Climate Change Adaptation Research in Agriculture in Botswana: On-going Research and/or Gaps in Climate Change Adaptation Research in Agriculture

Kgosikoma and Machacha
Department of Agricultural Research, Botswana

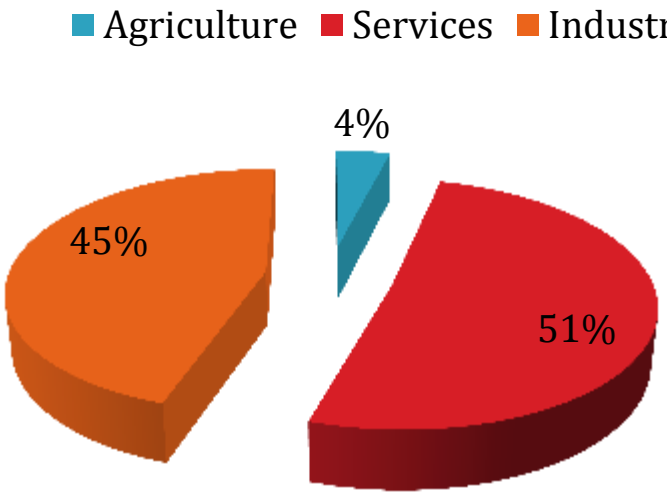
SADC Regional Workshop on Climate Change Adaptation in Agriculture
5 – 6 December 2013, Lilongwe, Malawi

PRESENTATION LAYOUT

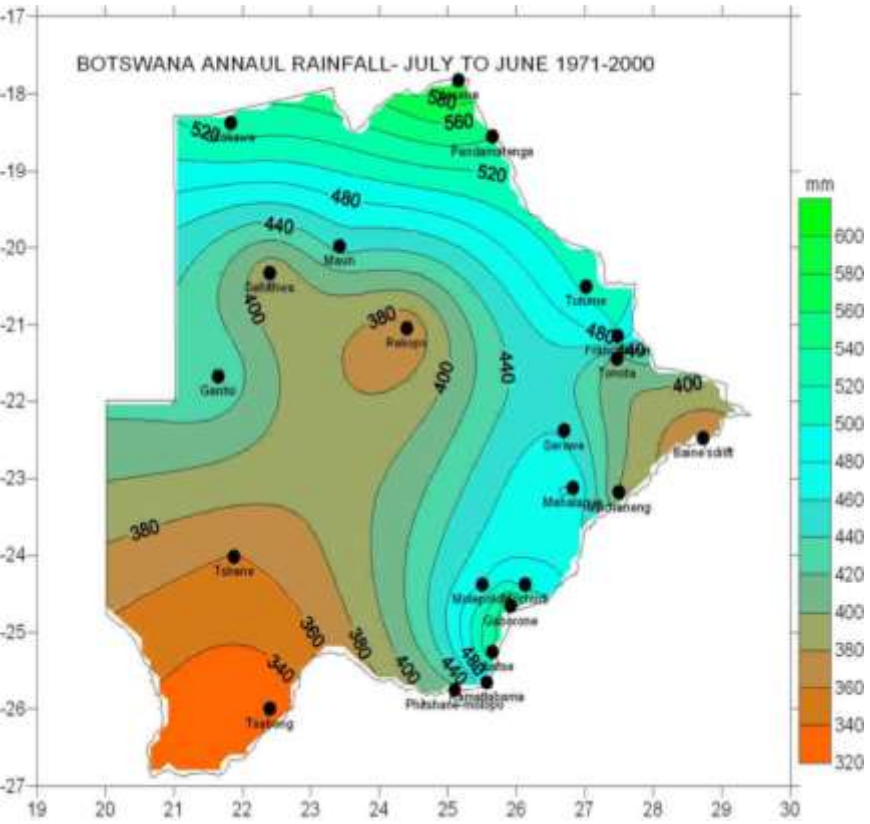
- Introduction
- Adaptation in Livestock
- Adaptation in Arable (CROPS)
- Gaps

Introduction

- Agriculture is still a key livelihood strategy in Botswana particularly in rural areas, but…..contribution to GDP is very low:



Factors limiting agricultural productivity



- Low rainfall
- High variability

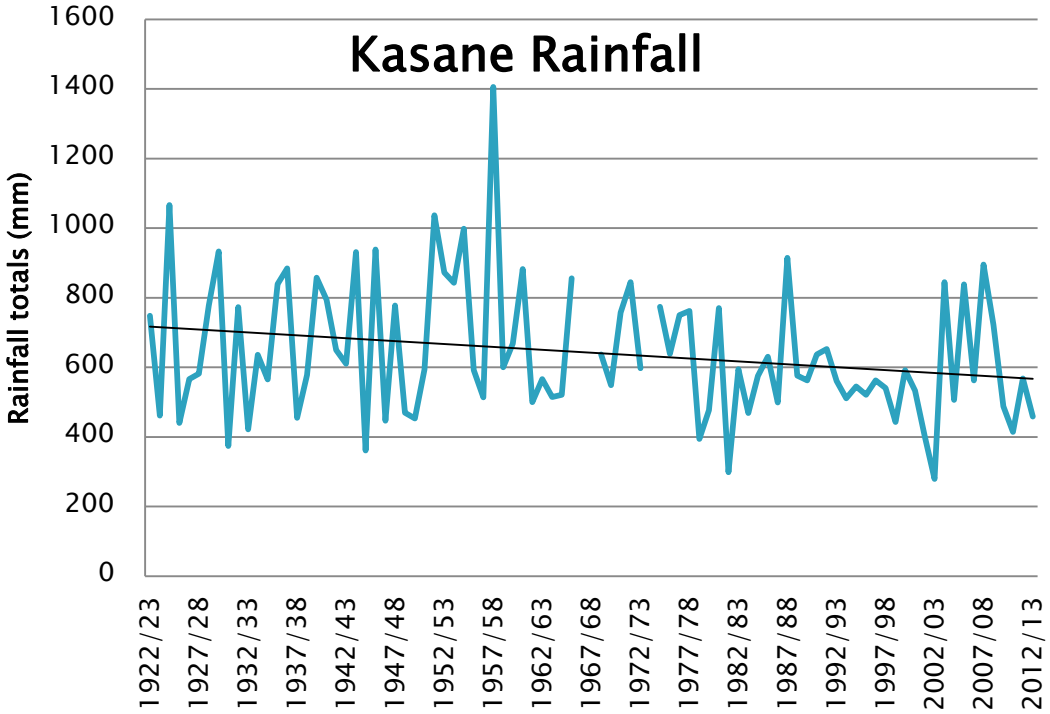
- Degraded ecosystems

.....and then comes CLIMATE CHANGE

Observed climate change in Botswana

- Rainfall analysis shows no distinct trend for most stations except for Kasane which shows a reduction in rainfall (1971-2000).

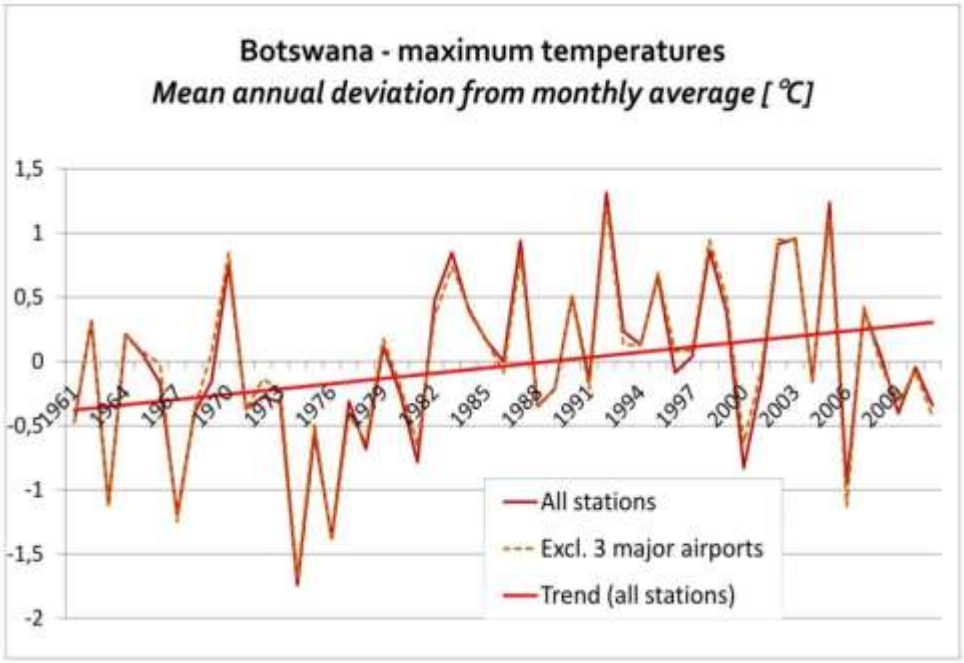
- Rainfall indicates high variability and unreliability



Observed climate change in Botswana Cont'D

- Increase in temp. - observed in most stations for both minimum and maximum temperatures (1971-2000)

- Increase in soil temperature
  - reduce soil moisture and water holding capacity (due to excessive evaporation)
  - increase results in animal suffering from heat stress (abortion)



- Agricultural productivity negatively affected by climate change

- **Sustainable adaptation strategies** are therefore necessary to reduce impact of climate change on agriculture sector

