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# Water Research Commission

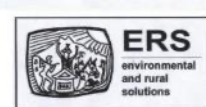
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Deliverable No.2: Monitoring framework: Exploration of appropriate monitoring tools to suite the contextual needs for evidence-based planning and implementation.

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## ACRONYMS

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AF	Adaptation Fund
APP	Adaptive planning process
CCA	Climate change adaptation
COSA	Committee on sustainable assessment
COP/CoP	Community of Practice
CRA	Climate resilient agriculture
CSO	Civil society organisation
CbCCA	Community based climate change adaptation
DAO	desired adaptation outcome
DFFE	Department of forestry, fisheries, and the environment
DM	District municipality
GCA	Global commission on adaptation
IP	Innovation platform
LG	Learning group
LM	Local municipality
M&E	Monitoring and evaluation

MDB	Multilateral development bank
MEL	Monitoring, evaluation and learning
PMERL	Participatory monitoring, evaluation, reflection and learning
MSP	Multistakeholder platform
NCCIS	National climate change information system
NCCAS	National climate change adaptation strategy
NDC	National determined contribution
NGO	Non-government organisation
OECD	Organisation for economic cooperation and development
SANBI	South African National Botanical Institute
SDG	Sustainable development goal
SWSA	Strategic water source area
UNFCCC	United Nations framework convention on climate change

## 1. INTRODUCTION

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This section provides a brief summary of the project vision, outcomes and operational details.

AIMS	
No	Aim
1.	Create and strengthen integrated institutional frameworks and mechanisms for scaling up proven multi-benefit approaches that promote collective action and coherent policies.
2.	Scaling up integrated approaches and practices in CbCCA.
3.	Monitoring and assessment of environmental benefits and agro-ecosystem resilience.
4.	Improvement of water resource management and governance, including community ownership and bottom-up approaches.

### OUTCOME

Vertical and horizontal integration of this community- based climate change adaptation (CbCCA) model and process lead to improved water and environmental resources management, improved rural livelihoods and improved climate resilience for smallholder farmers in communal tenure areas of South Africa.

### EXPECTED IMPACTS

1. Scaling out and scaling up of the CRA frameworks and implementation strategies lead to greater resilience and food security for smallholder farmers in their locality.
2. Incorporation of the smallholder decision support framework and CRA implementation into a range of programmatic and institutional processes
3. Improved awareness and implementation of appropriate agricultural and water management practices and CbCCA in a range of bioclimatic and institutional settings
4. Contribution of a robust CC resilience impact measurement tool for local, regional and national monitoring processes.
5. Concrete examples and models for ownership and management of local group-based water access and infrastructure.

### 5. Chronology of activities

1. Desktop review of CbCCA policy and implementation presently undertaken in South Africa
2. Set up CoPs:
  - a. Village based learning groups: A minimum of 1-3 LGs per province will be brought on board.

- b. Innovation platforms: 3 LG clusters, one for each province consisting of a minimum of 9- 36 LGs will be identified to engage coherently in this research and dissemination process.
  - c. Multistakeholder platforms: Engage existing multistakeholder platforms such as the uMzimvubu catchment partnership, SANBI- Living Catchments Programme, the Adaptation Network, etc.
- 3. Develop roles and implementation parameters for each CoP
  - a. Village based learning groups: CCA learning and review cycles, farmer level experimentation, CRA practices refinement, local food systems development, water and resource conservation access and management and participation and sharing in and across villages.
  - b. Innovation Platforms (IP): Clusters of LGs learn and share together with local and regional stakeholders for knowledge mediation and co-creation and engagement of Government Departments and officials (1-2 sessions annually for each IP)
  - c. Multistakeholder platforms: Development of CbCCA frameworks, implementation processes (including for example linkages to IDPS and disaster risk reduction planning and implementation at DM and LM level), reporting frameworks for the NDC to the CCA strategy, consideration of models for measurement of resilience and impact (1- 2 sessions annually for each multi stakeholder platform)
- 4. Cyclical implementation for all three CoP levels (information provision and sharing, analysis, action, and review) within the following thematic focus areas: Climate resilient agriculture practices, smallholder microfinance options, local food systems and marketing and community owned water and resources access and conservation management plans and processes. Each of these thematic areas is to be led by one of the senior researchers and a small sub-team.
- 5. Monitoring and evaluation: Consisting of the following broad actions:
  - a. Focus on 3-4 main quantitative indicators e.g. water productivity, production yields, soil organic carbon and soil health
  - b. Indicator development for resilience and impact and
  - c. Exploration of further useful models to develop an overarching framework.
- 6. Production of synthesis reports, handbooks and process manuals emanating from steps 1-4 with the primary aim of dissemination of information.
- 7. And refinement of the CbCCA decision support platform, incorporating updated data sets and further information from this research and dissemination process.

<b>DELIVERABLES</b>				
<b>N o.</b>	<b>Deliverable Title</b>	<b>Description</b>	<b>Target Date</b>	<b>Amount</b>
1	Desk top review for CbCCA in South Africa	Desk top review of South African policy, implementation frameworks and stakeholder platforms for CCA.	01/Aug/2022	R100 000,00
2	Report: Monitoring framework, ratified by multiple stakeholders	Exploration of appropriate monitoring tools to suite the contextual needs for evidence-based planning and implementation.	02/Dec/2022	R100 000,00
3	Handbook on scenarios and options for successful smallholder financial services within the South Africa	Summarize VSLA interventions in SA, Govt and Non-Govt and design best bet implementation process for smallholder microfinance options.	28/Feb/2022	R100 000,00
4	Development of CoPs and multi stakeholder platforms	Design development parameters, roles and implementation frameworks for CoPs at all levels, CRA learning groups, Innovation and multi stakeholder platforms; within the CbCCA framework.	04/Aug/2023	R133 000,00
5	Report: Local food systems and marketing strategies contextualized - Guidelines for implementation	Guidelines and case studies for building resilience in local food systems and local marketing strategies towards sustainable local food systems (local value chain)	08/Dec/2023	R133 000,00
6	Case studies: encouraging community ownership of water and natural resources access and management	Case studies (x3) towards providing an evidence base for encouraging community ownership of natural resource management through bottom-up approaches and institutional recognition of these processes.	28/Feb/2024	R134 000,00
7	Case studies: CbCCA implementation case studies in 3 different agroecological zones in SA	CbCCA implementation case studies in 3 different agroecological zones within South Africa	12/Aug/2024	R133 000,00
8	Refined CbCCA decision support framework with updated databases and CRA practices	Refined CbCCA DSS database and methodology with inclusion of further viable and appropriate CRA practices	13/Dec/2024	R133 000,00
9	Manual for implementation of successful multistakeholder platforms in CbCCA	Methodology and process manual for successful multi stakeholder platform development in CbCCA	28/Feb/2025	R134 000,00
10	Final Report	Final report: Summary of all findings, guidelines and case studies, learning and recommendations	18/Aug/2025 (Feb 2026)	R400 000,00

Deliverable 2, follows on from Deliverable 1 focusing on:

- Development of a coherent methodology for multistakeholder engagement, based on theoretical underpinnings and recent evaluative case studies of successful multistakeholder processes and platforms
- Exploration of appropriate monitoring tools to suite the contextual needs for evidence-based planning and implementation including:
  - Models for measurement of resilience and impact (within multi-stakeholder platforms)
  - Indicator development for resilience and impact
- Exploration of further useful models to develop an overarching framework.

## **2. CLIMATE RESILIENCE MONITORING TOOLS AND INDICATORS**

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A resounding call for evidence-based measurements (both qualitative and quantitative) of the impact of interventions and processes in climate change adaptation to climate resilience can be heard across sectors. While the primary emphasis globally is on the governmental contributions, commitments and flows of finances a broad range of other institutional role players have been grappling with the need for and possibility of a synergised framework for monitoring and evaluation. Given the wide range of methodological approaches from top-down to locally led adaptation and the different contexts for implementation this has been a complicated and confusing task.

For the purposes of this research brief a framework needs to be outlined, which is both globally and nationally aligned to ensure the widest applicability for the climate resilience metrics chosen. The work undertaken by the Global Commission on Adaptation (GCA) is used as a global reference point. For the South African comparison, the National Climate Change Adaptation Strategy (NCCAS) forms the main reference point. In addition, a few specific examples of indicator /metric frameworks are provided from different sources:

- A brief analysis of the Adaptation Fund metrics is to be provided, given that SANBI is the main implementing agent of this fund for South Africa and has developed protocols for monitoring and evaluation for the fund itself and also for projects that have been supported.
- The committee on sustainable assessment (COSA), which is a non-profit independent global consortium have developed indicator libraries, including one for resilience indicators. COSA indicators are always aligned with global norms such as the SDGs, multilateral guidelines, international agreements, and normative references. The indicators ensure comparability and benchmarking across regions or countries, making it easier for managers and policymakers. All COSA indicators feature SMART principles: Specific, Measurable, Achievable, Realistic, Time-bound and Trackable.



## **2.1 GLOBAL COMMISSION ON ADAPTATION**

The Global Commission on Adaptation was launched in The Hague in 2018 by the United Nations and the leaders of 22 other convening countries, including South Africa, with the mandate to accelerate adaptation by elevating the political visibility of adaptation and focusing on concrete solutions and finalised its recommendations in 2020. The work is being taken forward by the Global Centre on Adaptation, with the primary aim to monitor cooperative adaptation action of non-state actors and foster community collaboration and knowledge exchange (Global Commission on Adaptation, 2019) .

While climate mitigation is the ultimate imperative, carefully selected adaptation options specific to national contexts are equally important and will yield strong co-benefits to sustain development and reduce poverty. According to the Global Commission on Adaptation, investing US\$1.8 trillion globally between 2020 and 2030 in early warning systems, climate-resilient infrastructure, improved dryland agriculture crop production, global mangrove protection, and investments to make water resources more resilient could generate US\$7.1 trillion in total net benefits. The commission also argues that adaptation actions have a triple dividend:

1. Avoided losses
2. Positive economic benefits: reduced risks, increased productivity, and innovation and
3. Social and environmental benefit.

Climate resilience metrics (measures/indicators) will be key to assessing the extent to which adaptation financing activities and flows contribute to climate resilience and align with the goals of the Paris Agreement.

Multilateral Development Banks (MDBs) and the international finance community have developed a process for aligning adaptation indicators with the COP 24 Paris agreement of 2018.

The MDBs' approach is based on six building blocks that have been identified as the core areas for alignment with the objectives of the Paris Agreement. A joint MDB working group is developing methods and tools to operationalize this effort under each of the building blocks, which includes the mitigation and adaptation goals, accelerated contributions to the transition through climate finance of the different countries' NDCs, policy development support, reporting and internal alignment.

### **a. Principles for climate resilience metrics**

Climate resilience metrics complement adaptation finance tracking through a broad and flexible approach that reflects the great heterogeneity and diversity of climate vulnerability contexts and of potentially appropriate financing responses. The climate resilience metrics framework is a flexible structure based on a logical model and results chain. It guides the development of climate resilience metrics for individual assets and systems, and for financing portfolios, on two levels:

- Quality of project design (diagnostics, inputs, activities)

➤ Project results (outputs, outcomes, impacts)

The framework is underpinned by four core concepts to develop climate resilience metrics and functional characteristics of those metrics which reflect the need for:

1. A **context-specific approach** to climate resilience metrics
2. Compatibility with **the variable and often long timescales** associated with climate change impacts and building climate resilience
3. An explicit understanding of the **inherent uncertainties** associated with future climate conditions, and
4. The ability to cope with the challenges associated with **determining the boundaries** of climate resilience project.

These metrics can serve as a way of documenting more systematically climate resilience efforts and identify successful examples. In doing so, they can help also identify opportunities for further climate resilience support (Inter-American Development Bank, 2019)

To start to define the boundaries, context, timescales and uncertainties in adaptation three key imperatives; **human, environmental and economic** have been defined and within these broad systems namely **food, natural environment, water, cities, infrastructure, disaster risk management and finance** (Global Commission on Adaptation, 2019).

Adapting to climate change while also achieving healthy food for all, mitigating climate change, protecting ecosystems, and achieving the SDGs will require systemic changes to the global food system and global land use.

## 2.2 THE NATIONAL CLIMATE CHANGE ADAPTATION STRATEGY FOR SOUTH AFRICA

In South Africa, The National Climate Change Adaptation Strategy was finalised in August 2020 (DFFE, 2020). It outlines the goals, strategic outcomes, activities and timelines and expected impacts nationally, as well as the responsibilities and actions of all relevant government structures, nationally, provincially, and at municipal level. Despite the various efforts on vulnerability and response plan development, there is no agreed vulnerability and resilience methodology framework to provide guidance to this process.

Nevertheless, a monitoring and evaluation (M&E) system is in development by DFFE. The M&E system will focus on tracking the outcomes and impact of each strategic outcome together with the associated actions and indicators under each strategic outcome. The information/data collected through M&E will be analysed and profiled on the Climate Change Information System. The National Climate Change Information System (NCCIS) was recently launched and is part of the national effort to track South Africa's overall transition to a low-carbon and climate-resilient economy as required by the National Development Plan (Vision 2030) and the National Climate Change Response Policy (2011) as well as South Africa's Nationally Determined Contributions (2015) to the United Nations Framework Convention on Climate Change (UNFCCC). The NCCIS offers a series of methodologies and decision-support tools that can be used to enhance

tracking, assessment, and communication of the effects of climate action response policies and actions in an accurate, consistent and transparent manner at all scales of implementation to inform policy and decision making.

The Climate Change Adaptation Monitoring and Evaluation approach for South Africa has been organised into nine Desired Adaptation Outcomes (DAOs). Each is of cross-cutting, cross-sectoral relevance and describes, in a general sense, a desired state that will enhance South Africa’s transition towards climate resilience. These DAOs fall into two distinct groups and are shown in the table below.

Inputs to enable effective adaptation	
G1	Robust/integrated policies, programmes and plans for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and longer term
G2	Appropriate resources (including current and past financial investments), capacity and processes (human, legal and regulatory) and support mechanisms (institutional and governance structures) to facilitate climate change adaptation
G3	Accurate climate information (e.g., historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction
G4	Capacity development, education, and awareness programmes (formal and informal) for climate change adaptation (for example informed by adaptation research and with tools to utilise data/outputs).
G5	New and adapted technologies, knowledge, research and other cost-effective measures (for example nature-based solutions) used in climate change adaptation
G6	Climate change risks, impacts and vulnerabilities identified and addressed.
Impacts of adaptation interventions and associated measures	
G7	Systems, infrastructure, communities and sectors less vulnerable to climate change impacts (for example, through effectiveness of adaptation interventions/response measures)
G8	Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts)
G9	Secure food, water and energy supplies for all citizens (within the context of climate change and sustainable development).

(From NCCAS, 2020)

Comparing the global imperatives in climate change adaptation with the South African adaptation strategy reveals good overall synergies. Weak points are seen in the top-down nature of the South African planning process, where participatory planning and development processes are not even mentioned. In addition, the lack of coordination between the strategic sectors – notably environmental, water and agriculture in this context are evident in the framework. A brief comparison is made of the two strategies by the author, in the table below.

