Risk and vulnerability assessments for CCA October 2019



Why do a vulnerability assessment

How it is done

Linking the assessment to action

And monitoring of impact and resilience.



Begin at the end

• Main outcomes

- Improved functioning of degraded land and ecosystems...
- Improved adoption of knowledge based land management practices
- Improved livelihoods and economy
- Improved management capacity for communities and local government
- Through
 - Improved decision making in SLM practices and approaches and
 - Innovative and improved practices; implementation

Start with a baseline Use proxies and benchmarks Now the question is how to assess these indicators

Monitoring and measuring change

Indicators

- Outcomes
 - Reduced erosion, improved soil fertility and soil health, improved grasslands, improved water holding and availability, improved Carbon, improved diversity.
 - No of new practices, no of people
 - Improved food production, improved incomes, diversified income sources
 - Stakeholder organisations and decisions

Activities

- Improved productivity, diversity, water and soil management.....
- Improved management of natural resources (water, trees, grazing land, soil)
- Impact
 - Improved livelihoods (income, assets (social, physical, economic, human, natural)
 - Improved diversification
 - Improved resilience (related to SLM and CC shocks and vulnerabilities)

What is within our capacity to change

Potential indicators

- Climate Smart Agriculture Hub (CA) gardening: mulching, crop diversification, seed saving, post harvest, nutrition, water harvesting, land access
- Land Rehabilitation Hub (LCA) brush packing, use a Lapesi for economic activities, who benefits, involvement of livestock owners
- Improved Governance Hub multi stakeholder forum, actual management agreements and activities
- Improved Livestock and Rangeland Management Hub ; disease control, sheep feeding, improved wool production, financial management

A change in behaviour stems from a change in mindset; related to beliefs and experience -

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Has to be based on peoples' own motivation and not those of outsiders and Government

MDF's process



- To understand local conditions
- To unpack aspects of local vulnerability and resilience
- To assess the impact of CC and outline potential adaptive measures
- To develop a baseline and farmer typology for tailored implementation and
- To inform a decision support process for local adaptation practice

To allow local people to set their own agendas for informed decision making in CCA; prioritization, implementation and impact assessment

The WHAT

- Different types of criteria/ indicators in a socio-ecological system
- Need to be measurable; link initial assessments and baselines with potential impact measurements

VULNERABILITY

Socio-Economic

- Economic: Income (types, amounts), savings (types amounts), markets (formal/informal) debt/credit
- Social: Gender, household head, social organisations
- Human: education level, access to information

Access to resources

- Resources and infrastructure: Access to water, electricity, equipment
- Farming activities: Gardens, fields, livestock, natural resources
- Market access: Sales, food

RESILIENCE

- Economic: Income (types, amounts), savings (types amounts), markets (formal/informal)
- Social, social organisations, working together
- Human:, access to information, knowledge confidence and sharing
- Physical: Access to water, electricity, equipment, farming (gardens, fields, livestock)
- Increased farming activities, continuity, increased productivity, increased water use efficiency (RWH, access, availability, efficiency), Soil fertility and osil health....

The HOW Individual interviews; Socio–economic data

Baseline information: Socio-economic (n=41)

Income (in R1000)- employed 5.77 Income (in R1000)- unemployed 2.33 Income from veg sales Salary Grants Dependency ratio 1.14 No, of children 2.8 No, of adults in HH 3.2 Farmer 's cooperative School gardening group Savings group Learning group Social organization Tertiary 8 **High school Primary school** Household head Average Age Gender (F)



- Income is received from grants for 63% of households, from salaries for 46% of households and from sale of produce for 36,5% of households
- Average income for unemployed households (no-one in the household is employed) is R 2330/month and for those households where 1 or more members are employed is R5770/month.

Household head	Ave income	Dependency ratio
Male headed	R 6 730	0,89
Female headed	R 1 361	1,21

Severe disparity in income potential between male and female headed households, linked to a substantially higher depency ratio in female headed households indicate the high level of vulnerability of these households

Individual interviews and walkabouts

Baseline information: Access to resources (N=41) April 2019



- Lay of the land; land use patterns, ecological stresses, climate stresses
- Local adaptations



Ezimbovini (KZN) walkabout; Jan 2018 – shows heat and moisture stress in sweet potatoes, garden crops such as cabbages and CA intercropping trial with maize and beans

Farmer typologies (gender and vulnerability disaggregation)



51 years, woman headed hh, Grade 9-11, unemployed, Ave monthly income R2170, field cropping, gardening and livestock husbandry, no access to water in hh, local markets only, savings groups

