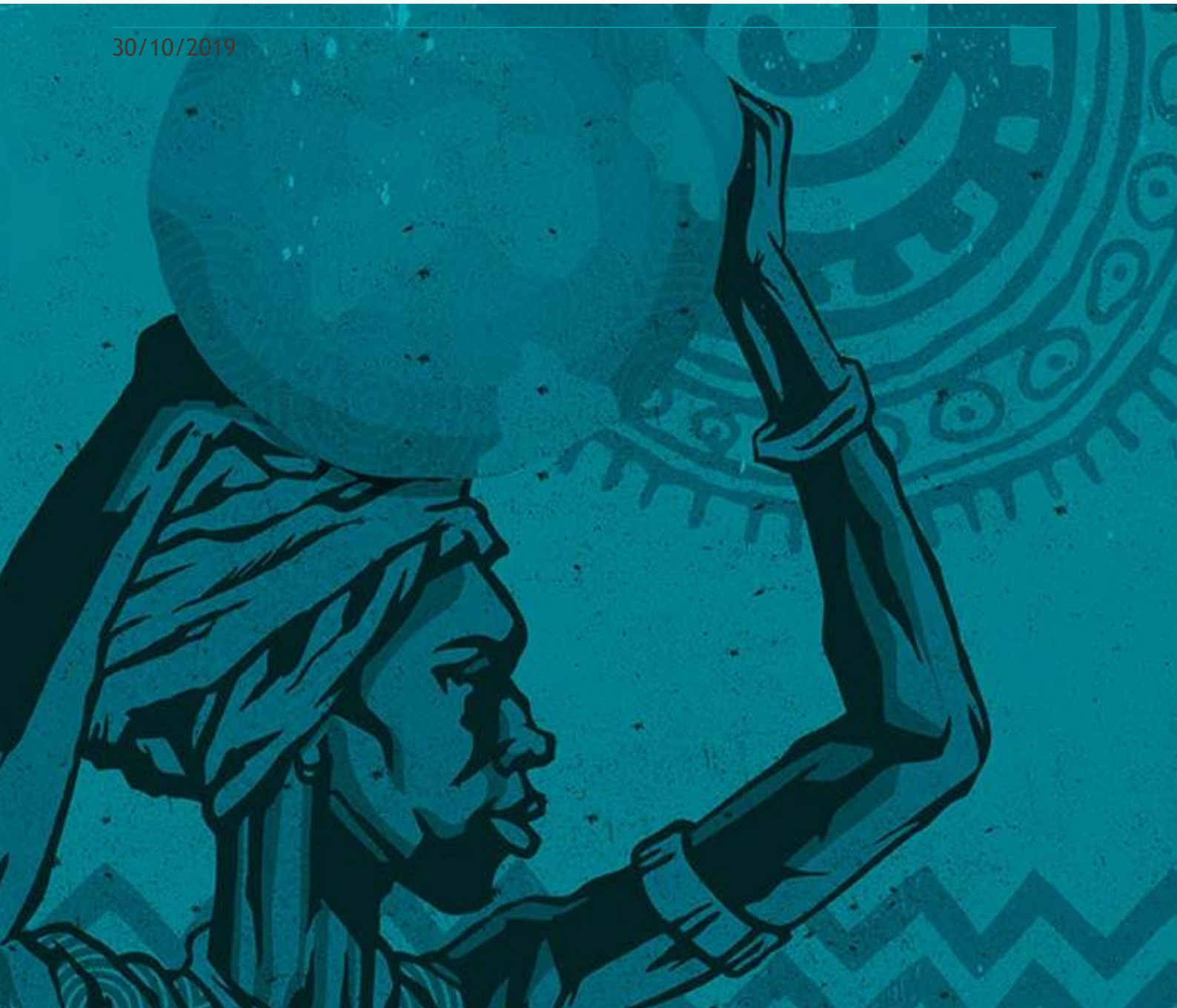


RESILIM-O: Resilience in the Limpopo Basin Program- Olifants

FINAL REPORT

Agricultural Support Initiative- Lower Olifants; November 2016-
October 2019

30/10/2019





Acknowledgements

MDF is extremely grateful for this opportunity provided by USAID and AWARD to explore and implement models, processes and practices in community level climate change adaptation and to build a body of knowledge on the impact of climate resilient agriculture on the livelihoods of the rural poor.

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About USAID: RESILIM

USAID's Resilience in the Limpopo River Basin (RESILIM) program addresses ongoing degradation in the Limpopo River Basin in southern Africa, where people face water shortages, increased floods, and declines in crop productivity as climate change further stresses an already water limited region.

There are two components to the program; one operating at a basin-scale (RESILIM-B, which is implemented by USA-based Chemonix and addresses similar issues at the scale of the four SADC member states that share the Limpopo Basin (South Africa, Botswana, Zimbabwe and Mozambique) and a catchment-scale project (RESILIM-O) that is being implemented by the Association for Water and Rural Development (AWARD). Both projects share the same overall objectives. You can find out more information on the RESILIM projects on www.usaid.gov website and www.award.org.za.

The USAID's RESILIM-O focusses on the Olifants catchment. The program aims to reduce the vulnerability of people and ecosystems in the Olifants Catchment specifically, by improving how transboundary natural resources are managed. By understanding the systemic causes of vulnerability, including climate vulnerability, it is promoting new ways of thinking and acting to promote integrated water and biodiversity management.

About AWARD

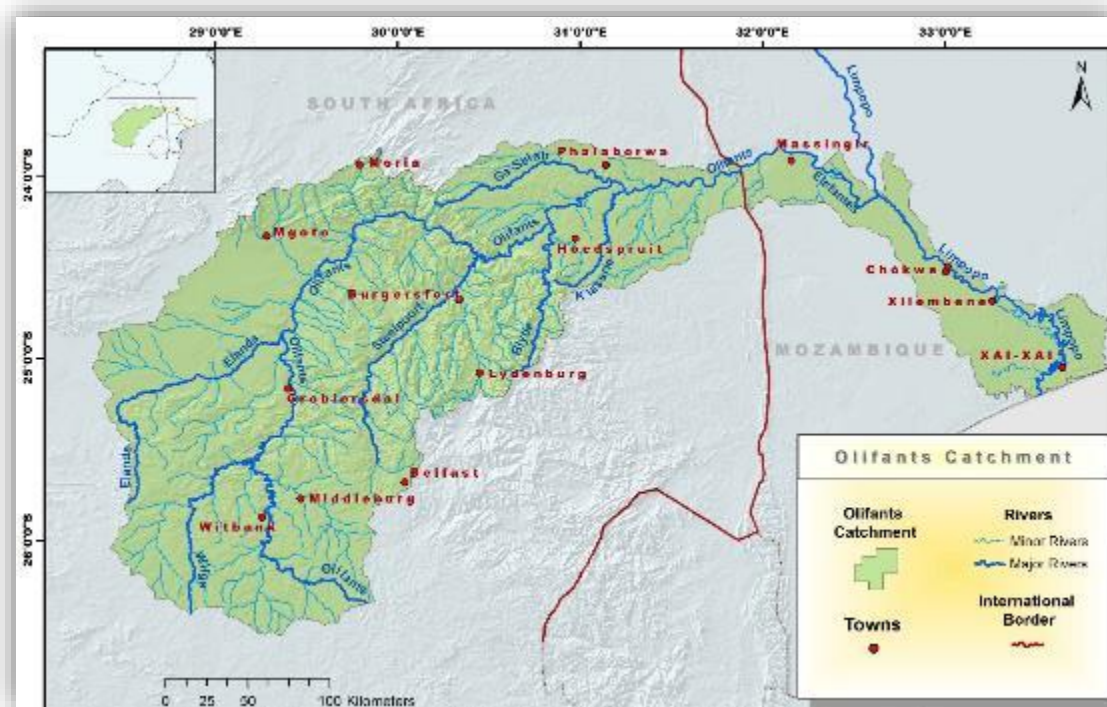
At AWARD, we recognize that the natural world's resources are limited, and undergoing rapid depletion and transformation. We know current practices of use and management are inadequate to deal with the changes and challenges we are facing. We design practical interventions to address the vulnerability of people and ecosystems, and merge considerations from both environmental and social perspectives. Our approach involves thinking across disciplines, boundaries and systems.

We are working with diverse people and institutions in the water and biodiversity sectors in the Olifants River Catchment to understand the multiple vulnerabilities to change, including climate change. Along with quality scientific contributions, our engagement in the socio-political context of the Olifants River Catchment allows us begin to begin to institutionalize integrated, resilience-based practices, providing a foundation for robust development policy and practice in the in this river catchment, and beyond.



The Olifants Catchment: An Overview

The Olifants River Catchment falls within the Limpopo River Basin, which is part of an international drainage basin that stretches across South Africa, Mozambique, Zimbabwe and Botswana. In fact, the Olifants River contributes nearly 40% of the water that flows in the Limpopo River making it an important catchment in the system as a whole.



At the heart of this catchment is the Olifants River, a vital artery that flows for 560 kilometres through South Africa and into Mozambique, where it is known as the Rio dos Elefantes in Mozambique.

This mighty river originates in South Africa's Mpumalanga Highveld, flowing northwards before curving in an easterly direction through the Kruger National Park and into Mozambique, finally finding rest in the salty water of the Indian Ocean near Xai Xai, just north of Maputo.

The main tributaries of the Olifants River are the Wilge, Elands, Ga-Selati, Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati Rivers.

Along with its tributaries, it is one of the six major Lowveld river systems, occupying an area just short of 55 000 square kilometres. It traverses three provinces in South Africa; Gauteng, Mpumalanga and Limpopo. About 3.5 million people live on the South African side of the catchment. In Mozambique, it flows through Gaza Province, which is home to about 700 000 people.



A system under change

Our catchment is the foundation of our livelihoods and development. Yet the river and associated natural resources in the Olifants Catchment are under threat...

Unchecked pollution, inappropriate land resource use, weak and poorly enforced policies and regulations and poor protection of habitats and biodiversity are degrading the Olifants at an alarming rate. What's more, the area is however under threat from factors such as mining for heavy metals, inappropriate land management, rural sprawl and unsustainable use of natural resources. This affects the level of goods and services provided by the ecosystem.

The diverse population groups living in the Olifants Catchment all have one thing in common; they rely on the river and the catchment's natural biodiversity for their livelihoods. This reliance can be direct or indirect. Rural communities rely on it for things such as traditional medicine, grazing and browse, fuel, food and housing materials. Some people in river-side communities harvest reeds, collect water from the river for washing and drinking and use it for recreational and spiritual practices. Subsistence farmers in Mozambique rely heavily on the catchment's flood plains. There are also large mines and associated industries, large scale agriculture and the wildlife economy, which all rely on a healthy, functioning river system. Often people forget that what they do upstream affects people down stream, sometimes with dire consequences.

The catchment is our home and it is worth investing in its future. The work reported here is part of the activities of the RESILIM- O project under the grant from USAID: Southern Africa.

Project partners



Mahlathini Development Foundation (MDF) is a small public benefit non-profit organization consisting of rural development practitioners who specialize in participatory learning and action processes, sustainable natural resource management and low external input farming systems, including a focus on rain water harvesting, conservation agriculture, intensive homestead food production, food security, climate change adaptation, micro finance and enterprise development.

MDF designs and implements rural development programs and training processes providing learning processes for adults all the way from semi- literate farmers to post graduate university level. We work in partnership with government and non-government organisations alike. We are sensitive to and mainstream where possible gender, disability and people living with HIV/AIDs.



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Acronyms and Abbreviations

AgriSI	Agricultural Support Initiative
CC	Climate change
CCA	Climate change adaptation
CRA	Climate resilient agriculture
CSA	Conservation South Africa
CWP	Community Work Program
DICLAD	Dialogues in Climate Change and Adaptation
DKA	German Catholic Church Fund
K2C	Kruger to Canyon Program
hh	household
LIMA	Lima Rural Development Foundation (NGO)
LF	local facilitator
MDF	Mahlathini Development Foundation (NGO)
NTT	National Toyota Trust
RIEng	Rural Integrated Engineering (Company)
RWH	Rainwater harvesting
SES	Socioeconomic system
SOL	Seeds of Light (NGO)
S&WC	soil and water conservation

1 Executive Summary

The Agricultural Support Initiative (AgriSI) was implemented as a sub-grant process within the larger RESILM-O program between 2017 and 2019.

The aim of this support was to enhance the resilience of the people and ecosystems in selected villages (5-7) in the Lower Olifants River basin, using a systemic social learning approach, providing support for increased adaptive capacity and resilience to the effects of climate change for households involved in agriculture in selected communities of the Lower Olifants River Catchment through:

- Improved soil and water conservation and agroecological practices for increased food security,
- Livelihood diversification and supplementation through alternative climate resistant production
- and Increased community empowerment as a result of self-organisation and collective action.

The expected Outcomes outlined in our theory of change are summarised as:

- Community level analysis and increased understanding of climate change, CC impacts and adaptive measures (*Baselines, planning and reviews*)
- Capacity building for learning groups and Local Facilitators (*learning workshops*)



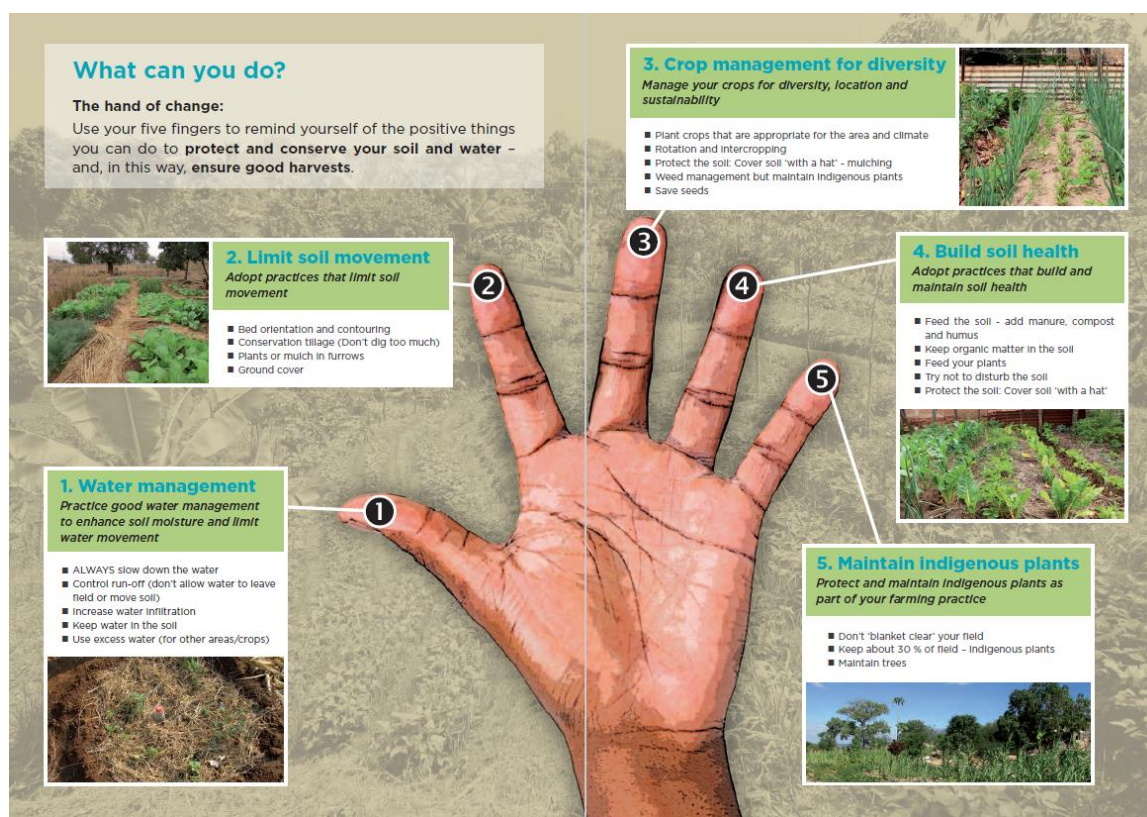
- Increased awareness and community level organisation; collective action and collaborative activities (*collaborative activities*)
- Improved, diversified production. Soil and water conservation practices implemented. (*Improved productivity and livelihoods*)
- Monitoring of implementation of best practices at household level. Identification and awareness raising around local and new best practice options (*review sessions and open days*).

The activities related to these outcomes (indicated in italics) are somewhat cyclical in nature and depended on the focus, interest and motivation of the members of each learning group.

Climate change impacts of increased heat (throughout the year) and increased variability in rainfall patterns with associated decrease in water availability, crop failures, livestock mortality and increased pest and disease incidence as well as the decrease in natural resources, were strongly perceived by the participants. The negative impact on participants' livelihoods and the social fabric of their communities was also emphasised.

Baselines indicated a high level of vulnerability of these households with a high dependency on social grants, low incomes (averaging around R2300/ household of 5 members), decreased production and productivity, with little to no livelihood diversification.

