PROSPECTS FOR IMPROVING IRRIGATED AGRICULTURE IN SOUTHERN AFRICA IN A CHANGING CLIMATE – LINKING WATER, ENERGY AND FOOD

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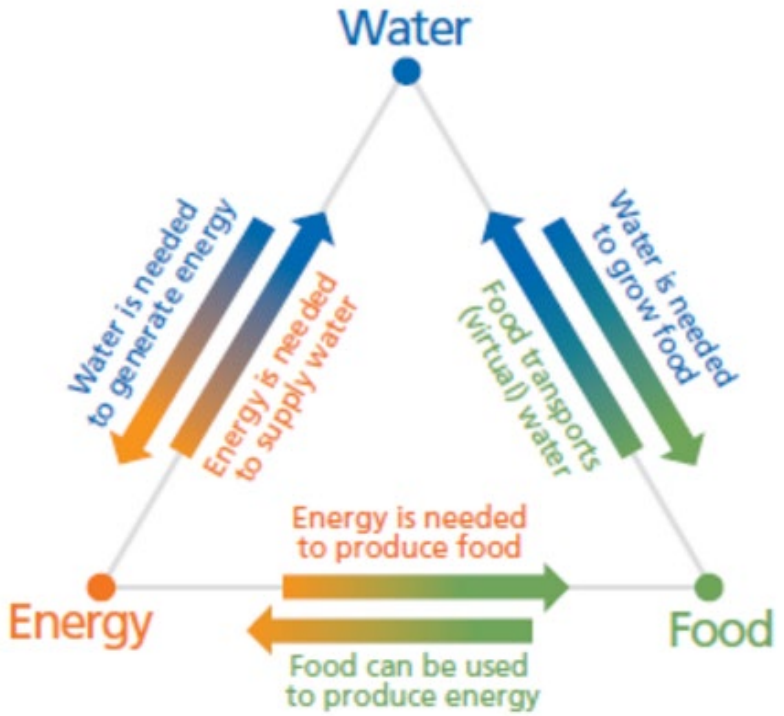
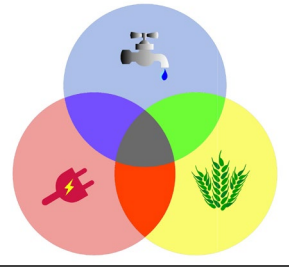
Introduction

- Agriculture for improved food and nutrition security in southern Africa
- Water is the main limiting factor to
- >90% rainfed and vulnerable
  - Climate change
  - Increasing rainfall variability and worsening drought incidences
- CAADP seeks to increase land under irrigation to increase agricultural productivity
- This will require more water withdrawals
  - Currently agriculture uses ~70% of available fresh water
- This will also require more energy to pump
  - Southern Africa is energy constrained

