Agricultural Interventions for Climate Variability

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Introduction

- Much of Southern Africa (SADC) is in semi-arid climate region
  - High variability of rainfall
  - Scarcity of water for crop production and livestock watering on regular basis every year
  - Low area & efficiency of irrigation
- The atmospheric evaporative demand cannot be met by rainfall that is received each year
- Special coping strategies are needed in agriculture
- One needs to take a systems approach, so as to consider all the components of the farming system

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Adaptive Interventions

- Consist of initiatives & measures to reduce vulnerability of natural & human systems against climate change and to increase resilience to change
- Adaptation has potential
  - to reduce adverse impacts of climate change
  - to enhance beneficial impacts
- But can incur costs & not prevent all damages.
- Occurs at range of inter-linking scales

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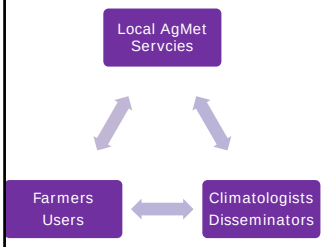
Participatory AgMet Service



Developed & maintained using action research cycle

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Activities include

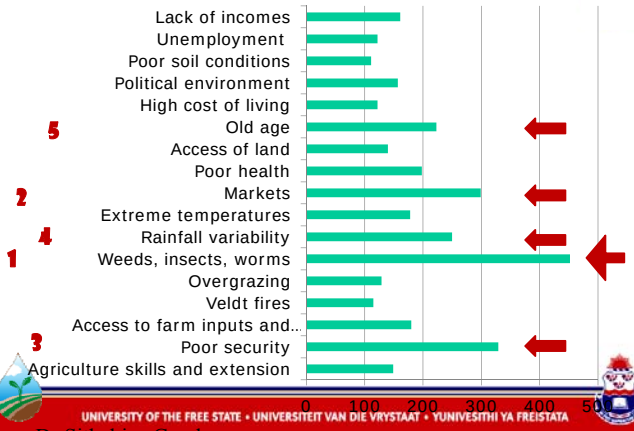
- *Studying farmers' practices and systems (e.g. research on farmers activities and use and production of resources)*
- *Needs assessment (identifying & understanding problems farmers face);*
- *Identification of climate/weather sensitive decisions*
- *Participatory extension (introducing & comparing new vs existing practices – tasks, timing, & use of resources);*
- *Assessing suitability of potential interventions (how appropriate for different farmers & systems & needed changes before starting on-farm research or demonstrations);*
- *Conducting on-farm participatory research (planning, recording & analysing & disseminating results);*
- *Adoption studies (clarifying why farmers have or have not adopted practices & what impact they have had)*

what do some of these people think?

- Go to grassroots
- What is their perspective of climate
- How does climate affect their livelihoods?
- What are their needs?
- What adaptations have they already made?
- How can we serve them better?

- Case study from Thaba Nchu, near Bloemfontein in free State Province of South Africa

Perception of Livelihood Risks in Thaba Nchu



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People's Perceptions of Climate Change in Thaba Nchu

VARIABLE	PROPERTIES	DIMENSIONS
PRECIPITATION	Inadequate rainfall	Drier: "The rainfall is not enough"
	High intensity of rainfall	Hard: 'when it rains, it falls hard and destroys our crops and livestock". "It is now more of thunderstorms and lightning". The rain falls with strong winds".
	High rainfall variability	More variable and unpredictable. "It now rains unexpectedly". We do not know when to grow our crops. Late onset: Instead of getting rains in September, it now rained in October, November or December.
TEMPERATURE	Extremes	More extreme: warmer in summer and cooler in winter. Warmer at day time and cooler at night time

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Adaptation Strategies in Thaba Nchu

