Harrison, G. (2001). Peasants, the agrarian question and lenses of development. *Progress in Development Studies*, 1(3), 187-203.
- Harvey, D. (2014). *Seventeen Contradictions and the End of Capitalism*. London: Unknown.
- Heikkilä, H., & Seppänen, L. (2014). Examining Developmental Dialogue: the Emergence of Transformative Agency. *Outlines-Critical Practice Studies*, 15(2), 5-30.
- Heisey , P. W., & Smale, M. (1995). *Maize Technology in Malawi: A Green Revolution in the Making?* Mexico City: CIMMYT.
- Herrero, M., Henderson, B., Havlík, P., Philip, K., Conant, R. T., Smith, P., . . . Stehfest, E. (2016). Greenhouse gas mitigation potentials in the livestock sector. *Nature Climate Change*, 6, 452-461.
- Hicks, D. (2012). *Sustainable Schools, Sustainable Futures A resource for teachers*. Gland: WWF.
- Hilal, A. H., & Said, S. (2013). Using NVivo in data analysis for qulaitative reserach. *International Interdisciplinary Journal of Education*, 181-186.
- Holden, S. T., & Fisher, M. (2012). *Can Adoption of Improved maize varieties help smallholder farmers adapt to drought? Evidence from Malawi*. Trondheim: Norwegian University of Life Sciences.
- Holden, S., & Mangisoni, J. (2013). *Input subsidies and improved maize varieties in Malawi: -What can we learn from the impacts in a drought year?* Ås Norway: Norwegian University of Life Sciences.
- Hopwood, N., & Gottschalk, B. (2017). Double stimulus 'in the wild': Services for families with Children at-risk. *Learning, Culture and Social Interaction*, 13, 23–37.
- Huss , W. R., & Honton , E. J. (1987). Scenario Planning Should You Use? *Long Range Planning*, 20(4), 21-29.
- Illeris, K. (2003). Workplace learning and learning theory. *Journal of Workplace Learning*, 15(4), 167-178.
- Inayatullah, S. (2008). Six pillars: futures thinking for transforming. *Foresight*, 10(1), 4-21.
- IPCC. (2007). *Climate Impacts, adaptation and Vulnerbility. Contribution of working group II to the Intergovernmental Pannel on Climate Change. Fourth Assessment Report*. Geneva: IPCC.

- IPCC. (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- IPCC. (2014). *Annex II: Glossary [Mach, K.J., S. Planton and C. von Stechow (eds.)]. In: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: IPCC.
- IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the IPCC*. Geneva: IPCC.
- IPCC. (2014). *Climate Change 2014-Impacts, Adaptation and Vulnerability: Regional Aspects (1 ed.)*. . Cambridge:: Cambridge University Press.
- Irish-Aid, . (2016). *Malawi Climate Action Report* . Lilongwe: Action-Aid.
- Irma, A., Sosten , C. S., Kalowekamo, F., & Trudel, M. (1996). *National Environmental Education and Communication Strategy, 1996–1999. Lilongwe, Malawi: Ministry of Research and Environmental Affairs, 1996*. Lilongwe: Ministry of Research and Environmental Affairs.
- Isaacs , S. (2012). *Turning on mobile learning in Africa and the Middle East*. Paris: UNESCO.
- Jahnke, H. E. (1982). *Livestock production systems and livestock development in tropical Africa*. -: Kieler Wissenschaftsverlag Vauk.
- JAICAF. (2008). *The Maize in Malawi and Zambia*. Tokyo: Japan Association for International Collaboration of Agriculture and Forestry.
- Jakku, E., Thorburn, P., Marshall, N., Dowd, A.-M., Howden, S., Mendham, E., . . . Brandon, C. (2016). Learning the hard way: a case study of an attempt at agricultural transformation in response to climate change. *Climate Change*, 137(3), 557–574.
- Jalasi, E. M. (2018). *Investigating and Expanding Learning across Activity System Boundaries in Improved Cook Stove Innovation Diffusion and Adoption in Malawi* . Grahamstown: Rhodes University.
- Jamu, D., Chapotera, M., & Likongwe, P. (2012). *Lake Chilwa water monitoring report. Zomba: LCBCCAP*. Zomba: LCBCCAP.
- Jones , L., & Boyd, J. (2011). Exploring Social Barriers to adaptation: Insights from Western Nepal. *Global Environmental Change*,, 21, 1262-1274.
- Jones, N., Koukoulas, S., Clark , J., Dimitrakopoulos, P., Eftihidou, M., & Tsaliki, P. (2014). Social capital and citizen perceptions of coastal management for tackling climate change impacts in Greece. *Reg Environ Change*, 14, 1083-1093.
- Jørstad, H. (2012). *Utilising Local Knowledge for Climate Change Adaptation.A Case Study of the Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP), Malawi*. Kristiansand: University of Agder.

- Kaatrakoski, H., Littlejohn, A., & Nina, H. (2017). Learning challenges in higher education: an analysis of contradictions within Open Educational Practice. *High Education*, 74(5), 99–615.
- Kachilonda, D. (2014). *Investigating and expanding learning in fisheries resources to inform extension training*. Grahamstown: Rhodes University.
- Kafumbata, D., Jamu, D., & Chiotha, S. (2014). Riparian ecosystem resilience and livelihood strategies under test: lessons from Lake Chilwa in Malawi and other lakes in Africa. *Phil. Trans. R. Soc*, 1-8.
- Kalanda-Joshua, M., Ngongondo, C., & Chipeta, L. (2011). Integrating indigenous knowledge with conventional science: Enhancing localised climate and weather forecasts in Ntchanga, Mulanje, Malawi. *Physics and Chemistry of the Earth*, 36(10), 996-1003.
- Kansiime, M., & Mastenbroek, A. (2016). Enhancing resilience of farmer seed system to climate-induced stresses: Insights from a case study in West Nile region, Uganda. *Journal of Rural Studies*, 47, 220-230.
- Kaptelinin, V. (2005). Perspectives on the object of activity. *Mind, Culture and Activity*, 12(1), 4-18. *Mind, Culture and Activity*, 12(1), 4-18.
- Karababa, E. (2006). Physical properties of popcorn kernels. *Journal of Food Engineering*(72), 100-107.
- Karabine, E., Lemma, A., Dupar, M., Jones, L., & Malugetta, Y. (2016). *The IPCC's Fifth Assessment Report. What's in for Africa?* London: CDKN.
- Kates, R., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *PNAS*, 109(19), 7156–7161.
- Kayira, J. (2013). *Re-Learning our Roots: Youth Participatory Research, Indigenous Knowledge, and Sustainability through Agriculture*. Saskatoon: University of Saskatchewan.
- Kemmis, S. (2009). Action Research as a practice-changing practice. *Educational Action Research*, 17(2), 463-474.
- Knut, A., & Jere, V. K. (2014). *Lead Farmer Extension and Training Guide on Sustainable Agriculture*. Lilongwe: Development Fund of Norway.
- Koszalka, T. A., & Wu, C.-P. (2001). *A cultural historical activity theory [CHAT] analysis of technology integration: Case study of two teachers*. New York: Syracuse University.
- Kumwenda, S., Msefula, C., Kadewa, W., Ngwira, B., & Morse, T. (2014). *Is manure from ecological sanitation latrines safe for use to fertilize crops? A review of evidence from literature*. Zomba: University of Malawi.