Socio-economic charcateristics		Typology	
	А	В	С
Gender	female	male/female	male
Dependency ratio	>1.25	0.75-1.25	<0.75
Level of education	<grade 10<="" td=""><td><grade 10<="" td=""><td>>grade 10</td></grade></td></grade>	<grade 10<="" td=""><td>>grade 10</td></grade>	>grade 10
Unemployement	yes	yes/no	no
Total income	RO-R1999	R2000-R4999	>R5000
Access electricy and tap-water	no access	access to one	access to both
Access to formal market	no access	no access	access
Farming purpose	food	food/market	market
Farm size	0,1-1ha	1-2ha	>2ha

The typologies are briefly summarised below

TYPOLOGY A: (2,5million); Female, farm for food only, very low incomes – mostly unemployed, access to small plots, no hh level access to water, lower education levels and no access to formal markets. Belong to VSLAs, engage in

other livelihood activities

TYPOLOGY B: (250 000) Male and female, farm for food and sell surplus, slightly higher incomes, some access to hh level water, somewhat higher education levels and no access to formal markets Belong to VSLAs TYPOLOGY C: (10 000); Male, farm mainly for income, much higher incomes from employment in hh, good access to water, higher education levels and access to formal markets. Belong to cooperatives or farm individually

FOCUS GROUP DISCUSSIONS:

CC dialogues – effects (past, present, future), seasonality, impacts, practices, prioritization criteria

WORKSHOPS OUTLINE

- 1. What we are seeing around us, what has been happening (nature, economy, society, village, livelihoods, farming) (list main issues (biophysical, social, economic) with ranking of vulnerability, organisational mapping, financial flows and services mapping
- 2. Past, present, future of farming activities and livelihoods (timelines and trends)
- 3. Climate vs weather (role play)
- 4. Scientific understanding of climate change (*Power point input*)
- 5. Seasonality diagrams of temperature and rainfall generally what it is, what is changing (seasonality diagrams)
- 6. Reality maps (choose temp, or rainfall): draw up mind maps of impacts (*mind mapping*)
- 7. Turn impacts in to priority goals (positive statements) and think through adaptive measures that we know of or think could work
- 8. Introduce a range of practices (facilitation team) related to these goals to broaden potential adaptive measures (A4 picture summaries and power point presentations)
- 9. Walkabouts and individual interviews (*transect walks, key informant interviews, mapping of local innovations/adaptations*)
- 10. Prioritization of practices matrix using farmer level criteria for assessment (matrix ranking and scoring)
- 11. Planning of farmer experimentation, learning sessions and implementation of practices (Individual experimentation outlines, lists)

Group 3

Seasonality

diagrams;

rainfall, heat

Impacts;

reality map



POTENTIAL ADAPTIVE MEASURES:

In all villages farmers had some ideas, or many, of potential practices for CCA

			Water (manage and	Soil health and			
		Natl resources/	increase available	Manage soil			
Area	Village	landscape	water)	movement)	Crops	Livestock	Other
				,			
Bergville	Thamela		RWH		Mulching		
No previou	is exposure to						
improved p	practices				Manure and fertilizer		
Bergville	Ezibomvini		Spring protection	Compost	Natural P&D control	Plant fodder	Savings groups
CA learning	g groups; 3-	Suggestions for Natural	RWH storage tanks;	Eurrows	Conservation Agriculture	Fodder	bulk buying
4915 (10107))	resource		FUITOWS		supplementation	I DUIK DUYINg
		lag behind for	Infield rainwater harvesting	Contours	Mulching		
		most groups	Drin kits	Diversion ditches	Tunnels		
			Greywater: tower	Stone bunds			
			gardens				
			Infiltration pits/				
			banana circles				
			Small dams				

Where to

Smallholder CCA decision support system: individual and facilitated



Facilitator-Farmer Decision Support System

$DSS \ outline$ Individual (computer model) and Facilitated

PHYSICAL ENVIRONMENT: Climate and geographical parameters; GPS coordinates, agroecological zones, soil texture, slope and soil organic carbon content

PRACTICES: Database of CRA practices including; managing available water, improving access to water, controlling soil movement, improving soil health and fertility, crop management, integrated croplivestock management, veld management and veld rehabilitation