Local adaptive measures were grouped around the simple heuristic of '5 fingers (see diagram below). This means that agroecology practices could be grouped into 5 key categories of water management, soil fertility, crop and seed choices, erosion control and indigenous plant incorporation. Specifically, adaptation practices included the use of compost basins for planting bananas, planting of indigenous trees, change for dryland cropping patterns, small dams and greywater use.





The five fingers approach categories agroecological practices into 5 main groups.

Adaptive measures suggested and explored included; shade cloth tunnels, drip irrigation, mulching, mixed cropping, trench beds and other beds with increased organic matter and water holding capacity, crop diversification, conservation agriculture (including legumes and cover crops), seed saving, cropping calendars, livestock fodder production, poultry and organic fruit production, soil and water conservation practices, rainwater harvesting, small dams and greywater management and use.

Practices were implemented by individuals and small groups through local level experimentation. Of the **new interventions**, the highest uptake of practices was for trench beds (86%) and mixed cropping (82%); followed by stone bunds (61%), planting from seed (50%) and liquid manure (43%). Mulching levels were low (32%), due to lack of mulching material in the environment. The extended drought, heat and lack of agricultural water supply led to very little natural vegetation being at hand for this practice.

A few practices did not “stick” despite our efforts of introduction and re-introduction of these ideas. These include making eco-circles, which use a bottle drip system and soil and water conservation practices such as swales, diversion ditches, contours, furrows and ditches and checkdams. The use of natural pest and disease control and conservation agriculture for field crops can also still be improved. These practices are all considered knowledge intensive, as farmers need to internalise a number of different concepts to work well with these practices and additionally have to use their own analysis and judgement in the implementation.

The **new innovations**; shade cloth tunnels (35%), bucket drip kits (35%), rain water harvesting (RWH) storage (*underground RWH tanks, surface reservoirs and small dams*) (24%) and small dams lined with bentonite, were limited to participants who received some financial assistance and those who could afford to try out these practices themselves. It was however considered important to introduce these ideas, due to their potential for impact on resilience.

Local good practice options, show that all the participants have tried some version of RWH, around 76% do seed saving and around 64% engage in propagation of multi-purpose plants, with fewer engaging in greywater management (46%), planting of legumes (38%), construction of furrows and ridges for planting (31%), and construction of basins filled with organic matter to plant bananas (18%).

Livelihoods diversification has been noted as the following activities, directly related to this intervention:

- Increased diversity of cropping for food production and local sales; 66% of participants.
Participants have included a wider range of vegetable types for both summer and winter cropping, have expanded their field cropping options and have been growing a range of culinary herbs.
- Organic marketing of herbs and vegetables; 21% of participants.
With the assistance of Hoedspruit Hub (HH) participants have engaged in an “organic box scheme”, managed through a Facebook page at HH. They have also been selling independently to a few lodges, restaurants and farmers markets.
- Processing; drying, milling, juice and bottling; 9% of participants.
This activity, although considered a good idea, has been quite limited in implementation. Only a few of the inherently more innovative participants have undertaken these activities.
- Diversification into small livestock; 16% of participants
Two groups of participants linked to learning groups have undertaken poultry initiatives; one for layers and one for broilers - assisted through increased incomes through their vegetable production as well as increased confidence in farming activities derived from their participation in the AgriSi program.



A significant step in improved social agency has been the initiation of water committees within three of the seven learning groups (including 98 participants) to explore and implement water provision systems for agricultural activities.

Learning has been substantial and ongoing and was further supported through cross visits, networking and stakeholder engagement at local and regional levels. A total of around 150 participants have been involved over the project period across 9 village-based learning groups.

Improved resilience has been achieved using the following indicators:

- 86% (N=120) of participants implemented more than 3 climate change (CC) adaptation responses,
- 44% show increased knowledge (using farmer experimentation as a proxy),
- 41% have engaged in collaborative activities,
- 77% have indicated an increased availability of food,
- 56% have indicated an increase in income and
- 30% have indicated an increase in livelihood diversification.

Food production through gardening has increased by 120%, field cropping by 15% and livestock production by 9%. Water use efficiency (access, availability, water holding, water saving) has increased by 45% and participants have indicated a strong sense of improved decision-making capacity and a positive mindset towards their future.

In summary participants have managed to improve and diversify their livelihoods through implementation of CCA practices, collaborative activities and building social agency. They have significantly improved their resilience to climate change.

2 Project Objectives

2.1 RESILIM-O objectives

USAID: RESILIM-O is a large multi-faceted, multi-stakeholder, cross-boundary program to reduce vulnerability to climate change through building improved transboundary water and biodiversity governance and management of the Olifants Basin through the adoption of science-based strategies that enhance the resilience of its people and ecosystems through systemic and social learning approaches. The program has been running for seven years and is being implemented by AWARD (The Association for Water and Rural Development) with funding from USAID.

The Agricultural Support Initiative (AgriSI) was implemented as a sub-grant within the larger program towards the end of 2016. This initiative works specifically with climate change adaptation processes with smallholder communities in the lower Olifants River basin. It is being implemented jointly by Mahlathini Development Foundation and AWARD.

The Agricultural Support Initiative (AgriSI) addresses two of the USAID:RESILIM-O program objectives directly:

- i. To institutionalize systemic, collaborative planning and action for resilience of ecosystems and associated livelihoods through enhancing the capacity of stakeholders to sustainably manage natural resources of the Olifants River Basin under different scenarios
- ii. To reduce vulnerability to climate change and other factors by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements.



2.2 Project objectives

The overarching goal of the program is to support marginalised communities in the preparation for climate change. This means that communities need to be able to adapt and respond to local contextual factors. In the context of this project sound agroecological practices for soil and water conservation (SWC) and the ability to self-organise and act collectively are regarded as fundamental for building adaptive capacity and resilience to climate change. Not only do agroecological farming approaches require minimum external inputs - which may be expensive and increase dependency if subsidized - but they foster farmers' sense that they can build sustainable futures from local inputs and efforts. With knowledge about the potential impacts of climate change included in the learning journey, farmers can make purposeful decisions around a spectrum of practices such water management, soil fertility and choice of seed and crop-type. This approach also supports livelihood diversification through the provision of additional sources of income - also fundamental for increased resilience.

The overall aim of the Agricultural Support Initiative is to enhance the resilience of the people and ecosystems in selected villages (8) in the Lower Olifants River basin, using a systemic social learning approach, exploring the question: *What are you learning about the socio-economic and biophysical characteristics of your environment, how these are changing and how are you able to respond to that?*

The overarching objective of this work is to provide support for increased adaptive capacity and resilience to the effects of climate change for households involved in agriculture in selected communities of the Olifants River Catchment through:

- Improved soil and water conservation and agroecological practices for increased food security;
- Livelihood diversification and supplementation through alternative climate resistant production;
- And increased community empowerment as a result of self-organisation and collective action.

The expected Outcomes outlined in our theory of change are summarised as:

- Community level analysis and increased understanding of climate change, CC impacts and adaptive measures (*Baselines, planning and reviews*)
- Capacity building for learning groups and Local Facilitators (*learning workshops*)
- Increased awareness and community level organisation; collective action and collaborative activities (*collaborative activities*)
- Improved, diversified production. Soil and water conservation practices implemented. (*Improved productivity and livelihoods*)
- Monitoring of implementation of best practices at household level. Identification and awareness raising around local and new best practice options (*review sessions and open days*).

The activities related to these outcomes (indicated in italics) are somewhat cyclical in nature and depended on the focus, interest and motivation of the members of each learning group.

3 Approach/ Process/ Activities

3.1 Project theory of change



The Theory of Change (Figure 1) captures the key pathways to the intended outcomes. More detail is provided in Table 1 regarding the chronology of activities, outcomes, indicators and targets for each objective.

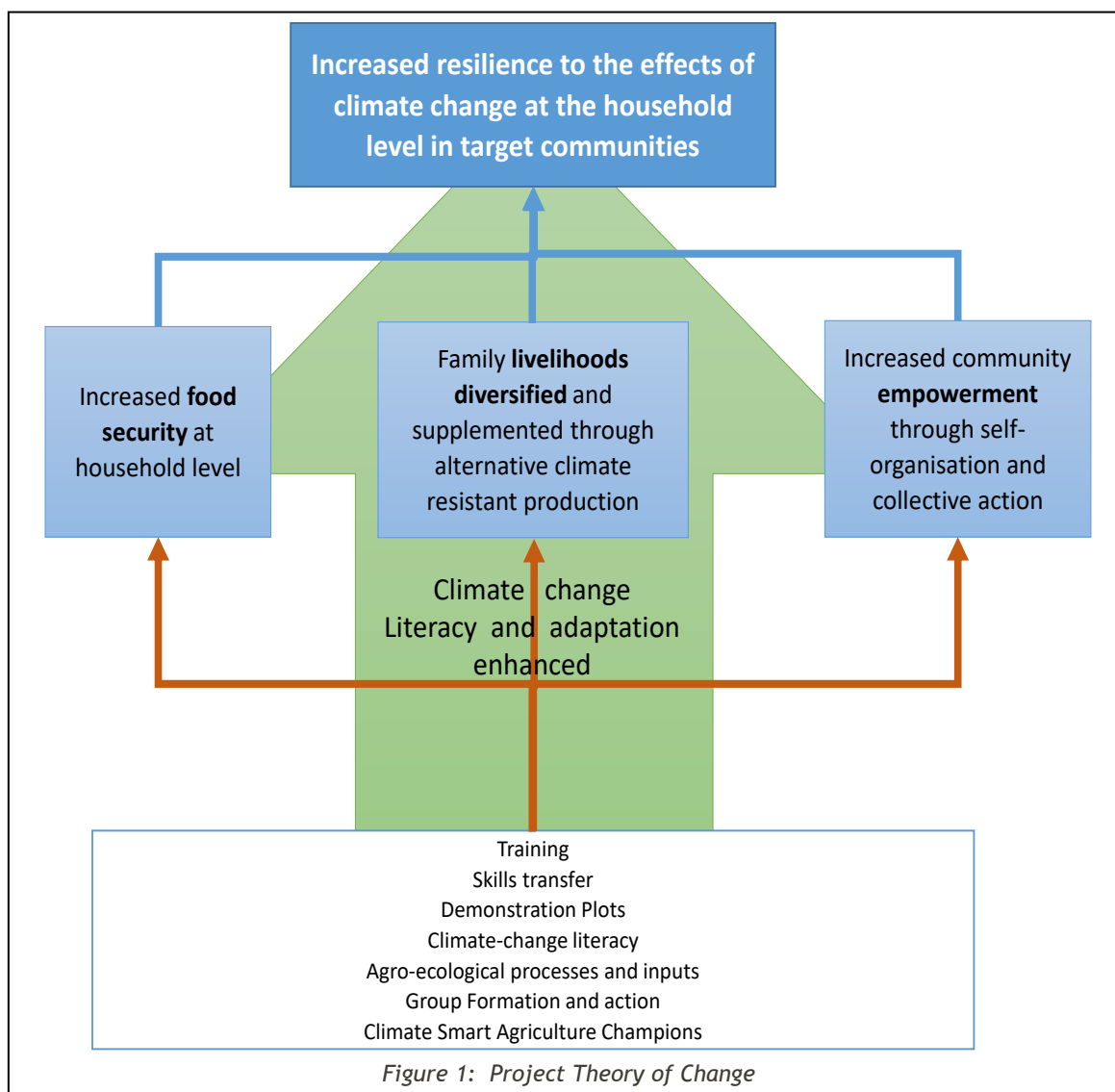


Table 1: Theory of change for the AgriSI Lower Olifants project (November 2016-October 2019), including outcomes, indicators and targets linked to the objectives

Although water security was not emphasised at the onset of the process, it was a central theme, without which increased food security in these land- based livelihoods systems is all but impossible. A substantial focus on water security thus developed within the program implementation process.



THEORY OF CHANGE:							
Overall Objectives		To institutionalize systemic, collaborative planning and action for resilience of ecosystems and associated livelihoods through enhancing the capacity of stakeholders to sustainably manage natural resources of the Olifants River Basin under different scenarios					
		To reduce vulnerability to climate change and other factors by supporting collective action, informed adaptation strategies and practices and tenable institutional arrangements					
AgriSI Objective		To provide support for increased adaptive capacity and resilience to the effects of climate change for households involved in agriculture in select communities of the Lower Olifants River Catchment					
Objectives	Key activities	Activities	Outputs/ milestones	Outcomes/ deliverables	Verifiable indicators	Climate change indicators	Targets
<i>Increased community empowerment as a result of self-organisation and collective action.</i>	Visioning and decision support	Initial introductions, baseline information, climate, soil and water mapping (past, present, future),	Community participation profiles. Baselines for all participating households.	Community level analysis and increased understanding of climate change. Linkages with local stakeholders	Baseline reports for all villages	2:4.8.2-14: Using CC information or vulnerability assessments to inform decisions and actions. Developing a plan of action to respond to and build resilience to climate change impacts.	120 participants
		Visioning and scenario development	Climate change maps for participating villages	Exploration of the SES under different future scenarios, collaborative understanding of climate change impacts.	2-3 Scenarios developed at a local level with baskets of options for best practice		Climate change adaptation scenarios and decision -making reports -x 3
		Learning group and Local facilitator (LF) mentoring and support	Learning groups and local facilitators/champions identified, functioning and agency developed	Capacity building for learning groups and LFs; including savings, group activities, water committees, community awareness	Progress reports		6-7 learning groups 6 CC champions (LFs)
		Networking and cross visits	Seasonal review and planning sessions for each learning group. Open days for showcasing activities and creating awareness in the broader community.	Seasonal review and planning sessions. Open day programs and events.	Increased awareness and community level organisation; collective action		Seasonal review and planning reports (x6). Open day programs and summary reports (4)



		Cross visits between learning groups in the lower and middle ORB and linking to and taking part in other stakeholder networking activities	Cross visits conducted inside the ORB (2-4)		Cross visit summary reports (2-4)	knowledge of climate change impacts and response options.	
<i>Improved soil and water conservation and agroecological farming practices for increased food security</i>	Learning and mentoring	7x day practical homestead -based learning sessions (in soil and water conservation, intensive homestead food production and conservation agriculture) for each of 5-7 learning groups.	Training outlines, handouts, materials and reports (6 groups x 6 trainings)	Improved, diversified production. Soil and water conservation practices implemented.	Training reports. Gardening monitoring reports. Attendance registers.		45% of participants implement at least 1 CC adaptation response, 25% of participants implement 2-3 responses and 5-10% implement >3. Final training manual by April 2017
		Ongoing mentoring and monitoring with further learning and support activities as required and requested (1 day/month x 32 months).	Introduction, demonstration and piloting of best practice options (new and local ideas)	Monitoring of implementation of best practices at household level. Identification and awareness raising around local and new best practice options (at least 4 identified and introduced)	Photo diaries, case studies, B2O reports	3:4.8.2-26. Number of stakeholders with increased capacity: use climate information in decision making; With increased knowledge of climate change impacts and response options;	6 case studies developed
<i>Livelihood diversification and supplementation through alternative climate resistant production and alternative income production options</i>		Focus sessions on climate change aspects and considerations to be included here (3/year).			Reports on 6 focus sessions, that include at least 4 new and or local best practice options.	Stakeholders implementing water saving strategies; Individuals diversifying incomes towards	6 CC w/s impact summaries



	Experimentation and introduction to innovations	Individuals undertake experiments with qualitative and quantitative monitoring.	S&WC and agroecological practices implemented and monitored for at least 100 individuals	Monitoring of implementation of best practices at household level. Final review and reporting of the experimentation and implementation process.	Individual experimentation plans, and garden monitoring reports	less climate sensitive activities	Best practice booklet (including cropping calendars) by July 2018
		Visits from local facilitators/champions and ongoing homestead food production monitoring (monthly for each participant).			Local facilitator monthly timesheets, photos		
	Collaborative work	Learning groups undertake joint soil and water conservation works in teams and implement planned activities for all households (3 days/month). Provision of technical and limited infrastructural support and incentives for these activities.	S&WC and practices implemented and monitored for learning group teams	Collaborative work strengthens local organisational and facilitation capacity	Collaborative S&WC works catalogued and reported on. (Min of 3 sites)		35% of participants engage in collaborative work at least once.



3.2 Summary of activities

The overall structure of activities was based on the following:

- Conduct climate change and adaptation exploration with voluntary groups in 8 villages, linked to the development of baselines (household visits and individual interviews) as well as adaptive strategies and practices for each of the groups;
- Set up learning groups, identify local facilitators and conduct a minimum of 7 learning workshops with each group in agroecological and soil and water conservation practices;
- Set up collaborative activities and individual farmer level experimentation processes (linked to the adaptive strategies for each village and the learning workshops);
- Provide mentoring and monitoring for the individual and group activities and undertake seasonal review and re-planning processes for each group, building in new activities and learning along the way (inclusive of livelihoods diversification) and
- Build social agency through cross-visits, open days networking, stakeholder engagement and learning group actions.

These activities are somewhat cyclical in nature and depended on the focus, interest and motivation of the learning group members.

The table below provides a brief summary of activities for each of the village learning groups.