- Kuutti, K. (1995). Activity Theory as a potential framework for humancomputer interaction research. In B. Nardi, *Context and Consciousness: Activity Theory and Human Computer Interaction* (pp. 17-44). Cambridge: Cambridge.
- Laala, M. (2011). Lifelong learning: What does it mean? *Procedia - Social and Behavioral Sciences*, 28(4), 470-474.
- Lambert, C., & McSherry, W. (2010). Reflexivity: a review of the literature in the context of midwifery research. *British Journal of Midwifery*, 18(5), 321-326.
- Lantolf, J. P. (2000). *Sociocultural Theory and Second Language Learning*. Oxford: Oxford University Press.
- Latchem, C. (2014). Informal Learning and NonFormal Education for Development. *Journal of Learning for Development*, 1(1), 1-13.
- Lazarus, R. (2009). *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*. Washington DC: Cornell.
- LCBCCAP. (2010). *Hotspot Identification Report*. Zomba: Unpublished.
- Lemtiri, A., Degruene, F., Barbieux, S., Marie-Pierre Hiel, Chélin, M., Parvin, N., . . . Colinet, G. (2016). Crop residue management in arable cropping systems under temperate climate. Part 1: Soil biological and chemical (phosphorus and nitrogen) properties. A review. *Biotechnol. Agron. Soc. Environ.* 2016, 20(1), 236-244.
- Lenin, V. I. (1976). *Collected Works, Volume 38. Philosophical notes*. Moscow: Progress Publishers.
- Leont'ev, A. N. (1978). *Activity, consciousness and personality*. Englewood Cliffs, NJ: Prentice Hall.
- Lotz-Sisitka, H. (2012). *(Re) Views on Social Learning Literature: A monograph for social learning researchers in natural resources management and environmental education*. Grahamstown: Rhodes University.
- Lotz-Sisitka, H., Mutizwa, M., Chikunda, C., Baloi, A., & Pesanayi, T. (2017). Transgressing the norm: Transformative agency in community-based learning for sustainability in southern African contexts. *Int Rev Educ*, 63, :897–914.
- Luca, B., Costamagna, C., Zavattaro, L., Grignani, C., & Bijttebier, J. (2015). Barriers and Drivers Towards the Incorporation of Crop Residue in the Soil. Analysis of Italian Farmers' Opinion With the Theory of Planned Behaviour. *Italian Journal of Agronomy*, 10(663), 178-184.
- Macintyre, T., Lotz-Sisitka, H., Wals, A., Vogel, C., & Tassone, V. (2017). Towards transformative social learning on the path to 1.5 degrees. *Sustainability*, 31, 80-87.
- Mahoo, H., Mbungu, W., Yonah, I., Recha, J., Radeny, M., Kimeli, P., & Kinyangi, J. (2015). *Integrating Indigenous Knowledge with Scientific Seasonal Forecasts for Climate Risk Management in Lushoto District in Tanzania. CCAFS Working Paper no. 103. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*. Copenhagen: CGIAR.

- Mansour, H., Zaki , N., Abdelhai, R., Sabry, N., Silverman , H., & El-Kamary, S. S. (2015). Investigating the informed consent process, therapeutic misconception and motivations of Egyptian research participants: a qualitative pilot study. *Eastern Mediterranean Health Journal*, 155-163.
- Mapfumo, P., Mtambanengwe , F., & Chikowo, R. (2016). Building on indigenous knowledge to strengthen the capacity of smallholder farming communities to adapt to climate change and variability in southern Africa. *Climate and Development*, 6(1), 72-82.
- Mariwah, S., & Drangert, J.-O. (2011). Community perceptions of human excreta as fertilizer in peri-urban agriculture in Ghana. *Waste Management & Research*, 1-10.
- Martelli, A. (2001). Scenario building and scenario planning: state of the art and prospects of evolution. *Futures Research Quarterly*, 17, 57-70.
- Masangano, C. M., Chiwasa, H., Kambewa, D. K., Kakwera, M., Chimombo, M., Marriam , M., & Gausi, W. (2016). Making the demand driven extensions services systems work through decentralised structures: Prospects for the future extension service delivery in Malawi . *Journal of Agricultural Extension and Rural Development* , 227-236.
- Masara, C. (2010). *Learning commercial beekeeping: Two cases of social learning in southern African community natural resources management contexts*. Grahamstown: Rhodes University.
- Matewele , M., & Singano , C. (2015). The breeding potential of local maize varieties as source of resistance to the maize weevil and larger grain borer in Malawi. *Malawi Journal of Agriculture, Natural Resources & Development*, 21-30.
- Mathugama , S. C., & Peiris , T. S. (2011). Critical Evaluation of Dry Spell Research. *International Journal of Basic & Applied Sciences*, 11(6), 153-160.
- Maxwel, J. (2009). Designing a qualitative study. In L. Bickman, & D. J. Rog, *The handbook of applied social research methods* (2nd ed., pp. 214-253). California, California, Thousand Oaks: Sage.
- Maxwell, J. (1992). Understanding validity in qualitative research. *Harvard Education Review*, 62(3), 279-300.
- Maxwell, J. (2012). *A realist approach to qualitative research*. California: SAGE.
- Maxwell, J. (2013). *Qualitative research design: An interactive approach* (3rd ed.). Thousand Oaks, California: Sage.
- McCann, J. (2001). *Maize and Grace: History, Corn, and Africa's New Landscapes, 1500–1999*. Cambridge: Cambridge.
- McGray, H., Hammil , A., Bradley, R., & Schpper, E. (2007). . *WeatHering tHe storm options for framing adaptation and development*. Washington DC: World Resources Institute.
- McKenzie, R. H. (2008). *Managing Livestock Manure*. Lethbridge: Alberta.

- Mefalopulos, P. (2008). *Development Communication Sourcebook: Broadening the Boundaries of Communication*. New York: The International Bank for Reconstruction and Development/The World Bank.
- Merriam, S. (2009). *Qualitative research: A guide to design and implementation, revised and expanded from qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
- Mersha, A., & Van Laerhoven, F. (2016). A gender approach to understanding the differentiated impact of barriers to adaptation: responses to climate change in rural Ethiopia. *Reg Environ Change*, 16, 1701–1713.
- Midega, C. A., Alice, M. W., Pittchar, J. O., & Khan, Z. R. (2016). Managing storage pests of maize: Farmers' knowledge, perceptions and practices in western Kenya. *Crop Protection*, 90, 142-149.
- Mihale, M. J., Deng, A. L., Selemani, H. O., Mugisha-Kamatenesi, M., & Kidukuli, W. (2009). Use of indigenous knowledge in the management of field and storage pests around Lake Victoria basin in Tanzania. *African Journal of Environmental Science and Technology*, 3(9), 251-259.
- Miles, M., & Huberman, A. (1994). *Qualitative data analysis. (p56) California: Sage Publications Inc. California: Sage Publications*.
- MoAFS. (2011). *Malawi agricultural sector wide approach. A prioritised and harmonised Agricultural Development Agenda: 2011-2015*. Lilongwe: Ministry of Agriculture and Food Security.
- Moncrieffe, J. M. (2004). *Power Relations, Inequality and Poverty*. London: Overseas Development Institute.
- Morales, H., & Ivette, P. (2000). Traditional knowledge and pest management in the Guatemalan highlands. *Agriculture and Human Values*, 17, 49–63.
- MoSTE. (2015). *Indigenous and Local Knowledge and Practices for Climate Resilience in Nepal, Mainstreaming Climate Change Risk Management in Development*. Kathmandu: Ministry of Science, Technology and Environment (MoSTE).
- Moyo, B. (2010). *The use and role of indigenous knowledge in small-scale agricultural systems in Africa: the case of farmers in northern Malawi. PhD thesis*. Glasgow: Glasgow University.
- Mphepo, G., Phalira, W., & Chiotha, S. S. (2011). *When and what to plant: the challenges to farmers of shifting onset of rainfall in Domasi Extension Planning Area, Machinga District in Malawi*. Zomba: LEAD.
- Mukute, M. (2010). *Exploring and expanding learning processes in sustainable agriculture workplace contexts. Thesis submitted in fulfilment of the requirements of the Degree of Doctor of Philosophy*. Grahamstown: Rhodes University.
- Munthali, G. K., Saka, J., Kamudonyo, D. R., Kasulo, V., Nkhokwe, J. L., & Kainja, J. (2003). *Drought Case Study for Malawi*. Blantyre: AIACC Project AF38.