Human, environmental and economic imperatives			
Global CCA framework			NCCAS - South Africa
Food systems	Food security	Improve small holder productivity	Increase research and development spending
			Continue to invest in climate change prediction and modelling data. Develop and continuously update a national climate information and early warning system. No mention of food systems

	Harness the power of nature		Improved extension: weather services, digital technology, farmer to farmer,	Framed as knowledge and capacity building. No focus on participatory or farmer level process, but enhancement of the role of agricultural extension officers in supporting the most vulnerable farmers is included	
			Seed systems: protect genetic diversity, develop new varieties, distribution systems	Not included present	
		Help farmers manage increased climate variability and shocks	Income diversification including farm diversification, increased market access, and increased off-farm diversification	Investigate the potential for expanding sectors and kick-starting new industries that are likely to thrive as a direct or indirect result of climate change effects	
			Stronger social security systems	Identify individuals and communities at most risk from climate change within municipalities and deliver targeted climate change vulnerability reduction programmes for these individuals and communities Inclusion of effective saving methodologies and financial education in training curricula	
			Bundled livestock/crop insurance		
		Address the challenges of most affected and vulnerable	Improve the rights and resource access of women farmers		
			Help pastoralists adapt via flexible combinations of policies and practices		
			Implement transition funds		
		Achieve policy coherence among food system goals	Redirect public support to promote & facilitate climate smart agriculture	Framed as implementation of climate smart and conservation agriculture practices, expansion of food garden programmes outside of land classified as agricultural land	
			Support synergies and minimize trade-offs between adaptation & mitigation		
			Conserve land & water resources at the landscape scale via improved agronomic practices and eco-agricultural approaches		
		Natural Environment	Accelerate existing actions	Identify, assess, and value natural assets for their potential to support adaptation and resilience.	Conduct research into the value of ecosystem services and the economic benefits of restoring these services in comparison to the development of hard infrastructure
				Develop high-level spatial plans to identify strategic opportunities at larger scales and to create shared visions for climate-resilient landscapes	Not in the NAS, but being implemented through DFFE, SANBI, DWS and NGOs.
				Participatory planning processes	Only mentioned as intergovernmental and departmental collaboration
Increase investment in nature-based solutions	National and local governments to reorient policies, subsidies, and investments, including developing programs to better mobilize private sector support		Framed as awareness raising and re-orientation rather than subsidies and investments		
	Increase resources and technical assistance for developing countries to support nature-based adaptation measures at scale.	Adopt climate resilient approaches to natural resource management to restore and maintain ecosystem goods and services			

Water	Manage water better	Harness the power of nature and expand water infrastructure	Invest in healthy watersheds; forests, wetlands, cities	Protect and conserve South Africa's most vulnerable ecosystems, landscapes and wildlife and monitor and control the spread of alien invasives. Monitor and control the spread of invasive alien species that benefit from climate change. Promote the expansion of tree cover, forests and plantations
			Enhance and expand water infrastructure	
		Cope with water scarcity by using water more productively	Reallocate water to societies' highest priorities	Ensure that water management institutions incorporate adaptive management responses
			Water smart cities	Adopt water-wise water management practices in urban areas
			Agricultural water use efficiency	Support farmers to use and manage water more sustainably
		Plan for floods and droughts	Improve planning at all government levels including better water monitoring systems	Capacitate and operationalise South Africa's National Disaster Management Framework to strengthen proactive climate change adaptive capacity, preparedness, response and recovery
		Improve water governance	Improved collaboration among government agencies	
			Capacity to develop and implement good planning and regulatory regimes	
			Support transboundary water security	
		Finance	Scale up financing systems	Governments should arrange for major increases in financing. Investments in stormwater management, infrastructure to reduce flood and drought risk, and ecosystem protection

(From GCA 2019, NCCAS, 2020)

Development of a framework for resilience indicators depends on the basic point or departure, assumptions and theory of change that is in place, as well as the definition of resilience that is being used.

#### b. SANBI: Adaptation Fund

The Adaptation Fund (AF) was established through decisions by the Parties to the United Nations Framework Convention for Climate Change and its Kyoto Protocol to finance concrete adaptation projects and programs in developing countries that are particularly vulnerable to the adverse effects of climate change. The South African National Botanical Institute (SANBI) is the national implementing entity (NEI) for South Africa. SANBI implements the evaluation policy of the adaptation fund. The purpose of this Evaluation Policy (EP) is to identify the fundamental expectations, processes, and protocol to support a reliable, useful, and ethical evaluation function that contributes to learning, decision-making, and accountability for the Adaptation Fund to pursue its mission, goal, and vision effectively (AF-TERG, 2022). The Fund's instruments that are dedicated to monitoring include the results-based management (RBM) system and Strategic Results Framework (SRF). The Fund prioritizes monitoring, evaluation and learning (MEL) because "learning for effective adaptation" is a central tenet of the Fund's mission, which

is reinforced by its strategic focus of learning and sharing to ensure the Fund remains effective, efficient, and fit for purpose.

The AF focuses on efficiency, effectiveness, relevance, impact and sustainability within social, environmental and economic dimensions and does not deal directly with resilience as a concept. The AF has adopted a results-based management framework for evaluation, in line with the Global commission on Adaptation, farming all MEL activities within a logical framework looking at goals, expected impact, outcomes, and outputs, as well as indicators and targets. The process involves ongoing monitoring and midterm and final evaluations, includes aspects of both process and impact assessment and is project focused. Evaluations are framed within the context of reducing vulnerability, increasing resilience and improving adaptive capacity, effectively, efficiently and sustainably.

The three main outputs for the AF are defined as:

**Output 1:** Risk and vulnerability assessments conducted and updated at national level. (Core indicator: number of beneficiaries)

**Output 2:** Strengthened capacity of national and regional centres and networks to rapidly respond to extreme weather events. (Core indicator: early warning systems)

**Output 3:** Targeted population groups participating in adaptation and risk-reduction awareness activities. (Core indicators: Assets produced, developed, improved or strengthened, natural assets protected and rehabilitated, increased income or avoided decrease in income) (The Adaptation Fund, 2014).

Comparing the outputs and core impact indicators of the AF with the Global CCA framework, shows a much narrower programmatic focus in South Africa, for use of adaptation funding, than has been globally defined, with an emphasis on the natural environment and food systems, but not water and financing.

With respect to indicator development, these have been left open, given the contextual complexity of adaptation implementation a few interesting provisos have been outlined:

- Consideration of measurement of success when no impacts happen: this relates to situations where the extreme events prepared for do not happen in the project cycle or adaptation activities have enabled a lack of impact of such events on the system
- Evaluations happen before longer-term impact is discernible; this is a common issue as project cycles are quite short. Measurement of process and adaptive capacity may be more relevant in such cases than measurement of impact
- Uncertainty in climate scenarios producing uncertainty of risk levels
- Short-term climate variability may affect the outcomes of the projects.
- Assessing the appropriateness of the activity: Look at the adaptation activity within the broader environment over and above its measured effectiveness at project level and
- Contribution of funding towards adaptation rather than evaluating attribution. (The Adaptation Fund, 2011)

### c. Committee on Sustainable Assessment (COSA) resilience indicators

The idea of resilience, particularly as a programming tool in response to disaster and climate-change phenomena, has become increasingly prevalent in international development. Given the widespread use of the terminology in various fields and by various technical and non-technical actors, it is important to present a synthesized view of resilience and create a common language to advance core terms. It is particularly important to translate high-level concepts of resilience into actionable measurement metrics in order to implement, monitor, and evaluate resilience programs

The COSA resilience measurement approach builds on the best current work to distil the optimal practices into a pragmatic and relatively low-cost process that permits a solid basic understanding while increasing broad access to these simpler tools (COSA, 2017)

The approach used to classify the indicators balances a multi-dimensional view based on dynamic resilience capacities (adaptive, absorptive, and transformative) with static social, environmental, and economic (SEE) dimensions (shown in text box: Indicators classification) in

#### Indicators Classification

**Capacity approach:** The capacity approach was developed by Béné et al. (Bene, Wood, Newsham, & Davies, 2012) and is founded on a belief that resilience is a dynamic construct described by three main strategies used to cope with stressors and shocks: absorptive, adaptive, and transformative.

- **Absorptive capacity:** This is the ability to reduce both risk of exposure to shocks and stressors and to absorb the impacts of shocks in the short term. We classify into absorptive capacity all the indicators necessary for risk prevention and risk mitigation.
- **Adaptive capacity:** Adaptive capacity is the ability to respond to longer-term social, economic, and environmental change. We classify all of the proactive choices about alternative livelihood strategies in light of changing conditions into adaptive capacity.
- **Transformative capacity:** Transformative capacity represents the ability to enhance governance and enable conditions that make households and communities more resilient. In other words, transformative capacity refers to system-level changes that enable a more lasting resilience.

**Capital approach:** The capital approach is founded on a belief that people require a range of assets to achieve positive livelihood outcomes. The Sustainable Livelihood Framework (DFID, 2000) inspired this vision.

- **Human capital** includes indicators referring to skills, knowledge, ability to work, and good health that are important to the pursuit of livelihood strategies.
- **Socio-political capital** includes the quantity and quality of social resources (e.g., networks, membership in groups, social relations, and access to wider institutions in society) from which people draw in pursuit of their livelihoods. It encapsulates good governance indicators.
- **Natural capital** includes all indicators that represent factors affecting households' livelihoods through climate change variables (e.g., adaptation, mitigation, and sequestration practices) and through the human activity
- **Physical capital** includes infrastructure, services, and productive assets that enable people to maintain safety and enhance their relative level of well-being.
- **Financial capital** includes all indicators referring to the financial resources that households use to achieve their economic and social objectives. It includes cash, and other liquid resources, (e.g., savings, credit, remittances, pensions).

order to capture the complexity of factors relevant to measuring agricultural resilience. SEE elements are in turn disaggregated into commonly accepted capitals (human, physical, socio-political, financial, natural) of a resilience measurement system in line with the Sustainable Livelihood Framework devised by the Department for International Development (DIFD, 2000).

The lessons learned from the field allowed COSA to define a set of Resilience Key Performance Indicators (R-KPIs) to create pragmatic knowledge on critical aspects of resilience and to address two main issues of the current resilience approaches: complexity and high implementation costs.

The table below outlines the full set of resilience indicators as outlined by COSA and provides a comparison with the indicators used in the AF process.

COSA Resilience indicator library			Adaptation Fund: Core indicators
Global theme	Indicator	Description	
Shock and risk	Risk context information	The type of risks at which households are exposed to.	
	Occurrence and severity of shocks	Occurrence of three major shocks (social, economic, or environmental) that led to a serious reduction in household's income, assets, or consumption in the last production year. Shocks ranked in order of severity.	
	Type of coping strategies and severity	Type of coping strategies that household applied to face the main shock experienced in the last production year (migration, aid, new sources of income, reducing expenses, using savings). Coping strategies ranked in order of importance.	
	Individual preparedness strategies	Strategies implemented by the household to face shocks (stock of feed/seeds, storage of water, measures taken to overcome leaf rust, new seeds varieties/animal breeds, irrigation systems).	
	Recovery ability	Perceived speediness and ability to recover from the main shock experienced in the last production year	
	Early warning systems	Access, source (extension agents, government officials, ICT), and frequency of critical information about adverse events. Perceptions about quality of information	
Community and institutional environment	Perceptions around political environment	Perceptions about accountability and transparency of political process, feeling of safety in community life, and trust in institutions.	
	Participation in decision making structures	Involvement and participation of household and minority groups (women, youth) in decision-making structures (village councils, tribal council, producer organizations).	
	Participation in community activities	Involvement and participation of household members in community activities (improvements in agricultural facilities, access to water or sewage, medical care, road, or school construction).	
	Perceptions about political environment	Perceptions about accountability and transparency of political process, feeling of safety in community life, and trust in institutions.	



	Access to safety nets	Availability of safety nets, both formal and informal, providing reasonable or ready support (food, work, cash) in case of necessity	
<b>Living conditions</b>	Poverty status*	Progress out of Poverty Index score (PPI) and evaluation of poverty propensity; this compares household's revenue to national (or regional, if available) poverty line.	
<b>Basic human rights and equity</b>	Households' adults' level of education (primary, secondary, etc.)	Number of household members aged 15 years and older who have primary school or higher level of education	
	Days without sufficient food*	Number of days in past year that any member of household cut food consumption due to lack of food and months/times of year of comparatively less household food security.	
	Nutritional diversity	Number of different food types (from list) that a family has eaten in the past seven days.	
<b>Innovation</b>	Access to information	Access to information about cropping and livestock practices through training programs (hours and type of trainings); access to market information (prices buyer receives, other local prices, global prices); access to weather information; access to health/nutrition information.	
	Adoption of new technologies	Adoption of new cropping/livestock practices and new agricultural equipment in the last five years.	
<b>Information</b>	Source of information	Source of information: extension agents, government officials, ICT, elders, peers	
<b>Basic services and infrastructures</b>	Access to school	Availability (presence and affordability) of school within reasonable travel distance	
	Access to medical care	Availability (presence and affordability) of medical care (nurse, doctor, or clinic) within reasonable travel distance.	
	Access to electricity	Availability (presence) of electricity at home (private generator or public electricity supply).	
	Access to water	Household access to water they consider safe to drink	
<b>Producers' livelihood</b>	Diversification of income	Portion of total production net income from focus crop, other crops, livestock activities, business activities	
	Nett household income	Total household revenue less total costs for focus crop production, other crop and livestock production costs, and costs for businesses run by household members	
<b>Financial resources</b>	Access to credit	Access to medium-sized production loan within a reasonable time (if needed); potential source of the loan.	
	Productive assets	Number of agricultural productive assets (medium scale equipment and large vehicles), livestock, and hectares of land owned/rented.	
	Access to savings	Type of savings tools implemented by the household and the corresponding amount saved (when applicable): investment in livestock/crops/material assets; participation in local savings group; money lending to others; money savings at home; savings at banks and formal institutions.	

<b>Diversification</b>	Number of income sources	Number of other crops (including those intercropped with focus crop) cultivated by the household. Number of self-employed (e.g., taxi driver, plumber, technician, etc.), or business activities (e.g., convenience store, handcrafting, etc.) in which household is involved. Number of animal products (meat, dairy, wool, honey, etc.) produced on farm for sale or for consumption. Number of other sources of income for the household (gifts, remittances, land rental, etc.).	
	Soil and Water conservation	Measures taken to conserve soil and improve water use by plants (contour planting, soil cover, live fences, hedgerows, buffer zones, soil berms, etc.), erosion control, inter cropping	
<b>Climate change</b>		Practices used to conserve water, such as drip irrigation, catchments, water-efficient processing, etc.	
	Local nutrient cycle	Soil fertility management practices (composting, mulching, etc.) and recycling of organic matter and crop wastes	
	Land use change	Conversion of natural land (e.g., prairie, forest, etc.) to land used for cultivation or pasture and forest, or conversion from cultivated or pastureland to natural land	
	Fertilizer use	Nitrogen, phosphorus, and potassium amounts in synthetic fertilizers used and compared to focus crop yields. This indicates both efficiency and potential pollution.	
	Pesticides use	Amount of natural or synthetic insecticides, herbicides, fungicides, etc. that are used on focus crop.	
	Integrated pest management practices	Integrated pest management practices employed on farm	

(from COSA, 2018)

#### d. Locally Led Adaptation (LLA)

These approaches have primarily been promoted through civil society organizations and large international development organizations. In this regard, eight LLA Principles were developed by the Global Commission on Adaptation and launched at the 2021 Climate Adaptation Summit, to guide efforts to promote LLA. (Sharma, 2021). These principles are meant to guide the development of projects, outputs and monitoring and evaluation frameworks, with indicators, as a process towards outlining coherent sets of indicators, applicable globally.