Table 2: Summary of activities for the AgrSI Lower Olifants program; 2017-2019

Activity	Description	Village Learning Groups
Climate change and adaptive strategy development workshops and individual baselines	<p>*2 Day workshops; CC understanding and concepts, impacts, past, present and future farming scenarios, adaptive strategies and prioritization of practices (initial round)</p> <p>*Individual interviews and hh visits for development of baselines</p> <p>*DICLAD workshops 1-3 for all villages</p>	Sedawa, Botshabelo, Mametja Willows, The Oaks, Lepelle, Fenale Turkey 1 and 2, Loraine (Sekororo)
Learning workshops	<p>*Soil management: Nutrients, composting, liming trench beds, shallow trenches, eco-circles, furrows and ridges, banana basins, mulching, run-on ditches, contours, line-levels, A-frames, check-dams, swales, stone lines,</p> <p>*Water management: Greywater (filtration, use, tower gardens), rain water harvesting, small dams,</p> <p>*Microclimate management and irrigation: Building of small shade cloth tunnels and bucket drip kits, irrigation scheduling</p> <p>*Crop management: Mixed cropping, new crops (total of 21 introduced), herb production, natural pest and disease control, conservation agriculture (intercropping, legumes, cover crops), fruit production, organic mango production, cropping calendars, seed saving,</p>	Sedawa (Chirstina Thobejane, Alex Magopa), Botshabelo (Mariam Malepe), Mametja (Magdalena Malepe) Willows (Melida Shaai, The Oaks Florence Lewelle), Fenale, Lepelle (Josias Sebuyane, Patricia Ngobeni), Turkey 1 and 2 (Isaac Malatji, Matshego Shaai)



	<p>*Natural resource management: Propagation of indigenous trees and plants (fruit, shade, medicinal), management of burning and chopping of trees for firewood</p> <p>*Livestock management: Poultry production, chicken tractors, production of poultry feed, livestock fodder production, agroforestry options</p>	
Collaborative activities and individual farmer level experimentation	<p>*Experimentation by around 75 individuals</p> <p>*Shade cloth tunnels for 36 individuals, bucket drip kits for 46 individuals</p> <p>*3 Underground RWH tanks built with DKA assistance</p> <p>*Organic marketing initiative with Hoedspruit Hub (28 participating farmers) including vegetables, herbs and mangoes</p>	<p>Sedawa, Botshabelo, Mametja Willows, Fenale, Lepelle, Turkey 1 and 2</p> <p>Sedawa, Mametja, Botshabelo</p> <p>Sedawa, Mametja, Turkey, Willows</p>
Mentoring and monitoring	<p>*Garden monitoring forms- filled in for 100 individuals over time, by LFs and field workers</p> <p>*Resilience snapshots - for impact of practices for 30 individuals</p> <p>*Seasonal review and re-planning sessions; x 15</p>	<p>Sedawa, Botshabelo, Mametja Willows, the Oaks, Fenale Lepelle, Turkey 1 and 2</p>
Social Agency	<p>*Cross visits between Lower Olifants villages x 8</p> <p>*Cross visits between Sekhukhune and Lower Olifants x 2</p> <p>*Open days x 2</p> <p>*Networking; Agroecology network meetings x 3</p> <p>*Stakeholder engagement: K2C, CWP, SOL, Limpopo Dept of Agriculture, CSA</p> <p>*Water committees; local supply and management of agricultural water supply</p>	<p>Sedawa, Botshabelo, Mametja Willows, FenaleLepelle, Turkey 1 and 2</p> <p>Lepelle, Sedawa and Turkey</p>

Below are photographs of the above-mentioned activities

3.2.1 Climate change adaptation workshops and baselines



Botshableo CC workshop and joint group review of five fingers indicator framework



DICLAD workshop CC impacts (Sedawa), Turkey CC workshop, Sekororo rainfall and temperature calendar



Baseline visits; local best practice; Banana basins, small dams and indigenous fruit trees (Dikgogoma)



3.2.2 Learning workshops



Run-on ditches (Botshabelo), trench beds (Willows), stone lines (Lepelle)



CA planter Mametja, drip kits Mametja



Tower garden (Fenale) and check dams (Turkey 1)



Small Dams (Turkey 2), Organic Mango Production (Lepelle), cropping calendars (Turkey 1)

3.2.3 Collaborative activities



Construction of tunnels (Willows), Underground RWH tanks (Sedawa), Organic marketing (Hoedspruit Hub)

3.2.4 Social agency



Water committee and learning group mapping out water supply options and doing a scouting exploration for water sources in the mountain



Village level cross visit to Turkey, Seasonal group review session and Alex Makgopa reporting back to the learning group from a cross visit to Sekhukhune



4 Results

4.1 Project outcomes and impact

The Agri SI process was designed as a sequence of activities involving farmer participants, facilitators and resource persons. Activities followed the chronology outlined below:

- Understanding current practices,
- Develop a vision of what could be,
- Discuss innovations and agree to try; sometimes with collaborative work,
- Develop a farm design and plan that includes experimentation with new ideas,
- Ongoing mentoring of implementation and experimentation
- Periodic cluster sessions,
- Periodic monitoring and self-assessment
- And networking and cross visits (1 of each per year)

Outcomes suggested in our theory of change are summarised again here, for purposes of clarity:

- Community level analysis and increased understanding of climate change, CC impacts and adaptive measures (*Baselines, planning and reviews*)
- Capacity building for learning groups and Local Facilitators (*learning workshops*)
- Increased awareness and community level organisation; collective action and collaborative activities (*collaborative activities*)
- Improved, diversified production. Soil and water conservation practices implemented. (*Improved productivity and livelihoods*)
- Monitoring of implementation of best practices at household level. Identification and awareness raising around local and new best practice options (*review sessions and open days*).

4.1.1 Community level analysis and increased understanding of climate change

Baselines were constructed for each of the 8 villages through focus group discussions, individual interviews and household ‘walkabouts’; starting with an exploration of climate change impacts and adaptive strategies and past, present and future farming activities as seen by the participants. The outlines of processes and interviews are provided in Attachment 1.

4.1.1.1 FOCUS GROUP DISCUSSIONS (CLIMATE CHANGE ADAPATATION DIALOGUES)

Facilitation steps used in the focus group discussions were:

1. Contextualization: Natural resources; need to look at climate change projections for KZN/EC/Limpopo, and discuss with people how these will affect them *Tools; A4 impact pictures or a Power Point presentation - of floods, droughts, erosion, declining natural resource base, declining yields, ...)*
2. Look at the difference between variability in weather and climate change. There is variability in weather and there is also a major change in that variability in weather, predictions and certainty (*Tools; role play- Phone call; weekend visit vs moving to an area*)
3. Exploration of temperature and rainfall and participants’ understanding of how these are changing (*Tool: Seasonal diagrams on temperature and rainfall - normal and how these are changing*)
4. Timeline in terms of agriculture (*Tool: livelihoods and farming timelines -assessment of past, present and future*)



5. Reality Map: Changes (in natural resources), impacts (of changes), practices (past, present, future), challenges/responses (*Tool: Mind mapping of impacts*)
6. Current practices and responses (effectiveness of responses) (*Tool: outlining adaptive measures on mind map*)

Below is a summary of climate change impacts as mentioned in these discussions, across the 8 villages in the Lower Olifants Basin.

Table 3: Climate change impacts summarised from baseline workshops for 8 Lower Olifants Basin villages (2017-2018)

Impacts of climate change on livelihoods and farming in the Limpopo Basin	
Water	Less water in the landscape; streams and springs dry up, boreholes run dry, soils dry out quickly after rain and dams dry up
	Municipal water supply becoming more unreliable;
	Need to buy water for household use - now sometimes for more than 6 months of the year
	RWH storage only enough for household use and for short periods
Soil	More erosion
	Soils becoming more compacted and infertile
	Soils too hot to sustain plant growth
Cropping	Can no longer plant dryland maize
	All cropping now requires irrigation - even crops such as sweet potato
	Drought tolerant crops such as sorghum and millet grow; but severe bird damage
	Heat damage to crops
	Reduced germination and growth
	Seeding of legumes becoming unreliable
	Lower yields
	Winter vegetables don't do well; stress induced bolting and lack of growth
	More pests and diseases
	Loss of indigenous seed stocks
Livestock	Less grazing; not enough to see cattle through winter
	More diseases in cattle and heat stress symptoms
	Fewer calves
	More deaths
Natural resources	Fewer trees; too much cutting for firewood
	Decrease in wild animals and indigenous plants
	Increased crop damage from wild animals such as birds and monkeys
	No longer able to harvest any resources due to scarcity
	Increased population puts pressure on resources
Social	More diseases
	Increased poverty and hunger
	Increased crime and reduced job opportunities
	Increased food prices
	Increased conflict
	Inability to survive

The severity of these changes is obvious in these villages and have been exacerbated by an extended drought; where comments like “we will all die”, “we will need to move from here to the cities” and “it feels like the end of the world is coming” were not uncommon.

People felt that they are being punished by God for the disintegration of their social fabric. They mentioned that people no longer follow the old rules or keep to their traditional beliefs and taboos, people do not care properly for their families and immorality, violence and theft are all too common.



There is thus a tacit understanding that these social problems exacerbate their ability to survive well into the future.

Potential adaptive measures were discussed as an outcome of the impact mind map and participants discussed in small groups possible practices and ideas which could help them adapt to the changes and reduce the negative impacts of these changes.

Being practically minded, most of the participants moved straight from impacts to practices - so strategies were not really discussed. Some of the groups had many ideas, some of which were gleaned from working with support organisations and NGOs. Those groups where no external support is available, did not have many 'new' ideas, but focussed more on doing what they are currently doing, better.

Below is an example of this discussion for Turkey in Limpopo (with limited external support)

Table 4: An example of potential adaptive measures from the Turkey (Limpopo) climate change dialogue process

Turkey CC workshop; December 2017			
Impacts	Description and linkages	Outcomes	Potential adaptive measure
GROUP 1			
Reduced water availability	Dams dry out, boreholes provide less water, rivers dry out, less rain	Reduced production, hunger, diseases, no jobs, poverty, crime, death	More boreholes, more dams, water management, irrigation in evenings and early morning, mulching, trench beds (keep moisture in and soil cool)
Drying of environment	Soils are hotter and drier, drought, plants wilt, increased pests		Save plant residues for animals, buy fodder, control pests on animals
Reduction of resources	Deforestation, Fruit trees die, livestock, wild animals die		Planting of trees after they have been cut down; make use of paraffin stoves and electricity, government involvement in solving the problem,
GROUP 2			
Extreme heat	Early fruiting, trees wilt	Poor crop health	Shade netting
Shortage of water	Rivers dry out, municipal supply only once per week. Boreholes dry out	Lack of education towards saving water	NGOs and government to assist Trench beds, mulching, save water in dams, drip irrigation, irrigate in evening, boreholes, greywater
Reduction of resources	Less grazing, seed shortage, trees are removed, indigenous animals are no longer there		Donations for/of seed Rather use paraffin stoves than firewood. Only chop down mature trees to allow others to grow, planting trees, government intervention Taking care of indigenous plants Plant fodder for livestock
Soils	Poor cultivation practices, soil erosion, dry soils, sandy soils		Using crop residues and manure, practice minimum tillage options
Social repercussions	Less or no food, health problems, no jobs	Burning of buses, divorce, separation of families, poverty, crime	Getting access to health care, parents must work
Shortage of implements			Setting up cooperatives for government support, use animal drawn traction- oxen and donkeys, improvise, make our own tools, make use of hand hoes



Based on the adaptive measures suggested and some input on potential implementation ideas, practices were then divided into five themes (known as the five fingers analysis) and prioritized for action, using community generated criteria

Table 5: Suggested practices for farmers, categorised into the 5 primary themes.

PRACTICES	Natural Resource Management	Soil	Water	Crops	Livestock
Tunnels/ shade cloth					
Bed design					
Mulching					
Natural pest and diseases					
Rainwater harvesting					
Trench bed					
Composting					
Fodder crops					
Underground water tanks, sand dams					
Mixed cropping					
Conservation of wetlands and streams					
Burying of disposable pampers					
Reducing burning of grazing veld and cutting grass					
Greywater Harvesting					

4.1.1.2 INDIVIDUAL INTERVIEWS AND HOUSEHOLD VISITS/ WALKABOUTS

The responses to these questionnaires were coded and analysed in excel sheets, to be able to summarise information from a number of different participants and get an indication of the 'profile' of the participants involved. Below is an example for Turkey 1 and 2.

4.1.1.2.1 Baseline information for Turkey (1 and 2)

Participants were visited in their homesteads and interviewed to glean information about their basic socio-economic situations and their farming resources and practices. The small charts below outline the summarised information.

Table 6: Socio-Economic information for turkey (N=20)

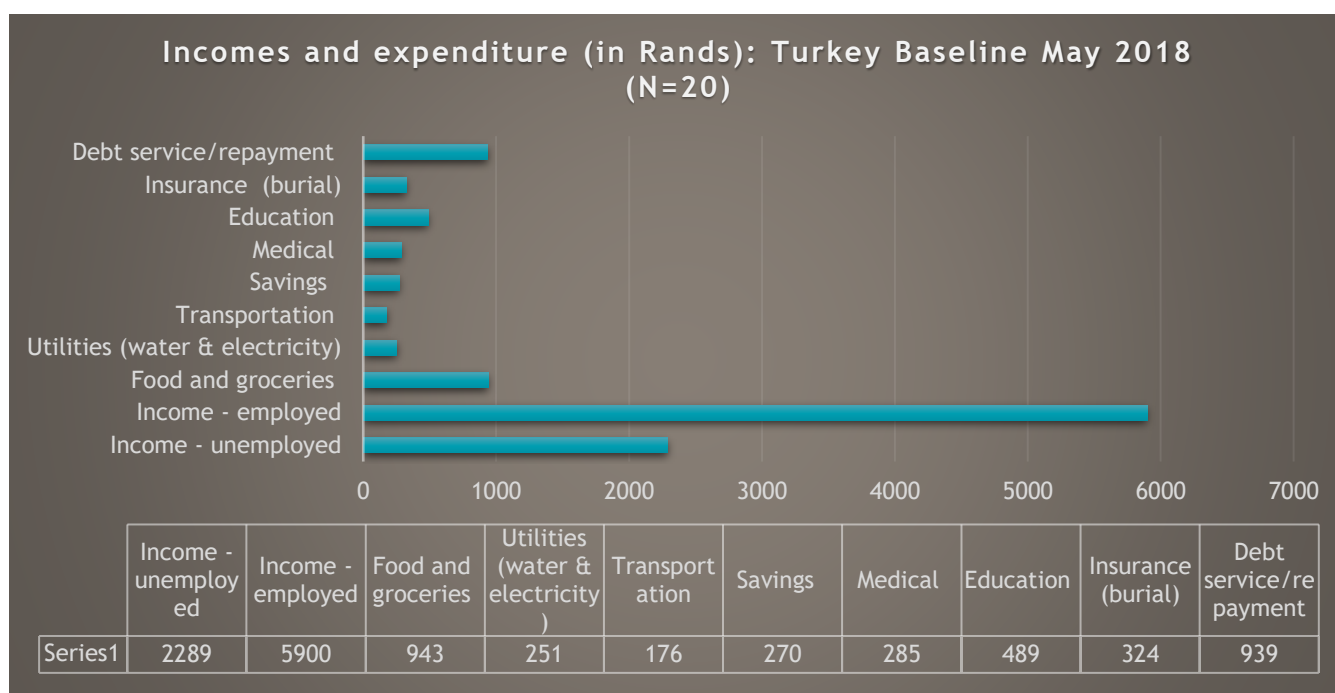
Household Information	Gender (F)	15
	Average age	53
	Disabilities	3
	Household head (respondent who is a head of their household)	18
Social organisation	Burial societies	20
	Stokvels	7
No of Household members	Average number of adults in household	3
	Average number of children	2
Income source (per household)	Grants (Type; pension, child)	20
	Grants (average number of grants per household)	2
	Remittances	6



	Salaries	5
	Income from livestock	3
	Income from fruit & veg sales	7

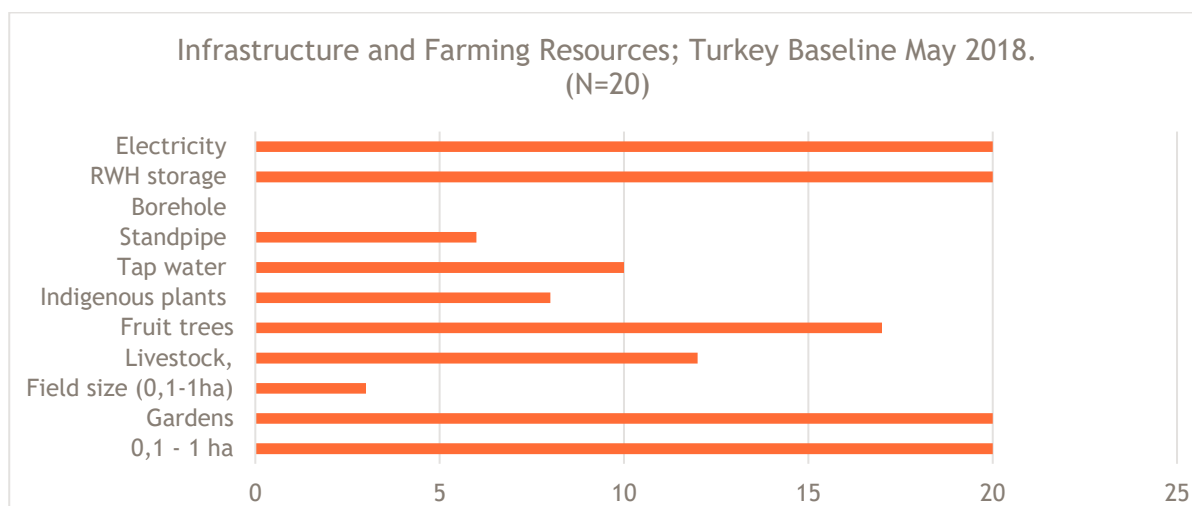
The table above indicates that most of the participants are mature women and quite a number of the participants are the heads of their households. None of the participants in this program are employed. All the households receive state grants, either child grants or pensions or both. Participants all belong to burial societies and a smaller number are also saving in local groups (stokvels) for buying food. A few participants make a small income from farming activities.