STRATEGY TYPE	PROPERTIES	SUPPORTED BY
In-field Rain Water Harvesting	Water and soil conservation	ARC and Partners
Changes in planting dates	Spreading risk by planting twice a year Plant only when it rains	Farmer driven
Changes in crops grown	From largely cereal to vegetables	Farmer driven
Agriculture practices	Build shelters for crops Soil conservation methods Broad casting to drop and line method	ARC Farmer driven
Use of municipal water	Irrigate using free municipality water	Government

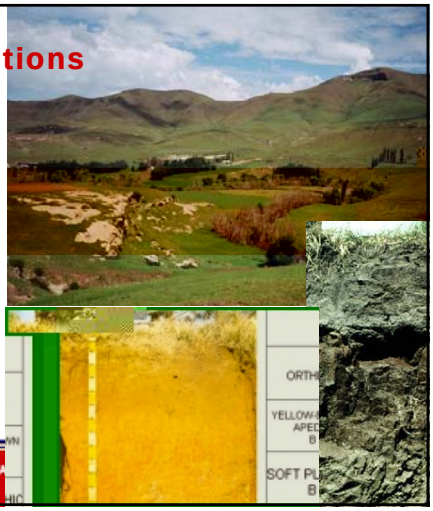
Dr Sithabiso Gandure

To be able to Adapt Must Manage Natural Resources

- Need to consider on-farm interventions related to:
  - Soil management;
  - Crops & livestock production;
  - Climate – related decisions;
  - Water resources.
- Adjustments must be made to balance the demands with the availability and within variability of each
- A variety of interventions possible – lets consider some

Soil interventions

- Choice of position in the landscape
  - Valley bottom
  - Hill slope
- Choice of soils
  - For specific purposes



Soil interventions

- Matching of tillage with different soil types
  - Deep ploughing to break plough pan
  - Minimum tillage to avoid erosion
  - Winter ploughing to collect first rains

Soil interventions

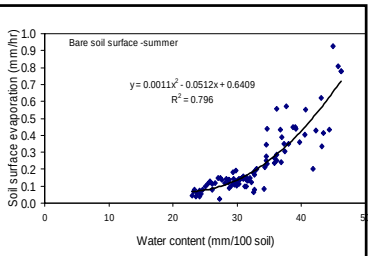
- Apply conservation agriculture principles
  - Minimum soil disturbance
  - Mulching
  - Crop rotation
  - Timely management
- Soil – crop matching
- Use planting basins
  - Collect runoff

Walter Mupangwa ICRISAT

Soil interventions

- Mulching to conserve soil water by reducing soil surface evaporation

Nhlonipo Nhlabathi, ARC-ISCW



For & by Pastoralists

Moving to alternative grazing areas

- Explained as a way to reduce risks
- So mobility is a coping strategy in arid environment

But also seen as production strategy

- Accessing combination of fodder plant (grass, trees & shrubs)
- Erratic rain => patches of nutritious grass distributed in space & time

Mobility is seeking & using opportunities optimally

And gives different perspective on pastoralism

- **As good custodians of variable environment**

Climate interventions

Climate interventions

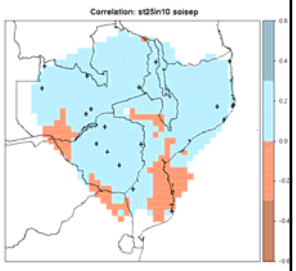
Planting Rains Example from SADC

Changes in growing-season rainfall characteristics and downscaled scenarios of change over southern Africa: implications for growing maize

Mark Tadross *et al.*, UCT

Mean planting dates assuming 25 mm rain after 1 August

Correlation between SOI and planting dates

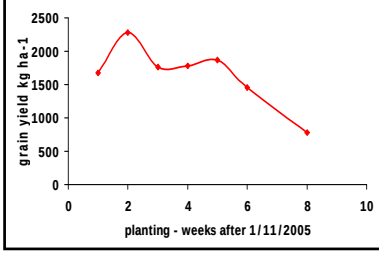


Climate interventions

Optimise radiation duration

Plant so crop has full cover before the summer solstice (21Dec)