- Murphy , E., & Rodriguez-Manzanares, M. A. (2008). Using activity theory and its principle of contradictions to guide research in educational technology. *Australasian Journal of Educational Technology*, 24(4), 442-457.
- Murphy, C., Tembo, M., Phiri, A., Yerokun, O., & Grummel, B. (2016). Adapting to climate change in shifting landscapes of belief. *Climatic Change*, 134, 101–114.
- Mutangadura , G. (2004). *Land in Africa: Market Asset, or Secure Livelihood? Women and Land Tenure Rights in Southern Africa: A human rights-based approach*. London: Church House, Westminster.
- Mutonyi, H. (2016). Stories, Proverbs, and Anecdotes as Scaffolds for Learning Science Concepts. *Journal of Research in Science teaching*, 53(6), 943–971.
- Mvula, P., & Mulwafu, W. (2018). Intensification, Crop Diversification, and Gender Relations in Malawi. In A. A. Djurfeldt, M. Fred , & A. C. Isinika, *Agriculture, Diversification, and Gender in Rural Africa. Longitudinal Perspectives from Six Countries* (pp. 180-197). Oxford: Oxford University Press.
- Nagoli , J., & Chiwona-Karlton, L. (2017). Uncovering human social networks in coping with Lake Chilwa recessions in Malawi. *Journal of Environmental Management*, 192, 134-141.
- Nagoli, J. (2016). *A Lake without Water. Livelihood coping strategies during the Lake Chilwa water recessions in Malawi. Doctoral Thesis*. Uppsala: Swedish University of Agricultural Sciences.
- Nagoli, J., & Chiwona-Karlton, L. (2017). Uncovering human social networks in coping with Lake Chilwa recessions in Malawi. *Journal of Environmental Management*, 134-141.
- Nagoli, J., Binauli, L., Chijere, A., & Chiotha, S. (2018). Too big to ignore. Gender and climate change adaptation in the Lake Chilwa Basin. In S. Chiotha, D. Jamu, J. Nagoli, P. Likongwe, & T. Chanyenga, *Socio-Ecological Resilience to Climate Change in a Fragile Ecosystem. The case of the Lake Chilwa Basin, Malawi* (pp. 149-160). London: Routledge.
- Nagoli, J., Green, E., Mulwafu, W., & Chiwona-Karlton, L. (2017). Coping with the Double Crisis: Lake Chilwa Recession and the Great Depression on Chisi Island in Colonial Malawi, 1930–1935. *Human Ecology*, 1-7.
- Nankhuni, F. J. (2016). *Background Paper on Agricultural Extension and Advisory Service Delivery in Malawi. Feed the Future Innovation Lab for Food Security Policy Research Paper 51*. East Lansing: Michigan State University.
- Nardi, B. A., & Kaptelinin, V. (2006). *Acting with technology : activity theory and interaction design*. Cambridge: Cambridge.
- National Statistical Office. (2018). *2018 Population and Housing Census*. Zomba: GoM.
- Nelson, C. (2002). *Contradictions in learning to write in a second language classroom: Insights from radical constructivism, activity theory, and complexity theory*. Austin: University of Texas at Austin.

- Ngwese, M. N., Saito, O., Akiko, S., Boafo, Y. A., & Jasaw, G. (2018). Traditional and Local Knowledge Practices for Disaster Risk Reduction in Northern Ghana. *Sustainability*, 825-842.
- Njaya, F., Snyder, K. A., Jamu, D., Wilson, J., Howard-Williams, C., Allison, E. H., & Neil, A. L. (2011). The natural history and fisheries ecology of Lake Chilwa, southern Malawi. *Journal of Great Lakes Research*, Unknown.
- Njaya, F. J. (2001). *Review of Management Measures for the Lake Chilwa, Malawi*. Zomba: Fisheries Department.
- NSO. (2012). *Integrated Household Survey 2010-2011*. Lilongwe: National Statistical Office.
- Osborne, H. (2007). *Building Resilience: Adaptation Mechanisms and Mainstreaming for the poor*. Oxford: Oxford Press.
- Ostrouch-Kamin'ska, J., & Vieira, C. (2015). *Private World(s). Gender and Informal Learning*. Rotterdam: Sense Publishers.
- Panagoulia, D., & Dimou, G. (2015). *Definitions and effects of droughts*. Athens: National Technical University of Athens.
- Paul, E. A. (2014). *Soil microbiology, ecology and biochemistry*. London: Academic Press.
- Pesanayi, T. V. (2019). *Boundary-crossing learning in agricultural learning systems: formative interventions for water and seed provision in southern Africa*. Grahamstown: Rhodes University.
- Pihlaja, J. (2005). *Learning in and for production. An Activity-Theoretical Study of the Historical Development of Distributed Systems of Generalizing*. Helsinki: University of Helsinki.
- Pillkahn, U. (2008). *Using Trends and Scenarios as Tools for Strategy Development*. Erlangen, Germany: Publicis Corporate Publishing.
- Pimmer, C., Mhango, S., Francis, M., & Mzumara, A. (2017). Mobile Instant Messaging for rural community health workers. A case from Malawi. *Global Health Action*, 10(1), 1-22.
- Porter, A. L. (2010). Technology foresight: types and methods. *Int. J. Foresight and Innovation Policy*, 6(1), 36-45.
- Prasanna, B. M., Joseph, H. E., Eddy, R., & Peschke, V. M. (2018). *Fall Armyworm in Africa: A GUIDE FOR INTEGRATED PEST MANAGEMENT. First Edition*. Mexico City: CDMX; CIMMYT.
- QSR. (2017). *NVivo 11 Pro for Windows. Getting Started Guide*. Unknown, Unknown, United States of America: QSR International.
- Ramisch, J. J. (2014). They don't know what they are talking about: Learning from the dissonances in dialogue about soil fertility knowledge and experimental practice in western Kenya. *Geoforum*, 55, 120-132.

- Ramphele, M. (2004). Womens' Indigenous knowledge: Building Bridges Between the Traditional and the Modern. In W. Bank, *Indigenous Knowledge: Local Pathways to Global Development* (pp. 13-17). World Bank.
- Reason, P., & Rowan, J. (1981). *Human inquiry: A sourcebook of new paradigm research*. Chichester: John Wiley.
- Resurreccion, B. P. (2013). Persistent Women and Environmental Linkages in Climate Change and Sustainable Development Agendas. *Women's Studies and International Forum*, 40, 33-43.
- Ricker-Gilberta,, J., Jumbeb, C., & Chamberlinca, J. (2014). How does population density influence agricultural intensification and productivity? Evidence from Malawi. *Food Policy*, 48, 114-128.
- Ringland, G. (1998). *Scenario Planning. Managing for the future*. Succex: John Willy and Sons Ltd.
- Rodgers, B. (2016). Miyambi Ya Patsokwe.
- Roggema, R., Vermeend , T., & van den , D. (2012). Incremental Change, Transition or Transformation? Optimising Change Pathways for Climate Adaptation in Spatial Planning. *Sustainability*, 2525-2549.
- Roth , L. R., & LaCroix, L. (2012). Working With Cultural-Historical Activity Theory. *Forum: Qualitative Social Research*, 13(2), 50-62.
- Roth , W.-M., & Lee , Y.-J. (2007). Vygotsky's neglected legacy": Cultural-historical activity theory. *Review of Educational Research*, 77(2), 186-232.
- Roxburg, C. (2009). *The use and abuse of scenarios*. London: McKinsey's .
- Rusinamhodzia, L., Corbeelsa, M., & Giller, K. E. (2016). Diversity in crop residue management across an intensification gradient in southern Africa: System dynamics and crop productivity. *Field Crops Research*, 185, 79–88.
- Ruth , M.-D., Amber, P., Agnes , Q. R., Meinzen-Dick, R., Greg , S., & Ana , V. (2013). *The Women's Empowerment in Agriculture Index*. Oxford: Oxford Poverty & Human Development Initiative.
- Sachs , C. E. (2018). *Gendered Fields: Rural Women, Agriculture, and Environment*. Newyork: Routledge.
- Sagona, W., & Mahonya, S. (2018). Enhancing household resilience through climate smart agriculture. In S. Chiotha, D. Jamu, J. Nagoli, P. Likongwe, & T. Chanyenga, *Socio-Ecological Resilience to Climate Change in Fragile Ecosystem. The case of Lake Chilwa Basin, Malawi* (pp. 101-121). London: Routledge.
- Said, S., & Hilal , A. H. (2013). Using Nvivo for data analysis in qulatatitive research. *International Interdisciplinary Journal of Education*, 2(2), 181-186.