Table 7: Incomes and expenditure in Turkey, May 2018



From the above table it can be seen that 15 of the 20 households interviewed rely on grants and remittances to survive and make an average monthly income of R2889/month. For the households where adult members have some employment, that average income is R5900/ month. Participants spend between 20-50% of their income on food and an almost similar amount on repaying debts.

Table 8: Infrastructure and farming resources, Turkey, May 2018



This table points towards the severe lack of municipal water provision in the village. All of the households that have taps (in the survey only 50%), mentioned that there has been no water for some time. This varies from village to village and also across time, but people estimated that they generally have water less than 50% of the time. As the drought has worsened, this situation has also become more dire and there are sections of these villages that have had no municipal water supply from more than 6 months. In these cases people “buy” water from neighbours in the village who have individual boreholes, or they belong to groups that provide private water provision arrangements (pipes in the mountain), for which they also pay. All participants collect some rainwater- but mostly this is in 210 l drums- so is not enough for household use. Around 45% of these participants have Jo-Jo tanks (5 000-10 000l) in their homesteads.

Household visits were conducted as part of day 2 of the 1st workshop. The idea was to do a transect walk through the village or area to broadly ascertain from visual observation;

- General environmental conditions in the area,
- Access to resources and infrastructure and
- Vulnerability of the people.

The household visits also provided an opportunity to conduct the baseline interviews. In addition, these household visits were set up to showcase practices and local innovations that participants are already undertaking.

EXAMPLE OF A WALKABOUT WITH HOUSEHOLD VISITS, LIMPOPO (2017)

PRACTICES WE ARE ALREADY FAMILIAR WITH: mulching, trench beds, furrows and ridges, intercropping, planting herbs, diversification (or different kinds of crops planted together), small dams, compost.

Further comments made by the group include:

- Mulching is done, but is not so popular, because of lack of materials
- Earth dams are dangerous for children
- Jo-Jos are expensive - we are using drip irrigation (2nd hand from commercial farms)
- Hybrid seeds are expensive and difficult to access, even though they have given very positive results

PRACTICES GLEANED FROM COMMUNITY WALKABOUT: small earth dams, planting grass in eroded areas, planting and keeping seed of old and traditional crops such as shallots, cowpeas, as well as indigenous greens such as cleome, using kitchen scraps in shallow trenches, compost pits, banana circles, management of mango trees by some pruning, planting green beans under shade of trees rather than sugar beans as the latter does not pod well in the shade., protecting litchis from birds



using netting. Participants learnt about pollination processes for mangoes. They did not know about male and female flowers. They also commented that ‘normally when we see brown patches on the mango leaves, “we did not think that this can affect the fruiting’. With the age of the trees, quality and quantity of fruit deteriorates.



Above left to right: Local innovations: small dam, shallots grown and seed kept, banana circles with compost and furrows and ridges for planting beans

A selection of the CSA practices was then introduced through the learning workshops, farmer experimentation and collaborative activities processes, taking the priorities of each village learning group into account

4.1.2 Learning workshops

Below is a summary of the workshops that were conducted for each of the learning groups. A total of 109 participants have received training over the lifespan of this project. The learning manual and farmer level handouts (in sePedi) are appended separately.

Table 9: Learning workshops conducted during the AgriSI program; 2017-2019

Workshop theme	Summary of topics/practices covered
Soil and water conservation	Contours, swales, diversion ditches, check dams, stone lines, mulching, furrows and ridges
Water management	Grey water management- bucket filtration, tower gardens, irrigation scheduling
Soil fertility	Soil types, structure, plant nutrients, composting, liquid manures
Bed design	Trench beds, shallow trenches, eco-circles,
Mixed cropping and crop diversification	Intercropping, crop rotation, multipurpose plants (moringa, lemon grass, Bulbinella, wormwood, aloes, garlic chives) vegetable crop diversification (turnips, leeks, open headed and leaf cabbages, rape, kale, kohlrabies, mustard spinach, chinese cabbage, broccoli, cauliflower, peas, green beans okra, brinjals, baby marrows, cherry tomatoes, spring onions, orange fleshed sweet potatoes, certified potatoes), herbs (parsley, coriander, thyme, rosemary, lavender, fennel, marigolds, comfrey)
Natural pest and disease control	Garden management, sanitation, pest repellent crops, natural brews, dangers from use of chemicals,



Fruit production	Indigenous and other fruit tree propagation techniques, management (composting, watering, pruning, organic production for marketing, sale of trees, introduction of new types (mango, avocado, banana, citrus[oranges, naartjies, grapefruit] nut trees), pest and disease control
Conservation Agriculture	Hand and animal drawn planters, basins, crops (maize, dry beans, cowpeas, bird resistant sorghum, millet, Sun hemp, sunflower, fodder oats, fodder rye, fodder radish), intercropping and crop rotation
Seed saving and cropping calendars	Cropping calendars for different types of season (dry, normal and wet) indicating changing planting times and crops, saving different types of vegetable, herb and fruit seed, open pollinated varieties and hybrids, cross pollination, bagging, isolation distances, preparation and storage of seed.
Farmer experimentation	Analysis of problems, possible solutions, ideas to try, what to observe and measure, experimental controls

Below, is a selection of photographs from learning workshops.



Demonstration of concepts in learning workshops; Soil type using bottle test in Willows and Using A 4 diagrams and photos for discussing seed formation in flowers in Mametja



Learning to construct and read line levels for making contours in Lepelle and the Local Facilitator providing advice the local school CWP gardening team in Sedawa



Sharing lemon grass between participants in Lepelle, The Sedawa LF (Cynthia Thobjeane), cofacilitating a CA workshop in Turkey and providing inputs of experimentation and LFs from The Oaks, Finale and Lepelle assisting each other in learning to fill in the garden monitoring forms



Multipurpose trees and plants for distribution during a learning workshop in Sedawa, participants designing their water flow diagram for S&W conservation workshop in Turkey 2 and participant sharing her farm planning layout in Willows



4.1.3 Collaborative activities

These activities have been taken on by the learning group, where individuals have worked collaboratively to effect these outcomes. Agency and organisational capacity for the learning groups have increased substantially. For five of the eight communities; Sedawa, Mametja, Botshabelo and Turkey 1 and 2 the learning group have become a local community structure, where participants meet independently of the service providers and have worked together to write funding proposals and plan activities.

Table 10: Summary of collaborative activities for the Lower Olifants AgriSI program 2017-2019

Collaborative activities	Description	Villages
Tunnels	36 tunnels constructed locally for individuals over a period of time, from multiple funding sources (including NTT and Lima RDF)	Botshabelo, Mametja, Sedawa, The Oaks, Willows, Finale, Turkey 1 and 2
Drip kits	46 drip kits distributed and used by participants in trench beds in and outside shade netting tunnels. The bucket drips are also designed to filter greywater as a water source.	Botshabelo, Mametja, Sedawa, The Oaks, Willows, Finale, Turkey 1 and 2
Underground RWH tanks	3 pilot tanks (22 000l) constructed with support from DKA	Botshabelo, Sedawa, Mametja
Small dams	4 workshops, (including Chris Stimie from RIEng), to construct dams and line them with bentonite to increase water holding	Mametja, Turkey
Organic Marketing process	23 Participants: 2 workshops at Hoedspruit Hub - quality control, pricing, harvesting, packaging and transport; 1 workshop at Hlokomela - growing herbs, harvesting and packaging; 8 village based workshops to outline process, transport and logistical arrangements and 1 combined review session. A total income of -R22 000 was made by participants (Aug-Nov 2018)	Sedawa, Mametja, Turkey, Willows
Water committees	40 Participants Turkey, 23 participants Sedawa, 35 participants Lepelle. Analysis of water sources and demand using Participatory video, scouting for new options and design of interventions (support from RIEng and Raymond Vonk-Geophysical Survey Consultant). Funding proposals for support in agricultural water provision, written by water committees (US Embassy, Joyce Meyer Ministries)	Sedawa, Lepelle, Turkey



Learning to use a video camera for the participatory video in water issues, group construction of shade netting tunnels (Botshabelo) and group construction of bucket drip irrigation kit (Willows)



4.1.4 Improved production and livelihoods

A range of different **indicators** have been monitored throughout the life span of the project; focussing mainly on implementation of climate resilient agriculture (CRA) practices (soil and water management, crops, livestock and natural resources) and livelihoods indicators (food and income). Monitoring was conducted for all active participants, generally at least once a quarter. Monitoring was conducted for 72 participants for 2018-2019. A further discussion on indicators will follow in section 4.3.

The practices implemented through the learning, farmer experimentation and collaborative activities has been divided into three categories:

- New interventions; these are activities and practices within farming systems that build on existing knowledge and are well known within the broader environment; e.g. mulching
- New innovations; these are appropriate technological interventions introduced to augment locally managed practices; e.g. shade cloth tunnels and
- Local good practices; these are local and traditional practices identified with CCA potential that have been promoted among participants; e.g. banana basins

Figure 4 below indicates the overall uptake of climate resilient agriculture practices across the eight villages in Mametja where these were introduced through learning workshops, demonstrations and farmer experimentation.

Of the **new interventions**, the highest uptake of practices was for trench beds (86%) and mixed cropping (82%); followed by stone bunds (61%), planting from seed (50%) and liquid manure (43%). Mulching levels were low (32%), due to lack of mulching material in the environment. The extended drought, heat and lack of agricultural water supply led to very little natural vegetation being at hand for this practice.

A few practices did not “stick” despite our efforts of introduction and re-introduction of these ideas. These include making and using of liquid manure and eco-circles, which use a bottle drip system. The use of natural pest and disease control and conservation agriculture for field crops can also still be improved. These practices are all considered knowledge intensive, as farmers need to internalise a number of different concepts to work well with these practices and additionally have to use their own analysis and judgement in the implementation.

The **new innovations** (shade cloth tunnels (35%), bucket drip kits (35%), RWH storage (*underground RWH tanks, surface reservoirs and small dams*) (24%) and small dams lined with bentonite [*Not in diagram- very recently introduced*]), were limited to participants who received some financial assistance and those who could afford to try out these practices themselves. It was however considered important to introduce these ideas, due to their potential for impact on resilience

Local good practice options, shows that all the participants have tried some version of RWH, around 76% do seed saving and around 64% engage in propagation of multi-purpose plants, with fewer engaging in greywater management (46%), planting of legumes (38%), construction of furrows and ridges for planting (31%), and construction of basins filled with organic matter to plant bananas (18%).

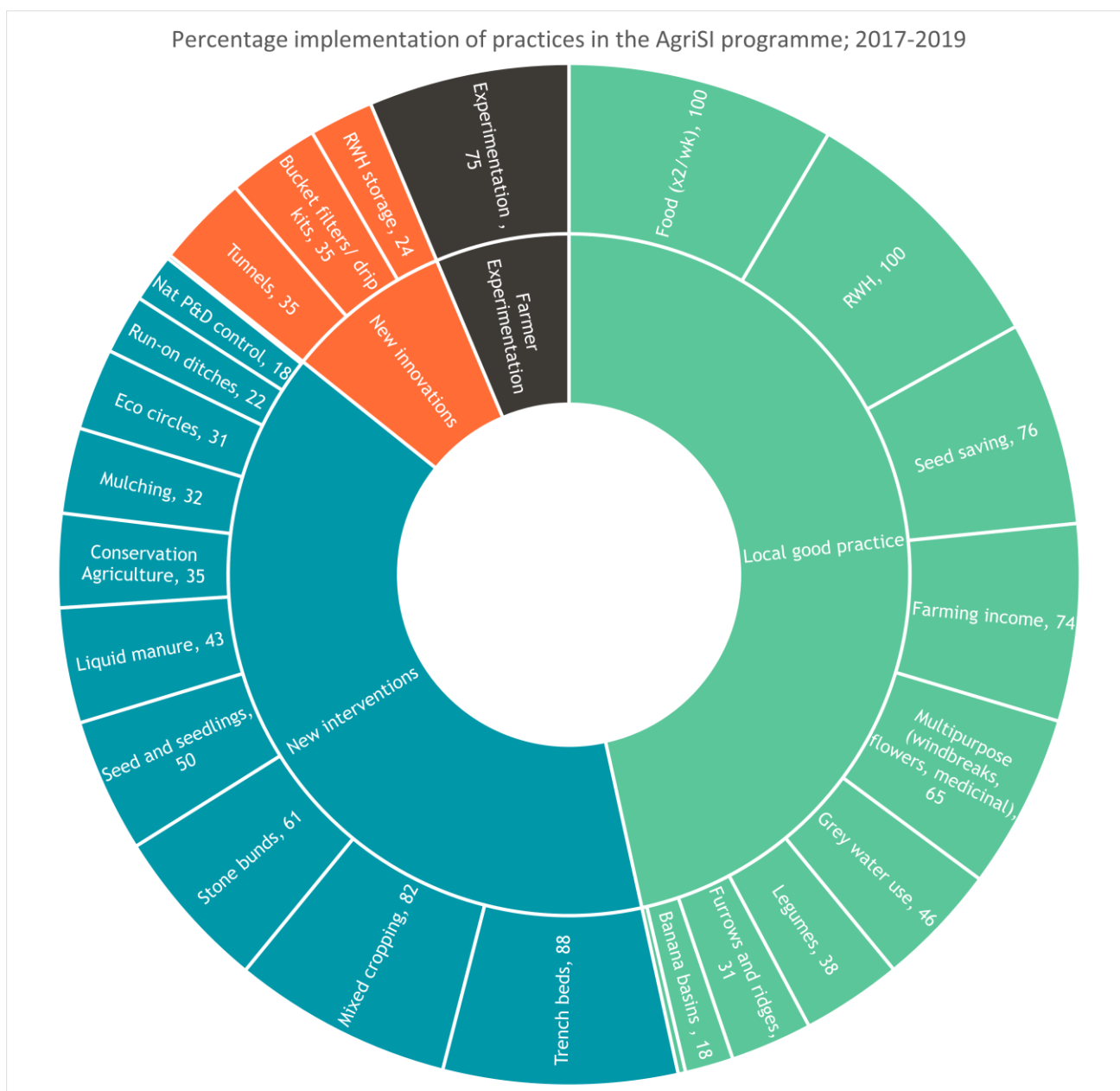


Figure 1: Percentage implementation of CRA practices within the Lower Olifants AgriSi program 2017-2019

All participants have grown enough produce to harvest on average twice a week for local consumption and around 74% of participants have made small incomes from sales of produce. Incomes range from between R50-R2 400/month and averages at around R700/month. This is a remarkable achievement in the face of the severe climatic conditions in the area.

To get a sense of the impact of the project processes on these indicators, we have compared the indicators across 2017/18 and 2018/19, to assess the changes in the implementation of practices across these time periods. Two new villages (Turkey 1 and 2) were included in the 2018/19 monitoring process.

From Figure 5 below, it can be seen that there was a sharp increase in food production (60%) and farming income (28%) after the second year of implementation. This is perhaps the strongest indication that this process of working with climate resilient agriculture practices has had a positive impact on the livelihoods of the participants.



The increase in local use of RWH practices (basins, drums and Jo-Jo tanks) is an indication of both increased awareness of this practice, but also increased need, as access to water for household purposes and farming has been decreasing.

There have also been significant increases in the use of liquid manure (31%), eco-circles (22%), mixed cropping (21%), conservation agriculture (19%) trench beds (12%), and stone bunds (10%) and some increase in greywater use, seed saving and banana basins.

Decreases in the implementation of soil and water conservation practices such as run-on ditches, contours, mulching, and furrows and ridges are indicative of the lack of rain, reducing the urgency in implementation and participants' pre-occupation with only focusing on practices directly related to the production of food.

The level of participation in **farmer experimentation**, increased by 14%; indicating an ongoing and slowly growing interest in this method of learning by the participants.