Focus group Focus group and discussions, individual **Prioritization of Practices** individual interviews, prioritization *Labour walkabouts Farming system *Cost /ulnerability *Ease of implementation Aspiration context *Productivity *Water management *Technical * Gardening *Soil health *Soil health management * Resources *Field cropping *Water use efficiency *crop management * Institutions * Livestock production *Knowledge *Livestock management * Trees (including fruit) *Livelihoods Natural resource management

Link vulnerability criteria to practices

Criteria for confining the selected practices based on farmer's typology, physical environment and farming system (if practice not constrained =1)

Practices	Proxies for physical environment																					
	AEZ			Soil texture		Soil OC		Slope		Farming system				Typology								
	Tropics semiarid warm	Subtropics semiarid warm	Subtropics sub- humid cool	Sandy soils	Loamy soils	Clayey soils	Silty soils	<0.5%	0.5-2%	>2%	<5%	5-15%	>15%	Field cropping	gardening	vegetable	Livestock	nat. resources	Tree and other	A	B	C
Drip irrigation	1	1	1		1	1	1	1	1	1	1			1		1					1	1
Bucket drip kits	1	1	1		1	1	1	1	1	1	1				1					1	1	
Furrows and ridges/ furrow irrigation	1	1	1			1	1	1	1	1	1			1	1					1	1	1

Bucket Drip kits

- Gardens
- <0,1ha,
- Medium cost, medium skills, including learning and mentoring
- Medium maintenance drippers need to be checked and cleaned regularly ; medium labour intensive to set up, maintenance easy.

DESCRIPTION

- Stones and sand are placed in a bucket (20L) for filtration of greywater to be used in dripping system
- The drip kit is assembled on site making your own string drippers and choosing width of lines and spacing of drippers.
- 2 lines 30cm apart and 5 m long is good for a trench bed and provides 4mm of irrigation.
- Watering is done on a daily basis



A well functioning string dripper that makes a wetted circle around the dripper

Bucket with stones; a cloth bad of sand is added on top to complete the filter

Making the string drippers

Attaching the dripper lines to the feeder pipe from the bucket



210l drum drip irrigation system used in a tunnel



Mulching the beds adds to efficient water management



A bucket drip kit irrigating a 1mx 3m trench bed with mixed



CRA implementation summaries; Kwazulu- Natal



CRA implementation summaries; Eastern Cape



Assessing the outcomes: Quantitative



Table 1 : Measurements taken for the gardening trials

Parameter	Instruments	Dates
Evapotranspiration (Et _o)	Davis weather station	ongoing
Soil moisture	Chameleon water sensors	On going
Amount of water applied	Measuring cylinder	On going
Rainfall	Rain gauge	On going
Weighing of the harvest	Weighing scale	On going
Rand value of the harvest	Local market price	At harvest

Table 2 : Measurements taken for the field cropping trials

Parameter	Instruments	Dates					
Evapotranspiration (Et _o)	Davis weather station	ongoing					
Soil moisture	Gravimetric soil water samples	4x in growing season					
Bulk density	Sampling	Once towards end of the season					
Soil fertility	Sampling for analysis at CEDARA soil Lab	End of growing season					
Soil health	Sampling for analysis by Soil Health Solutions	End of growing seaosn					
Rainfall	Rain gauges installed in 5 sites	On going					
Infiltration	Single and double ring infiltrometers	Once during the season					
Run-off	Run-off plots installed in three sites	On going					
Weighing of the	Weighing scale, including grain and	At end of growing season- for					
harvest	biomass (lab analysis)	Maize only					
Rand value of harvest	Local market price	At harvest					

Qualitative indicators; visual proxies



Above Left-Right: Doing the bulk density test using a knife blade. A clod of earth showing good aggregation, organic matter and fine root system. A soil sausage showing the high clay content of the soil.



Above left to right: Examples of the shatter test for soil structure – showing good soil structure; with porous loos soil with irregular aggregates of a dark colour indicate of higher organic matter – an intermediate or moderate soil structure – With a larger proportion of clods that break up into unaggregated soil, but also larger clods staying intact and Poor Soil structure with a large clod showing very little root penetration and few macro pores.