Adaptive research associated with livestock sector

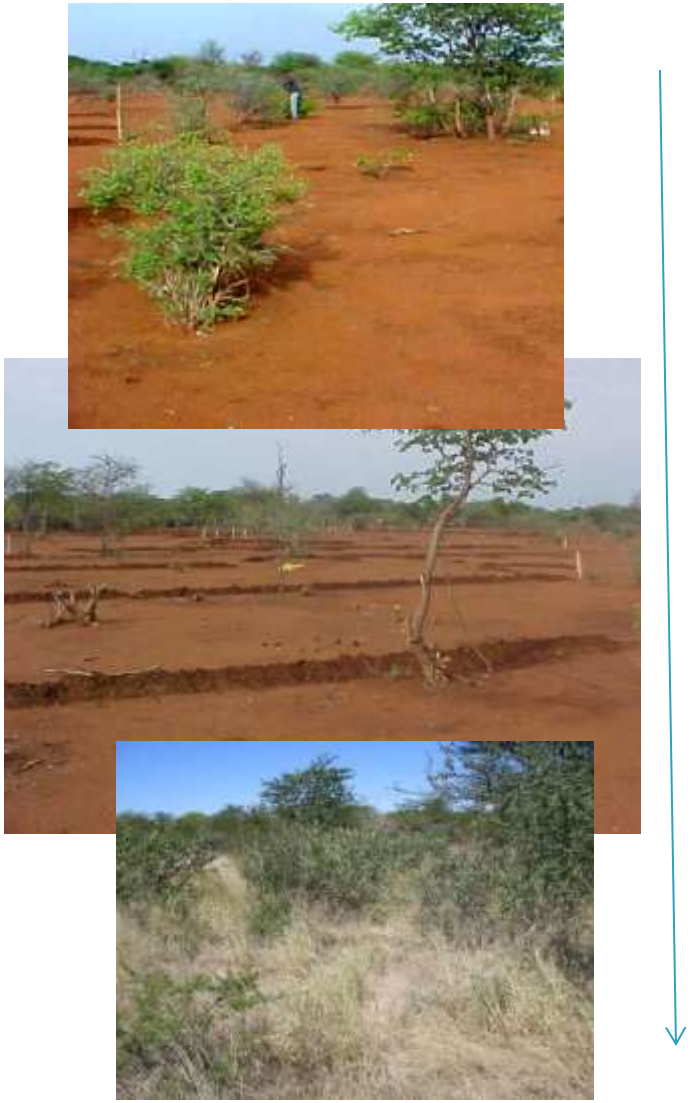
❑ Ecosystem based adaptation

- Rangeland in excellent condition (healthy) will be more resilient on climate change and sustain livestock production

- Degradation of rangeland ecosystem increases vulnerability of pastoral communities to climate change.

- Degraded ecosystems therefore need to be rehabilitated

- Intervention (strips & reseeding) is needed to create conducive micro-environment for grass growth.



•Degraded rangeland in Botswana rehabilitate through strips and reseeding

❑ Ecosystem based adaptation

17 years studies was carried out to determine sustainable livestock stocking rates and recommended 8-10 ha/LSU in sandveld and 10-12 ha/LSU for Mophane vegetation.

Adaptation research associated with livestock sector Cont'D

❑ Use of environmentally adapted breeds

➢Local breeds are more adapted to local environment than exotic breeds

➢Small framed and thus require less feed for nutrient maintenance

➢ Can walk longer distance in search of grazing resource

➢Selecting breeds that are tolerant to heat stress (maker assistant selection-biotechnolgy)

▪Selecting breeds that are resistant to internal and external parasites (maker

Adaptation research associated with livestock sector Con'D

❑ Fodder production

➢ Fodder production could buffer the impact of climate change by ensuring - feed is readily available to supplement during drought period

▪Lablab is a drought tolerant herbaceous, average protein content is 14% and dry matter yield is 2-7t/ha.

▪ Cenchrus ciliaris (Molekangwetsi) has high yield (3.9 to 5 tonnes/ha)

Adaptation research associated with arable sector

❑ Conservation agriculture

➢ Zero tillage

- low fossil fuel used less – GHG released in the atmosphere
- Ability for soil hold CO_2 - less of it released

- Minimum tillage – reduce soil - wind erosion
  - reduce evaporation - conserve soil moisture

- Winter tillage - removes weeds- that utilizes moisture during the off season

Adaptation research associated with arable sector

Short duration varieties (early maturing)

- Sorghum

- Mahube and phofu 100 – 120 days compared 125-130 days.

- Cowpea (ER7)

- Maturity: 60 days (Early)

- Maize ZM309

Adaptation research associated with arable sector Con'D

Future Crops

- Bambara groundnut

✓It is an important food legume crop (high protein content)
✓Bambara groundnut fixes N into the soil thus can reduce fertilizer use – less GHG.

- Tepary beans
  - ✓ Flowers in approximately 30 days
  - ✓ Matures in approximately 70 days
  - ✓ Survive low rainfall of 150mm
  - ✓ Can do better than Cowpeas under drought conditions

Research gaps in relation to climate change adaptation in Botswana

- Down Scaling Global Projection- to better understand locations situations
- R & D to be informed by our better understanding - location situations.
- National vulnerability assessments
- Crops, vegetation and livestock species response to increased temperature
- Early warning system
- Quantifying nitrous oxide losses and nitrogen use efficiency in grain crops cropping system on different type of soil types with contrasting soil carbon status and land management.

Research gaps in relation to climate change adaptation in Botswana Con'D

- Measuring methane production under different production system as predictor of methane emissions

- Potential soil carbon sequestration in crop production and impact on soil productivity and greenhouse gas emissions.

THANK YOU