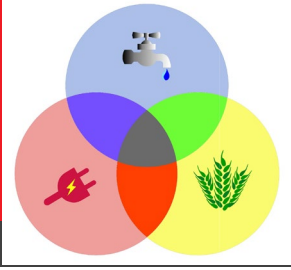


Aims and Objectives



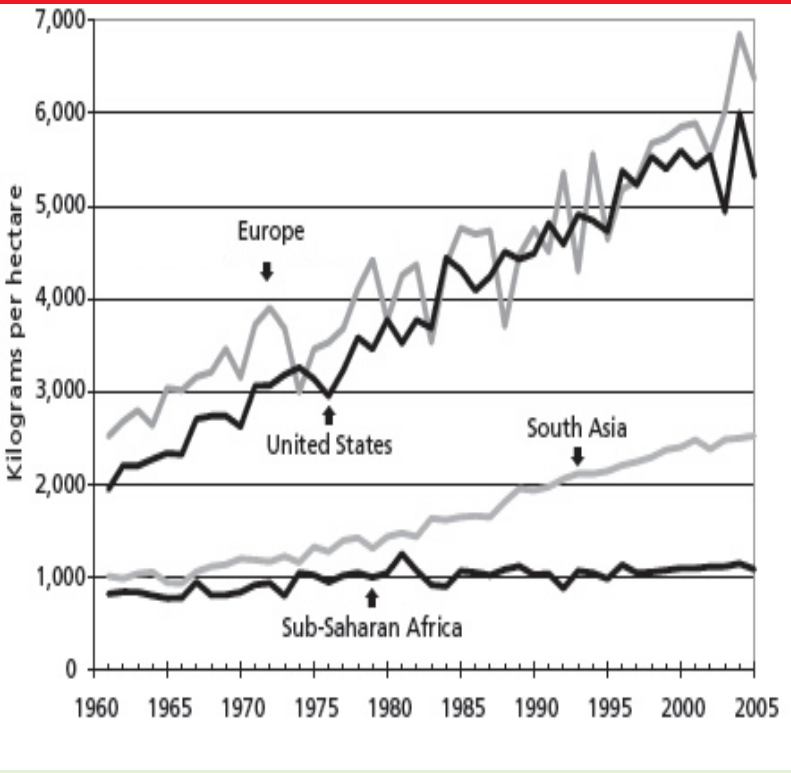
- Asses the feasibility of increasing the area under irrigation
- Assess the current status of irrigated agriculture in southern Africa from a water–energy–food nexus perspective
- Identify gaps and opportunities for improving irrigated agriculture

Methodology



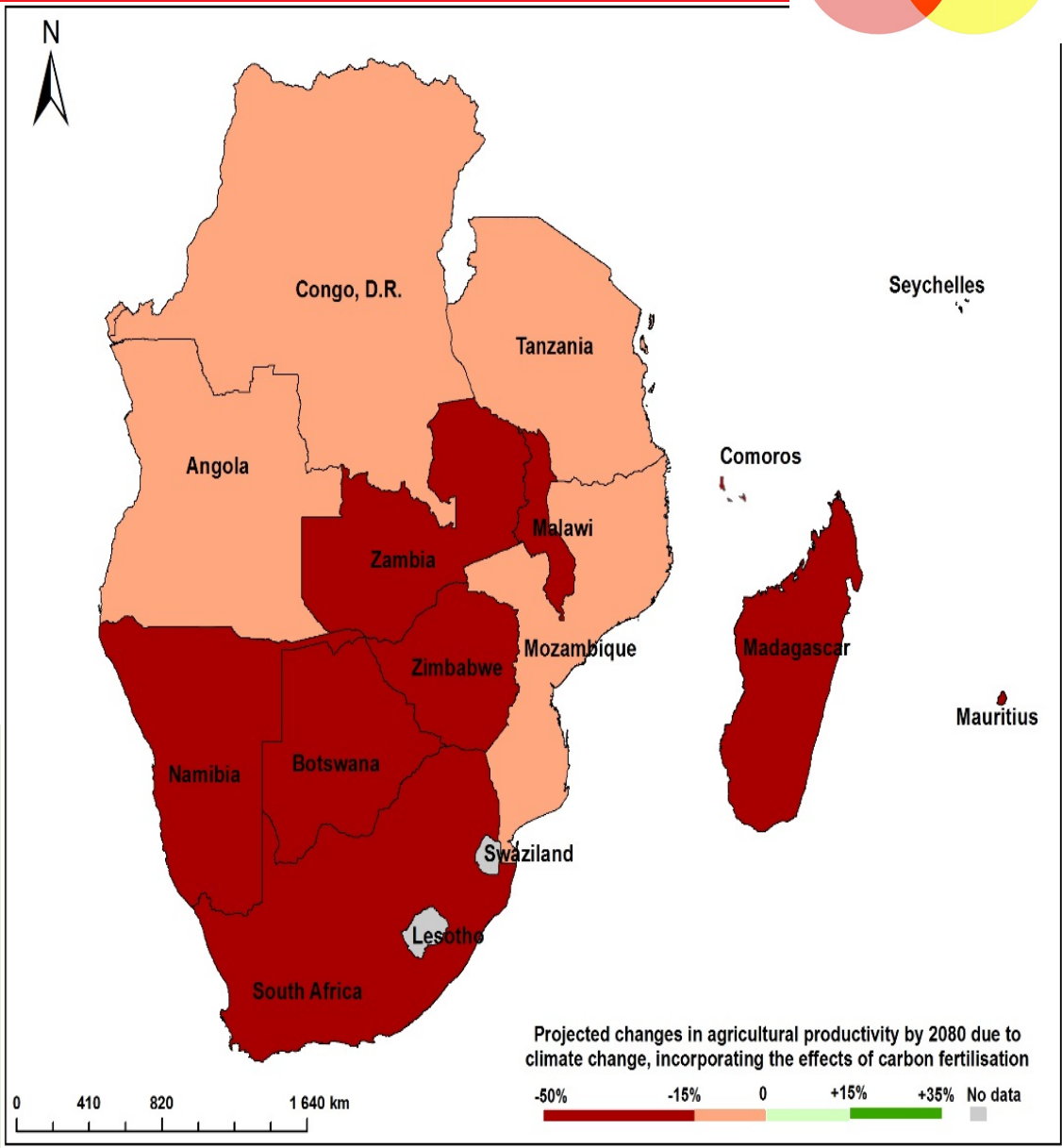
- Key policies concerning agricultural development:
  - Comprehensive Africa Agriculture Development Programme (CAADP) (NEPAD, 2003),
  - Malabo Declaration (NEPAD, 2014a),
  - Malabo Declaration Programme of Work (NEPAD, 2014b), and
  - SADC Regional Agricultural Policy (RAP) (SADC, 2014) were reviewed.
- Publicly available documents:
  - policy briefs,
  - Reports, and
  - Scientific articles on food, energy and water
- Examples were mostly drawn from the SADC region which provided a good case study for reviewing and contextualising these targets.
- The review also focused on highlighting the water-energy-food linkages