**The principles are the following:**

- **Devolving decision making to the lowest appropriate level:** Giving local institutions and communities more direct access to finance and decision-making power over how adaptation actions are defined, prioritized, designed, implemented; how progress is monitored; and how success is evaluated.
- **Addressing structural inequalities faced by women, youth, children, disabled, displaced, Indigenous Peoples and marginalised ethnic groups:** Integrating gender-based, economic, and political inequalities that are root causes of vulnerability into the

core of adaptation action and encouraging vulnerable and marginalized individuals to meaningfully participate in and lead adaptation decisions.

- **Providing patient and predictable funding that can be accessed more easily:** Supporting long-term development of local governance processes, capacity, and institutions through simpler access modalities and longer term and more predictable funding horizons, to ensure that communities can effectively implement adaptation actions.
- **Investing in local capabilities to leave an institutional legacy:** Improving the capabilities of local institutions to ensure they can understand climate risks and uncertainties, generate solutions, and facilitate and manage adaptation initiatives over the long term without being dependent on project-based donor funding.
- **Building a robust understanding of climate risk and uncertainty:** Informing adaptation decisions through a combination of local, traditional, Indigenous, generational and scientific knowledge that can enable resilience under a range of future climate scenarios.
- **Flexible programming and learning:** Enabling adaptive management to address the inherent uncertainty in adaptation, especially through robust monitoring and learning systems, flexible finance, and flexible programming.
- **Ensuring transparency and accountability:** Making processes of financing, designing, and delivering programs more transparent and accountable downward to local stakeholders.
- **Collaborative action and investment:** Collaboration across sectors, initiatives, and levels to ensure that different initiatives and different sources of funding (humanitarian assistance, development, disaster risk reduction, green recovery funds, etc.) support each other, and their activities avoid duplication, to enhance efficiencies and good practice.

These principles in essence reflect the frameworks described above, but include specific ideas around devolving decision making, addressing structural inequalities and building local capacity for action and governance. These are aspects not presently well-defined or incorporated into the South African CCA thinking and programming. The concepts of adaptive management and multi stakeholder engagement are important and these are being considered.

This is for example reflected in a recent evaluation of the Small Grants facility of the AF (CA-SGF, 2018). Their learnings, which should now be incorporated into the next round of implementation emphasize a holistic approach, partnerships at multiple levels, locally driven processes, adaptive management and capacity enhancement.

### **3. MULTI STAKEHOLDER ENGAGEMENT: TOWARDS A COHERENT METHODOLOGY**

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There are various ways in which people or groups come up with solutions for complex situations or to explore new and promising opportunities that require working in partnership. These partnerships and interactions are expressed in different ways ranging from coalition, alliances, networks and platforms to participatory governance, stakeholder engagements and interactive policymaking. The term multi-stakeholder platform (MSP) is an overarching concept for partnerships highlighting a vision that different groups sharing a common goal can work together (Surminski & Leck, 2016). These different groups include government, both local and national, Civil Society Organizations (CSOs), Non-Government Organizations (NGOs), private sector and academia (Forino, 2015). They also include local people and communities.

Important considerations for an MSP is inclusion of multiple stakeholders at different levels with a shared vision or aim to resolve a complex issue coming together, learning and sharing knowledge amongst each other in order to reach a collective resolution.

Successful MSPs are observed through the following principles:

- They are able to achieve lasting outcomes
- They involve wide variety of actors
- They have the ability to create sustainable working groups and
- They work towards finding common solutions. (Thorpe, Guijt, Sprenger, & Darian, 2021)

If these principles are in place, then MSPs have the ability to facilitate and promote policy and legal reforms, create neutral spaces for climate and other related issues and promote buy-in for responsible governance. The manner in which the partnerships are setup, the processes used, the capacity for leadership and the skill of facilitation are important underlying considerations for success.

There are a broad range of multi stakeholder engagement platforms in South Africa and also a broad range of approaches to such platforms. In this review, the focus will be on the more recently developed forums in the fields of integrated catchment and water resources management and on the Adaptation Network as the one formal and representative national network/ multistakeholder engagement platform in CCA in South Africa.

#### **a. SANBI Living catchments Project**

The Living Catchments Project, a partnership between SANBI, the Water Research Commission and the Department of Science and Innovation, actively addresses the water related issues in South Africa, with a focus on ecological infrastructure and water security.

The primary aim of the Living Catchments Project is to create more resilient, better resourced, and more relational communities at both catchment and national scales, that are able to draw from the best that the research has to offer in the process of governing the equitable,

productive and sustainable use of water resources and ecosystem goods and services, through strengthening of an enabling environment for catchment governance and the integration of built and ecological infrastructure in support of water security, economic development and livelihood improvement (Living Catchments Project, 2022).

Four catchment platforms have been convened, namely the uMzimvubu, Berg-Breede, Olifants and uThukela catchments. Communities of practice comprising of traditional leaders, civil society, rural communities, policy makers, researchers, and practitioners have been set up, each consisting of a defined membership, vision, and action plan for the respective catchments. The emphasis is on collaboration, co-learning and co-creation.

The outputs and core indicators for this process are as follows:

**Output 1:** The CoP builds and nurtures a co-learning and co-creation space to develop a research and innovation linked agenda for their catchment (Core indicator: Increase diversity of actors, articulation of research priorities and evidence of sharing)

**Output 2:** Capacity and tools for work in Strategic Water Source Area catchments is increased and embedded (Core indicator: Evidence of use of tools in implementation)

**Output 3:** Learning, circulating of ideas and experience, and expansion of networks is facilitated through designed encounters (Core indicator: Articulation of learning and evidence of using approaches and methods from one catchment in another)

**Output 4:** Social spaces fostering collaboration & co-learning are sustainable and locally institutionalised (Core indicator: Sustainability of hosting and chairing the CoP) (Letty B. , 2022)

The LCP has pioneered the inclusion of multistakeholder involvement in management and governance issues related to water and have also developed the first broad based monitoring process for impact of multistakeholder engagement, related to environmental and water issues and thus provides a good grounding for further exploration of indicators in this field. This process is however as yet not touching directly on issues of resilience and adaptation, although these could be considered to be embedded in the catchment processes to some extent.

#### **b. The uThukela Water Source Forum**

Building on the SANBI-LCP and towards establishing a strategic water source area partnership for the Northern Drakensberg SWA, WWF's Freshwater programme is supporting the initiation of a multistakeholder partnership. The convenors for this partnership are The Institute of Natural Resources, the Centre for Water Resources Research (UZKN) and MDF.

The process is still in the initial stages of participatory development of a vision towards action and uses the adaptive planning process along with OECD's process on multi stakeholder engagement for water governance (OECD, 2015) as its strategic approach.

The process for development of an MSP is outlined in the diagram below.

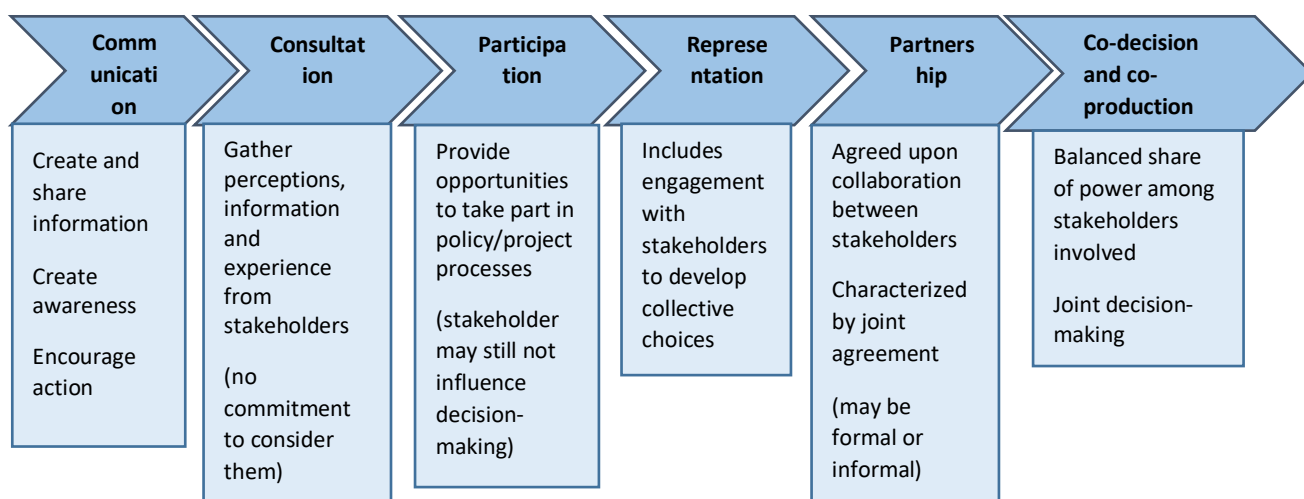


Figure 1: Progression for multi stakeholder platforms development (OECD, 2015)

The principles for engagement in development of an MSP and the steps towards achieving these principles are summarized in the table below.

Table 1: Table outlining principles for multi stakeholder engagement and steps in achieving these (OECD, 2015)

Principle	What needs to be done
1. <b>Inclusiveness and equity</b>	Map all SH with a stake or an interest: their responsibilities, interests and interactions with other SH
2. <b>Clarity of goals, transparency and accountability</b>	Define decision-making, the objectives of SH engagement and expected use of input
3. <b>Capacity and information</b>	Allocate proper financial and human resources and information sharing
4. <b>Efficiency and effectiveness</b>	Assess and re-assess the process: Learn, adjust and improve the SH engagement
5. <b>Institution and structure</b>	Embed engagement processes in legal and policy frameworks, organizational structures/principles and responsible authorities
6. <b>Adaptiveness</b>	Customize the type and level of engagement to the needs and be flexible to changing circumstances

Between June and November 2022, three multi stakeholder events have been held, in addition to smaller and face to face interactions with specific organizations towards including as many of the role players as possible, mapping the stakeholders, outlining their roles and responsibilities as well as mandates and interests and in starting to define a vision for the partnership. In addition, collaboration in activities and engagements in the catchment have been initiated, primarily around local water access options through spring protection and reticulation (which has included the WWF, INR, CWRR, MDF, and the Maloti Drakensberg Transfrontier Park (MTDP) as well as alien clearing and restoration activities (WWF, INR, MDF, Wildlands and MTDP, KZN

Wildlife and Conservation South Africa (CSA). The importance of implementation alongside discussions has been emphasized from the outset.

Nearly 100 stakeholders have been involved to date, with around 60 organizations/ groups/ communities represented representing policy and government, operators, financial actors, interest and influential groups and users.

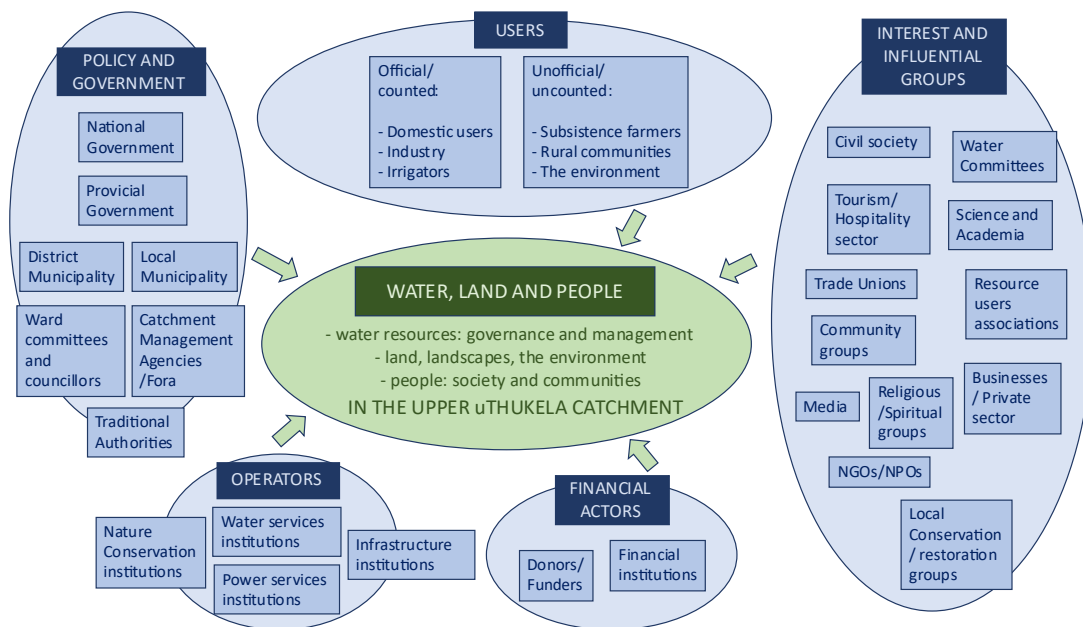


Figure 2: A diagram representing the types of organisations represented in the uThukela water source partnership.

The adaptive planning process has thus considered present issues and concerns, values and a vision for the partnership. A vision has been developed: **Integration of different entities to conserve and utilize the landscape and its water, other natural and cultural resources fairly as well as empower its people, to build resilience and achieve sustainable socio-economic growth.**

Activities that have been proposed, which will now be further explored and developed into an action plan can be summarized as:

- Networking coordination and communication
- Enabling collaborative and aligned action between stakeholders for securing the SWSA
- Focus on water access, infrastructure and management in the catchment focusing on the rural poor
- Coordinate relevant research and monitoring, including data exchange
- Foster co-learning and co-creation
- Help coordinate investment and priority management interventions
- Create job opportunities and add more projects and

- Continue the gains from related projects linking with the various programmes of work in the catchment for added effort.

The vision and high-level activities for this MSP align well with the sister platforms for the Mpumalanga and Eastern Cape Drakensberg SWSAs. A recent evaluation of the uMzimvubu Catchment Partnership programme provides further insight into best practice in implementation.

### c. The uMzimvubu Catchment Partnership evaluation

*Written by Sissie Matela and Nickly Mc Cleod – Environmental and Rural Solutions*

In the Eastern Cape Drakensberg, through the uMzimvubu Catchment Partnership (UCP) which is an informal, voluntary partnership guided by a Memorandum of Understanding (MoU), the network of partners formed in 2012 mainly to address the widespread land degradation, starting with rangeland restoration and stewardship. ERS and Conservation South Africa (CSA) were founding members, but the task required establishing a network of partners with expertise and resources.

A recent evaluation of the WWF investments in the Umzimvubu catchment, particularly through ERS as a key convener with the Nedbank WSP support mentioned earlier, was undertaken by The Association for Water and Rural Development (AWARD), a respected NGO and research organisation. The AWARD evaluation provided valuable insights into what has been successful, or not, and why. The findings summarised below are extracted from this report, the full version of which can be provide an as annexure if required. These findings may be useful for the thinking around how to convene effective partnerships towards specific goals such as climate smart food security networks.