- Sandra , C., Marjolein , G., van Asselt , B., Grosskurth , J., Storms , C. A., Rijkens-Klomp , N., . . . Rotmans, J. (2000). *An assessment of recent European and global scenario studies and models*. Copenhagen: Euopen Environmental Agency.
- Sannino , A., Engeström, Y., & Lemos, M. (2016). Formative Interventions for Expansive Learning and Transformative Agency. *Journal of the Learning Science*, 25(4), 599-633.
- Sawchuck, P. H., Duarte, N., & Elhammoumi, M. (2006). *Critical Perspectives on Activity*. Newyork: Cambridge University Press.
- Sawchuck, P. H., Duarte, N., & Elhammoumi, M. (2006). *Critical Perspectives on Activity. Explorations Across Education, Work and Every Day Life*. New York: Cambridge University Press.
- Saxena, P. (2015). JOHARI WINDOW: An Effective Model for Improving Interpersonal Communication and Managerial Effectiveness. *SIT Journal of Management*, 5(2), 134-146.
- Schugururensky, D. (2000). *The Forms of Infmral Learning: Towards a conceptualization of the field*. Ontario: Centre for the Study of Education and Work.
- Schwartz, M. S. (2001). The nature of the relationship between corporate codes of ethics. *Journal of Business Ethics*, 32(3), 247-262.
- Sefton-Green, J. (2007). *Literature Review in Informal Learning with Technology Outside School*; . Bristol: Futurelab.
- Semali, L. M., & Kincheche, J. L. (2011). What is indigenous knowledge and why should we study it. In L. Semali, *What is indigenous knowledge? Voices from the academy* (pp. 3-22). New York: Retoutledge.
- Serdeczny, O., Adams, S., Coumou, D., Robinson, A., Hare, W., Schaeffe, M., . . . Reinhardt, J. (2016). Climate change impacts in Sub-Saharan Africa: from physical changes to their social repercussions. *Regional Environmental Change*, -.
- Shackleton , S., Ziervogel, G., Saillu, S., Gill, T., & Tschakert, P. (2015). Why is socially just climate change adaptation so challenging in Sub-saharan Africa? A Review of barriers identified from empirical cases. 6(Unknown). *WIREs Climate change*,, 321-324.
- Simelton, E., Quinn , C. H., Nnyaladzi , B., Dougill, A. J., Dyer , J. C., Frazer, E. D., . . . Stringer, L. C. (2013). Is rainfall really changing? Farmers' perceptions, meteorological data, and policy implications. *Climate and Development*, 1-17.
- Simpson, B. M., Heinrich , G., & Malindi, G. (2012). *Strengthening pluralistic agricultural extension in – Rapid scoping mission 9-27 January 2012. Modernizing Extension and Advisory*. New York: USAID.

- Smale , M., & Phiri, A. (1997). *Institutional Change and Discontinuities in Farmers' Use of Hybrid Maize Seed and Fertilizer in Malawi::Findings from the 1996-97 CIMMYT/MoALD Survey*. Mexico: CIMMYT.
- Snapp , S., & Fisher, M. (2014). "Filling the maize basket" supports crop diversity and quality of household diet in Malawi. *Original Article*, 84-96.
- Spencer, J. E. (1966). *Shifting Cultivation in Southeastern Asia*. Berkeley and Los Angeles. Berkeley, Los Angeles, London: University of California Press.
- Stewart , G., Hajat Zoran, A., & Asimenye , V. (2016). *Climate smart Agriculture Scoping Study*. Lilongwe: Malawi Climate Smart Agriculture Alliance.
- Stone , P., & Veloso, M. (1998). Layered approach to learning client behaviors in the robocup soccer serve. *Applied Artificial Intelligence*, 12(2), 165-188.
- Strewing, F. W., & Stead, G. (2001). *BPlanning, designing and reporting research*. Cape Town: Pearson Education.
- Stringer, L., Dyer, J., Reed, M., Dougill, A., Twyman, C., & Mkwambisi, D. (2009). Adaptations to climate change, drought and desertification: local insights to enhance policy in southern Africa. *Environ. Sci. Policy*, 1-18.
doi:10.1016/j.envsci.2009.04.002
- Stuckey, H. L. (2015). The second step in data analysis: Coding qualitative research data. *Methodological Issues in Social Health and Diabetes Reserach*, 7-10.
- Sutcliffe , C., Dougill, A., & Quinn, C. (2016). Evidence and perceptions of rainfall change in Malawi: Do maize cultivar choices enhance climate change adaptation in subSaharan Africa? *Reg Environ Change*, 16, 1215-1224.
- Tahseen, J., Moyo , B., & Mandaloma, L. (2014). *Assessment of extension and advisory methods and approaches to reach rural women-Exmaples from Malawi*. Glasgow: Glasgow Caledonian University.
- Tappan, M. B. (1998). Moral Education in the Zone of Proximal Development. *Journal of Moral Education*, 27(2), 141-160.
- Tasokwa , K., Nyariki, D., Mkwambisi, D., & Kogi-Makau, W. (2011). Gender vulnerability to climate variability and household food insecurity. *Climate and Development*, 3(4), 298-309.
- Teddy , I. F., & Gregory , J. (2009). *Cultural Historical Activity Theory*. Oslo: University of Oslo.
- Thi Kim Anh , D., & Marginson , S. (2014). *Vygotskian socio-cultural theory and globalization: Implications for educational research*. Melbourne: University of Melbourne.
- Thornton, P. K. (2010). Livestock production: recent trends, future prospects. *Phil. Trans. R. Soc. B* , 365, 2853–2867.

- Thrupp, L. A., Hecht, S., & Browder, J. (1997). *The Diversity and Dynamics of Shifting Cultivation: Myths, Realities, and Policy Implications*. Washington DC: WORLD RESOURCES INSTITUT.
- Tiba, Z. (2011). 'Maize is Life, but Rice is Money!' A Village Case Study of the 2001/02. *Journal of Agrarian Change*, 11(1), 3-28.
- Tindana, P. O., Kass, N., & Akweongo, P. (2006). The Informed Consent Process in a Rural African Setting: A Case Study of the Kassena-Nankana District of Northern Gha. *IRB Ethics and Human Reserach*, Unknown.
- Tol, R., Klein, R., & Nicholl, R. (2009). *Towards Successful Adaptation to Sea Level Rise along Europe's Coast*.
- Tosey, P. (2006). *Bateson's Levels Of Learning: a Framework For Transformative Learning?* Guildford: Surrey .
- Tosey, P., Langley, D., & Mathison, J. (2015). *Basteson's Levels of Learning as a conceptual framework*. Guildford: University of Surrey.
- Tschakert, P., & Dietrich, K. A. (2010). Anticipatory Learning for Climate Change Adaptation and Resilience. 15(2), 11. Retrieved from <http://www.ecologyandsociety.org/vol15/iss2/art11/>. *Ecology and Society*, 15(2), Online.
- Tsirizeni, M. D., Chiotha, S. S., Mphepo, G. Y., Likongwe, P., Daniels, E., Gillick, S., & Sydney, K. F. (2018). Innovative community communication and outreach. In S. S. Chiotha, D. Jamu, J. Nagoli, P. Likongwe, & C. Tembo, *Socio- Ecological Resilience to Climate Change in a Fragile Ecosystem* (pp. 245-261). London and New York: Routledge.
- Tzanakis, M. (2013). Social capital in Bourdieu's, Coleman's and Putnam's theory: empirical evidence and emergent measurement issue. *Educate*, 13(2), 2-23.
- Uden, L. (2007). Activity theory for designing mobile learning. *International Journal of Mobile Learning and Organization*, 1(1), 81-102.
- UNEP. (2002). *Global Environment Outlook 3. Past, present and future perspectives*. London: Earthscan Publications Ltd.
- UNESCO. (2006). *25 Biosphere Reserves added to UNESCO's Man and Biosphere Network*. Retrieved October 12, 2015, from <http://www.portal.unesco.org/en/ev.php>
- UNESCO. (2015). *Rethinking Education: Towards a Global Common Good? (1 ed.)*. Paris: UNESCO. Paris: UNESCO.
- United, N. (2016). *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations.
- United Nations. (1992). *United Nations Convention on Climate Change, Articles*. -: United Nations.