Status of agriculture in southern Africa



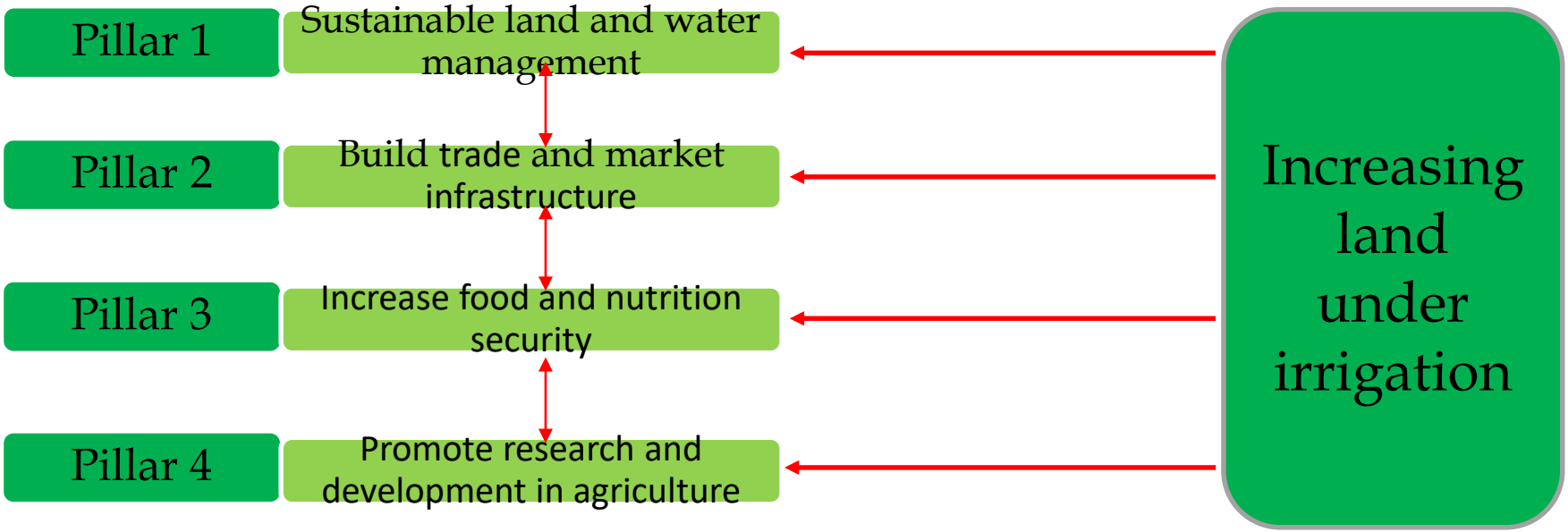
Small farmers

Smallholders manage over 400 million farms and **provide over 80 percent of the food consumed** in Asia and sub-Saharan Africa.