Where the partnership/collaborative is at present:

1. **In terms of partnership-building, the UCP was strengthened in several ways during the project period.** The WWF funding supported a UCP Coordinator position within ERS and covered the costs of hosting the quarterly meetings and field-based learning events; WWF supported ERS with organisational development; Teaming and Convening workshops arranged by WWF helped to strengthen relational and inter-personal skills and promote organisational development for 20 participants from six partner organisations. Several new governance and coordination structures emerged as sub-groups within the UCP. There was a strong growth of partnerships for governance and implementation (including funding partnerships), and also partnerships for research. Building of regional and national partnerships did take place but distilling lessons to inform policy through these partnerships was less well achieved.
2. **UCP-level strategic planning and MEL are inadequate.** While there is a lot of collaborative work and planning between partners on projects, UCP-level strategic



planning is a rather *ad hoc* process. The UCP's theory of change is not well developed; it is not detailed enough to be useful and doesn't identify assumptions or link to research questions. While the UCP strategy document is useful, the *practice* of strategizing needs to be strengthened. There is a need for more reflective practice, both within each organisation and collectively in the UCP. Although attempts have been made to improve M&E processes and tools, these efforts have had a rather stop-start character. The M&E function has been very under-resourced over the years.

3. **Landscape and livelihoods-related outcomes were well achieved.** Landscape outcomes included improved rangeland condition and ground cover to prevent erosion and provide good grazing for cattle, removal of alien invasive tree species and improved water quality through protection of springs from surface contamination. In terms of livelihoods, outcomes included skills development and employment opportunities for youth (a particular focus of the First Rand project), employment through clearing of wattle, and support for entrepreneurship linked to the development of green business value chains for livestock and charcoal production. However, wattle regrowth is a major threat to the investments already made and a solution is needed to deal with this.
4. **Teaming and Convening workshops** arranged by WWF helped to strengthen relational and inter-personal skills and promote organisational development for 20 participants from six partner organisations (ERS, CSA, MLM, EWT, Lima and WWF). This included helping administrative and financial staff to understand the needs and priorities of 'implementation' staff and vice versa.
5. **Several new governance and coordination structures** emerged as sub-groups within the UCP. These mostly developed organically to meet the needs of collaborative projects (some being funded through WWF), but also partly in response to a push by SANBI to establish "communities of practice" or working groups focused on particular topics. They are important because they show that partners recognise the need to work together, and they help to guide and document these collaborations, for example through promoting regular meetings and the keeping of minutes or meeting notes.
  - The **Water and Alien Vegetation Task Force or WATF** (involving ERS, local implementers, DFFE, SANBI and research organisations).
  - The **Matatiele Resource Management Unit** (ERS, Avocado Vision and Inhlabathi).
  - The **Water Security Project Steering Committee** (all six Traditional Authorities, ERS, Lima, CSA, Department of Water & Sanitation, CONTRALESA, Matatiele LM and the Alfred Nzo District Municipality as the Water Services Authority).
  - A **Waste Management** group led by Matatiele LM and supported by ERS, CSA and Lima.

- A **Carbon Possibilities and Ecosystem-Based Adaptation** group led by CSA.
  - A **Research** task team is being discussed to guide the growing body of research work in the catchment.
  - The local **Grazing Associations** formed through the work with livestock farmers are extremely important local governance institutions that have cemented partnerships between farmers, the Traditional Authorities, and the NGOs involved (CSA, ERS, Lima, Meat Naturally).
- The UCP shifted over the time period of the evaluation from a somewhat “competitive” space between the various partners – especially the NGOs - to a more **collaborative space** where joint implementation of projects has become more frequent<sup>1</sup>. Reasons suggested for this shift include an increasingly deliberate focus on social learning, through the influence of SANBI and the Living Catchments Project, as well as strengthening of interpersonal relationships through formal and informal interactions over time.<sup>2</sup>
  - The fact that **local government partners as well as Traditional Authorities have been drawn in and become key players** in the partnership is unusual compared to most other places around the country<sup>3</sup>. This is beneficial because the traditional leaders are important role players in natural resource governance and land allocation in communal areas, and they are in a good position to identify ecological and social priorities in their communities. The establishment of the Maloti Thaba Tsa Metsi Protected Area (see Section 3.1.2) would never have been possible without the strong support and involvement of the six Traditional Authorities, for example. The local and district municipalities, on the other hand, are important for embedding the work within formal planning processes (e.g., Integrated Development Plans, Spatial Development Frameworks and Local Economic Development Plans). Although this does not necessarily guarantee funding support, it does help to promote a unified vision of what is needed in the area.

The following mechanisms were identified as **enabling progress** towards outcomes:

- The characteristics of the core UCP partners (ERS, Lima, CSA) make the UCP effective in achieving outcomes in the catchment. These are the key organisations that do the work on the ground. Characteristics included relational warmth, shared values and a shared way of working described as respectful, participatory, transparent and culturally appropriate. The “peripheral partners” are important in supporting the core, providing

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<sup>1</sup> Snorek et al., in press; Interview17-govt

<sup>2</sup> Interview12-NGO

<sup>3</sup> Interview17-govt, Interview26-NGO, Interview7-TA

resources, expanding the scope, transferring ideas and lessons to other areas, sharing different ways of addressing problems, conducting research, and linking to policy.

- The co-implementation of projects (enabled by the shared values and long-standing relationships within the UCP) produced a lot of learning for the implementing organisations and led to both innovation and collaborative refining of models that work.
- Learning and sharing of successes within the UCP community led to members applying models elsewhere (outside the uMzimvubu catchment).
- Creativity and flexibility among the core NGO partners were instrumental in building a group of young people who could effectively support projects and act as ambassadors at community level. This reaped huge benefits and produced a multiplier effect for most aspects of work.
- The diversity of organisations in the UCP (NGO, different levels of government, parastatals, social enterprises, Traditional Authorities, and research organisations) enables meaningful division of labour between partners.

The following mechanisms acted as **constraints to progress**:

- ERS' capacity and functioning. Given its key role in the UCP, the functioning of ERS affects the functioning of the UCP. The main issues identified were busyness and "taking on too much"; persistent underfunding of operational overheads; the absence of any M&E personnel to assist with reporting, reflection and learning, and knowledge management; and difficulty attracting qualified and experienced staff in a remote geographical location. A red flag is the fact that both of ERS' directors are looking to retire in the next few years, and no succession plan is yet in place.
- Budget and staffing constraints within municipalities, as well as a lack of political will in some cases, mean that local government does not play as much of a role in the UCP's strategic planning and M&E as it should.
- The COVID-19 pandemic affected the extent to which some of the outcomes could be achieved (e.g., hectares cleared, youth entrepreneurs supported).

The evaluation recommends that **the UCP should continue to be nurtured as a community of practice and innovation system**, and that **the group of youth "Eco-champs" should be expanded, and the role made less precarious**.

Below, a summary of stakeholder engagement and participatory tools developed and used within both the UCP and its 'anchor project' extension - the Maloti Thaba Tsa Metsi (MTTM), a proposed protected area along the upper Umzimvubu watershed.

Some of the important components identified, which became an integral part of the values pack, include:

- **Deepening the relationship with local leadership and communities** by establishing and growing an interactive, relational, trustworthy local presence of NGOs throughout the upper Umzimvubu Catchment. This required co-creation of implementation projects together with all stakeholders, and timesous cost-effective delivery of outcomes, including spring protection, youth employment job creation, beef value chains, alien plant clearing etc
- **Improving coordination between research institutions** and local role players through sharing of results to ensure benefits accrue for growth and development. This required crafting a research priorities ‘wishlist’ and ensuring that academic institutions align with catchment needs and share findings back with participants. A knowledge hub and monitoring and learning framework are beginning to emerge and need much more attention to become effective.
- **Sharing lessons** between catchments by documenting projects, lessons learned, reflections and sharing these between catchments
- Deepen and expand the active community of practice around EI nationally, through catchment-based indabas and interactive field-based learning exchanges to **foster effective transformative social learning**
- **Fostering participatory Citizen science practises as a basis for monitoring, evaluation and learning:** action-oriented awareness building where community members confront the consequences of specific actions and are an integral part of designing solutions. The approach is easily adapted based on observations and encourages deeper interest in real research for better practise and outcomes. The pictures below show field-based citizen science activities where village residents, youth and ERS field co-ordinators link with research institutions to apply rigorous science in a well-designed and easily applied citizen science format.
- **Participation in IDP Forums** to gather information on what the priority developmental issues are that come directly from communities: the process follows along provisions of Section 25 of the Municipal Systems Act (MSA) no.32 of 2000. ERS shares information on specific projects and associated budgets, specifically under public education and awareness, spatial planning issues, agriculture and SMME support, water supply and sanitation and environmental management
- **Community meetings/sharing forums** which focus around implementation projects, impacts, recruitment, challenges and benefits e.g. rangeland associations. These mostly have an open agenda to allow for optimal participation and use sensitive facilitation techniques
- **Focus group discussions**, combined with survey of people’s perceptions

- **Quarterly Umzimvubu Catchment Partnership meetings** which provide a platform for sharing, networking and planning
- **PSC establishment** for stakeholder engagement during active specific project implementation. These are often contract-based, and more success has been achieved by having foundational groups which live between and beyond funded projects and which can guide the latter within a longer and broader context
- **Deployment of youth Ecochamps** in villages to gather data, gauge community responsiveness and advise on recommended modification to approaches to remain relevant and aligned with good governance practice, to build consensus and increase benefits on landscapes for people and the environment

Many of the above tools and methodologies are modified from, or combinations of, time-honoured and tested participatory approaches, as well as reflective and responsive ‘learning from doing’ and are founded on working together from a common baseline towards a common vision: together they form a flexible suite of responsive resource management strategies.

### **3.1 MONITORING AND EVALUATION IN MULTI STAKEHOLDER ENGAGEMENTS**

Monitoring and Evaluation (M&E) is a process of checking how programs, projects, organizations, institutions and etc. are doing (i.e. performance) or whether they are achieving the desired outcomes looking at their objectives, visions and targets. Traditionally M&E methods and process do not support learning or reflection as they are concerned with reports focusing heavily on donor accountability (Rhodes University, 2019)). This kind of M&E is generally done by external experts, and with predetermined indicators.

There have been calls for more flexible and context sensitive systems which can rely on continuous analysis and adaptation to allow a project to respond to local context, changing needs and evolving knowledge as the project unfolds. This has led to development of M&E systems that include learning, reflection and participation in complex socio-ecological systems (SES). Monitoring in these contexts involves the recording of activities and results, that will then be collated to account for how resources have been used, and to what end. Monitoring provides the information needed for accountability purposes, but also data that can be used for evaluation purposes.

Monitoring can also be done by programme participants (or citizen scientists and community activists) to monitor what is happening to Commons resources like rivers, air quality and forests, to pick up the impacts of pollution for example, and track improvements brought about by sustainability actions. Citizen monitoring is a powerful approach to stakeholder engagement and

social learning, an example of the evaluative nature of stakeholder engagement and social learning.

#### **d. MEL and PMERL**

Monitoring, Evaluation and Learning (MEL), includes analysis of ongoing monitoring data to inform project implementation, which assumes an option to change implementation if required. In terms of the evaluative component, assessments look for patterns and trends, again to be able to make informed decision about potential changes required to improve the project's ability to achieve the desired outcomes.

The Participatory monitoring, evaluation, reflection and learning (PMERL) approach expands on this by opening up the design of the process to include those most directly affected and agreeing to contribute to data gathering and do the analyse together, thus opening the process to data gathering and analysis by project/process beneficiaries as well. In general, a diverse range of data sources and reflection opportunities are sought – including opportunities that encourage and enable managers at various levels in the programme and its governance system, to consider the feedback loops from the field. Feedback loops provide information to the organization about the successes or failures of the organization's system. A positive feedback loop assumes that the positive outcomes or outputs are fed back into the system

In complex SES, the pathways to success need to be worked out during and through action-taking and reflection. learning must be informed by real-time data and observations, and shared reflection on what this information means (Kotschy, Cockburn, Conde-Aller, & Rosenberg, 2021). PMERL can be a powerful tool for building collaboration, a common vision and a strong basis for ongoing strategic adaptive management. This process also allows for participatory or co-development of indicators.

These processes fit into evaluative approaches, such as empiricist approaches, constructivist approaches, process-based evaluations, theory driven approaches and participatory approaches. (Rhodes University, 2019). These will not be discussed in detail here. There are many kinds of evaluations, that serve different purposes in the life of a programme: from diagnostic evaluations and feasibility assessments to; design evaluation, implementation evaluation, economic evaluation (like cost-benefit analyses), outcomes evaluation and impact evaluation, as well as synthesis or meta-evaluations that collate and analyse the findings of other evaluations.

Below are a few examples of evaluation of multistakeholder platforms, providing some indication of the evaluative approach and the M&E system.

### a. Examples

The UCP evaluation outcomes were described in section 3c above. Here a brief description of implementation and evaluative methodology is provided.

The emphasis is on **social learning**, which is defined as a change in understanding that goes beyond the individual and spreads within communities or groups through social interactions between people (Reed *et al.* 2010). Ison *et al.* (2007) describe social learning as a process of socially constructing an issue, a type of collective “meaning-making” leading to a change in understanding and practice which may produce collective action to transform a situation. Most complex problem-solving around natural resources management requires action beyond the individual, making this type of learning and collective action centrally important.

A **developmental evaluation approach** largely replaces the idea of an “objective, external” evaluator. Developmental evaluation is useful in innovative settings where goals are emergent and changing rather than predetermined and fixed, time frames are fluid (e.g., in longer term programmes) and the purposes are innovation, change, and learning rather than (or in addition to) external accountability. Accountability is first and foremost to the implementers themselves, as opposed to external parties like funders, as it is assumed that the implementers driving the programme, as social innovators and change agents, have very high stakes in their programme achieving what they broadly set out to do. Developmental evaluation is suitable for complex contexts because it is sensitive to the context, and it helps to track contextual changes and reflect on their implications for the programme’s theory of change and implementation plans. Responsiveness and adaptation, both to the context and to the life cycle of the programme, are key features of developmental evaluation. Programmes using **adaptive cycles or strategic adaptive management**, find developmental evaluation most aligned to their way of work. The evaluators need to be comfortable with “uncertain beginnings, muddled middles and unpredictable endings that ripple on and on without end” and to understand these as unavoidable features of innovative change-oriented projects in complex social systems (Patton, 2011).

For the Tsitsa Project the catchment process is based on social-ecological systems, thinking, adaptive planning and PMERL. The emphasis is on participation in all aspects, including the communities benefiting from the process centrally into planning, implementation, monitoring and evaluation.

The methodology takes a broad range of concerned stakeholders through a participatory process to define their values and concerns and outline the specific context of their catchment towards developing a joint vision for the future of the catchment. This is followed by identifying the key strengths of the catchment towards defining objectives; it identifies the fundamental purpose of managing a specific resource. Once the special features of these resources are defined, then an exploration of threats and constraints can lead to prioritizing certain sets of activities and processes and lead to an action plan, which can be implemented and reviewed. This is an ongoing, cyclical, and adaptive process. Overall, the project has found that taking

account of social-ecological connections increases adaptive possibilities (Palmer, Rogers, Holleman, & Wolff, 2018).

When looking at Adaptive management as applied in multi stakeholder engagement and also in CCA, we have now explored a range of principles, outputs and frameworks for development of indicators, as well as evaluation and monitoring frameworks. Learnings from these summaries and case studies a preparatory for the development of a manual for implementation of successful multistakeholder platforms in CbCCA (Deliverable 9 of this brief).