Although only by inference, these comparisons over time also give an indication of the sustainability of uptake of these practices - as increases indicate a continuation of practices, while a decrease points towards discontinuation. If participants have used a practice for 2-3 seasons, we would assume that they would continue to do so in the future

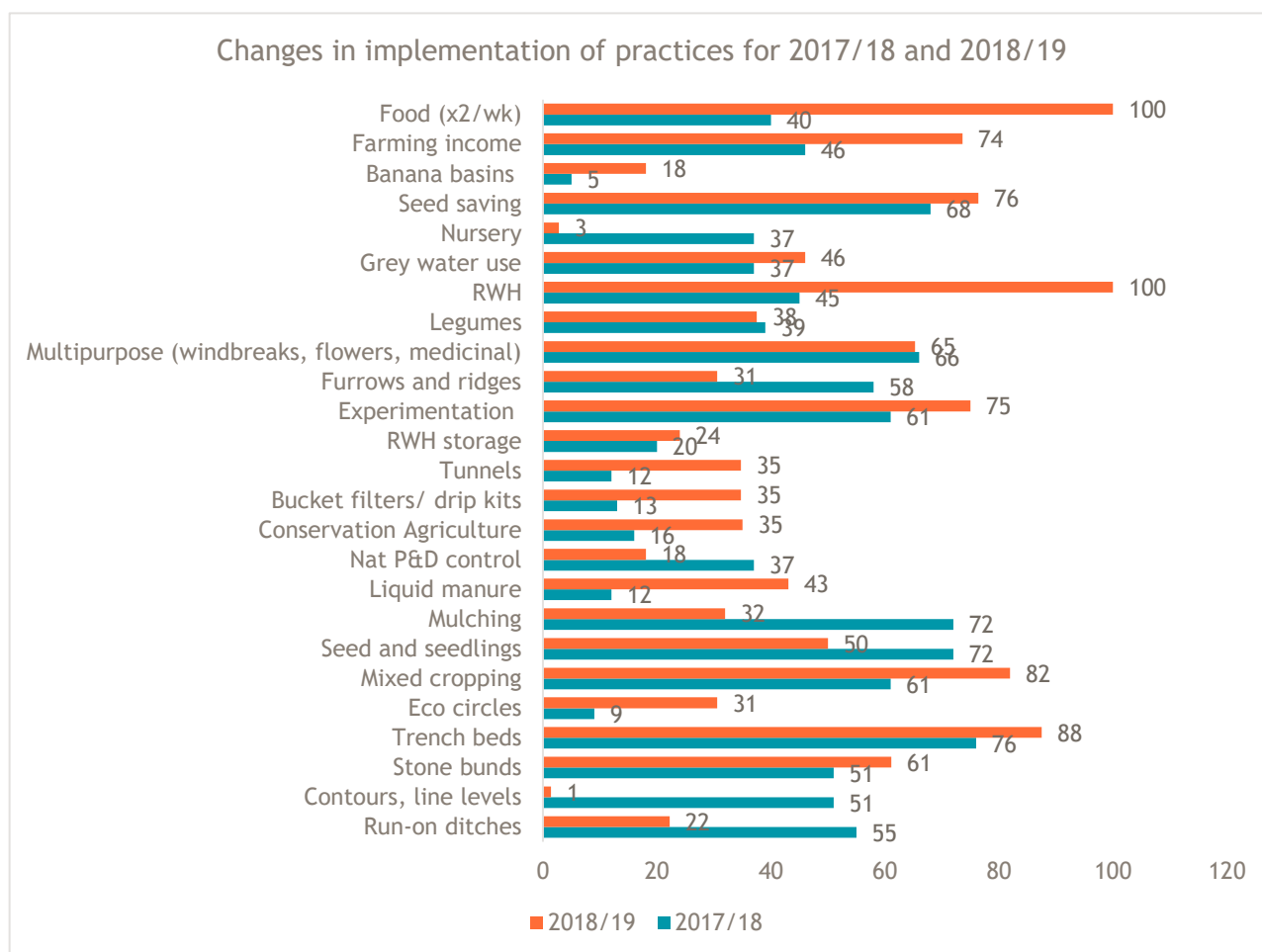


Figure 2: Changes in implementation of practices between 2017/18 and 2018/19

The photographs below provide a visual snapshot of the implementation of some of the practices mentioned above.



Coriander and spinach production in tunnels with drip irrigation, mulching and mixed cropping (including marigolds and thyme) in tunnels, trench beds with mixture of kale and mustard spinach (new crops grown from seed kept).



Improved local practices; Small dams with bentonite lining to hold water and composting implemented after training at Hoedspruit Hub



Conservation agriculture; bird resistant sorghum (introduced) and intercropping of maize with cowpeas



Livestock fodder (black oats), underground RWH tank, mixed cropping and furrows and ridges with mulching



In the following small sections, we will discuss measurements and observations linked to improved understanding and learning as well as improved adaptive capacity for individuals implementing CRA practices.

4.1.4.1 WATER PRODUCTIVITY ASSESSMENTS

These assessments were done to gauge the impact of the climate resilient agriculture practices on both productivity and water use; the two main biophysical criteria for improved resilience.

A local weather station was set up and water sensors (Chameleon sensors) installed in the farmer experimentation plots to compare normal beds trench beds and trench beds inside shade netting tunnels. The farmers helped with record keeping, including amount of irrigation water applied and weighing of harvests. During this process they learnt a lot about irrigation scheduling (how much water to apply how often). These results were then presented by them to their learning groups during the review sessions and discussed for wider adoption.

The small table below summarises these results. For the purposes of this exercise the farmers opted to use a simplified formula for water productivity; namely amount of irrigation water applied vs yield, as they found compensating for leaching and evapotranspiration difficult to comprehend.

Right and far right: Matshego Shaai's trench beds outside and inside her tunnel, planted to spinach for the purposes of the water productivity calculations.



Table 11: Water productivity calculations for Sedawa, 2018 for 2 participants in Sedawa and Mametja.

Name of farmer	Farmers' method (Water applied)		
	water use (m ³)	Total weight (kg)	WP (kg/m ³)
Christina Thobejane (Tunnel; trench beds, with mulch)	1,10	48,9	56,7
Christina Thobejane (Furrows and ridges with mulch)	3,91	24,5	5
Christina trench outside	2,93	14,7	11,3
Nora Mahlako (Tunnel; trench beds without mulch)	9,47	19,6	5

From the table above it is clear that the water productivity (WP) for Christina's trench beds inside her tunnel was around 5 times more than that for her trench bed outside the tunnel and 10 times more than her normal beds (furrows and ridges). This clearly indicates the advantages of combining these practices (organic matter, mulching and microclimate control) as an adaptation strategy. She also changed her



irrigation practices to doing a deep watering once a week, rather than using small amounts of water every day. Norah Mahlaku however did not use mulch and continued with using small amounts of water daily. This reduced the WP for her tunnel substantially.

A cost-benefit analysis for Christina’s experiment, using the cost of water in the area (R35/210l), indicates that given the harsh conditions and high prices for water, only the trench beds with mulching inside the tunnel could be used profitably. This is a significant outcome and was reflected also in the very high demand for tunnels from the participants.

Table 12: Cost-benefit analysis for the Water Productivity experiment for Christina Thobejane, Sedawa, 2018.

Practice	Water (l)	Cost (R/m ²)	Yield	Sales (Rands/ m ²)	Profit (R/m ²)
Trench inside tunnel	1100	R18,70	6 bundles/m ²	R60	R41,30
Trench outside tunnel	2926	R48,80	4,2 bundles/m ²	R42	-R6,80
Furrows and ridges	3913	R130,40	2,4 bundles/m ²	R24	-R106,40

This analysis also indicates that it is the synergism of a number of combined practices that is likely to have the greatest impact on resilience.

WP calculations for the dryland cropping options could not be concluded, due to repeated crop failure; which is in itself an indication of the high risk of dryland cropping in this area.

A number of participants also adapted these practices by extending their shade netting areas, constructing their own drip irrigation systems and collecting tree leaves and cutting grass for mulching.



Examples of extension of shade netting structures (Turkey, Mametja)



Mulching; with leaves, cut grass from the homestead (Sedawa) and Moses Mogofe (Willows) demonstrating how he made his drip irrigation system. Building of a trench bed underneath a grape vine for the shading effect (in lieu of netting)



4.1.4.2 LIVELIHOODS DIVERSIFICATION

Livelihoods diversification has been noted as the following activities, directly related to this intervention:

- Increased diversity of cropping for food production and local sales; 66% of participants.
Participants have included a wider range of vegetable types for both summer and winter cropping, have expanded their field cropping options and have been growing a range of culinary herbs.
- Organic marketing of herbs and vegetables; 21% of participants.
With the assistance of Hoedspruit Hub (HH) participants have engaged in an organic box scheme, managed through a Facebook page at HH. They have also been selling independently to a few lodges and restaurants and farmers markets.
- Processing; drying, milling, juice and bottling; 9% of participants.
This activity, although considered a good idea, has been quite limited in implementation. Only a few of the inherently more innovative participants have undertaken these activities.
- Diversification into small livestock; 16% of participants
Two groups of participants linked to learning groups have undertaken poultry initiatives; one for layers and one for broilers - assisted through increased incomes through their vegetable production as well as increased confidence in farming activities derived from their participation in the AgriSi program.

Below are a few indicative photographs



Dried coriander sold by the teaspoon (Matshego Shaai, Turkey) , the Facebook page for HH for organic vegie boxes and selling herbs at the local farmers' market.



Layer production in Turkey (Phedisang project), mango juice (Christina Thobejane, Sedawa) and grain and legume milling (Isaac Malatji, Turkey)



4.1.5 Review sessions and open days

Review sessions were held seasonally (every 6 months) for each of the learning groups to review progress and plan the next season's activities.

4.1.5.1 LEARNING GROUP REVIEW SESSIONS

NOTE; Comments made by farmers are recorded in italics.

Agendas were reasonably simple in terms of assessing implementation and planned activities and including learning and issues as sub-themes. Analysis was done according to the five finger themes. Below is a summary of one of these review sessions for the Sedawa learning group (2018/19).

Table 13: Summary of Review sessions for the Sedawa learning group (2018/19)

ACTION	CONSTRAINTS	HAS IT WORKED	FUTURE; NEXT STEPS
GOAL: Improve water use efficiency and increase access to water			
RWH: Jo-Jo's, 210l drums, basins, small dams, underground tanks	<i>JoJos are easy but expensive - in digging for dams, labour does not cost so that could help Increases mosquitos</i>	<i>Yes; Small dams have been dug by few- if not lined they lose a lot of water. Water in JoJo only lasts about 1 month- so it is not enough for gardening</i>	<i>Plan to do roof structures and gutters properly If we do joint savings, we can work together to buy JoJos There are some challenges with savings groups, but we are used to them from burial societies etc We can harvest water from the road for the underground tanks</i>
Keep riverine vegetation	<i>People are still chopping down trees next to the river for firewood</i>	<i>There is knowledge about pruning trees rather than chopping whole trees</i>	<i>Need to work with traditional authority to ensure we keep riverine vegetation</i>
Prevent veld fires	No		<i>Can work with the traditional authorities and spread the word through our learning groups</i>
Infiltration pits/areas/ reconstructing wetlands	NO	<i>We can get some reeds from other wetlands to get the process going</i>	<i>These are joint activities through community meetings- but there is now more cohesion through the learning groups, so it can be possible</i>
Water infrastructure management	No		<i>Would like to set up an awareness campaign in the area, so that all community members take care of infrastructure</i>
Planting in beds with mulching, Trench beds		<i>Yes; reduces watering form every day to every 2-3 days. Contributes also to soil fertility, carrots grow nice and straight</i>	<i>Provide shade for these beds - potentially using maize stover to keep them cool.</i>
Greywater; drip kits, ash	<i>No- more a supplementary activity when there is no other water</i>	<i>Yes; works at household level in gardens if you use ash to clear the water. The ash residue with soap then goes into the toilet to reduce smells</i>	<i>-Impact not that great, but worth doing.</i>
Irrigation methods		<i>Timing- am or pm to save water</i>	<i>This is a standard practice</i>
GOAL: soil management			



Increase organic matter; incorporate leaves, crops, ash, manure Trench beds, eco-circles		<i>Yes, the new bed types hold water for a very long time if you can start by saturating them. Eco-circles are easier than trench beds and work just as well</i>	<i>Plan for continuity in different circumstances</i>
Erosion control; stone lines contours, diversion furrows	<i>No- not aware of line levels and how to measure contours</i>	<i>Yes; plant just below the stone lines or furrows as there is more water and fertility there. Diversion furrows are good, but difficult to dig.</i>	<i>-If you add infiltration pits below the stone lines it works very well - can plant in that. -It is easier to make furrows and ridges in the garden than diversion ditches -Continue with improved furrows and ridges- on contour, with mulching and planting various crops.</i>
GOAL: Crop management			
Trees in the garden		<i>Yes - afternoon shade is important</i>	
Close spacing - linked to minimum tillage (CA)	<i>No- not many participants are aware yet of this option</i>	<i>Yes; close spacing in field crops gives quick canopy cover - cooler and wetter, it also helps with erosions control and there is still enough air movement</i>	<i>Include bird resistant sorghum and millet as good harvests can be realised from these drought resistant crops. Cowpeas can be harvested twice in a seasons.</i>

i. Learnings

These are summarised in point form below:

- *Planting trees for shading crops is a good idea*
- *Some trees help with pest control*
- *We are realizing how most of the things MDF has covered fits into CCA- for example the tunnels*
- *Some of the practices such as mixed cropping is good; one can see the results you are working towards*
- *There are good ideas in terms of practices for CC and extreme temperatures- but it is not enough*
- *We learnt about heat tolerant crops from each other, and also when to plant.*
- *We learnt about promoting pest predators- lizard hotel*
- *We learnt about the erosion control furrows and what to plant now*
- *We learnt about planning according to quick wins (from the matrix that was done)*
- *Water saving techniques - including tower gardens*
- *Harvesting water from the road using diversion ditches*
- *Garden refuse as mulch rather than burning it*

ii. Future CC actions

- *More focus on access to water*
- *More CSA techniques and deepening the implementation of the present ones*
- *Tunnels and trench beds have worked particularly well*
- *Planting calendars: CC based crop choice calendars*
- *Can grow the dryland crops in summer, but need water in winter for vegetable production*
- *Can try layers; but cost of feed is an issue and access to clean water. Sunflowers and sorghum can be grown for the chickens. Indigenous chickens are no longer kept - as they are not very productive and destroy crops*
- *For broilers there are already a number of projects in the area, but can still do this competitively - can do chicken pieces as a value add.*
- *Need also to deal with livestock - the effects of CC on livestock production*



- *We shouldn't end here. We tried these ideas under the worst situations (drought) - they may do a lot better now in a better year*
- *One of the highlights has been the cost-benefit analysis in our learning sessions; where more inputs could mean a much better yield- rather than low inputs and low yields.*
- *Savings can be introduced*
- *Make a committee to continue to explore options for spring protection and efficient management of water from them.*
- *Need now to implement the improved erosion control measures that have been introduced.*
- *Once water is sorted there needs to be more focus on commercial production*
- *Bulk buying for JoJo tanks- MDF to find potential discount options*
- *Bring DRD representatives on board with the NGOs already working in these areas (Sedawa) to see if more things can be brought.*
- *Also work with the municipality - improve the relationship with the councillors and then set up a joint strategy with community and NGOs working together*
- *NGOs must make sure they keep their promises as community members cannot trust them otherwise*
- *NGOs need to take more care to help support local produce when catering and also local caterers.*

4.1.5.2 CLUSTER REVIEWS AND OPEN DAYS

Review sessions for the whole cluster (all villages) were held annually. These sessions also provided opportunities for participants to show case their practices and teach others, to assess the impact of these practices on their farming and livelihoods and undertake joint or collaborative activities, such as initiating the water committees. These sessions were held as open days, including as many stakeholders as possible. Participants from CSA, K2C, SOL, Lima RDF, Middle Olifants' AgriSI program and Limpopo Department of Agriculture attended these events. Other stakeholders, such as those from Water Services, the Municipalities and Environmental Affairs could not be persuaded to attend, despite repeated efforts.

Below is an example from a cluster review workshop held in October 2018, of the “traffic lights” assessment of implementation of practices and progress in implementation. Although the traffic light assessments were used with the groups throughout the implementation process; it became clear that the implementation of practices did not show a linear relationship over time, as can be seen from Figure 5 in the section above. Participants implemented practices seasonally and those that suited them best at any point in time. Their main criteria were availability and access to water. So, for example, soil erosion control practices have not been prioritised due to the general lack of rain during the implementation period and intensive gardening practices were prioritized, as these were still possible within the constraint of limited water access.

Table 14: Traffic lights assessment of implementation of CRA practices, October 2018.