Twomlow, ICRISAT

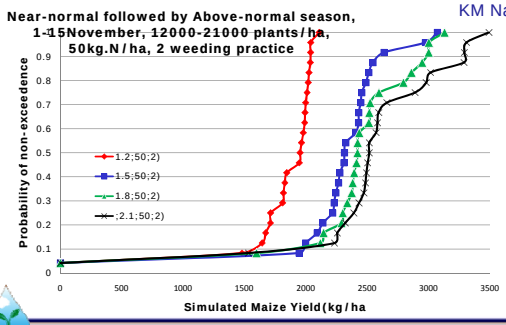


Climate interventions using seasonal forecast

Use crop models to find optimal planting densities for different rainfall seasons

OND near normal & JFM Above N

KM Nape & AS Steyn

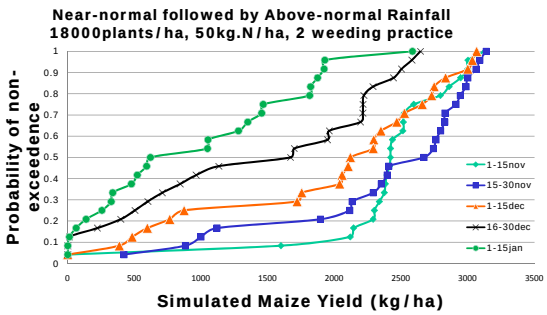


Climate interventions using seasonal forecast

Effect of planting date on maize yields in

OND near normal & JFM Above N

KM Nape & AS Steyn

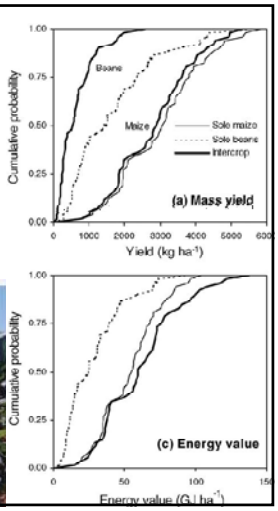


Climate interventions

Optimise radiation interception

- Use intercropping (e.g. maize & beans)
- Plant cover crops between fruit trees

Mitsuru Tsubo with Harun Ogindo & Elijah Mukhala



Many other Climate interventions still to be developed

Changes **in rainfall patterns & shifts in temperature regimes**

- Influence seasonal & annual water balance
- Affect time when crop can grow

Changes **in length of growing season** LGP

- Higher temperature => large increases in LGP
  - e.g. LGP<120d: by 2080 (B2) area reduced by 17%
- Lower rain or poor distribution => decrease LGP
- Developing countries:
  - 40% land have LGP<120d
  - Increase arid land by 2080 (B2) 3.4% & 5.5% (A2)

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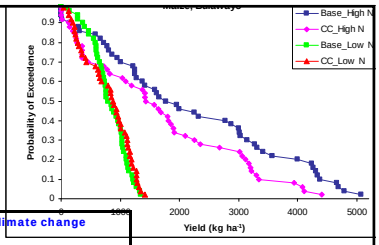
Modeling Example from Zimbabwe

John Dimes ICRISAT

- Use APSIM model
- Duration of season decrease
- Crop choice important



	Baseline				Climate change			
Crop	Total biomass (Mg ha^{-1})	Duration (d)	In-crop rain (mm)	HI	Total biomass (Mg ha^{-1})	Duration (d)	In-crop rain (mm)	HI
Sorghum	6.4	107	396	0.41	4.7	88	320	0.44
Maize	6.4	129	433	0.29	4.7	107	352	0.28
Groundnut	4.6	122	416	0.42	3.7	106	345	0.37
Pigeon pea	4.3	165	463	0.27	4.4	136	397	0.24