In addition, some more exploration of the concept of co-productive agility will be undertaken, The concept is defined by Chambers, et al., 2022 as *“the willingness and ability of diverse actors to iteratively engage in reflexive dialogues to grow shared ideas and actions that would not have been possible from the outset. It relies on embedding knowledge production within processes of change to constantly recognize, reposition, and navigate tensions and opportunities”* (Chambers, et al., 2022).

Co-productive agility opens up multiple pathways to transformation through: (1) elevating marginalized agendas in ways that maintain their integrity and broaden struggles for justice; (2) questioning dominant agendas by engaging with power in ways that challenge assumptions, (3) navigating conflicting agendas to actively transform interlinked paradigms, practices, and structures and (4) exploring diverse agendas to foster learning and mutual respect for a plurality of perspectives.”

#### **4. PROCESS PLANNING AND PROGRESS TO DATE**

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The intention is threefold, as describe below and shown in the diagram:

- Expand introduction and implementation of the CbCCA DSS framework within the areas of operation of MDF with a number of different communities. Work with existing communities as the basis of the case studies in specific thematic areas.
- Introduce and implement the CbCCA DSS framework with a range of other role-players expanding into new areas, including different agroecological zones and
- Work at multistakeholder level to introduce the methodology as an option for adaptation planning and action, both within civil society and also including Government stakeholders. This is the first step towards institutionalization of the process and will involve mainly working within existing multistakeholder platforms and networks as the starting point.
- Further exploration of the categories of stakeholders and the roles and relationships between stakeholders is important for the present research brief.



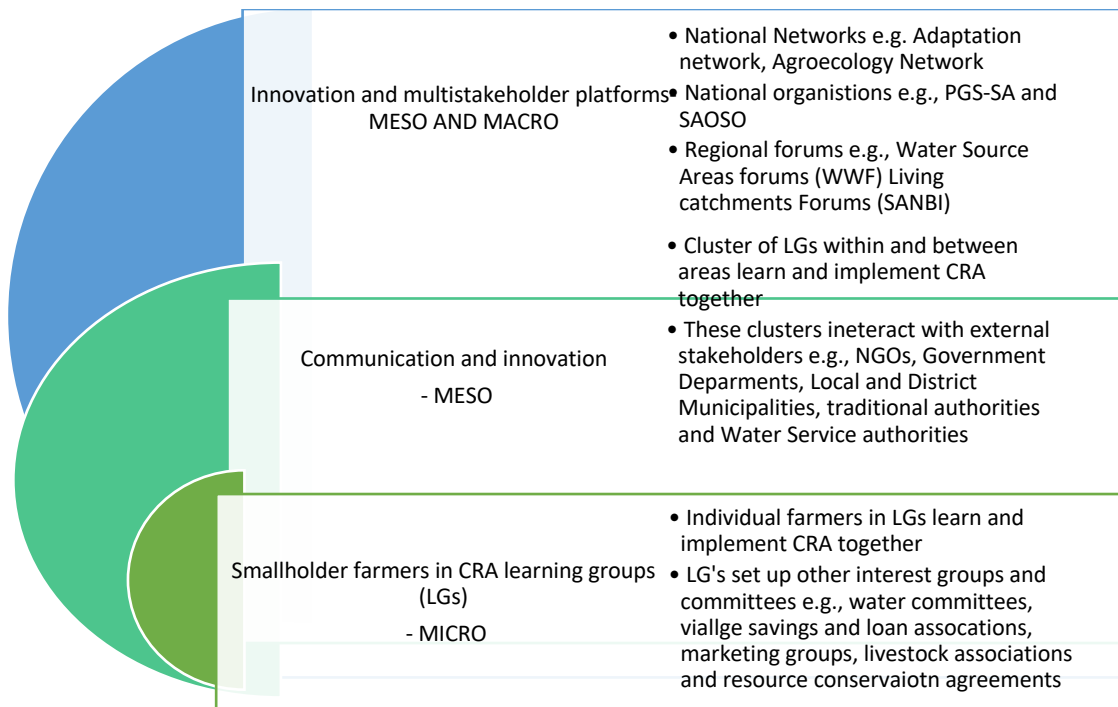


Figure 3: Conceptualization of stakeholder platforms at multiple levels to support CbCCA

### Smallholder farmers in climate resilient agriculture learning groups

This process has been initiated by continuing and strengthening specific CRA learning groups, which have been supported by MDF in the past and who have done well in implementation and building of social agency. These groups will provide the focus for further exploration of food systems, water stewardship and governance and engagement with local and district municipalities.

Table 2: Micro-level CoP engagement: September -December 2022

Note: Collaborative strategies in bold undertaken during this reporting period

Province	Site/Area; villages	CoPs	Collaborative strategies
KZN	Bergville: Ezibomvini, Stulwane, Vimbukahlo, Eqeleni, Vumbukhalo	-Village level Climate Resilient Agriculture (CRA) learning groups: (~130 participants)	- Tunnels and drip kits -Individual experimentation with basket of options (CA, agroecology, fodder supplementation) -VSLAs (village savings and loan associations) <b>-Marketing committee – local markets stalls, uThukela Development Agency and Dept of Basic Education</b> <b>-Water committees; Local schemes in 3 villages</b>

			-CA review and planning sessions – Adaptive research design for volumetric water benefit pilot project, with WWF
	Midlands: Ozwathini, Gobizembe, Mayizekanye	- Village level Climate Resilient Agriculture (CRA) learning groups: (~90 participants)  -Livestock associations and cooperatives (SARDLR)	- Tunnels and drip kits - Individual experimentation with basket of options (CA, agroecology, fodder supplementation) -VSLAs (village savings and loan associations) -Marketing committee – local markets stalls -Livestock committees – with DARDLR for calf rearing, potato and maize production <b>-CA adaptive research project planning with Asset Research</b>
<b>Limpopo</b>	Sekororo: Sedawa, Turkey, Mulati	- Village level Climate Resilient Agriculture (CRA) learning groups: (~75 participants)	- Tunnels and drip kits - Individual experimentation with basket of options (CA, agroecology, fodder supplementation) <b>-VSLAs (village savings and loan associations)</b> <b>-Regrouping for Mametja-Sekororo PGS and exploration of local marketing options</b>
<b>EC</b>	Matatiele Ned, Nchodu, Nkau, Rashule	-Village level Climate Resilient Agriculture (CRA) learning groups: (~90 participants)	- Individual experimentation with basket of options (CA, agroecology, fodder supplementation) -VSLAs (village savings and loan associations) in association with SaveAct) <b>- Tunnels and drip kits</b> <b>-Planning for local water access</b>

***A small case study on the Conservation Agriculture (CA) review and planning sessions as well as CA adaptive research design and implementation for Bergville is provided in Appendix 2.***

#### **Communication and innovation**

No activities have been undertaken under Innovation Platforms during this period.

#### **Multistakeholder platforms**

To date the research team has participated in a range multistakeholder platforms, networks and communities of practices (CoPs) towards developing a framework for awareness raising, dissemination and incorporation of the CbCCA-DSS methodology into local and regional planning processes and developing methodological coherence for a number of the themes to be explored in this brief.

In this present period between July and December 2022 the following stakeholder engagement activities have been undertaken:

- Presentations: WWF (World-Wide Fund for Nature) Agroecology webinar, Ukulinga Howard Davis Symposium, WWF board - Northern Drakensberg Field Trip,
- Planning meetings: Nqe Dlamini, Nicky McCleod, Derick du Toit and Brigid Letty

- Civil Society engagement: Eduventures- Namibia, CCAMP policy engagement
- Multi stakeholder engagement: Olifants water Indaba, Adaptation Network, uThukela water source partnership, UCP – Review of CRA implementation and spring protection activities in the catchment, planning for future engagement
- Articles: in Adaptation Newsletter October 2022 *\_See Appendix 3 for the article*

Conceptual discussion on a range of topics including vulnerability assessments, the role of agroecology in CCA, methods for monitoring and evaluation of multistakeholder processes, development of stakeholder platforms and inclusion of volumetric water benefit accounting as a tool for implementation of integrated water resources management have been undertaken in the last 3 months and will be continued into the next deliverable.

The table below outlines actions and meetings to date.

*Table 3: Planning and multi stakeholder interactions for the CCA-DSSII research process:*

<b>Date</b>	<b>Organization and individuals</b>	<b>Activity</b>	<b>Notes</b>
2022/07/08	Tsitsa Project- <i>Laura Bannatyne</i>	Informal conversation around implementing the DMF developed adaptation platform to help in a short-term implementation and review process of the project	Further discussions with the team around how to incorporate different aspects as well as the resilience snapshots into their process
2022/07/04	MDF – <i>implementation team</i>	Presentation of TOC for desktop review for inputs by writing team	Interns and field team members to assist with specific sections of the desktop study
2022/04/12, 08/16-17, 11/02	AWARD – Derick du Toit	Meeting in Hoedspruit to discuss AWARD’s contribution Youth induction programme– Tala Table network Planning for CRA learning group expansion, Mametja-Sekororo PGS continuation	Focus to be on local food systems case study, youth engagement
2022/05/09, 09/19, 10/24, 11/17	StratAct – <i>Nqe Dlamini</i>	Introduction of topic and discussion of Deliverable 3 (Handbook on scenarios and options for successful smallholder financial services within the South Africa) Development of research brief. Finalization of survey and focus group discussion outlines, planning for field work	Nqe Dlamini is registered for a PhD in Adult education at UKZN under the theme of micro finance for smallholders and is to lead this aspect of work.
2022/06/01	Sociotech Interfacing- <i>Marna de Lange</i>	Discussion with STI re the CbCCA model specifically incorporation of climate change action in food security implementation – sharing of resources Meeting with STI team in Polokwane to present model and discuss potential implementation collaboration	The intention is to run workshops with STI staff and communities to incorporate climate action into their implementation
2022/07/29			
2022/02/12	Ttshintha Amakhaya – <i>Winile Makhabo</i>	Discussions for presentation of the CbCCA model to 9 partner organizations, with the intention of implementation in WC, EC, Limpopo and KZN	Still to be followed up – change in national coordinator

2022/02/20, 10/03-05, 11/15	Wildlands	Discussions and subsequent joint proposal for inclusion of CbCCA into resource conservation programming. Initial field visit to place CRS within EbA activities and Social Impact Assessment.	Proposal development for Isimangaliso Wetland Programme for Blue Action Fund
2022/03/15-16	SAMC conference	Presentation of a paper: CbCCA improves Climate change resilience for smallholder farmers in central Drakensberg	Submission of full academic paper by 2022/09/30
2022/02/21, 03/16, 04/14,...	WWF-Water Source Areas	Negotiation for MDF CRA implementation to be part of the water stewardship programme in the upper uThukela	Inclusion in a pilot for volumetric water benefits for smallholders; CA and water access (2022-2024)
2022/02/22, 04/19, 11/08	Umzimvubu Catchment Partnership – <i>Nicky McCleod, Sissie Mathela</i>	Presentation of CbCCA DSS at 34 <sup>th</sup> quarterly meeting of the UCP (~120 participants). Development of MoU and work programme with ERS Webinar to review CRA and spring protection implementation and plan for future projects	Ongoing involvement in UCP. Collaboration on issues of governance and multi stakeholder platforms
2022/05/23, 09/13	Karen Kotschy	Learning in M&E interest group meeting Discussions re methodology for UCP and Tsitsa project multi stakeholder engagement evaluation	Continued involvement for academic framing of new modalities for M&E
2022/04/06-08	LCP – Convenors' workshop – <i>Erna Kruger (MDF), Brigid Letty (INR)</i>	Learning and sharing workshop for Living Catchments Multistakeholder platform convenors	Part of SANBI-WRC partnership and programme.
2022/06/14	LCP- Upper Uthukela	VSTEOP stakeholder analysis exercise for role players in upper uThukela as part of and Adaptive Planning Process	Visioning for multi stakeholder platforms
2022/05/19	Adaptation Network-Vulnerability assessments	Presentation of MDF vulnerability and resilience assessment tool to CoP for vulnerability assessments convened by Indigo Development and Bread for the World	Ongoing interaction in sharing and learning. Next CoP meeting in August 2022
2022/06/29, 07/13, 07/29, 08/17	Adaptation Network (AN) – Capacity building CoP	Meetings of newly set up CoP for design of capacity building process within multi stakeholder network – implementation of a capacity development process funded by the Govt of Flanders Inception workshop of SEED project under AN	Ongoing involvement
2022/05/30, 06/26, 07/27	Agroecology networking – (AESAs)	-Farming for Climate Justice-part research in solidarity networks with Coventry University (UK). -Joined webinar by CGIAR on measuring impact of CSA across their CCAFS programme -Focus group discussion on agroecology in CCA – SIDA research process. - NGO focus group and farmer focus group discussions for agroecology cast study for 'Fastenaktion' research process managed by Stephen Greenberg	Role of agroecology in CbCCA – conceptual and development of case studies

2022/11/17 2022/11/18		-Presentation to the Agroecology research working group on Agroecology transitions towards exploring transition pathways - CCAMP (Agriculture Master Plan) – policy engagement multistakeholder workshop – Cape Town	Provision of policy input for updating the agriculture masterplan for climate change – 1 <sup>st</sup> meeting for an ongoing process
2022/07/06, 07/29, 11/17	SAOSO/PGS SA	Group certification and coordination of organic/agroecological farming inputs working group meetings Development of smallholder farm assessment form, logs, labelling and rules for engagement	Ongoing involvement in CoP
2022/08/11	WWF	Webinar on Agroecology implementation in WWF programmes: Presentation “Agroecology Transitions” E Kruger and M Malinga	Deepen understanding of Agroecology within WWF programme implementation
2022/09/01	Eduventures (Namibia)	Environmental and sustainability education in the context of climate change and Transnational project initiation, with signing of MoU. M Malinga and E Kruger	Sharing of CCA-DSS framework in a transnational environmental education partnership - ongoing
2022/09/20	KZN Conservation Agriculture Forum	Convened by KZNDARD, at Cedara, with report backs on all CA implementation and research in the province. M Malinga	Continue MDF engagement in CA in KZN, through LandCare and research
2022/09/29 11/10	uThukela water Source Partnership	WWF, INR, CWRR and MDF Convene and develop a water source partnership. Web based introductory meeting for new stakeholders to engage in APP and visioning Workshop at Okahlamba Local Municipality to finalize vision for the partnership and start to develop a broad action plan	Ongoing development of the partnership with associated activities, including Development of an M&E process
2022/10/12	Ukulinga Howard Davis Memorial symposium	Presentation of a paper “CbCCA improves resilience in central Drakensberg” by E Kruger, M Touchers (SAEON) and R Henriksson (UKZN) <b><i>A copy of the presentation is provided in Appendix 1.</i></b>	Activity linked also to another WRC project on Mapping of ecosystem services in the upper uThukela
2022/10/14	WWF- board	Presentation of climate resilient agriculture in upper uThukela and conceptualization of water benefits. . E Kruger M Malinga	Towards a greater understanding of water benefits and restoration potential of climate resilient agriculture practices and inclusion in catchment-based resource conservation.
2022/10/31- 11/02	Olifants’ Catchment Indaba	SANBI Living Catchments multi stakeholder event in Olifants’ catchment	Sharing and learning in multi stakeholder partnerships