Practice	Implementation	No of people (N=62)	Comments
WATER MANAGEMENT			
Mulching		23	Saves water, suppresses weeds
Furrows and ridges		9	Make sure you allow the grass to grow before you turn the soil. Helps control soil pests
Banana basins		13	Prevents water run-off, provides fertility and water for the trees as you add leaves and compost before planting the trees
Roof water harvesting		50	Tanks for storage not enough, so this does not last long and does not work in the dry season. We use this water for drinking
Underground tanks		2	Very expensive and have now been dry for a long time as there has been no rain. Holds 24 000l, but even that was not enough to use for gardening
Stone bunds		15	Reduces erosion and holds water



Diversion ditches		4	This helps to control and increase the amount of water that goes into the garden
Small basins		18	Provides some extra water for the crops planted.
SOIL MANAGEMENT			
Use feedbags to make ridges		2	Control soil erosion
Plant grass on bare soil		0	Good idea, but no-one is implementing this. Can use lemon grass, black oats for example, this planted grass prevents weeds from growing
Contour planting		9	We are more aware of this now and are doing this in the larger fields
Plant trees around the fence and yard		9	For wind protection; Not much planting of trees now, due to drought, but it is known to be a good idea. Plant any kind of no fruiting tree to protect the fruit trees in the yard.
CROP MANAGEMENT			
Correct timing of irrigation		7	Early mornings or late afternoons- this reduces stress and wilting
Planting sweet potatoes		15	Works well on ridges and furrows and works even in these hot, dry conditions - but needs some watering
Tunnels (shade houses)		10	These work extremely well and all participants are interested
Bulbinella		3	To trap water and is used for medicinal purposes (introduced by MDF)
Using organic pest control remedies		15	Chilli and aloe and liquid manure works well. Not many pests seen
Liquid manure		10	Use black jack leaves, chicken and goat manure - works well
Keep loosening the soil		27	Traditional practice (in fact not recommended for soil health and soil structure- causes compaction, and capping)
Drip irrigation		10	Helps to use less water and save the water especially if mulching also used. Plants grow well
Use of herbs in-between veggies		21	This is now becoming common practices. It helps for pest control, water management
Trench beds		28	They make a big difference - good looking crops, big and healthy
Shallow trenches		16	Easier than trenches with a similar result. Can be done on larger areas
Compost		4	Labour intensive, not enough water
Use of manure		62	We all now use manure and understand that the soil needs to be fed
NATURAL RESOURCES			
Less cutting of trees		62	We are all aware and trying to save the trees
Minimising veld fires		62	We are all aware and are not burning veld
Planting of indigenous trees		26	We are all aware and are doing this on a small scale in our yards

Below are a few indicative photographs of participants showcasing practices and ideas at these workshops



Showcasing soil and water conservation practices at the cluster workshop (end 2017), presentation by the Middle Olifants groups, showcasing their vegetables and showcasing organic production, marketing and seed saving at the recent cluster workshop in August 2019

4.2 Sustainability of impact

Participatory impact assessments have been conducted using focus group discussions as well as individual interviews (see Attachments 2 for outlines) for 25 participants, to gauge the impact of implementation on the livelihoods of participants. Given that these assessments are focussing on participants' own implementation and production, the assumption is that this work will be carried forward into the future.

In addition, arrangements have been made with both K2C and CSA who are both still active in the conservation and agroecology spheres of implementation in the area, to continue a level of monitoring and support for these participants. In addition, funding has been secured from the US embassy to support the water committees (Sedawa and Turkey) to sink boreholes and reticulate water for agricultural purposes.

A proposal has been submitted to the Resilient Waters Program (USAID) to expand the implementation of this process into more villages in the region.

4.3 Indicator data

4.3.1 AgriSI quantitative indicators

The table below summarises quantitative data for the Lower Olifants AgriSI process (2017-2019)

Table 15: AgriSI Lower Olifants quantitative indicator data: 2017-2019

Indicator	Overall target	Actual
No of participants in learning groups (average for all seasons)	120	94
No of learning groups	6-7	8
No of local facilitators	6	6
Percentage of participants engaged in CC adaptation responses (averaged from individual garden monitoring forms n=72)	1-2 (45%) 2-3 (25%) >3 (10-15%)	4% 10% 86%



No of participants experimenting with new innovations -local -co-designed (average of all practices categories)	15% 45%	55% 30%
No of participants showing increased knowledge (farmer experimentation used as a proxy)	35%	44%
Percentage of participants engaged in collaborative activities (tunnels, RWH, water committees)	35%	41%
Percentage of participants with improved livelihoods -increased availability of food -increased income -increased diversity of activities and livelihoods options	40% 5% 5%	77% 56% 30%

4.3.2 Participatory Impact Assessments (PIA)

The PIA process for Turkey (September 2019) is summarised below as an example

i. Introduction

Community impact indicators look at the end result of project activities on people's lives and measure the fundamentals assets, resources and feelings of people affected by the project. These indicators may be quantitative, such as income earned from crops sales, or qualitative such as improved skills, knowledge or social status.

ii. Climate change Impacts

Below is a summary of the community's understanding of climate change impacts on their environment

Table 16: CC impacts for Turkey; re-cap for PIA, September 2019

Natural (environment and farming)	Physical (environment and farming)	Economic	Human (skills and knowledge)	Social (organisations)
<i>Trees are dying; including indigenous trees and fruit trees</i>	<i>Soil erosion and more dongas</i>	<i>Less income from farming</i>	<i>Loss of old people's farming knowledge to share with youth</i>	<i>Decrease in playing stokvels</i>
<i>No grass and water for livestock to graze</i>	<i>Soil structure has changed; soils are very dry and hot with increased compaction</i>	<i>We buy water for both consumption and irrigation</i>	<i>Farming activities have decreased</i>	<i>Working with only one NGO to assist with farming activities</i>
<i>More diseases and pests associated with extreme heat</i>	<i>Livestock disease is increasing</i>	<i>We buy seedlings and seeds yet they die with no single harvest</i>	<i>Shortage of food</i>	<i>Fighting for water sources in the mountains</i>
<i>Less rain, increased heat</i>	<i>Crops not surviving the heat</i>		<i>Shortage of water</i>	
<i>Growing seasons have changed</i>	<i>Buying livestock food to keep them alive</i>			
<i>Ground water level dropping</i>				
<i>Rivers are all dry</i>				
<i>Springs and wells are drying up</i>				

From the discussion the following points of interest were raised:



- For these participants CC is already a reality, which has led to increased vulnerability and decreased farming activities.
- They grew up in farms instead of schools and they understood how to farm and which practices worked well in their area. This has now changed and they now appreciate that the way in which they farm also needs to change.
- Generally, it has been hard for farmers to adapt and to appreciate that even working in small gardens to accommodate for the small quantities of water available is a good thing. Most people just gave up.
- Farmers also discussed how different NGOs have been coming in and out to assist with water issues. They mentioned that World Vision for example assisted with spring protection in the mountains and reticulation of water to the villages, as well as providing small rainwater harvesting dams. Community members however feel generally that this water should be for household consumption and not farming; which leads to conflicts.

Right: The Turkey learning groups conducting the PIA process



iii. Adaptive measures

Here participants discussed a number of practices they implemented; some initiated with support from AgriSI and some of their volition:

- They have learnt to construct tunnels and they buy more nets to add to the tunnels they were awarded, because the results are good. The tunnels protect crops from extreme heat and from pests like chickens and birds that eat crops,
- 90% of households in Turkey use wood for cooking, which means many trees are cut down, which leads to more dongas and soil erosion in the community. What they do now is to teach others that are not part of the learning group, the importance of trees and why it is important to plant trees. They are planting more indigenous trees in and around their homesteads,
- They are also implementing soil and water conservation practices in their homesteads and gardens,
- They have started using self-made drip irrigation systems; having learnt how to do this and also about good irrigation practices and water needs for different crops,
- They no longer burn organic matter but use it to fertilise the soil and reduce the rate of water evaporation by mulching.
- They use liquid manure for pest and disease control on their crops, using plants like aloe, chilli, garlic and black jack.

iv. Climate Resilient Agriculture (CRA) practices

Participants summarised all the different introduced practices they have implemented, under the five finger themes. They also discussed these among themselves and found that some participants are now interested to also try these practices; having not tried them out to date. These include; eco-circles, tunnels, Conservation Agriculture, compost, shallow trench beds and liquid manure using comfrey. This provides an indication that the learning process is ongoing and well embedded in the community, as people see good results form each other and become more motivated to try out the practices.

Table 17: CRA practices implemented in Turkey



Water management	Controlling of soil movement	Crop management	Soil fertility	Livestock	People	Natural resources
Mulching	Contours and line levels	Mixed cropping	Trench beds	Planting Lucerne	Market access for herbs and vegetables.	No cutting of trees
Jo-Jo tanks and small dams for RWH	Stone lines	Liquid manure for pests and disease control	Legumes	Planting Sun hemp	Learning group	Planting of trees
Using tunnels	CA	Adding compost	Making compost and adding to trees and soil			Flowers and medicinal trees like aloe and moringa
Using drip kits for irrigation	Planting of trees	Eco-circles	Adding organic matter			
Grey water	Furrows and ridges	Trench beds and raised beds	Crop rotation			
Rain water storage		Diversified crops and crop rotation				

Participants pointed out that it was easy for them to implement the practices as they have seen results from neighbouring villages and they were happy to see that there are practices they can implement that work even with extreme heat and shortages of water.

v. Changes and benefits from CRA practices

Here we worked with the participants to outline some of the indicators they would use to assess the changes and impact of these changes on their livelihoods. Comments made included:

- From using a trench bed alone, they get good yields and beautiful fresh produce,
- The knowledge has changed everything. Without this knowledge, farming would have died out and they would be buying vegetables from the shop. Now they are producing their vegetables and saving this money for other household needs and making small incomes from sales as well,
- Soil fertility has increased through adding compost that they make using organic matter collected in their household,
- They know how to control pests and disease in their gardens without having to buy pesticides that are expensive,
- Good water management. They are very happy to have the know that they can have a garden by only using grey-water for irrigation.
- The biggest change has been in their farming system and cropping seasons. This was made possible through the diversity of crops introduced through the AgriSI project.

SCALE used for the matrix:

- 10< There is no change after implementation
- 20< There is change but not that convincing to implement the practice again
- 30<The practice is working as there are some signs of change
- 40< The practice is working and it can be recommended to other farmers
- 50<The practice is working well and gives good results

The table below summarises the matrix ranking exercise for assessing the impact of different practices. Participants used a scale from 10 - 50.

Practice	Harvest/ Yield	Water management	Soil fertility	Pest control	Labour	Total
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Tunnel	50	40	20	50	40	200
Drip kits	30	50	10	20	30	140
Mulching	30	30	40	40	50	190
Compost	40	20	50	30	40	180
Conservation Agriculture	30	40	30	20	50	170
Furrows and ridges	10	10	10	10	10	50
Liquid manure	40	10	40	50	50	190
Trench beds	50	50	50	30	50	230
Eco-circles	40	50	50	50	50	240
Planting of trees	30	30	20	20	20	120
Adding organic matter	40	20	50	40	40	190
Grey water	30	50	10	10	50	150
Crop diversification	40	40	40	40	40	200

The practices that have had the greatest impact for them are tunnels, eco-circles, trench beds and crop diversification. The criteria participants decided upon to assess these practices include improved yields, improved water management (which includes aspects of such as using less water, improved water holding capacity and improved water productivity), improved soil fertility, improved pest control and reduced pest presence and efficient use of labour. These criteria provide a comprehensive analysis of each practice.

vi. Expanding on CRA practices

Participants have clearly pointed out the importance of CRA practices and how they will continue with the practices in their gardens and their fields. They also continue to recommend practises to other community members and other neighbouring villages. Participants have also pointed out that CRA practices have made their lives easier as they are able to feed their own families with what they produce and make from their gardens.

Below are some further practices and ideas they would like to continue with

Table 18: New ideas for follow-up and continuation for the Turkey learning group; September 2019

New practices	New workshops	New farming categories
Liquid manure using comfrey- participants have learnt how comfrey fertilizes the soil and also assists with pest control and with bone problems.	Crop processing workshop to add value and increase crop shelf life; for example, how to make pesto and sauces with crops from their garden.	Poultry - Participants have seen the importance of integrating their crop farming with livestock farming after agroecology network workshop; where farmers exchanged experiences and successes. Access to manure for gardening is also a big advantage.
Eco-circles were initially only tried by 4 participants who have observed the following results; the practice uses less water, assists with pest control and good yields and beautiful fresh produce.	Workshop on how they can use new introduced crops, to make it easier for them to explain to their customers in the village, which will make it easier for costumers not to fear buying a crop they don't know.	
Tower gardens- participants never implemented the practice simply because the practice demands	Seed saving workshop- they would love to have a review workshop on seed saving, because they are still	



bought materials and they felt that trench beds provided equally good results, but only required labour and local materials.	experiencing storage problems for saved seed.	
Tunnels- Participants still want tunnels in their gardens. Tunnels not only protect their crops from extreme heat, but combined with trench beds and mixed cropping there is good yield and water management, not forgetting beautiful fresh produce.	Workshop in business management; to improve their ability to run their farming as a sunniness and make a reasonable income	

vii. In conclusion

Participants appreciated the knowledge gained from working with Mahlathini Development Foundation through this project. They gave up on farming before, because of the loss they made through environmental and climatic changes with no knowledge of how to adapt to the changing environment and climate. They also thanked MDF for the knowledge on crop diversity, using herbs and cover crops (fodder) as examples. These new crops have made a big difference in continuity of production and ability to make an income and they noted that the project not only taught them new things but also gave them opportunities to meet with other farmers to share experiences and challenges. This networking gave them more courage to continue with their farming activities.

4.3.3 Resilience snapshots

These individual interviews follow a similar process to the focus group discussions and add further qualitative and quantitative information regarding impact.

26 of these snapshots were taken for participants from 5 of the 8 villages between April-September 2019.

Below is a summary of the responses.

4.3.3.1 LEARNING AND CHANGE

i. What have you learnt about dealing with CC and climatic extremes?

- *I have learnt that practices such as trench beds and tunnels provide good growth and yields, despite difficult weather conditions. Also, these practices are cheap. Although it is initially a lot of work, the increased yields make a big difference. We get more food than we did before and will now be able to continue farming*
- *Tunnels also help in reducing heat and water stress in plants and this leads to much better production*
- *Tunnels help in this extreme heat by protecting our vegetables from heat and pests. Climate smart practices enable us to continue with farming activities even in this difficult climate change.*
- *Having a tunnel and mulching inside the tunnel is the best in water management for irrigation.*
- *Irrigation management, such as using drip kits help a lot as there is less evaporation and water is saved. It also saves time.*
- *Working with mixed cropping and crop rotation has decreased the incidence of pests and diseases, although there are still problems.*
- *Including more organic matter in the soil helps to hold water and to protect plants from heat stress.*



- Working with the five fingers principles [manage soil movement, manage soil fertility, manage water, manage crops and manage natural resources) (tool) helps to keep in mind all different aspects to include in changing practices
- Using liquid manure and mixed cropping means that I now do not need any other means for pest and disease control.
- I have learnt about practices that will help me continue with farming activities even though water is a struggle and the sun is too hot for any vegetable to survive in our environment, the little we have been given is better than nothing.
- Leaving the soil exposed to heat and rain and turning over the soil to plough and plant has destroyed the soil making it infertile and very hard. Improving the soil takes time, but makes a big difference in growth of crops.
- I learnt to conserve water, by using grey water and mulching in my garden. I also learnt a lot on the importance of soil health.
- I have learned the importance of saving water and the conserving our soil.
- I have experienced harsh weather with no rain and harvests using our traditional ways of farming, which affected our livelihood as we had to buy all vegetables instead of growing them myself. Now I know how to deal with changes of climate, since I met Mahlathini and AWARD, and they taught us practices that changed my life. I don't buy vegetables that I need every day, I pick from my garden.

ii. What is your experience regarding the impact of CC on your life?

- Climate change has been hard on us, especially on our farming activities. Farming seems impossible in this condition, especially with no rain. Being unemployed and relying on grants is even worse, as the head of the household; farming makes it better because you farm for both consumption and making an income

iii. Do you share your knowledge and experiences with the learning group or community members?

- Yes, I talk to my neighbours about the gardening practices, so that they can also try and revive their gardens
- Yes I share my experiences and knowledge with community members at the workshops and my neighbours; by telling them what we do and how the knowledge is helping us in terms of making things better
- Yes I share my knowledge, especially with unemployed members of the community because I am making a living and I don't go hungry with my small garden

iv. How do you share the knowledge gained with other members of your community?

- Discussions at savings meetings, at the springs when we collect water
- By inviting them to join us on our meetings and sharing experiences
- Always have meetings where we invite community members to join and we share all knowledge and experiences
- I invite people community members to attend meeting with us and also allow community members in my household
- I share my experiences and knowledge learned from working with Mahlathini with the community and I also recruit new members to join and learn like am learning.
- I do visits community members selling them vegetables and share with them what I have learned and how it is helping me, to encourage them to see what we are benefiting to better our finance and was of farming

v. What helps you to learn more about new innovations and information?