- University, C. (2010). *Cultural–Historical Activity Theory Laboratory for Comparative Human Cognition*. San Diego: Elsevier Ltd.
- USAID. (2007). *Adapting to climate variability and change. A guidance manual for development planning*. New York: USAID.
- Utembe, W. R., Nkhonje, S., & Mhango, T. (2010). The role of radio in climate change adaptation and mitigation in Malawi. In R. Chapota (Ed.). (pp. 1-123). Lilongwe: Farm radio.
- Valbuena , D., Homann-Kee Tui, S., Erenstein , O., Teufel , N., Duncan, A., Abdoulaye, T., . . . Gérard, B. (2015). Identifying determinants, pressures and trade-offs of crop residue use in mixed smallholder farms in Sub-Saharan Africa and South Asia. *Agricultural Systems*, 134, 107–118.
- van der Heijden, K., Bradfield, R., Burt, G., Cairns, G., & Wright, G. (2002). *van der Heijden, K. et al. (2002), The Sixth Sense: Accelerating Organisational Learning with Scenarios*. Chichester: Wiley & Sons,.
- van Notten, P. (2005). *Writing on the Wall. Scenario development in times of discontinuity*. Florida: Boca Raton.
- Vernooy , R., Bhuwon , S., & Bessett, G. (2017). *Community seed banks: concept and practice. Facilitator handbook*. Rome: Biodiversity International.
- Vernooy, R., Sthapit, . B., Otieno, G., Shrestha, P., & Gupta, A. (2017). The roles of community seed banks in climate change adaption. *Development in Practice*, 27(3), 316-327.
- Villamor, G., van Noordwijk, M., Djanibekov, U., Chiong-Javier , M., & Catacutan, D. (2014). Gender differences in land-use decisions: shaping multifunctional landscapes? . *Current Opinion in Environmental Sustainability*, 6, 128-133.
- Virkkunen , J., & Newnham , D. (2013). *THE CHANGE LABORATORY A tool for a collaborative development of work and education*. Unknown: Unknown.
- Vygotsky, L. (1978). *Mind in society: the development of higher psychological processes*. Cambridge: Harvard University Press.
- Wardle, E. A. (2004). Can Cross-Disciplinary Links Help Us Teach "Academic Discourse" in FYC? *Across the Disciplines*, 1-17.
- Waters, E., Barnet, J., & Puleston, A. (2014). Contrasting perspectives on barriers to adaptation in Australian Climate Change Policy. *Climate Change*, 124, 691-702.
- Webb, C. (1993). Feminist Research: definition, methodology, methods and evaluation. , 18,. *Journal of Advanced Nursing*, 416-428.
- Webb, S. (2000). *The Politics of Social Work: Power and Subjectivity*. Department of Applied Social Studies. London: University of Bradford.

- Weindl, I., Lotze-Campen, H., Popp, A., Müller, C., Havlík, P., Herrero, M., . . . Rolinski, S. (2015). Livestock in a changing climate: production system transitions as an adaptation strategy for agriculture. *Environ. Res. Lett.*, 10, 1-12.
- Wilhite, D. A. (2009). *Defining Drought: The Challenge for Early Warning Systems*. Lincoln: University of Nebraska.
- Wilkinson, S. (1998). Focus Group Discussions on Feminist Research: Power, Interaction and co-construction of meaning. *Women's Studies International Forum*, 111-125.
- Wilson, J. (2014). The History of the Level of Lake Chilwa. *The Society of Malawi Journal*, 67(2), 41-45.
- Wolcott, H. F. (1990). *Writing up qualitative research*. London: Sage.
- Wolf, E. R. (1983). *Europe and the People without History*. Berkeley, Los Angeles, London: University of California Press.
- Wollenberg, E., Edmunds, D., & Louise, B. (2000). Using scenarios to make decisions about the future: anticipatory learning for the adaptive co-management of community forests. *Landscape and Urban Planning*, 47, 65-77.
- Woodsong, M. N., MacQueen, C., Guest, K., & Namey, E. (2005). *Qualitative research methods: A data collector's field guide*. Research Triangle Park. New York City: Family Health International.
- Worthen, H., & Berry, J. (2006). 'Our Working Conditions Sre Our Students' Learning Conditions'. A CHAT analysis of College Teachers. In *Critical Perspectives on Activity. Explorations Across Education, Work and Every Day Life* (pp. 123-144). Cambridge: London.
- Young, M. (2015). What is Learning and Why Does It Matter? *European Journal of Education*, 50(1), 17-20.
- Zafari, A., & Kianmehr, M. (2012). Livestock manure management and pelleting. *The CIGR e-journal*, 14(3), 78-84.
- Zuma-Netshiukhwi, G., Stigter, K., & Walker, S. (2013). Use of Traditional Weather/Climate Knowledge by Farmers in the South-Western Free State of South Africa: Agrometeorological Learning by Scientists. *Atmosphere*, 384-410.

APPENDICES

Appendix 1: Approval Letter from Rhodes University	Error! Bookmark not defined.
Appendix 2: Approval Letter from the National Commission for Science and Technology, Malawi.....	Error! Bookmark not defined.
Appendix 3: List of participants for the District Executive Committee Meeting held on 2nd September 2016	Error! Bookmark not defined.
Appendix 4a: Signatures and thumb prints of the participants in Domasi EPA	Error! Bookmark not defined.
Appendix 4b: Signatures and thumb prints of the participants in Nsanama EPA.....	Error! Bookmark not defined.
Appendix 5: Questionnaire/checklist for focus group discussions.....	Error! Bookmark not defined.
Appendix 6: Sample results of women consulting elders and other community members on learning to cope with drought, 1943 to 2017 (Domasi EPA)..	Error! Bookmark not defined.
Appendix 7a: Names of community members who received local maize seed for upscaling, Katundu Section, Makuluni Diversity Block Nsanama EPA..	Error! Bookmark not defined.
Appendix 7b: Names of community members who received local maize seed for upscaling, Khuzumba Section, Namisisi Diversity Block Nsanama EPA	Error! Bookmark not defined.
Appendix 8: Names of Nsanama WhatsApp Group Members	Error! Bookmark not defined.
Appendix 9: Names of Domasi Youth WhatsApp Group Members	Error! Bookmark not defined.

Appendix 1: Approval Letter from Rhodes University



EDUCATION FACULTY • PO Box 94, Grahamstown, 6140
Tel: (046) 603 8385 / (046) 603 8393 • Fax: (046) 622 8028 • e-mail: d.wilmot@ru.ac.za

PROPOSAL AND ETHICAL CLEARANCE APPROVAL

Ethical clearance number 2017.03.1.01

The minute of the EHDC meeting of 9 March 2017 reflect the following:

2017.03.1 Class a restricted matters Doctor of Philosophy research proposals

To consider the following research proposal for the degree of PhD (Education) in the Faculty of Education:

Mphopo, Gibson Yadunda (16M9030)

Topic: Climate change, drought and inter-seasonal dry spells, and rural woman's informal learning towards adaptation in the Lake Chilwa Basin, Malawi.

Supervisors: Professor H Lotz-Sisitka, Professor S Shackleton and Professor Sosten Chiotha (University of Malawi)

Decision: *Approved*

This letter confirms the approval of the above proposal at a meeting of the Faculty of Education Higher Degrees' Committee on the 9 March 2017.

The proposal demonstrates an awareness of ethical responsibilities and a commitment to ethical research processes. The approval of the proposal by the committee thus constitutes ethical clearance.

Sincerely

Prof Marc Schäfer
Chair of the EHDC, Rhodes University
17th May 2017

Appendix 2: Approval Letter from the National Commission for Science and Technology, Malawi



NATIONAL COMMISSION FOR SCIENCE & TECHNOLOGY

Lingadzi House
Robert Mugabe Crescent
P/Bag B303
City Centre
Lilongwe

Tel: +265 1 771 550
+265 1 774 189
+265 1 774 869
Fax: +265 1772 431
Email: directorgeneral@ncst.mw
Website: <http://www.ncst.mw>

Ref No: NCST/RTT/2/6

5th July 2017

Mr. Gibson Y Mphepo

Head of Programmes

LEAD SEA ZOMBA

E-mail Address: gmphepo@leadsea.mw

Dear Mr. Mphepo,

Research ethics and regulatory approval and permit of protocol No. P.05/17/176: climate change, drought and inter-seasonal dry spells and rural women's informal learning towards adaptation in the in the lake Chilwa Basin

Having satisfied all the ethical, scientific and regulatory requirements, procedures and guidelines for the conduct of research in the social sciences sector in Malawi, I am pleased to inform you that the above referred research protocol appearing on the regulatory register of the National Commission for Science and Technology as filed by the National Committee on Research Ethics in the Social Sciences and Humanities, has officially been approved. This letter is an **Ethical and Regulatory Permit** for you to proceed with the implementation of the study protocol. Should there be any amendments to the approved version of the protocol in the course of implementing it, you shall be required to seek approval of such amendments before implementation of the same at no extra fee.

This approval and permit is valid for **one year** from the date of issuance. If the study goes beyond one year, an annual approval for continuation shall be required to be sought from this research ethics committee in a format that is available at the secretariat. Annual continuing review and approval does not require any fee payment. Once the study is finished, you are required to furnish the Committee and the Commission with a final report of the study. Please

keep the approved and administered consent forms and other study related documentation as the committee may carry out inspection of ethics and regulatory compliance any time during or after the study but not beyond five years after study closure. Any adverse events are required to be reported to the committee within twenty-four hours for review and determination, should they occur.