#### 4.1 WORK PLAN: DECEMBER 2022 – FEBRUARY 2023

The following broad activities are to be undertaken during this period:

- Continuation of implementation for the CRA learning groups across three provinces
- Ongoing involvement in CoPs: AN-capacity building and learning, PGS-SA,
- Undertake individual interviews towards the microfinance research brief (50 participants across KZN)
- Undertake focus group discussions towards microfinance research brief
- Develop and populate outline for Microfinance handbook, to complete a draft by 28<sup>th</sup> February 2023
- MoU for the Institute of Natural resources work package
- Finalization of master’s student concept note and registration at UKZN

Table 4: Work plan November 2022-March 2023

Work plan November 2022-March 2023				
Deliverable no	Activities	Team members	Dates	Submission
<b>2. Desktop review of Multistakeholder engagements</b>	Exploration of appropriate monitoring tools for evidence-based planning and implementation. Analysis of multistakeholder forums	MDF: Erna Kruger ERS: Nicky McCleod AWARD: Derick du Toit INR: Brigid Letty	2022/11/18	2022/12/02
	Capacity building: Concept proposals for 2 MSc theses and engagement of potential supervisors	MDF: Erna Kruger, Temakholo Mathebula and Ayanda Madlala	Concepts: 2022/12/02 Registration: 2023/02/28	2022/12/02
<b>3. Handbook on microfinance services for smallholder farmers</b>	MoU with StratAct for implementation of research package. Summary for development into a handbook.	MDF: Erna Kruger, Ayanda Madlala, Hlengiwe Hlongwane, Thabani Madondo StratAct: Nqe Dlamini	MoU: 2022/09/01, Workplan: 2022/10/10, Draft report: 2023/01/13 Handbook: 2023/02/18	2023/02/28
<b>4. Development of CoPs and multi stakeholder platforms</b>	COPs: 9 Village level CRA learning groups in KZN, EC and Limpopo engaged - assessments done, annual implementation plans outlined, CRA experimentation outlined and set up (incl. new practices: e.g., multipurpose poultry, linking sanitation and agriculture, water access explorations, veld	MDF: Erna Kruger, Temakholo Mathebula, Ayanda Madlala, Betty Maimela, Michael Malinga	2023/02/28	2023/08/04

	restoration, youth engagement in resources restoration, Tala Table network, development of local marketing strategies and VLSAs)			
	COPs: Multistakeholder forums: uThukela water source partnership	MDF: Erna Kruger INR: Brigid Letty	Stakeholder mapping and visioning: 2022/11/05 Ongoing	
	Networks working groups: Adaptation Network - capacity development and learning, PGSSA- Certification and farmer inputs, CA forum.	MDF: Erna Kruger, Michael Malinga	Ongoing	
	Tala Table Network: Youth involvement programme, Mametja-Sekororo PGS	MDF; Erna Kruger, Betty Maimela AWARD: Derick du Toit	Ongoing	

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**APPENDIX 1: UKULINGA HOWARD DAVIS MEMORIAL SYMPOSIUM PRESENTATION  
2022/10/11**

## CbCCA in central Drakensberg improves resilience of smallholder farmers

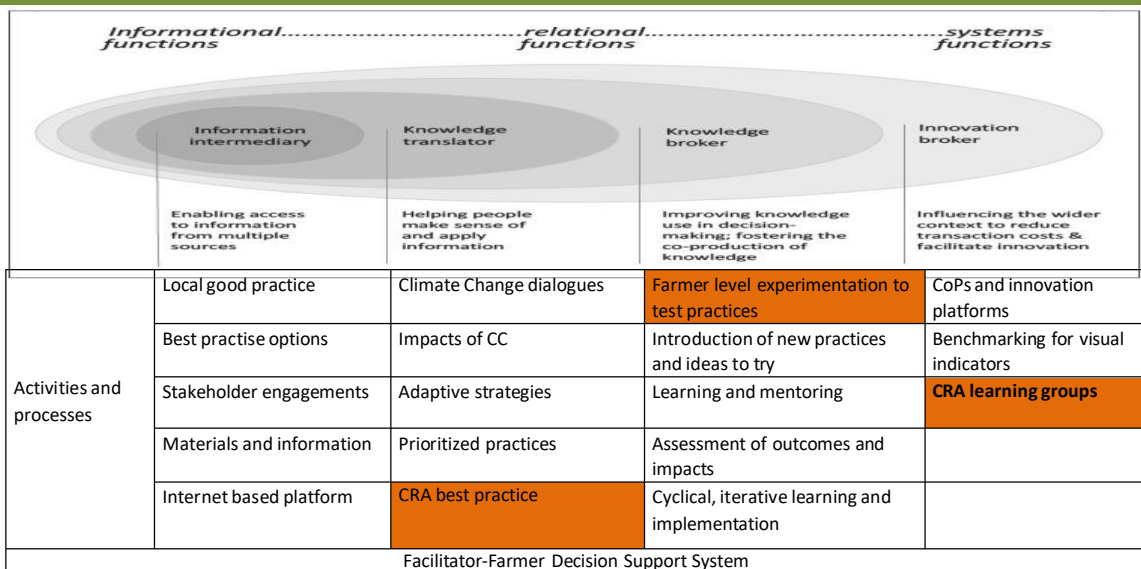
*F. Kruaer, M. Toucher, R. Henriksson (MDE, SAFON, UKZN-CWRR)*

October 2022

**mahlathini**  
development foundation

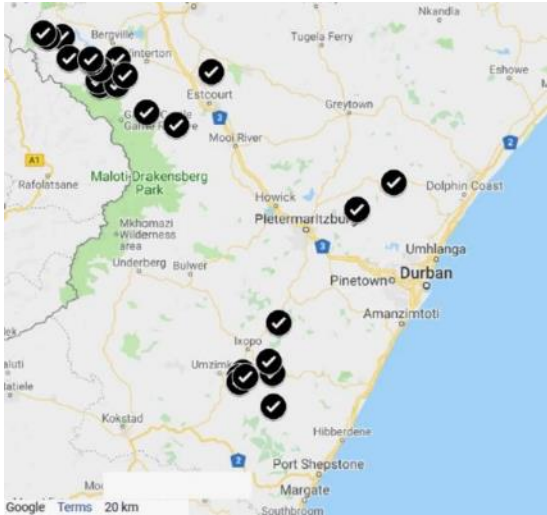
- 1
- 2

## Smallholder CCA decision support system: individual and facilitated



# Climate Resilient Agriculture learning groups

## Research areas and process



- Bergville: 5 villages. 120 farmers
- Midlands: 7 villages. 76 farmers
- SKZN: 3 villages. 94 farmers

### PROCESS:

- Village level CRA learning groups
- Implement a range of prioritized CRA activities/practices
- And undertake farmer led experimentation for measurement of results and impact
- groups do cyclical planning and reviews and engage in further actions and multistakeholder processes

3

# Climate Change Impacts in Bergville area

## Climate change impacts on livelihoods and farming (KZN)

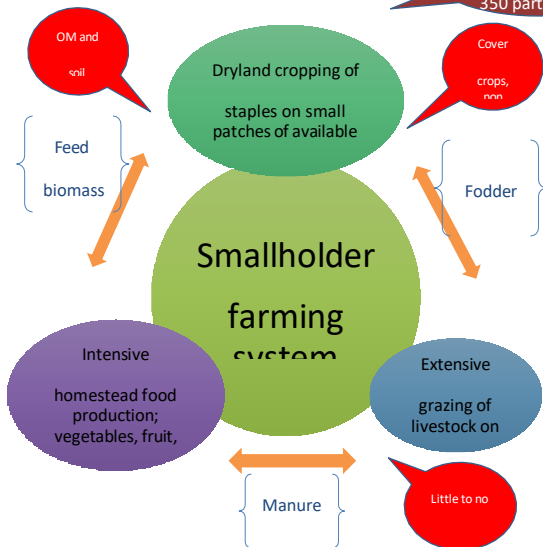
<b>Water</b>	Less water in the landscape; streams and springs drying up, boreholes running dry, soils dry out quickly after rain Dams dry up Municipal water supply becoming more unreliable
<b>Soil</b>	More erosion Soils becoming more compacted and infertile
<b>Cropping</b>	Timing for planting has changed- later Heat damage to crops Reduced germination and growth Seeding of legumes becoming unreliable Lower yields (~40% yield reduction for 2018-2019 cropping season ) More pests and diseases Loss of indigenous seed stocks
<b>Livestock</b>	Less grazing; not enough to see cattle through winter More disease in cattle and heat stress symptoms Fewer calves More deaths
<b>Natural resources</b>	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 Availability of indigenous vegetables has decreased
<b>Social</b>	More diseases Increased poverty and hunger Increased crime and reduced job opportunities



4



## The smallholder farming system



across 18 villages  
350 participants



5

## CRA ACTIVITIES

- **Conservation Agriculture:** Quantitative research support to the Smallholder Farmer Innovation Programme: *Intercropping, crop rotation, cover crops, fodder production*
- **Livestock integration:** *Winter fodder supplementation, hay baling, conservation agreements, local livestock auctions*
- **Intensive homestead food production:** Agroecology: *Micro-tunnels, trench beds, mixed cropping, mulching, greywater management, fruit production, crop diversification*
- **Community owned local water access:** Water committees: *Spring protection, boreholes, water reticulation, pipes and tanks at homestead level*
- **Village savings and loan associations:** *Village based savings groups for savings and small loans for productive activities*
- **Local marketing and food systems:** *Monthly produce market stalls, organised per village, exploration of further marketing options, small mills for maize*
- **Soil and water conservation:** *village-based learning groups in Climate change adaptation undertake resource conservation activities*

Assess impact with measurement of quantitative and qualitative indicators



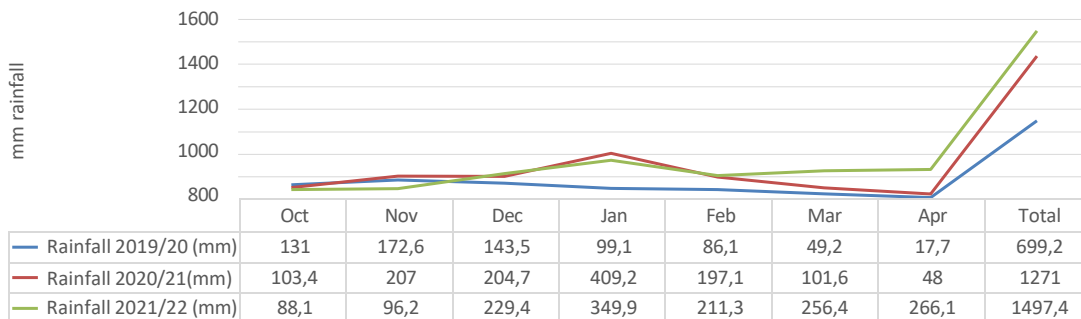
6



# Measurements

## Rainfall - SAEON

Monthly rainfall averages 2019-2022

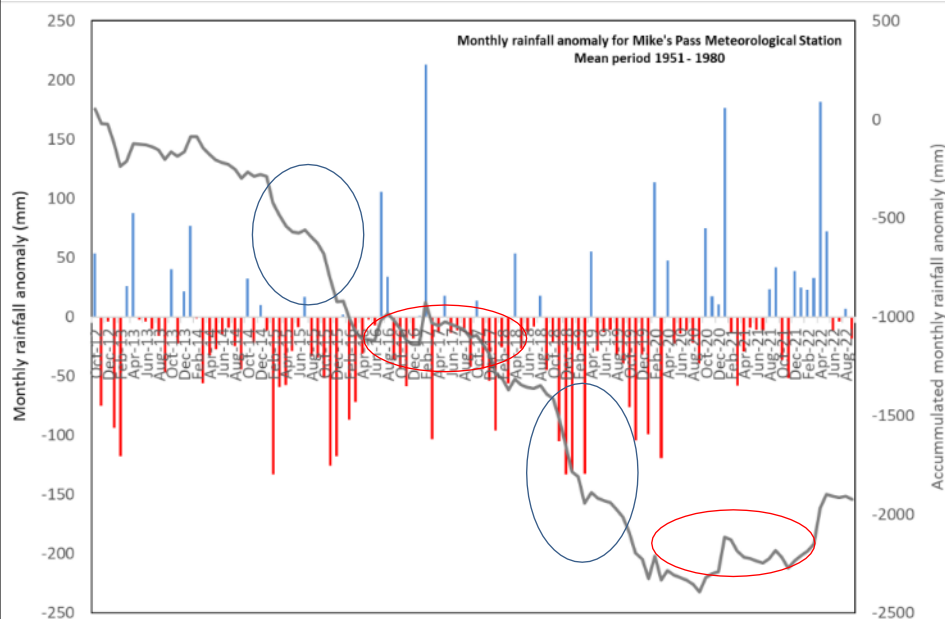


- Overall rainfall for 2020/21 almost double that of 2019/20
- Rainfall this season (1497,4mm) was even higher than in 2020/21 (1271mm)
- Periodicity is different: For 2020/21 and 2021/22 much more rainfall later in the season
- For 2021/22 rainfall early in the season even lower than the previous 2 years.
- Late season rainfall (March-April) affected bean yields and caused increased fungal load in maize grain

7

# Measurements

## Rainfall – Long term averages



- Rainfall in the last 8 to 9 years has been lower than the long-term average more often than higher.

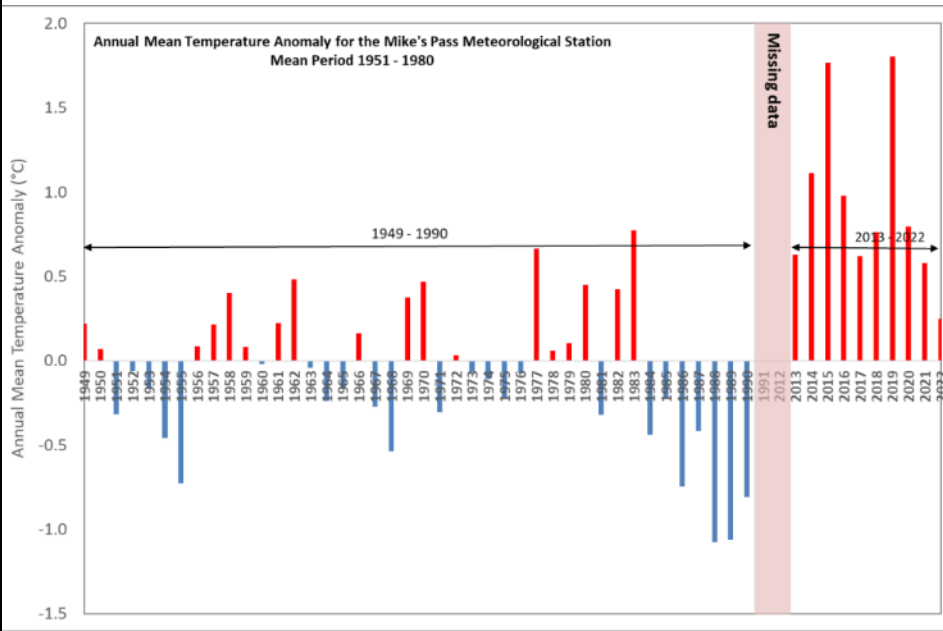
(The grey line is the sum of deviations over time)

- The trend in the line is mostly downwards indicating drier than average conditions for a sustained period of time.
- There are two relatively stable periods for the line

8

# Measurements

## Temperature – Long term averages



- Average annual temperature in the last 10 years has been consistently higher than the long-term average
- And for 6 of those years the average is higher than any temperatures coming before.
- An average temperature change of >1,5°C has been measured

9

# Measurements

## Runoff – Pans in CA experimental and control plots in cropping fields

% Rainfall conversion to runoff (6 participants across 4 villages)	Runoff CA trial plot (L)	Runoff CA control plot (L)
2019/2020	4%	7%
2020/2021	6%	11%
2021/2022	5%	7%
<b>Average</b>	<b>5%</b>	<b>8%</b>

Right and far right: Installation of run-off pans in control and CA trial plots, respectively.