	No (N=6)	Comments
Listening to other farmers experiences and experiments	5	Bottom line is that farmers learn from farmers



By doing and experimenting in own garden	5	Doing new things takes courage and brings risk but it is the only way to adapt to a changing situation
Motivated by other farmers work and experiences	4	This helps to motivate farmers to try out some of the ideas
Learning workshops	5	An opportunity to be exposed to new ideas and to motivate for change

vi. What new things have you added into your practices? How has it worked?

- *The shade net tunnels work very well to reduce heat and water stress and there are fewer pests. We have added further shade- netting structures in our gardens*
- *I have made my own version of a drip-kit using an old bucket and piping. This saves water and time*
- *We dig small dams in our gardens during the summer months, so that the added water can penetrate into the soil and there is enough moisture in the soil to grow our dryland crops such as maize, cowpeas, peanuts and sweet potatoes*
- *Using manure and mulching in our traditional beds- the furrows and ridges has helped to increase crop survival and yields*
- *The tower gardens are very productive and this is a nice, clean way of using greywater, which is sometimes the only water for gardening we have access to.*

4.3.3.2 CLIMATE SMART PRACTICES

vii. Impacts and lessons learnt

Past Issues	Past practice	Present practice	Impact	Lessons
Drying fast, wilting of plants, having to irrigate often	Exposing the soil	Cover the soil by mulching and farming inside the tunnel	Less evaporation and my vegetables don't dry out quickly	<i>Learned the importance of covering the soil and good water management</i>
Poor quality vegetables	Not fertilising the soil and disturbing the soil	Adding organic material to the soil and minimum soil disturbance	Good soil condition and healthy vegetables	<i>I have to look after my soil in order to continue with my farming activities because I love farming</i>
Pest and disease problems	Used ash -which is only effective for certain pests	Use liquid manure made from weeds and cow manure, I also use mixed cropping for pest and disease control	Very good and effective	<i>We don't need chemicals to fight pests and disease in our garden as they will affect our soil and our health</i>
Pest problems	Using blue death	Use liquid manure for both soil fertility and pest and disease control	Healthy vegetables and good soil conditions	<i>We can use organic materials from our household to treat pests and diseases without using chemicals</i>



Soil erosion	Turning the soil when planting maize and cover crops.	Minimum soil disturbance when planting maize (CA)	Softer soil that holds more water, better yields	<i>I learned that I have to conserve my soil, always cover my soil.</i>
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viii. Assessment of impact for CSA practices tried out using local indicators

-1 = worse than normal practice

0=no change

1=some positive change

2=medium positive change

3= high positive change

	Name of practice	Soil	Water	Productivity	Labour	Pest and disease control	Cost and maintenance	Livelihoods	Adaptation
1	Trench beds	2	2	2	-1	0	2	2	2
2	Tunnel (w trench beds)	2	3	3	-1	2	1	3	3
3	Mulching	1	1	2	1	2	2	1	1
4	Mixed cropping and crop rotation	0	1	1	1	2	2	1	1
4	Tower garden	2	3	3	2	0	0	2	2
5	Planting basins	0	2	2	0	0	1	1	1
7	Raised beds, with mulch	1	2	2	1	0	1	0	1
8	eco-circle	2	3	2	-1	1	0	1	1
9	CA; w intercropping, legumes, cover crops	3	2	3	1	1	0	2	2
10	Using goat manure (composted in a kraal)	3	1	2	0	1	0	1	1

ix. Resilience snapshots

Here, the results have been compared with a similar study done in Bergville (KZN) to provide for a comparative analysis of impacts across different agroecological zones.

Resilience indicators	Increase for Limpopo	Increase for KZN	Comment
Increase in size of farming activities	Gardening; 1% Field cropping; - 98% Livestock; 6%	Gardening 18% Field cropping 63% Livestock 31%	Cropping areas measured, no of livestock assessed Dryland cropping has reduced significantly due to drought conditions and infertile soil
Increased farming activities	No	No	All involved in gardening, field cropping and livestock management
Increased season	Yes	Yes	For field cropping and gardening- autumn and winter options
Increased crop diversity	Crops: 21 new crops Practices: 11 new practices	Crops: 12 new crops Practices: 8 new practices	Management options include; drip irrigation, tunnels, no-till planters, JoJo tanks, RWH drums,
Increased productivity	Gardening; 120% Field cropping: 15%	Gardening - 72% Field cropping - 79%	Based on increase in yields (mainly from tunnels and trench beds for gardening CA for field cropping)



	Livestock: 6%	Livestock - 25%	
Increased water use efficiency	45%	25%	Access, RWH, water holding capacity and irrigation efficiency rated
Increased income	13%	13%	Based on average monthly incomes, mostly through marketing of produce locally and through the organic marketing system
Increased household food provisioning	Vegetables; 7 types-10kg/week Fruit; 5-10kg/week Dryland crops (maize, legumes, sweet potatoes); 5-10kg/week	Maize; 20kg/week Vegetables; 7kg/week	Food produced and consumed in the household
Increased savings	Not applicable	R150/month	Average of savings now undertaken
Increased social agency (collaborative actions)	2	2	Learning groups and local water committees
Increased informed decision making	5	5	Own experience, local facilitators, other farmers, facilitators, extension officers
Positive mindsets	2-3	2-3	More to much more positive about the future: Much improved household food security and food availability

These snapshots provide a very good indication of the actual changes that participants have made and the impact of these changes on their livelihoods.

4.3.4 Case studies

A few monitoring case studies have been compiled in a separate appendix: *Farmers are doing things in the Lower Olifants*'.

4.4 Successes and challenges

The key success of this process has been the use of a social learning approach (learning groups, local facilitators and individual experimentation) for promotion and implementation of a range of CCA responses. Participants have learnt a lot about analysis of climate change impacts and analysis of the impact of their activities and have improved their decision-making capacity; both individually and jointly.

The key challenges have been:

- The lack of positive engagement of the authorities and government officials,
- The local drought linked to lack of water provision in these communities,
- Lack of funding support for the smallholder farmers and
- Internal conflicts related to competition for resource and local political instabilities.

In general, however, these communities have shown a large degree of fortitude in the face of their almost overwhelming problems and this, more than anything, has led to them embracing and working with the concepts and approaches introduced.

4.5 Key learnings



Many of the learnings for the farmers themselves have been woven into the body of this report; relating to their farming, their personal motivations and understanding and their societies. Learning was supported by the strongly participatory nature of this process as well as the innovation systems concepts where learning happens through cycles of practice, observation and analysis. Local facilitators have played an important role in the continued motivation and participation of the learning group participants, or lack thereof, as the case may be. As a result, the process continued with only 3 of the 8 local facilitators chosen at the onset and 2 more local facilitators were brought on board.

Local facilitators (LFs) are playing an important role in bringing people together and providing for collective action, albeit on the level of working in the gardens. They are dealing with conflict in the groups and supporting individuals in their implementation. They are coordinating some collective action in the villages. New members have been joining throughout the implementation process in most of the villages and in a few groups are meeting by themselves to learn and implement together.

The LFs who have grasped the concept of learning with the participants and working with experimentation as an idea to promote implementation have been very successful - notably Sedawa, Mametja, Botshabelo and Turkey. Those who have worked within a model of being in charge of the groups and 'ensuring' that they do the right thing have in fact seen their groups dwindle to almost nothing - Willows, The Oaks and Lepelle.

Participants feel that learning in the groups vastly outweighs what they can learn on their own and have set up ways in which they work together. They also feel however that the LFs may not know enough about these new techniques and still value the input of the facilitation team more than that of the LFs.

Learning within the supporting organisations, AWARD and MDF has been substantial for the fieldworkers and interns involved, where they have had to internalise and work with a lot of new information around farming practices and resource management, as well as local conditions and societies and effective facilitation in a social learning environment. The two main facilitators; Sylvester Selala and Betty Maimela acquitted themselves very well, despite neither having previous agricultural or facilitation experience. They were provided with a well-structured process and intensive mentoring.

Some advances have been made in stakeholder interaction in working with other NGOs active in the area (such as Seeds of Light, Hoedspruit Hub, K2C, Hlokomela, Lima Rural development Foundation and Zingela Ulwazi) towards working together and limited sharing of implementation budgets. Cementing the process around climate change and adaptation has assisted stakeholders to more clearly understand the needs for this cooperation

The attitude of stakeholders and staff slightly more removed from the process however (mostly Government and Municipal structures), has been a lot more difficult to assess and has ranged from somewhat incredulous to openly sceptical in most cases. Many have come to this process with preconceived ideas and concepts, which has reduced their ability to engage positively. These misunderstandings are underpinned by linear and contradictory thought patterns as to what development and resilience means and is not so much a product of ignorance as a product of our institutional paradigms. There is generally very little respect or empathy for smallholders and their survival imperatives, with most stakeholders engaging in the process from their perspective of personal gain, rather than from a perspective of what would be best for people and the environment they live in.

In summary, key learnings have been the following:

- Working with learning groups within a social learning process and using farmer level experimentation to promote and cement implementation of new ideas has been very successful in shifting participants' implementation towards climate resilient agriculture practices.



- Social agency has been increased and developed within these groups, allowing participants to tackle some of the intractable problems and issues in their villages; notably access to water, sharing of information and resources and joint marketing initiatives.
- The ongoing learning and mentoring approach has also assisted staff and other stakeholders involved in this process to internalise best practice options in climate resilient agriculture as well as well as facilitation imperatives for such highly participatory processes.

4.6 Communication materials

The table below outlines communication materials produced during this AgriSI process

Table 19: Communication materials for the Lower Olifants' AgriSI program; 2017-2019

Communication materials	Descriptions	Stored
Reports - MDF	AgriSI 2016-2018: 7 Milestone reports AgriSi 2018-2019: 6 Milestone reports and a final report	MDF website, AWARD
Reports, brochures and booklets - AWARD	AWARD- AgriSI-Monitoring progress-Farmers Field visits 2018 v1 AWARD- AgriSI-Farmers' stories of change, Knowledge & Practices for Climate Change Adaptation. Agroecology & Permaculture-2018 v1 AWARD-AgriSI -Farmer baseline report- Sekororo-Turkey village 20180702 v1 AWARD-Climate smart agriculture in the lower Olifants River Catchment 20180510 v1 AWARD-KRA4 AgriSI-AgriSI project, Field visit to monitor progress of farmers and local facilitators-20180608 Herb booklets; English and Spedi AWARD Brochure The five finger principles for agroecology	AWARD
Articles	Adaptation Network newsletter: Climate Smart Agriculture in Lower Olifants Basin- Nov 2017 AWARD facebook page and website: farmers are doing things in the Lower Olifants - May 2019	Adaptation Network AWARD
Presentations	Agroecology Network: MDF_ Agroecology - April 2018 MDF_ Best practise in Agroecology -Nov 2018 MDF_ Community Based Climate Smart Agriculture - Nov 2018 (DEA-Climate Change Committee) MDF and HH_ Organic box scheme: Lessons and way forward- Nov 2018 MDF-_Smallholder decision support system for climate resilient agriculture - Nov 2018	AWARD, MDF website MDF Website AWARD, MDF AWARD, MDF



	<p>MDF _Use of chameleons in smallholder water management learning processes (Virtual Irrigation Academy Conference, Pretoria) - May 2019</p> <p>MDF_ Risk and vulnerability assessments for CCA- (DEA-national risk and vulnerability Framework Workshop, Gauteng) -Aug 2019</p> <p>MDF_ A smallholder level decision support process improves resilience to climate change (Ukulinga Howard Davis Symposium on partnerships for improved resilience, Pietermaritzburg)- Aug 2019</p> <p>AWARD: CCA practices- Oct 2017 AgriSI overview-April 2019</p> <p>MDF: AgriSi cluster review workshop - October 2018 Sedawa review and planning session - Feb 2019</p>	<p>MDF website</p> <p>MDF website</p> <p>MDF website</p>
Learning support materials	<p>Presentations: Introduction to poultry production Seed saving Natural pest and disease control (English and Pedi)</p> <p>Manuals: AWARD Resilm-O AgriSI Water and soil conservation manual AgriSI Intensive homestead food production farmer handouts- isiPedi (Provided in a separate appendix to this report)</p>	<p>MDF</p> <p>AWARD, MDF Website</p>
Photographs	Extensive database of field work, monitoring and learning group photographs	AWARD, MDF

5 Conclusions and Recommendations

This has been an extremely valuable learning exercise and lessons learnt are considered widely adaptable to other rural situations and for scaling up interventions in community based CCA. We now have a successful working model for how implementation can go forward. We believe this process is applicable for national implementation and can be used as a basis of implementation by the relevant institutional role players.

We would strongly suggest further support by the USAID's Resilient Waters Program for further implementation and scaling of this approach and for exploration of ways to access institutional support and develop appropriate and sufficient financing mechanisms.

Our recommendations for future implementation include:

- Participatory analysis and learning around climate change impacts and potential adaptive strategies and practices is crucial for allowing local level agendas in climate change adaptation to develop and mature



- Learning groups, working within a social learning and innovations systems methodological approach are a powerful avenue for building motivation and effecting positive change at a local level
- Within this context, focussing the actual implementation of climate resilient agriculture practices on individuals is important
- Collaborative activities among participants are an emergent property of this approach; with the added advantages that they are not externally motivated and introduced and are entirely voluntary on the part of participants.
- Implementation of climate resilient agricultural and land management practices provides for a significant improvement in adaptation capacity and resilience; but only if implemented in a coherent fashion
- Introduction of a suite of options for adaptation is important; to allow participants to experiment with and implement a range of options across soil, water, crop, livestock and natural resource management. It is the combined effect that allows for the change, rather than any one particular practice.
- Working with a smallholder farmer level decision support process for implementation of baskets of options of Climate Resilient Agriculture practices works extremely well in terms of learning and adoption.
- A focus on soil and water conservation, microclimate management (e.g. shade house structures), soil organic matter and rainwater harvesting is crucial in underpinning improved productivity and production. Attempting to expand on conventional agricultural practices in this context is not feasible, given the already extreme conditions and intense competition for dwindling water resources in this catchment.



6 Attachments

Attachment 1

Community level climate change adaptation analysis

Below is an outline of the 2- day workshop process, which includes an example of the household visits/walkabouts.

Community level climate change adaptation exploration workshop outline					
DAY 1					
Time	Activity	Process	Notes	Materials	Who
9:00am	INTRODUCTION				
9:00-9:45am	Community and team introductions	In pairs, take 5 minutes to talk to each other. Then introduce each other to the group. Choose a person you don't know well (both team and community). [include Name and surname, farming activities (garden, field, livestock natural resources), income from farming]	Depending on the size of the group, this can take a long time. If time is short, then just do a quick round of introductions.	Attendance register - with columns for farming enterprises (so that each participant can tick what they do) - in English and Zulu/Pedi. Name tags ; stickers, kokis	Materials and logistics: Facilitation: Recording:
	Purpose of the day	Introduction of the organisation/s and purpose of this workshop- link to already ongoing activities if possible and introduce visitors and other stakeholders involved	Talk to CC necessitating adaptation from us - we may need to change how we do things and what we do to - This w/s is to help us explore options for such changes	Flip stand, newsprint, kokis, data projector, screen, extension cables, plugs - double adaptors. Black refuse bags and masking tape (for blacking out windows), camera- and one person to undertake to take photos throughout the day. Extra batteries for camera and sim card	Materials and logistics: Facilitation: Recording:
9:50am	PRESENT SITUATION				



9:50-10:30am	Present livelihoods and farming situation - discuss impacts related to CC	Use a series of impact pictures- from the local situation. Include the 5 categories (and describe them to the group) - water management (increased efficiency and access), soil management (erosion control, fertility, health), crops, livestock and natural resources	Impact pictures- either ppt or printed on A4 to facilitate dialogue (or both). Record community comments	Power point presentation pictures	Ppt : Facilitation:
10:30am	PAST, PRESENT, FUTURE				
10:30-11:30am	Discuss farming activities as they have changed, what they are now and what may happen in the future if the present trends continue	SMALL GROUPS (5-10people): facilitated discussion on farming activities (include the 5 categories) - prompt for all five and keep conversation focussed OR Facilitate a shorter plenary discussion on how things are changing (if time is pressing)	Important to note and record any discussions around changes and adaptations- so things people are already doing to accommodate for changes - also where they are not sure what to do	Small groups; each needs a facilitator and recorder	Facilitation: Recording:
11:30am-12:00pm	TEA	Fruit (apples, oranges, biscuits, juice and water, paper cups (lots) and plates... Generous helpings - and lots of juice if it is hot. Find someone to be in charge of food and refreshments, while the rest of the workshop continues			
12:00am	CLIMATE CHANGE PREDICTIONS				
12:00 - 12:50pm	Summary of predictions for the locality (from scientific basis) [15min]	Present to group - using flipchart or power point - Keep it simple with brief bold statements that can be remembered. Include concepts of certainty - and CC scenarios - unmitigated, neutral and mitigated			Facilitation: Recording:
	Weather vs Climate [10min]	Role play; phone conversation - weekend visit for weather, relocating to an area for seasonality/climate.	check in with participants how they understand the difference from the role play		Facilitation:



	Seasonality diagrams [25min]	SMALL GROUPS (5-10people): facilitated discussion on temperatures for each month of the year- in a normal year and then discuss how this is changing and going to change. Start with the hottest month and then the coldest month as reference points	Do temperature first or if the group is small and works quickly include rainfall then on the same chart.	Easy to use kebab sticks bought from supermarket for this. Small groups; each needs a facilitator and recorder	Facilitation: Recording:
1:00pm	REALITY/IMPACT MAPS				
1:00-2:00pm	Impact of CC mind map	SMALL GROUPS (5-10people): facilitated discussion - MIND MAP of livelihood and farming impacts (using the 5 categories) using Hotter (drier) as the starting point - LINKAGES between cards on the mind map - make arrows (and include more cards if need be and discuss (e.g. hotter soils, lead to poor germination lead to poor yields lead to hunger)	Prompt for social, economic, environmental impacts as well if these don't come up in the group...	Small groups; each needs a facilitator and recorder	Facilitation: Recording:
2:00-2:30pm	Possible adaptive measures	POSSIBLE SOLUTIONS: things that people know, have changed, have tried and or are trying, to deal with the changes. Use different coloured cards to attach these solutions to the mind map. If participants are struggling then rephrase the -ve impact statements into a +ve outcome and ask what actions are possible.	Also make a separate list on newsprint of names of people trying things plus the innovation they are trying (this is to facilitate h/h visits on day 2)	The cards need to be written in local language with smaller translations in English written in on the cards as well (to avoid the need for alter translations)	Facilitation: Recording:
2:30-2:45pm	CLOSURE	REPORT BACKS - of possible solutions PLANNING FOR DAY 2 - choose 3-4 participants for household visits and ask for a small group of other interested	Households to be within walking distance hopefully. Otherwise drive these 3-4 participants around and meet	Rapporteurs need to be chosen from the group to summarise the solutions in the report backs [5min/group]	Facilitation: Recording:



		individuals to join. Decide on venue and time (12 noon) for continuing with practices	for focus group thereafter		
	LUNCH Local catering groups to provide meals - -R45 per head (Rice and stew with one veg... or something similar-)				
DAY 2					
9:00am	HOUSEHOLD VISITS				
9:00 am-12:00pm		To look at local adaptations and innovations To assess the household situations To start to elucidate criteria people use to make choices and decisions	Use questionnaire and fill in through semi structured interview and observations	Questionnaires to contain the following info: <ul style="list-style-type: none"> • Head of household (male/female) • No of adults • No of children (dependency ratio) • Income sources • Level of income • Scale of operation; 0,1-1ha, 1-2(5)ha, > 2 (5)ha • Farming activities; Aspirations - gardens, fields, livestock ,trees • Market access • Other activities • Resources • Water access • Infrastructure • Knowledge and skills • Literacy rate • Social organisation 	Facilitation: Recording:
		Team meets in evening (BEFORE DAY 2) to discuss mind maps and lists of solutions and choose a range of practices from the database to present. (5-10) Also, summarise criteria that came from the household visit discussions			
	TEA	Packed tea for on the go to share with household members			
12:00	PRACTICES				
12:00-1:00pm	New ideas/ practices/ innovations	Recap and summary of day 1 Introduce a selection of new practices _power point and A4s (chosen the night before by facilitation team to match the general sense of what participants need ideas for or what they are trying (to improve upon those).	Select the 5-10 practices beforehand and make sure there are 3-4 copies of the A4s for the small groups and or a power point presentation - record comments from participants	Sets of practices (A 4s), attendance registers	Materials and logistics: Facilitation: Recording:



		Provide descriptions and get questions and comments			
1:00-1:20pm	Criteria for selection of practices	In plenary present criteria, discuss with group and add more (prompt for criteria to relate to five categories (e.g., saving and using water well, increasing access to water, improving organic matter, increasing soil health, increasing natural resources.... etc) along with criteria like cost, labour, time....	Choose 5-7/8 criteria max. Some criteria can be made from two into one...	Flipchart, newsprint, kokis	Facilitation: Recording:
1:20 - 2:00pm	Prioritization of practices	SMALL GROUPS: Choose a selection of practices from their own suggestions and new ideas presented (5-10) and assess them using the criteria chosen in a matrix.	Let the group decide for each square using a scale of 0-2 where 0 = bad or little, 1=ok to medium and 2 = a lot to good.	Newsprint, kokis. Small group facilitator and recorder	Facilitation: Recording:
2:00pm	WAY FORWARD				
2:00-2:30pm	Each individual chooses their practices Set up sessions in January to refine choices and start on demonstrations and training in implementation of practices and farmer experimentation Choose 'volunteers' for the 4 proposed tunnels for joint /group experimentation per site	Learning sessions		Put together a list for each small group for each individual to record their name, surname, tel /cell phone and practices	Facilitation: Recording:
	LUNCH Local catering groups to provide meals - (Rice and stew with one veg... or something similar-)				
CLIMATE CHANGE PREDICTIONS:					
Hotter	1-4 degrees Celsius	For every month of the year	HIGH probability/ Certainty		
Less rain	Similar amount of rain but over a shorter period of time (fewer rainy days per season)	Greater intensity of rainfall	This will lead to an overall drying effect in the environment		
	Greater intensity of rainfall				
	More rain in spring and or more rain in summer	Storms	LOW certainty		
Longer term	Greater frequency of droughts under scenarios 1 and 2		Scenario 1 - Business as usual; Scenario 2 - Stabilise emissions; Scenario- 3-Reduce emissions		
	Greater frequency of extreme rainfall events under scenarios 1 and 2				



Homestead assessment monitoring sheet (baseline)

Interviewer:

Signature Householder: Permission

A. IDENTIFICATION OF HOUSEHOLD	
DATE:	
LOCAL MUNICIPALITY	
LOCATION; Village	
Cluster; subvillage/learning group	
HOUSEHOLD NUMBER; GPS COORDINATES (give a no so that you can use that no for ID of photographs!! And take a pic of the householder, her garden and interesting innovations	

B. RESIDENTS OF HOUSEHOLD		
Head of household name & surname		
Gender, age		
Person interviewed; Name, Surname, Age		
Disabilities; physical, mental - injuries, chronic diseases, HIV/AIDs, bed ridden, ...		
Number of people who are permanent residents of the household. Those that eat and sleep in the household for at least 5 days a week:		
	Male	Female
Number of people of these ages and gender in the household:	0 - 5	
	6 - 12	
	13- 18	
	19-25	
	26-40	
	41-59	
	60+	

C. LIVELIHOOD ASSETS: INCOME FROM ALL SOURCES										
Read the list aloud; tick the box which corresponds to the resident members who are older than 18yrs of age. Leave rows blank for categories that do not apply.										
1) INCOME CATEGORY PER MONTH	1	2	3	4	5	6	7	8	9	
a. Wage or casual work										
1) food										



b. Income from family members (remittance)	2) cash										
	3) goods										
c. Income from local farm produce											
d. Income from non-local farm produce											
e. Income from formal or informal business											
f. Income from renting dwelling											
g. Pension/disability/other social grant (No of ea type of grant)											
h. Income Aid from formal organisations other than Gov.	1) food										
	2) cash										
	3) vouchers										
i. Other (specify)											
j. Refuse to answer											
k. Don't know											
l. No income											
Amount per person											
2) TOTAL AVERAGE INCOME/ MONTH		Per households									
Categories	Code	Categories		Code							
R0	1	R1600 - R3200		5							
R50 - R400	2	R3200 - R6400		6							
R400 - R800	3	R6400 - R12800		7							
R800 - R1600	4										

D. HOUSEHOLD ASSETS: EXPENSES FROM ALL SOURCES

Read the list aloud, circle the code that applies and complete the information for that row; if an annual expense, give a monthly estimate.

3) EXPENSE CATEGORY	Code	Amount
----------------------------	-------------	---------------



a. Food and groceries	1		Last month
b. Utilities (water, electricity, etc)	2		Last month
c. Transportation	3		Last month
d. Savings	4		Last month
e. Medical	5		Last month
f. Education (school fees, uniforms, etc.)	6		Last month
g. Insurance (life, burial, etc.)	7		Last month
h. Debt service/repayment	8		Last month
i. Other (specify type of)	9		Last month
j. NONE	10		
k. Refuse to answer	11		

Garden description and size: Include a map drawing of homestead with all aspects including fencing, water sources, fruit, windbreaks, trees, vegetables, kraals. run off, dwellings, slope, aspect, erosion: Proportion of vegetable garden in use:- cultivated within the last 6 months (Put as a percentage)

PRESENT INFRASTRUCTURE?			
	Yes	No	Comments; On quantity, state, interesting things..
a. Fencing			
b. Jo-Jo tanks			
c. Municipal water supply - tap in yard - reliability- how often it works			
d. Irrigation; hoses, pipes, buckets, bottles			
e. Other - local innovations - boreholes.....			

PRESENT PRACTISES?



	Yes	No	Detailed description of what is there) (Name all types of plants present, with some idea of quantity)
a) Vegetables			
b) Fruit			
c) Herbs and multifunctional plants (including windbreaks, hedges, flowers)			
d) Nursery			
e) Field crops (CA)			
f) Livestock			
g) Soil fertility: (What is used, how much who often) (Compost ,manure (type), fertilizer, liquid manure, green manures, legumes.....			
h) Garden management; tillage practices (incl furrows			
i) Livestock integration:			

CONSERVATION PRINCIPLES?			
	Yes	No	Detailed description of what is there- list practices
Water management: a) Infiltration (soil structure, texture, organic matter,...) b) Greywater use and management (filtered, ash, dedicated structures) c) Water harvesting and storage (diversion furrows, swales, bunds, small stone walls, check dams, gabions, Water conservation (organic matter, mulching) d)			
Soil erosion control e) contours, ditches, f) stone lines, g) furrows (function)			



h)			
Soil health i) State of soil; presence of organic matter, presence of erosion, presence of compaction (is the soil very hard just below the surface, j) Bed design (trench beds, ridges, dedicated beds and paths, terraces, sunken/raised beds, k) Compost, improved manure, green manures, legumes, l)			
Diversity/ crop management m) Mixed cropping n) Crop rotation o) Seed saving p) Nursery/ propagation q) Continuity- seedling production r) Natural pest and disease control practices s)			
Wild/ diverse plants t) Indigenous or medicinal plants u) Windbreaks/ hedges/ live fencing v) Herbs, bee fodder, pest and disease control species			

HOUSEHOLD PROVISIONING (comments from interviewee)

Food provided for family; what, how much, how often (staples ,vegetables, fruit, small livestock):

Nutritional aspects of cropping:

Selling: what, how much, how often



Household observation checklist (for the interviewer)	
Extent and diversity of garden (presence of resources, manure, different trees,	
Labour and general health	
Overall situation in the household (are there any obvious social issues)	
Any local innovations and interesting things (different plants, unusual crops - e.g. white sorghum, millet, juko beans, herbs, wild plants, medicinal plants, herbs, fruit)	
Social engagement - groups, stokvels, church, farming, selling,	
Non agricultural livelihood activities (e.g craft, use of natural resources in the area, selling water...?...	
Environmental issues; soil degradation, erosion,	
Potential for SWC and RWH - are there nice paved areas, no of houses to collect water from, willingness in household to contribute labour	
Suitability for technical innovation (greenhouse, drip kits, RWH)-	
Potential as local facilitator	
Interest and potential for field cropping and being a CA volunteer	
Other	



Attachment 2

Participatory Impact Assessment workshop outline

1. Recap climate change impacts

- Explore what people have noticed about impacts and make lists under headings: natural, physical, economic, human and social

Group level brainstorming of ideas; written on cards under the headings given, with arrows for increase or decrease

2. Recap adaptive strategies/ practices

- What have people been doing to adapt to this, fix the problems, make things better?
- What can be done? (first look at what has been done and then any further ideas of what can be done)
- Elucidate adaptations for each category: natural, physical, economic human, social

*Group level brainstorming; write on different cards (those done and those thought of) and place next to the impact, indicate with a * which of these have been facilitated or introduced (and by whom) - this can be other farmers, projects, extension officers....*

3. Practices: Recap 5 fingers and list all practices under each category

- Re-introduce the 5 fingers concept - and include a further category of the whole hand - which is the social and personal
- Which practices have been implemented (introduced and other)?

Go around in the circle and each person mentions what s/he has done (productive, economic, social, personal actions) and what she would still like to try

- Add these practices to the five fingers diagram

Make an A1 diagram of the five finger and then add practices on cards

- Go through practices recommended through the DSS

Use cards with ranked practices from the DSS- describe and show the ones that people are not familiar with.

- Rank practices for next round of implementation

Rank the list of practices by a show of hands.

4. What have been the changes or benefits from each practice

- What changes have there been?

Brainstorming changes - an interrogate to get to the more

- How important are these changes to your lives? How do you decide? Which criteria would you use to decide?

Do a matrix ranking: changes (in columns), criteria (in rows) - Use proportional piling, working down each column by asking "how important is this practice for the criteria" and comparing the practices with each other (to an extent) as you go down the list.... Exercise is done in small groups of 5-8 participants

Below is an example of how this could look

	food	income	Soil, water	Access, ease,	knowledge
Trench beds					
Tunnels					
CA					
Cover crops					
Legumes					
Other crops; potatoes, sweet potatoes					
Savings					



Subsidised inputs					
Saving for inputs					
Farmer centre					
Small businesses					
Learning group					
Water committee					

5. Expanding on practices

- Introduce new practices for each of five fingers
- Participants assess each practice (after deciding on criteria for how you decide this practice is useful?)

Eventually the whole exercise can be summarised in the table below

	Natural	Physical	Economic	Human	Social
CC impacts					
Adaptive strategies					
Actions/ practices					
Changes due to practices					
Importance of these changes to your livelihood					

Individual CC resilience snapshots

These are individual questionnaires that provide an in-depth assessment of the impact of the implementation of CRA practices on a person's livelihood. Proxy indicators for resilience are built up from the interview.

RESILIENCE SNAPSHOT							
Date							
Province							
Village							
Increased in farming (Size)		Before (Size in sqm)	Now (Size in sqm)	Comment: Percentage increase			
	Gardening						
	Field cropping						
	Livestock						



	Trees nat resources						
Increased diversity in farming		Y/N before	Y/N now		Comment:		
	Gardening						
	Field cropping						
	Livestock						
	Trees, nat resources						
Increased diversity (1)		Management and practices before	No b4	No now	What has changed; new crops	What has changed; new practices	What has changed; , new management
	Gardening						
	Field cropping						
	Livestock						
	Trees nat resources						
		Types	BEFORE: Quantity (KG, No)	NOW: Quantity (KG, No)	Percentage increase		
Increased productivity	Gardening					(Amount in kgs/tonnes, 10,20,50kg bags/containers, no of meals (for a family))	
		Livestock					
	Trees nat resources						
	Increase Access	Inc RWH	Inc water holding	inc water productivity (irrigation)	SCALE		
						0= same or worse than before; 1= somewhat better than before, 2= much better than before	
	Income before (ave	Income now (Ave monthly	Comments				



	monthly in Rands)	in Rands)					
	Food types (staples, veg, livestock, fruit)	Quantity/week (kg)	No of times/week (1-7)	Sales/week (in Rands)	Comments		
Increased water use efficiency (incl RWH, water holding, water access, water productivity)							
Increased livelihood security (income)							
Increased livelihood security (Household provisioning and food security)							
	Income options Before	Income options Now	Comment; name new options e.g. which crops, etc	Scale			
					1=social grants; 2=remittances; 3=farming income;4= small business		
	Amount per month Before	Amount per month Now	Use of savings	Scale			
					1=food; 2=household use; 3=education; 4=production; 5=other		
		Yes/no Before	Yes/no Now	Comment			
	Gardening						
	Field cropping						
Increased livelihood diversity/options	Livestock						
	Trees nat resources						
Savings (safety, security, achievement)	Activities in groups Before-name	Activities in groups Now	E.g. savings, church, learning groups, coops, farmers associations, work teams, selling, inputs, farmers centres water committees ...				



Increased growing season	Information used to choose activities Before	Information used to choose activities Now	E.g. Other community members, learning in groups, written info, radio, facilitators, extension officers, etc
			E.g. savings, church, learning groups, coops, farmers associations, work teams, selling, inputs, farmers centres water committees ...
			E.g. Other community members, learning in groups, written info, radio, facilitators, extension officers, etc
Collaborative actions/social agency			SCALE:0=less positive about the future; 1=the same; 2=more positive about the future; 3=much more positive
Collaborative actions/social agency			SCALE:0=less positive about the future; 1=the same; 2=more positive about the future; 3=much more positive
	Rate your mindset Before	Rate your mindset now	
Informed decision making			SCALE:0=less positive about the future; 1=the same; 2=more positive about the future; 3=much more positive
Informed decision making			SCALE:0=less positive about the future; 1=the same; 2=more positive about the future; 3=much more positive
Positive mindsets			