Wishing you a successful implementation of your study.

Yours Sincerely,

A handwritten signature in dark ink, appearing to read 'Mike G. Kachedwa', with a stylized, flowing script.

Mike G. Kachedwa

**Chief Research Services Officer and Head of NCRSH Secretariat, Health, Social Sciences
and Humanities Division**

For: Chairman of NCRSH

**Appendix 3: List of participants for the District Executive Committee Meeting
held on 2nd September 2016**






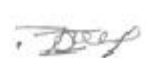
No.	First name	Surname	Sex	Institution	E-mail/Mobile No (+265)
1	Them bani	Chilingulo	Male	Ministry of Sports	8819819959
2	Jiran	Jicky	Male	Red Cross	995584259
3	Bright	Singini	Male	PACHI	999331558
4	Hilda	Chapota	Female	PACHI	99630450
5	Florida	Banda	Female	PACHI	999456447
6	Kasuzi	Mbaluko	Male	YONECO	99963883
7	Thomas	Chirambo	Male	YONECO	888204856
8	Mphatso	Kapito	Female	Water	888515340
9	Costings	Mwinjiro	Male	Judiciary	888398504
10	Agness	Matumba	Female	Angaliba Foundation	999454345
11	H.	Kalinde	Male	Youth Response	888174724
12	S.	Zuza	Male	Youth Response	995696674
13	Mayamiko	Pambatimbe	Male	Mary's Meals	997008891
14	C.	Chisuse	Male	Goal Malawi	999261072
15	Yohane	Namalaka	Male	District Council	999662298
16	Linde	Chiwale	Male	District Council	882196085
17	Chrissie	Banda	Female	Labour Office	881948349
18	Laston	Makaika	Male	Youth Impact	999488703
19	Brian	Kumwenda	Male	NRB	996838666
20	Joster	Muhalu	Male	District Council	111648885
21	Temwa	Kachipapa	Female	YONECO	999289314
22	Towers	Ng'oma	Female	SSDI	999360654
23	Nelson	Nkochi	Male	ASPIRE	881552052
24	General	Kanola	Male	ASPIRE	995305848
25	Gideon	Mzaza	Male	ADRA Malawi	8883851856
26	Gibson	Mphepo	Male	LEAD	881675832
27	Martha	Chiveda	Female	Social Welfare	998296826
28	Rodrick	Sinoya	Male	YONECO	881094969
29	Fodwek	Kamadzi	Male	ADRA Malawi	999671931
30	Jimmy	Kapanda	Male	PACHI	999231000
31	Andre	Malefula	Male	Gender	999257030
32	Wanangwa	Mumba	Female	YONECO	888022380
33	Nick	Ngoma	Male	YONECO	999499998
34	Lemani	Makina	Male	YONECO	881094993

Note:



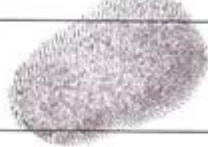




ADRA	Adventist Development and Relief Agency (A faith-based relief programme)
ASPIRE	Empowering Girls Through Education and Health
LEAD	Leadership for Environment and Development
NRB	National Registration Bureau
PACHI	Parent and Child Health Initiative Trust
SSDI	Support for the Service Delivery Integration (USAID Programme on Health)
YONECO	Youth Net and Counselling

Appendix 4a: Signatures and thumb prints of the participants in Domasi EPA

DATE: 17 JULY 2017



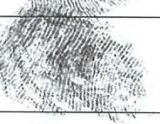


No	Full Name	Village	Signature/Fingerprint
✓ 1	Hilda Stande	Mapira	Hilda Stande
✓ 2	Roseby Duwa	Mussa	Rosibe Duwa
✓ 3	Joyce Grey	Mapira	Joyce Grey
4	Maria Petro	Matipa	
✓ 5	Agness Charles	Chipajira	
✓ 6	Jennifer Maiteni	Salimu	
✓ 7	Stella Allick	Mdala	S Allick
8	Roseby Felex	Chipiri	R Felexi
✓ 9	Margret Mbulaje	Chipiye	
✓ 10	Malita Austine	Tengule	
11	Margret Charles	Mikungu	M ^r charS
✓ 12	Zione John	Mtengule	

DATE: 18 JULY 2014

No	Full Name	Village	Signature/Fingerprint
1	Agnes Amisa	Tengule	
2	Hawa Maluwa	Kwera	
3	Tereza Matamba	Mitawa	
4	Mercy Kanyge	Gowero	M. Kanyge
5	Rose James	Sauwau	
6	Rose Yusuf	Mussa	
7	Patuma Kenesi	Mumba	
8	Zione Shaibu	Chipili	
9	Joyce Wailosi	chipili	Joyce Wailosi
10	Enekesi Mpinda	Mpita	Empinda
11	Zaidatu Tali	mpinda	Zaidatu Tali

Appendix 4b: Signatures and thumb prints of the participants in Nsanama EPA

DATE: 24/7/17

No	Full Name	Village	Signature/Fingerprint
✓ 1	ESNAT BIZIMUK	MAKULUNI	E. Rudi E. Bizimuk
✓ 2	ESTER WOT	MAKULUNI	E. Bizimuk E. Rudi
3	ENILESI NIMAZA	MAKULUNI	
4	JAZIRA BAMUSI	PULITI	Jazira BAMUSI
5	✓ DOROTHY MEYA	CHILALA	D. Meyya
6	✓ DOROTHY JOHN	PHETEMBE	D. JOHN
7	✓ EDNA RICHARD	PHETEMBE	
8	REGINA ABASI	SAISI KAUNGA	
9	✓ NELLY ONILE	INTOKOMA	
10	✓ MARY AMONI	KHOLOMA	M. AMON
11	ENILESI KINGS	MAKULUNI	
12	FAYNES WILSON	CHILALA	F. Willison

DATE: 20/07/17

No	Full Name	Village	Signature/Fingerprint
✓ 1	Rose Mulewa	Chulala	Rose mulewa
✓ 2	Elesina Mkanamwano	Saidi-Mataka	E. Nkanamwano
✓ 3	Nellie Mahamudu	Chilala	N. mahamudu
✓ 4	Emmie Dickson	Kauma	Emmie Dickson
5	Charity Majawa	Phetembe	
6	Agnes Ciladi	Kauma	
✓ 7	Emma Chalaka	Saidi-Mataka	EMACHALAKA
8	Grace James	Nsinga	GRACE JEMUS
✓ 9	Halima Sailesi	Nsinga	
✓ 10	Hajira Tambala	Pulika	Hajira Tambala
✓ 11	Simonjire Mtchona	Pulika	
12	Chrissy Helix	Phetembe	KISISE HELEKISI

Appendix 5: Questionnaire/checklist for focus group discussions

Researchers.....

Date Location.....

SECTION ONE: Analysis of causalities to drought and dry spells (Expected time: 40 Minutes)

Phase 1

Q1: Lake Chilwa is a Lake prone to drought and dry spells over the past 100 years. What were the key drivers to drought and dry spells?

SECTION TWO: Disaster risk management (20 minutes)

Q2: What kind of disasters have you faced in your area over the past 30 years (Floods, Droughts, Fires, Strong winds, pest outbreaks, disease outbreaks)

Q3: What have been the major causes of each of these disasters? (Split into natural and man-made)

Q4: What have been the mitigation measures (local or introduced)

SECTION THREE: Adaptation and coping strategies (1.5 hours)

Q5: Drought and dry spells have caused both social and ecological impacts in the Lake Chilwa Basin. Do you remember some years when the impacts can be regarded as disasters?

Q6: In response to drought and dry spell impacts particularly in maize production, various adaptation practices have been implemented in your area.

- a. What are these adaptation practices?
- b. How were the practice introduced in your area?
- c. How effective were these practices?
- d. What was the role of women?
- e. What were some of the manifestations of contradictions and enablers for each adaptation practice?

PHASE THREE: Continuation of Section 2 (30 Minutes)

Q 7: What are some of the common local farming practices in your area and how have these helped to address drought and dry spells?