Highest priority is to raise current productivity of SHF systems

- soil fertility constrained systems NOT water constrained

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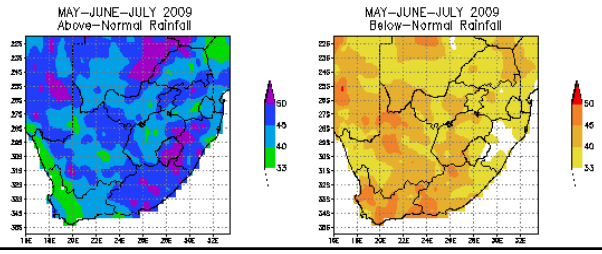
Use of Seasonal Forecasts - from SAWS

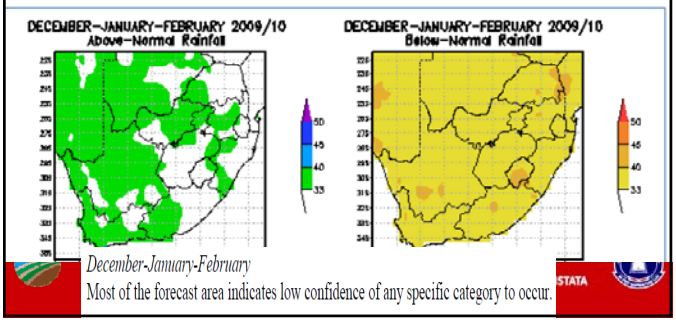
Still need development before easily used:

- Must be readily available
- Should be in everyday language
- Most people only interested in own area not whole country
- Little understanding of probabilities
- Need someone to interpret & relate to on-farm decisions



Seasonal Forecasts - SAWS

- So local people ask – how should I use this info?
- Please help us to understand and apply to my own decisions



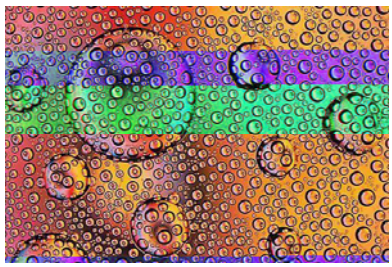
Use of Seasonal Forecasts - Zambia 2008/09

With good prospects for above normal summer rains in 2008/09

- Use longer season cultivars
- Apply recommended top N dressing
- On-farm mother-baby trials in Zambia

Durton Nanja & Prospard Gondwe

Interventions with water at farm level



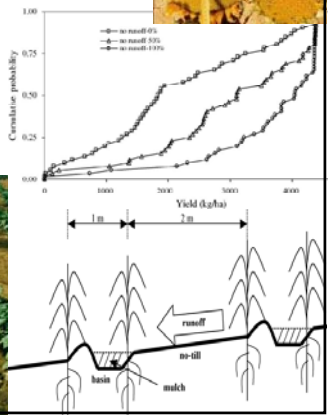
Interventions with water

- Irrigation
  - Full
  - Supplementary
  - Deficit
  - Spate from overland flow
- Use models to predict water use
  - SAPWAT3
  - "how?" group from Australia

Interventions with water

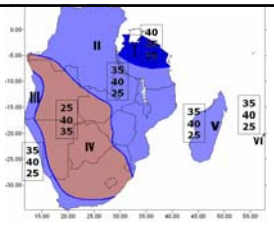
- Rain water harvesting
  - Ex-field (e.g. from koppie)
  - Infield (e.g. basins, micro catchments)

ARC-Glen with UFS - Mitsuru Tsubo and Malcolm Hensley



For Implementation

- Need services
  - Extension service
  - Agromet information
  - Climate forecasts
- Must be good
  - Communication &
  - Dissemination channels
  - Via Intermediaries



For Implementation

- Must consider
  - Vulnerability of people
  - Variability of climate
- Need training in
  - Agromet services
  - Use of Climate info
  - Participatory Action Research

Conclusion

Even in semi-arid areas there are many **opportunities**

to use and development **climate services**

to **manage** the natural resources and thus

be able to **optimise** the farming systems so as to **produce food** as well as **maintaining** a **sustainable** farming system

by not depleting the resources but by balance using modern climate tools as was shown in the examples.