- Run-off averages across all CA trial plots almost 30-50% lower than runoff in the control plots (CA control maize- mono cropped)
- Between 2%-5% of total rainfall is saved through reduced runoff in the CA trial plots

Right: Signs of run-off in a CA control M plot in Bergville



69 Liter /m<sup>2</sup> now in the soil. That is 694 000 L/ha per year, more water in the soil and available to crops

10

## Measurements and results

### Water productivity field cropping

- Water productivity for CA maize grown as an intercrop with beans or cowpeas is higher than single cropped CA maize and
- Water productivity for CA plots is significantly higher than conventionally tilled plots.
- Despite annual differences in water productivity, these trends remained the same across three seasons for all three areas within KZN.
- The close spacing used in the CA trial plots provides extra WP benefits when compared to the 'normal' spacing used in these villages

Cropping options	WP (kg/m <sup>3</sup> )	WP (kg/m <sup>3</sup> )	WP (kg/m <sup>3</sup> )	Ave WP (3 yrs)
	2021/22 (n=7)	2020/21 (n=11)	2019/20 (n=9)	
CA – Maize (M)	2,64	2,28	1,11	<b>2,0</b>
CA- Maize, bean intercrop (M+B)	3,07	2,50	1,21	<b>2,3</b>
CA- Maize cowpea intercrop (M+CP)		2,84	1,43	<b>2,1</b>
CA- Maize control (M-CA control)	1,42	1,1	0,8	<b>1,1</b>
Conventionally tilled maize (M-Conv Control)		0,75	0,36	<b>0,6</b>

WP for maize grown in a multi-cropping rotation CA system is much higher (x2) than CA mono-cropped maize or conventionally tilled maize (x3)

11

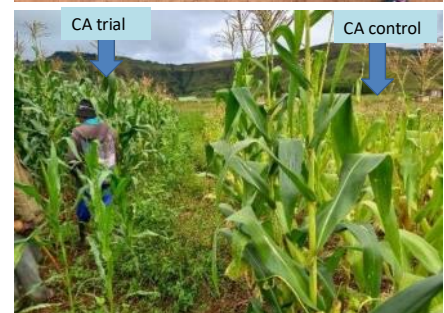
## Measurements and results

### Volumetric water benefit field cropping

	CA trial (inter cropping and crop rotation)	CA control (mono cropped M)	Conv control (mono cropped M)
kg/m <sup>3</sup> (WP)	2,3	1,1	0,6
Difference (CA trial- CA control- Conv control)	1,2	0,5	
Volumetric water difference (l/kg)	1 200	500	
Yield (t/ha)	5,11	2,87	
VWB (l/ha)	<b>6 132 000</b>	<b>1 435 000</b>	

Volumetric water benefit for intercropped and rotated CA plots is

~6 million litres/ha more than conventional tillage and for mono-cropped CA plots is ~1million



12

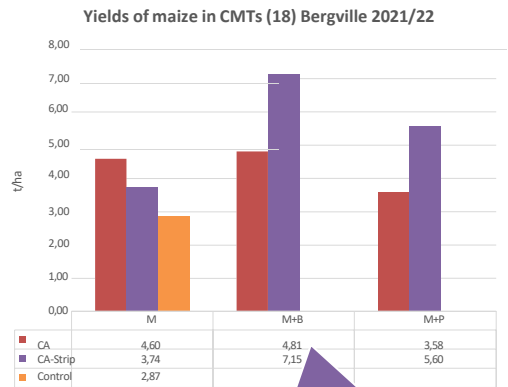
# Measurements and results

## Yields of maize in CA trials - Bergville

Weighing of maize yields per plot in CA trials



- Average yields for maize planted in intercropped plots (M+B, M+Pumpkin) are much higher than the yields in maize only plots
- Average yields for the CA trial plots (intercropped and maize only averaged) are much higher than maize yields in the CA control plots (planted to maize only in consecutive years)
- For 2021/22 yields were on average 1-2 t/ha lower than the previous season.



Yield advantages for maize through intercropping and crop rotation are evident after a continuous CA implementation cycle of 4 or more years

Ave yield M- intercrop: 5,22t/ha,  
Ave yield M- monocrop: 4,18 t/ha  
Ave yield M- control: 2,87t/ha

Maximum yields have increased from 6,7 t/ha to 13,6 t/ha between 2014 and 2021, for high performing smallholder farmers. A yield gain of ~1 t/ha per annum is possible under CA cropping systems despite difficult climatic conditions

# Measurements

## Water productivity vegetable production

- Water productivity for vegetables grown inside the tunnels is between 140%-250% more than outside the tunnels



This means that on average you will save 500-1 250 liters of water for every kg of vegetables produced

Water productivity calculated for a range of vegetable crops for Phumelele Hlongwane (Ezibomvini), Feb 2019-March 2020

Plot	Crop	Simple scientific method (ETc)		
		Yield per plot (5x1m) (kg)	Water use (m3)	WP (kg/m3)
Trench bed inside tunnel	Chinese cabbage	60,5	0,5	122
Trench bed outside tunnel	Chinese cabbage	34,7	0,5	72,1
Trench bed inside tunnel	Green pepper	30,1	0,7	46,5
Trench bed outside tunnel	Green pepper	24,6	0,7	34,5
Trench bed inside tunnel	Spinach	49	0,7	73,7
Trench bed outside tunnel	Spinach	19,6	0,7	29,1

This equates 36 000-92 000l /tunnel/ annum of water



## Measurements

## Marketing –summary of sales on market days



Collapse of market stalls after social unrest. Seasonality of vegetable

~R382 / farmer/

Summary of market incomes for Market stalls: April 2021-August 2022					
Date	No farmers	Villages	Amount	Market	Produce
2021/04/10	11	2	R2 419,00	Emmaus	
2021/05/09	16	3	R1 580,00	Emmaus	
2021/06/09	18	4	R5 072,00	Emmaus, Stulwane	
2021/07/10	16	4	R3 415,00	Emmaus, Stulwane	
2021/08/07	9	3	R2 379,00	Emmaus	
2021/09/09	18	4	R3 745,00	Emmaus	
2021/10/08	8	4	R845,00	Bergville market	VEGETABLES: Broccoli, cauliflower, cabbage, kale, chinese cabbage, mustard spinach, leeks, onions, lettuce, carrots, beetroot, green peppers, chillies, brinjals, green maize, green beans, tomatoes,
2021/06/04	16	4	R11 527,50	Bamshela - Ozwathini	HERBS: coriander, parsley, fennel,
2021/08/04	8	4	R3 866,00	Bamshela - Ozwathini	FIELD CROPS: Maize, dry beans, sweet potatoes, amadumbe, pumpkins, butternut
2021/09/03,06,07	12	5	R5 448,00	Bamshela - Ozwathini	FRUIT: Bananas, avocados, naartjies, lemons
2021/10/05,06	12	5	R3 354,00	Bamshela - Ozwathini	M.EAT: Pork, broilers, chicken pieces, eggs
2021/11/03,04	9	4	R2 964,00	Bamshela - Ozwathini	PROCESSED FOOD: Bottled chillies, mealie bread vetkoek
2021/10/11	3	2	R19 800,00	Sale to shops in Bergville: Bover and Saverite	OTHER: Incema, seed potatoes, pinafores, grass brooms, mats, beads, art work
2022/03/02	19	4	R1 310,00	UEDA - Emmaus Hall	Combo packs - via social media in Pietermaritzburg: Potatoes, carrots, eggs, chillies, onions, cabbage (half and chopped), green beans, beetroot, avocado, brinjals, green peppers, chopped mixed veg.
2021/12/02,03	10	4	R2 964,00	Bamshela - Ozwathini	
2021/12/03	10	4	R1 400,00	Ozwathini- social media	
2021/10/06	6	3	R2 610,00	Bamshela - Ozwathini	
2022/02/05,12,19	8	4	R3 010,00	Bamshela - Ozwathini	
2022/03/11	6	4	R1 216,00	Bamshela - Ozwathini	
2022/03/04	7	3	R2 565,00	Bamshela - Ozwathini	
2022/06/02,03,04	7	4	R4 782,00	Bamshela - Ozwathini	
2022/07/05	11	3	R2 500,00	Bergville town market stall	
2022/08/03	17	6	R4823,00	Bergville town market stall with FSG farmers	
2022/08/04,05,06	7	3	R4248,00	Bamshela-Ozwathini	
	<b>11</b>	<b>4</b>	<b>R96 626,50</b>	<b>INCOME: ~ R6 901 800/month</b>	Ave income per participant: R382 per market day (R100-R1,600)

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## Monitoring tools

## Income and livelihoods



~Average increased value of livelihood is ~R3000/ month

Commodity (n=100)	Average monthly income per participant	Annual potential income
Broilers	R1 024,50	R12 294,00
Layers (eggs)	R641,00	R7 692,00
Field crops:		
Maize	R209,41	R3 713,00
Beans	R237,50	R2 850,00
Vegetables	R247,00	R2 964,00
Average monthly value of food per participant		
All commodities: This is an estimate only (further corroborated in resilience snapshots)*	R700,00	R8 400,00
Commodity for a selection of participants only	Average monthly income per participant	Annual potential income
Green Maize	R1 300,00	R15 600,00 (up to R24 000)
Stall fed calves	R750,00	R9 000,00 (up to R50 000)
Total value of production (incl all commodities but excl the selection)	R3 059,41	R36 712,92

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## Monitoring tools

## CA Innovation system monitoring dashboard 2013-2020

Social agency	2013	2020	Value chain	2013	2020	Productivity	2013	2020
No of female farmers	89%	75%	Saving for inputs	0%	28%	Intercropping – maize and beans	0%	92%
No of participants involved	41	487	Reduced labour in CA plots	0%	78%	Intercropping maize and other legumes	0%	17%
Learning groups (No)	4	31	Reduced weeding in CA plots	0%	39%	Crop rotation	0%	20%
Months of food provisioning:			Use of planters:			Cover crops; summer mix – sunflower, millet, Sunhemp, sorghum	0%	26%
10-12	-	15%	Hand hoes	97%	26%			
7-9	-	38%	Hand planters		69%			
4-6	-	39%	Animal drawn planters	3%	5%			
1-3	100%	8%	Tractor drawn planters		5%			
VSLAs (Village Saving and Loan Associations) - % of participants involved	0%	79%	Local financing of infrastructure	0		Cover crops; winter mix relay cropping – Saia oats, fodder rye, fodder radish	0%	31%
			Threshers		1			
			Mills		1			
			Spring protection		2			
Sale of crops locally (maize, beans, cowpeas, sunflowers)	0%	15%	Farmer centres	0	2	Fodder: provisioning of livestock through cut and carry	0%	10%
Innovation platforms; including external stakeholders	0	3	Ave maize yield (t/ha)	3,7	6,4	Seed saving	0%	11%

17

## Monitoring tools

## Resilience snapshots: Individual interviews

Resilience indicators	Increase for Drakensberg	Comment
Increase in size of farming activities	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 no of farming activities	No	All involved in gardening, field cropping and livestock management
Increased season	Yes	For field cropping and gardening- autumn and winter options
Increased crop diversity	Crops: 12 new crops Practices: 8 new practices	Management options include; drip irrigation, tunnels, no-till planters, JoJo tanks, RWH drums,
Increased productivity	Gardening > 72% Field cropping >79% Livestock > 25%	Based on increase in yields (mainly from tunnels and trench beds for gardening CA for field cropping
Increased water use efficiency	25%	Access, RWH, water holding capacity and irrigation efficiency rated
Increased income	23%	Based on average monthly incomes, mostly through marketing of produce locally and through the organic marketing system
Increased household food provisioning	Maize- 20kg/week Vegetables – 7kg/week	Food produced and consumed in the household
Increased savings	R267/month	Average of savings now undertaken
Increased social agency (collaborative actions)	>3	Learning groups, farmer centres, local water committees, marketing groups, livestock associations
Increased informed decision making	> 5	Own experience, local facilitators, other farmers, facilitators, extension officers
Positive mindsets	2 to 3	More to much more positive about the future: Much improved household food security and food availability

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## Monitoring tools

## Participatory Impact assessments



	Soil; health and fertility	Money; income and savings	Productivity; acceptance of practice, saving in farming – equipment, labour	Knowledge; increased knowledge and ability to use	Food; how much produced and how healthy	Water; use and access	Social agency; Support, empowerment	Total
Conservation Agriculture	22	21	26	28	18	23	18	156
Savings	6	15	14	15	12	11	15	88
Livestock	19	11	18	7	5	12	11	83
Gardening	14	15	12	13	15	17	21	107
Crop rotation	16	12	13	12	12	15	10	90
Intercropping	12	13	15	12	11	11	9	83
Small businesses	11	17	15	10	20	11	9	93

In KZN positive impact of CRA and associated practices in order of importance: CA, gardening (tunnels, agroecology), small businesses (farmer centres, poultry), savings, livestock (integration – fodder, health)

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## Learning groups

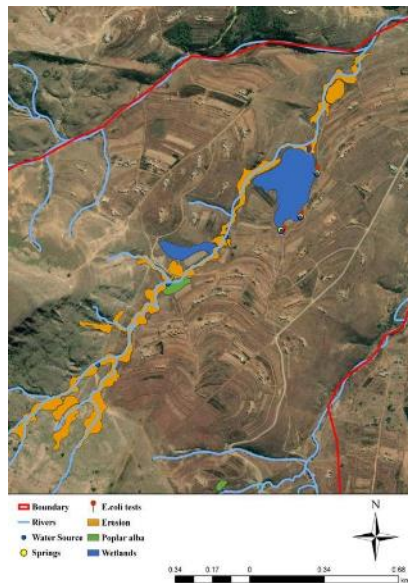
## Development of social agency

- Learning groups provide institutional focus
- Exploration of many associated issues
- Link to stakeholders both internal and external
- Platform for change and innovation
- Blended finance options: E.g.