SECTION FOUR: INFORMAL LEARNING ASSOCIATED WITH VARIOUS ADAPTATION OPTIONS (1 Hour)

Q8: For each of the adaptation options named in Q4, what are the historical, current and planned informal **learning practices** (In terms of learning resources such as presence of competent actors; learning tools; learning channels; learners' awareness; learning processes such as documentation and monitoring; learning content)

Q9: What is the role of women in such informal learning settings?

SECTION THREE: HISTORICAL AND EXISTING SOCIAL NETWORKS (social capital—what bonds women? rules, regulations, religion etc) (30 minutes)

Q10: What are the women dominated social networks relevant to climate change adaptation and DRR in your area?

Q11: How have these social networks helped build resilience against the impacts of drought and dry spells?

Appendix six: Key informant interviews questionnaire

Key informant questionnaire/checklist for a study on informal learning, local knowledge practices in farming, drought and dry spells at Domasi and Nsanama Extension Planning Areas

Question 1: What is your perception about the change in the following informal learning processes with respect to drought and dry spells?

Pathway	Has usage (frequency) changeover the past 30 years (Yes/No/No idea)	Source of information for the 'Yes' responses
Meetings/Workshops		
Observation through demonstration plots		
Radio Programmes		
Tv Programmes		

Posters		
Local Newspapers		
Observation not through demonstration plots		
Social networks (<i>Magulu a Zimayi</i>)		
Village Saving Loan Schemes		
Faith-based networks (e.g. Dawa/Mvano/ /Dorcas)		
Mother Groups		
Preaching sermons		
Drama		
Songs		
Story telling		
Agriculture Fairs/Shows		
Poems		
Proverbs		
Other (Add)		

Q2: How are informal learning processes documented and monitored?

Q3: How do you know the number of people that have learnt informally against each of the informal learning channels?

Q4: What is your perception about the following local farming practices

Local farming practice	Is this practice utilized by your sector? (Yes/No/No idea/Somehow used)	Is this knowledge practice now more frequently used by local communities due to drought than before?	What have been the Informal learning channels for this practice over the past 30 years	If the informal learning practice has been documented over the past 30 years, how has this been done (e.g. documented in reports)

Traditional weather forecasts e.g. forecasting good and poor rains				
Multiple Cropping				
Cultivation of maize varieties				
Local pest and disease control methods in maize				
Local Soil fertility enhancement mechanisms				
Add any other local farming practices				

Appendix 7: Sample results of women consulting elders and other community members on learning to cope with drought, 1943 to 2017 (Domasi EPA)

Coping method	1943	45	49	50	65	67	70	73	80	90	95	2002	2012	2013	2015	2017
Cassava leaves	0	0	3	3	1	1	2	2	3	3	3	1	1	1	2	2
Reduced meals	0	0	3	3	0	0	0	0	0	0	0	3	0	0	0	0
Wild Yam	0	0	3	0	0	0	0	0	0	0	0	3	0	0	0	0
Wild grass seeds	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0
Migration	0	0	3	0	0	0	0	0	2	0	0	3	1	1	1	0
Sale of household properties	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0
Piece work	0	0	3	3	0	0	0	0	3	0	0	3	1	1	2	0
Family ties	0	0	3	0	0	0	0	3	0	0	3	0	2	2	0	0
Prostitution	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0
Theft	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	3
Maize Bran	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	0
Rice Bran	0	0	3	0	0	0	0	0	0	0	0	3	0	0	0	0
Charcoal sales	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3	3

Appendix 7a: Names of community members who received local maize seed for upscaling, Katundu Section, Makuluni Diversity Block Nsanama EPA
(Date: 26/11.2018)

ID	Name of Beneficiary	Sex	Village	Cultivar	Quantity (Kg)	Member Status
1	Cleverson Chakhulula	M	Makuluni	Bingo	1	Old
				Kafula	1	
				Kampalapati	1	
				Nakachiswe	1	
				Kanjerenjere	1	
2	Estery Lodi	F	Makuluni	Alinafe	1	Old
				Kafula	1	
				Nakachiswe	1	
				Kanjerenjere	1	
				Lilongwe	1	
3	Mustafa Bauleni	M	Makuluni	Bingo	1	Old
				Alinafe	1	
				Kamalapati	1	
				Lilongwe	1	
				Nakachiswe	1	
4	Esnat Biziwick	F	Issa	Bingo	2	Old
				Kafula	1	
				Kanjerenjere	2	
5	Sumeson Jafali	M	Makuluni	Nakachewo	2	Old
				Bingo	2	
				Kampalapati	1	
6	Edina Richard	F	Phetembe	Kafula	1	Old
				Alinafe	1	
				Nakachiswe	2	
7	Dorothy John	F	Phetembe	Bingo	1	Old
				Nakachiswe	2	
				Kampalapati	2	
8	Menard Makondesa	M	Issa	Bingo	2	Old
				Kafula	1	
				Kapalapati	2	
9	Mervis Ramusi	F	Chipojola	Alinafe	1	New
				Nakachiswe	1	
10	Kassim Anason	M	Somela	Kampalapati	2	New
11	Zione Yuda	F	Mang'anda	Lilongwe	2	New
12	Sigina Pichesi	M	Mang'anda	Lilongwe	2	New
13	John Tube	M	Mang'anda	Lilongwe	2	New
14	Chrise Amini	F	Nsomela	Bingo	2	New
15	Esnat Stenala	F	Nsomela	Lilongwe	2	New
16	Melifa Rashid	F	Nsomela	Lilongwe	2	New
17	Margret Asidi	F	Nsomela	Lilongwe	2	New
18	Agness James	F	Nsomela	Lilongwe	2	New
19	Hawa Amini	F	Nsomela	Kampalapati	2	New
20	Grace Amini	F	Chipojola	Lilongwe	2	New

21	Esnat Chakhulula	F	Chipojola	Nakachiswe	2	New
22	Melia Josephy	F	Chipojola	Bingo	2	New
23	Agata Josephy	F	Chipojola	Bingo	2	New
24	Alinafe Amini	F	Nsomela	Lilongwe	2	New
25	Esnat Majawa	F	Phetembe	Alinafe	2	New
25	Regina John	F	Phetembe	Kanjerenjere	2	New
26	Charity Majawa	F	Phetembe	Bingo	2	New
27	Anne Chakhulula	F	Makuluni	Bingo	2	New
28	Aida Austin	F	Makuluni	Kanjerenjere	2	New
29	Fanny Luwesi	F	Issa	Nakachiswe	2	New
30	Mercy Kwalira	F	Makuluni	Lilongwe	1	New
31	Stivelia Bizwick	F	Issa	Lilongwe		New
32	Edward Richard	M	Mbina	Bingo	5	New
33	Nsanama Youth WhatsApp Group	N/A		Kampalapati	4 ½	New
				Alinafe	1 ½	
				Nakachiswe	3	
				Lilongwe	1	
34	GVH Chipojola	F	Chipojola	Kampalapati	3	Old
35	Sayesi Chitete	M	Makuluni	Bingo	2	Old
				Alinafe	1	
				Kampalapati	2	
36	Dinesi Daes	M	Chipojola	Nakachiswe	2	Old
				Kampalapati	1	
37	Rosena Makondesa	F	Chipojola	Bingo	2	Old
				Nakachiswe	2	
				Kapalapati	1	
38	Memory Machard	F	Makuluni	Bingo	2	Old
				Kapalapati	1	
				Nakachiswe	2	
39	Esta Menard	F	Makuluni	Bingo	2	Old
				Nakachiswe	1	
				Kampalapati	2	
40	Zelina Chibalo	F	Chipojola	Nakachiswe	2	New
41	Lidiya Mark	F	Issa	Nakachiswe	1	New
				Bingo	1	
42	Faines Lord	F	Makuluni	Kafula	1	Old
				Kampalapati	2	
				Bingo	2	
43	Falesi Shambu	F	Mang'anda	Bingo	2	Old
				Kampalapati	2	
				Kafula	1	
44	Elezia Ajasi	F	Makuluni	Bingo	2	Old
				Kampalapati	2	
				Alinafe		
45	Patuma Piches	F	Mang'anda	Alinafe	1	New