Visual indicator of Soil Quality	Visual Score (VS)	Weight	Comments						
Soil Structure (clods, aggregates)	0 = Poor conditions;	× 4	Shatter test						
Soil porosity (macro pores, clods)	1 = Moderate	× 5	Coarse pore content						
Soil colour (dark, average, light and uniformity (mottles)	conditions; 2 = Good conditions	× 3	Incl mottles and organic matter						
Soil surface (crusting, siltation, runoff)		x 3	Assessment of soil surface texture						
Earthworm counts		× 2							
Soil cover (0-15%;15-30%; >30%)		× 3	Revised scale, using quadrant						
Soil depth (penetration resistance to rod into soil)		× 2							
Bulk density		× 2	Using knife tip penetration in a small pit.						
Root growth and development		× 2	New scale						
Ranking Score (sum of VS rank	tings) Max =52								

Table: New redesigned VSA Indicator sheet for 2018

Water productivity; Gardening

Table : Water productivity for gardening practices for two participantsfrom Bergville; July-Aug 2018

Bgvl June-Sept 2018	Simple sci	entific meth	od (ET)	Farmers' applied)	method	(Water
Name of famer	water	Total	WP	water use	Total	WP
	use (m³)	weight	(kg/m	(m³)	weight	(kg/m
		(kg)	³)		(kg)	³)
Phumelele Hlongwane	1,65	21,06	12,76	1,85	21,06	11,38
trench bed inside tunnel						
Phumelele Hlongwane;	0,83	5,32	6,45	1,75	5,32	3,04
trench bed outside tunnel						
Ntombakhe Zikode trench	1,65	17,71	10,73	2,37	17,71	7,47
bed inside tunnel						
Ntombakhe Zikode;	0,50	3,35	6,76	0,53	3,35	6,33
trench bed outside tunnel						

Table: Water productivity for gardening practices for two participants fromLimpopo (Sedawa); April -July 2018

	Simple (ET)	scientific	method	Farmers' applied)	method	(Water
Name of famer	water use (m ³)	Total weight (kg)	WP (kg/m ³)	water use (m ³)	Total weight (kg)	WP (kg/m ³)
Christina Thobejane (Tunnel; trench beds, with mulch)	0,8	48,9	65	1,10	48,9	56,7
Christina Thobejane (Furrows and ridges with mulch)	0,5	24,5	46,4	3,91	24,5	5
Christina trench outside	0,8	14,7	18,4	2,93	14,7	11,3
Nora Mahlako (Tunnel; trench beds without mulch)	0,8	19,6	26	9,47	19,6	5

WP for trench beds substantially higher than "normal bed". WP in tunnels substantially higher than outside; around 5 x more in Limpopo and around 3 x more in KZN

Impact: Resilience snapshots; Individual interviews

Resilience indicators	Increase for Limpopo	Increase for KZN	Comment
Increase in size of farming activities	Gardening; 1% Field cropping; – 98% Livestock; 6%	Gardening – 18% Field cropping – 63% Livestock – 31%	Cropping areas measured, no of livestock assessed Dryland cropping has reduced significantly due to drought conditions and infertile soil
Increased farming activities	No	No	All involved in gardening, field cropping and livestock management
Increased season	Yes	Yes	For field cropping and gardening- autumn and winter options
Increased crop diversity	Crops: 21 new crops Practices: 11 new practices	Crops: 12 new crops Practices: 8 new practices	Management options include; drip irrigation, tunnels, no-till planters, JoJo tanks, RWH drums,
Increased productivity	Gardening; 120% Field cropping: 15% Livestock: 6%	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	45%	25%	Access, RWH, water holding capacity and irrigation efficiency rated
Increased income	13%	13%	Based on average monthly incomes, mostly though marketing of produce locally and through the organic marketing system
Increased household food provisioning	Vegetables; 7-10kg/week Fruit; 5-10kg/week Dryland crops (maize, legumes, sweet potatoes); 5-10kg/week	Maize- 20kg/week Vegetables – 7kg/week	Food produced and consumed in the household
Increased savings	Not applicable	R150/month	Average of savings now undertaken
Increased social agency (collaborative actions)	2	2	Learning groups, farmer centres, local water committees
Increased informed decision making	5	5	Own experience, local facilitators, other farmers, facilitators, extension officers
Positive mindsets	2-3	2-3	More to much more positive about the future: Much improved household food security and food availability



	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, empower ment	Total
onservation griculture	22	21	26	28	18	23	18	156
avings	6	15	14	15	12	11	15	88
vestock	19	11	18	7	5	12	11	83
ardening	14	15	12	13	15	17	21	107
rop rotation	16	12	13	12	12	15	10	90
tercropping	12	13	15	12	11	11	9	83
mall usinesses	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)



Recommendations

RVA - Implementation - Impact

- Systemic approach
- Grounded in local contextualisation
- For appropriate community led implementation and
- Participatory impact assessment for
- Incremental and cyclical improvements and behaviour change

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Thank You