With partners: UKZN-

CWRR, DUCT-AEN, SANBI-LCP, WWF-WSA

Local governance structures absent or weak  
Financial support required



20



## Conclusion

CRA implementation within a CbCCA approach is providing:

- Water, soil health and fertility and productivity improvements
- Livelihoods and social security improvements
- Social agency improvements and
- Evidence based increased



Effective model for  
CbCCA; locally  
contextualised and

Appropriate for  
partnering in

21

## POLICY IMPLICATIONS

- Local water committees who undertake communally managed and owned water access infrastructure management need a legal framework of support and legal recognition through the Water Service Authorities and need to be able to make agreements of mutual support
- The CbCCA framework and linked climate resilient agriculture practices and implementation options can provide a good entry point for both LMs and DM's to engage in a considered, longer term support process for adaptation that is both participatory and sustainable – to move the implementation away from the vote forcing superficial placebo actions presently in place and provide for an integrated development option.
- Enabling processes for market entry and development of local value chains are very long overdue



## **APPENDIX 2: CA LEARNING GROUP REVIEWS NAD PLANNING: BERGVILLE, AUGUST 2022**

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Focus group sessions for review and planning were held with 5 CRA learning groups (75 participants):

- Stulwane (2022/08/19)
- Ezibomvini (2022/08/17)
- Eqeleni (2022/08/18)
- Vimbukhalo (2022/08/16) and
- Emadakaneni/ Emahlathini (2022/08/30)

The guide for running the focus group sessions is presented in below. This provides guiding questions for discussions within the groups. The sections include: General CA implementation, experimentation, marketing options and farmer centres and planning for the coming season. Below summaries are provided for all five groups combined under these headings.

### **CA- General implementation**

Most of the farmers are still very pleased with the CA practise. They testified that this kind of farming has increased their yields and the quality of the produce. They have recognized that CA reduces soil erosion and improves the quality of their soil as they are protected from the sun and other elements. The farmers find CA less tiring and easier than the normal cropping practices.

For the 2021/22 planting season smallholders involved in CA experimentation and implementation did not receive any inputs support, for their planting season. In past years, input for the CA trials have been provided initially at not cost and later at subsidised rates. This lack of support came at a time when inputs costs suddenly almost doubled and certain inputs became very difficult to access, after the KZN social unrest. Farmers all managed to plant their CA plots, although most “skimped” on herbicides and pesticides

CRA learning groups were very appreciative of assistance arranged through MDF for use of the Okahlamba LM tractors to pull the two-row no till planters and assist farmers in planting both the CA trials and their control plots. The drivers however have little experience in managing no till planters and caused a lot of damage to the planters by driving across the fields too fast. In Stulwane the farmers have come together to pay a annual fee of R100 each for use of the planters as a maintenance fund. This has worked very well, despite a few of the farmers renegeing on the contributions.

The heavy rainfall towards the ned of the season – between January and April 2022 had devastating consequences in the communities, through washing away of roads, and homes. Some participants’ fields also had a lot of run off damage – although the CA fields performed well in comparison to their normal fields and those that were ploughed washed away almost completely.

Most of the farmers practicing CA for more than 4 years managed to realize good yields for maize from their CA plots despite the heavy rainfall. Bean harvests were almost completely decimated.

Livestock invasions in the unfenced fields was a big problem in almost all the villages as the agreements to send cattle to the mountains in summer to allow for cropping have not been adhered to by livestock owners- given the fast deterioration of veld condition. The latter is due to overgrazing and four years of heat and below average rainfall, then followed by exceptionally high rainfall.

Participants felt that the one maize variety PAN53, an old generic hybrid coped the best with these new wet challenging conditions, as the maize cobs matured closed and as a result suffered a lot less from water damage and rotting. Pan53 however takes a long time to mature and is thus more susceptible to diseases, of which there was a high incidence in this season. Participants felt that the short season maize has a number of distinct benefits, in that it can be planted earlier and matures fast, despite the cobs being smaller than for the generic hybrids. They like the idea of planting different types of maize that can accommodate a range of different conditions, as it is impossible to know exactly what will happen in a season.

There was also the recognition that soils are slowly acidifying again after lime application 3-4 years ago and participants asked for assistance in procurement of lime – mostly transport as they offered to pay for the lime itself.

Farmers also undertook to discuss their issues with the livestock committees in their villages and to impress upon the livestock farmers that cropping is also an important activity in the area and needs to be respected.

They further suggested that those who are not yet members of village savings and loan associations should join, as these groups assist a lot in having finances available for planting.

Some farmers stressed that the two row planters that are shared in the groups need to be looked after properly. If a farmer doesn't clean out the fertilizer after use, corrosion occurs and then the planter doesn't work properly when the next participant wants to use it. They then need to spend time on cleaning and maintaining the planter before using it. Mr O Kubone, the KZN DARD extension officer joined in four of these planning sessions (Stulwane, Vimbukhalo, Eqeleni and Ezibomvini) as these groups are also setting up cooperatives under the auspices of the Department to be able to benefit from support being offered.

### Experimentation

**Close spacing;** This practice is promoted in the CA trials to reduce the weeding load. It is however not well liked by farmers despite reducing the need for weeding substantially, as it does cause heavy shading of the intercropped beans in high rainfall seasons and reduces the yield of the beans. Some farmers still believe it also reduces the yields in maize, despite having been shown the results of the yields for a number of consecutive years- which shows the exact opposite.

**Herbicide application:** The heavy and continuous rainfall made the effective use of herbicides almost impossible. Roundup for example needs around 10 days to create good dieback of the weeds and if it rains in between or 1-2 days after spraying it is largely ineffective. It was also not possible to spray again as the rain thwarted these attempts as well. As a result, weeds were a major challenge this season. There is a growing recognition among the farmers that herbicides can damage their crops and specifically seeds for cover crops and legumes and reduce subsequent growth. They are more appreciative now of the burn down herbicide options as compared to the systemic ones such as Roundup, as these do not have long lasting effects on their crops and soil, despite being less effective.

**Strip cropping vs the 10x10m blocks:** Farmers prefer strip over plots, as the spacing there can more easily be 'relaxed' and they believe it increases the yield of their maize. There is also less space taken up by paths between the plots. In the areas where both 10cx10's and strips have been used for a number of years, farmers have recognised that they are very similar, just a different way of laying out the plots

**Cover crops:** Most farmers did not harvest any seed from their cover crops as it was eaten by birds before it even matured, especially sunflowers. Sorghum matured later and thus farmers could harvest some here. They did feed the biomass to their goats and cattle

**Maize only, vs maize and bean intercrops:** Farmers say that the maize only plots have big cobs, and M+B maize is smaller in size. Generally, there is not much agreement on the benefit of intercropping, as some farmers “swear’ by it as a useful practice that improves yield of both maize and legumes and other believe the exact opposite.

**Crop rotation:** The plots that were previously planted cover crops give great yields when planted to maize. Farmers say the cover crops makes the soil fertile., helps to shade the soil and keep it health, improved the yield and health of the follow on crop and provides some feed for their livestock. The difficulty comes in harvesting seed to be able to re plant the cover crops.

#### Markets and farmer centres

The farmer centre in Ezibomvini is still very popular and well used but has not been tried out effectively in the other villages. The local marketing stalls set up first at the pension pay out points and later in Bergville town itself has worked very well. Farmers make a little income every time they join these markets and can sell their field crops there as well. Mostly they are planting for food security, and only selling of surplus if they have. They also sell informally to neighbours.

#### Planning for coming season

In all the villages farmers undertook to pay towards their inputs and pay a subsidised price for the CA trial inputs. They requested access to the short season maize and also suggested that PAN53 may be a better option in really wet seasons, when compared to the other varieties they have planted. Plans we put in place for payments and also for access to the Okahlamba tractors, as these have been made available again for a two- week period in mid-November. Farmers undertook to work closely with the tractor drivers to ensure they do it properly this season.

#### Collaboratively managed trials (CMTs) planning

The farmer level collaboratively managed CA trials have been set up for 25 participants across 6 villages. Each trial is 1000m<sup>2</sup> in extent with 10 plots of 100m<sup>2</sup> each. The layout is the same for all 25 farmers and is shown below

The layout for these trials is shown below:

- M-Maize (PAN53 or PAN6479)
- SSM- Short season maize (PAN5A190 or PAN5A172)
- B-Beans (PAN9292 or Gadra)
- SCC- Summer cover crops (Sun hemp and fodder sorghum and sunflower)
- CP- Cowpea ( Betshuana white)
- Pk- Pumpkin (Queensland blue or Flat white boer)
- WCC (Fodder rye and fodder radish and Saia oats)

<b>BLOCKS (10x10m) x 10 plots</b>	1 M	2 M+B	3 SCC	4 M	5 M+B
	10 M+CP/Pk	SCC	8 M+B	7 M	6 SCC
<b>Strips (2mx50m) x10 strips</b>	1 M				
	2 M+B				

	3 SCC
	4 M
	5 M+B
	6 SCC
	7 M
	8 M+B
	9 SCC
	10 M+CP/Pk
<b>Fodder Strips (2m x 50m) x 8 strips</b> Short season maize PAN5A190=yellow PAN5A172=white	SSM
	B/WCC relay
	SSM
	Lespedeza
	SSM
	Tall Fescue
	SSM
	B/WCC relay

NOTES: Fodder strips are to be planted in late January 2023.

For the CMT's the following inputs are provided: 12kg of MAP and LAN respectively, seed for maize beans and cover crops, herbicide for pre-plant spraying and Kemprin for control of cutworm and stalk borer. Lime is supplied to a selection of participants who still have acidity issues in their fields. All CMT's and control plots are planted by the farmers themselves using planting equipment shared by the learning group. Tractors for planting of strips as well as ploughing in of lime for remedial plots have been arranged through the Okahlamba Local Municipality and the KZNDARD.

Each participant also undertakes to plant a 1000m<sup>2</sup> CA control plot – which is planted to a monocrop of maize, using their own seed and fertilizer.

### **APPENDIX 3: ADAPTATION NEWSLETTER OCTOBER 2022. ARTICLE**

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# 02 | ASSESSMENT OF CLIMATE RESILIENT AGRICULTURE PRACTICES BY SMALLHOLDER FARMERS

Article by Erna Kruger, [Mahlathini Development Foundation](http://Mahlathini Development Foundation)  
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Photo Source: [Mahlathini Development Foundation](http://Mahlathini Development Foundation)

A shade cloth tunnel in Nchodu (Eastern Cape), where mixed vegetables have been planted in trench beds, and are irrigated using drip irrigation with bucket filters.

A range of climate-resilient agriculture practices are in existence – and selection needs to be tailored to the particular environment in which they are to be used, taking into account the physical environment (including the climate and state of soils) and the preferred farming system (e.g. what crops are grown).

As part of a Water Research Commission project, Mahlathini Development Foundation worked with farmers in different communities in three provinces. The aim was to take a participatory action research approach to improve homestead food production in the context of a changing climate.

The project involved farmer-level experimentation and demonstration of practices for three consecutive seasons in sites chosen to be representative of different agroecological conditions within South Africa.

Table 1 (see below) summarises the sites, number of participants and farmer-level experimentation undertaken with each village learning group, over a period of three years.

The climate resilient agriculture (CRA) practices promoted through this study encompass vegetable and fruit production as well as small livestock integration; practices that are undertaken within the boundaries of the homestead. Practices also include soil and water conservation, as well as microclimate management.

Given that learning is also important, as part of the project farmers created learning groups. Within each group, some farmers would volunteer to undertake on-farm experimentation, so that the group could learn through observation and reflection and comparison with existing practices (which essentially acts as a control).

Participants developed and applied criteria that assess the potential of each practice for productivity which

summarised as; productivity, water use, labour, cost, ease of implementation and income potential (table 2).

The table shows that some climate-resilient agricultural practices are deemed more effective than others. Participants clearly rated the use of trench beds, and shade cloth tunnels as the most effective practices that provided a positive impact on food provision, soil conditions and water management.

These were also the practices that were taken up by the largest number of participants and sustained after the research process.

Further practices such as liquid manure, mulching, composting, mixed cropping and seed saving were also considered important, and their impact was linked to the need for improved organic bed design strategies and water management.

This work has shown the commitment of smallholder farmers to adapt to climate change and the positive impacts possible when participants choose, experiment with and adopt effective CRA practices.

Moreover, the results of this study provide nuances to the existing knowledge of climate-resilient agricultural practices, by highlighting the benefits of different practices across different domains. This knowledge can help other farmers to prioritise the practices that they might like to adopt, depending on their needs.



A tower garden in Mayizekanye (KZN), for safe use of greywater



Table 1: Summary of farmer experimentation sites for this study.

Area	Village	Number of participants			Climate Resilient Agriculture practices tried*										
		2017/18	2018/19	2019/20	Water			Soil		Crop/ tree resilience				Livestock resilience	
					Harvesting	Retention	Use efficiency	Conservation	Improvement	Crop diversification	Mixed cropping	Drought and heat tolerant crops	Integrated weed and pest management	Fodder and supplementation	Livestock integration
Mametja, Limpopo	Sedawa, Turkey Willows, Botshabelo, San'teng	108	78	65	x	x	x	x	x	x	x	x	x		x
Bergville, KwaZulu-Natal	Ezibomvini, Stulwane, Egeleeni, Mhwazini,	65	68	50		x	x	x	x	x	x	x	x	x	
Southern KwaZulu-Natal	Madzikane, Olofa, Spring Valley	32	25	22		x	x	x	x	x	x	x	x	x	
Midlands, KwaZulu-Natal	Gobizembe, Mayzekanye, Ozwathini	27	28	41		x	x	x	x	x	x	x	x	x	
Eastern Cape	Xumbu, Berlin, Qhuzini, Dimbaza	18	15	45			x		x		x		x		

\* This is a simplified categorisation of practices, as most contribute to several objectives

Table 2: Summary of CRA practices tried throughout this farmer-level experimentation and learning process.

Climate Resilient Agriculture practices tried	Criteria		Improved food provision			Improved soil conditions			Improved water management			Uptake of practise			Skills and resources to sustain practise			Score
	Descriptors	More food	Increased diversity	Increased continuity	Improved fertility	Improved organic matter	Improved soil health	Improved water holding capacity	Efficient use of water	Improved access	Experimentation with practise (no of people)	Continuation of practise after experimentation	Increased implementation of practise	Use of own resources	Knowledge to implement practise adequately	Access to required /external resources		
1.3.1.1 Trench beds		1	1		1	1	1	1	1		1	1	1	1	1	1	13	
1.3.1.2 Furrows and ridges		1			1	1		1	1		1	1	1	1	1	1	11	
1.3.1.3 Shallow trenches		1			1	1		1						1			5	
1.3.2 Composting		1			1	1	1	1				1		1	1		8	
1.3.3 Liquid Manure		1			1						1	1		1	1	1	7	
1.3.4 Shade cloth tunnels		1		1	1	1	1	1	1		1	1	1	1	1	1	13	
1.3.5 Mulching		1			1	1	1	1	1		1	1		1			7	
1.3.6 Eco-circles		1			1	1	1		1		1			1			7	
1.3.7.1 Tower gardens		1	1		1				1			1		1			6	
1.3.8 Mixed cropping, crop diversification		1	1	1			1		1		1	1		1	1		9	
1.3.9 Natural pest and disease control		1	1				1				1	1		1			6	
1.3.10 Seed Saving		1	1	1							1	1	1	1			7	
1.3.11.1 Banana basins		1		1	1	1	1	1	1		1	1		1	1		11	
1.3.11.2 Organic mango production		1	1		1	1	1	1	1		1	1		1	1		11	
1.3.12 Stone bunds and check dams		1			1	1		1			1	1		1	1		8	
1.3.13 Infiltration ditches (run-on ditches, diversion ditches)		1						1	1	1		1		1			6	
1.3.14 Rainwater harvesting (RWH)		1						1	1	1		1		1			6	
1.3.15 Small dams		1						1	1	1		1		1			6	