				Kampalapati	1	
46	Elina Chinomba	F	Chipojola	Bingo	2	New
47	Efele Kamwendo	F	Issa	Nakachiswe	2	New
48	Esnart Willard	F	Chipojola	Alinafe	2	New
49	Belita Mnepo	F	Makuluni	Kampalapati	2	New
50	Olivia Elias	F	Makuluni	Nakachiswe	2	New
51	Mofart Beston	M	Malopa	Bingo	2	New
52	Njeruza Medso	F	Nsomela	Lilongwe	2	New
53	Rodah Potalinga	F	Nsomela	Lilongwe	2	New
54	Emily Mawindo	F	Makuluni	Nakachiswe	2	New
55	Wilson Mayoyo	M	Makuluni	Nakachiswe	2	New
56	Malium Dulana	F	Makuluni	Nakachiswe	2	New
57	Sitela Dulani	F	Makuluni	Nakachiswe	2	New
58	Agness Chitete	F	Makuluni	Bingo	2	New
59	Margret Chitete	F	Makuluni	Bingo	2	New
60	Estery James	F	Makuluni	Bingo	2	New
61	Willard Matemba	M	Namosi	Kafula	2	New
62	Pichesi Njali	M	Nduta	Kafula	2	New
63	Dolope Khuzeya	F	Makuluni	Bingo	1	New
64	Anne Waliyala	F	Issa	Bingo	2	New
65	Loveness Melex	F	Phetembe	Kampalapati	2	New
66	Charity Majawa	F	Phetembe	Kanjerenjere	2	New
67	Songanile Daison	F	Issa	Kanjerenjere	2	New
68	Sogelee Royi	F	Issa	Bingo	2	New
69	Iron James	M	Chipojola	Bingo	2	New
70	Rodah Biziwick	F	Issa	Bingo	2	New
71	Eliza Makondesa	F	Issa	Lilongwe	2	New
72	Steven Mark	M	Issa	Lilongwe	2	New
73	Yohane Chagwa	M	Makuluni	Lilongwe	2	New

Appendix 7b: Names of community members who received local maize seed for upscaling, Khuzumba Section, Namisisi Diversity Block Nsanama EPA

id	Name of beneficiary	Sex	Village	Maize cultivar received	Quantity received (kg)	Member status
1	Hajira Tambala	F	Koche	Alinafe	1	Old
				Kafula	1	Old
				Kanjerenjere	1	Old
				Nakachiswe	1	Old
2	Grace James	F	Sinja	Alinafe	1	Old
				Kafula	1	Old
				Kanjerenjere	1	Old
				Nakachiswe	1	Old
3	Hamida Saidi	F	Pulika	Alinafe	1	Old
				Kafula	1	Old
				Kanjerenjere	1	Old
				Nakachiswe	1	Old
4	Usuman Mamu	M	Pulika	Kafula	1	Old
				Alinafe	1	Old
5	Esnart Andiochi	F	Sinja	Kafula	1	Old
				Alinafe	1	Old
6	Estere Makwesa	F	Sinja	Kanjerenjere	1	New
				Kafula	1	New
6	Samina James	F	Pulika	Kafula	1	New
				Nakachiswe	1	Old
7	Dupre Asima	F	Sinja	Lilongwe	1	Old
				Kafula	1	Old
7	Simonjire Mtchona	F	Pulika	Kanjerenjere	1	Old
				Kafula	1	Old
8	Jenifer Rajab	F	Sinja	Kanjerenjere	1	New
9	Saina Adam	F	Pulika	Kanjerenjere	1	New
10	Grace James	F	Sinja	Kanjerenjere	1	Old
				Kafula	1	Old
11	Halima Sailesi	F	Sinja	Kanjerenjere	1	Old
				Kafula	1	Old
12	Hajira Tambala	F	Pulika	Kafula	1	Old
				Lilongwe	1	Old
13	Hajila Eliya	F	Pulika	Nakaduswe	1	New
				Likongwe	1	New
14	Mariam Mustafa	F	Pulika	Nakachiswe	1	New
				Kafula	1	New
15	Shalifa Wisiki	F	Pulika	Kafula	1	Old
				Kanjerenjere	1	Old

Appendix 8: Names of Nsanama WhatsApp Group Members

NO	NAME	VILLAGE	SEX	NAME OF YOUTH CLUB	PHONE NUMBER
1	Shamiona Savare	Amin	M	Mlomba	099807399
2	Ellen Magombo	Nsanama	F	Mlomba	0998303380
3	Violet Gondwe	Nsanama	F	Mlomba	0996868110
4	Martha Fartson	Nsanama	F	Nsanama	09985423
5	Esther Patrick	Mukuhela	F	Mlomba	088505935
6	Hanifa Molesi	Chipaka	F	Mlomba	-
7	Nelson Makandanje	Namisi	M	Mlomba	088116999
8	Stain Lucius	Sinja	M	Towe	088674476
9	Imulan Bakali	Sinja	M	Towe	08806634
10	Bright Mailos	Mtokoma	M	Mlomba	088507605
11	Mcdonald Nkalapa	Said	M	Mlomba	09924999
12	Shafi Janatu	Mbang'ombe	M	Pentecost	088330330
13	Zanto Tangoya	Maliwa	M	CCAP	None
14	Innocent Kasupe	Malowa	M	Mlomba	None
15	Lindiwe Kaila	Mtokoma	F	Mlomba	08868730
16	Devi Kabaisa	Doka	M	Mlomba	09978454
17	Collins Chida	Saidi	M	Mlomba	0885601
18	Mcmillan Grant	Chipojola	M	Chipojola	08840453
1	Falidah Chimlandu	Pulika	F	Jowe	0884324092
2	Ishmael Kaunda	Mtokoma	M	Mlomba	088402401
3	Patrick Jangiya	Chitinji	M	Namaotcha	088454151
4	Blessings Baluwes	Lupangwe	M	Mlomba	0888433185
5	Patuma Sailesi	Mtokoma	F	Mlomba	None
6	Amidu Katenga	Mtokoma	M	Mlomba	0886518542
7	Fyson Kausiwa	Mtokoma	M	Mlomba	0882467689
8	Fatuma Mdoka	Mtokoma	M	Mlomba	0882504015
9	Isaac George	Nsanama	M	Nsanama	0881736473
10	Patson Chiumia	Sinja	M	Towe	0884974585

11	Mussa Logani	Nsanama	M	Nsanama	0882514325
12	Shabil Kapeta	Nsanama	M	Nsanama	0884641669
13	Tizo Doctor	Nsanama	M	Nsanama	0883893093
14	Dines Daes	Chipojola	M	Chipojola	0998301950
15	Moses Komwa	Nsanama	M	Nsanama	0997717161
16	Manesi George	Nsanama	M	Nsanama	0881482287
17	Tendai Mberere	Nsanama	F	Nsanama	0884334754
18	Emmanuel Joel	Nsanama	M	Nsanama	0884040722
1	Martin Nayopa	Nsanama	M	Nsanama Epa	0999602300
2	Shalid Ishmael	Chikweo	M	Tigonjetse	0882849816
3	Chifundo Injes	Nsanama	M	Mlomba	0996236631
4	Edda Damiano	Chimenya	F	Pabwaro	099369979
5	Maggie Chibalo	M'balaka	F	Pabwalo	0881173029
6	George	Finiasi	M	Towe	None
7	Precious	Mtama Mtokoma	M	Mlamba	None
8	Gibson Mphepo	LEAD	M	LEAD	0881675832
9	C. Douglas	LEAD	M	LEAD	0888914009

Appendix 9: Names of Domasi Youth WhatsApp Group Members

No.	Full Name	Sex	Village	Mobile Number
1	Andrew Banda	M	Chidothe	088366336
2	Madalitso James	M	Makawa	0884627647
3	John Nyama	M	Mitawa	0882479871
4	Grant Razaro	M	Matundu	0881369220
5	Ishue James	M	Kutengule	0882841155
6	Denson Mavumbe	M	Mtenda	0888589852
7	Patricia Dailesi	F	Makawa	0881364979
8	Hawa Richard	F	Chamba	0880596332
9	Elliot Ndaona	M	Matundu	0884998843
10	Rose Bright	F	Msumbo	0886067166
11	Ismael Hassani	M	Kazembe	0882116397
12	Martha Milimbo	F	Chimatwa	0993588823
13	Tamara Kamanga	F	Makawa	0881570904
14	Alinafe Mdiye	M	Mtambalika	0888589830
15	Harold Kasulo	M	Fidesi	0884618489
16	Eric Mkupu	M	Msumbo	0882422950
17	Richard German	M	Msumbo	0883733847
18	Joyce Mtambalika	F	Mitawa	0888097489
19	Wonderful Chakanika	M	Mtenda	0882442130
20	Hedgeson Kapoje	M	Kutengule	0883171163