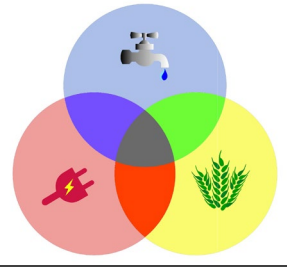


Comprehensive Africa Agriculture Development Programme (CAADP)

Initiative spearheaded by the New Partnership for Africa's Development (NEPAD) in partnership with the United Nations' Food and Agriculture Organisation (FAO)



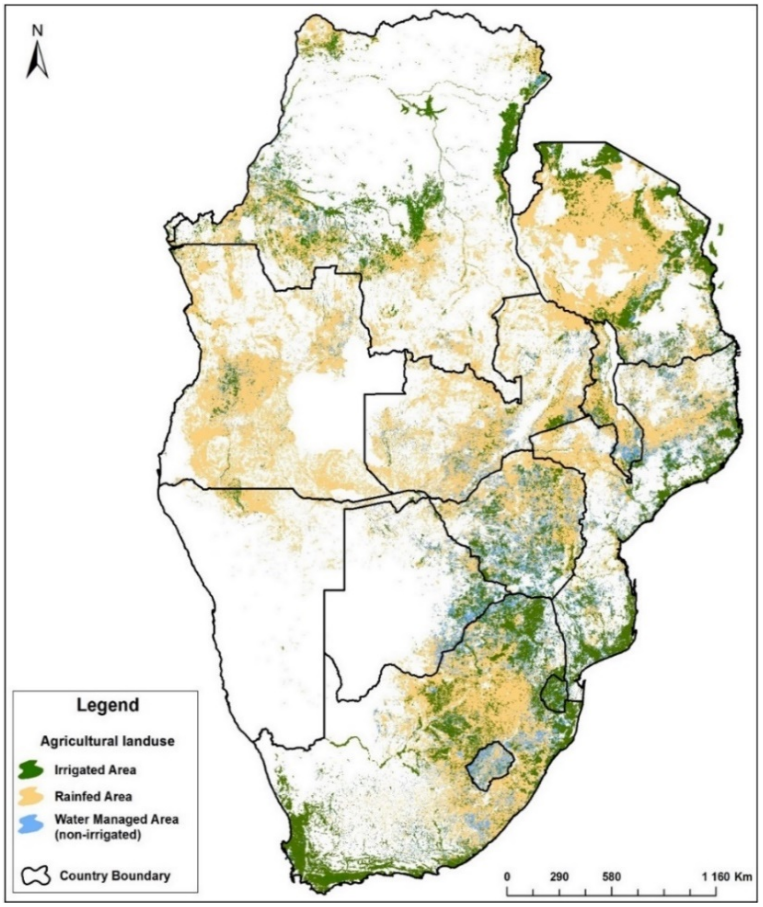
Implications of increasing irrigation



- Increasing water withdrawals for agriculture
  - Agriculture already accounts for > 70% of fresh water withdrawals
- Investments in infrastructure
  - Physical vs. economic water scarcity
  - Dams
  - Skills and technology
- Energy requirements for irrigation
  - Southern Africa largely energy insecure
  - Increase in energy outlays to distribute and pump water incorporating energy in development planning and the transboundary initiatives

- Need to balance and coordinate the region's food security agenda with available water and energy resources i.e. the water-energy-food nexus approach

Rainfed vs irrigated agriculture in SADC



Agricultural system	Area (ha)
Irrigated area	9 365 861.05
Rainfed area	74 466 578.58
Water managed area (non-irrigated)	22 746 744.80
Total cultivated area	106 579 184.43

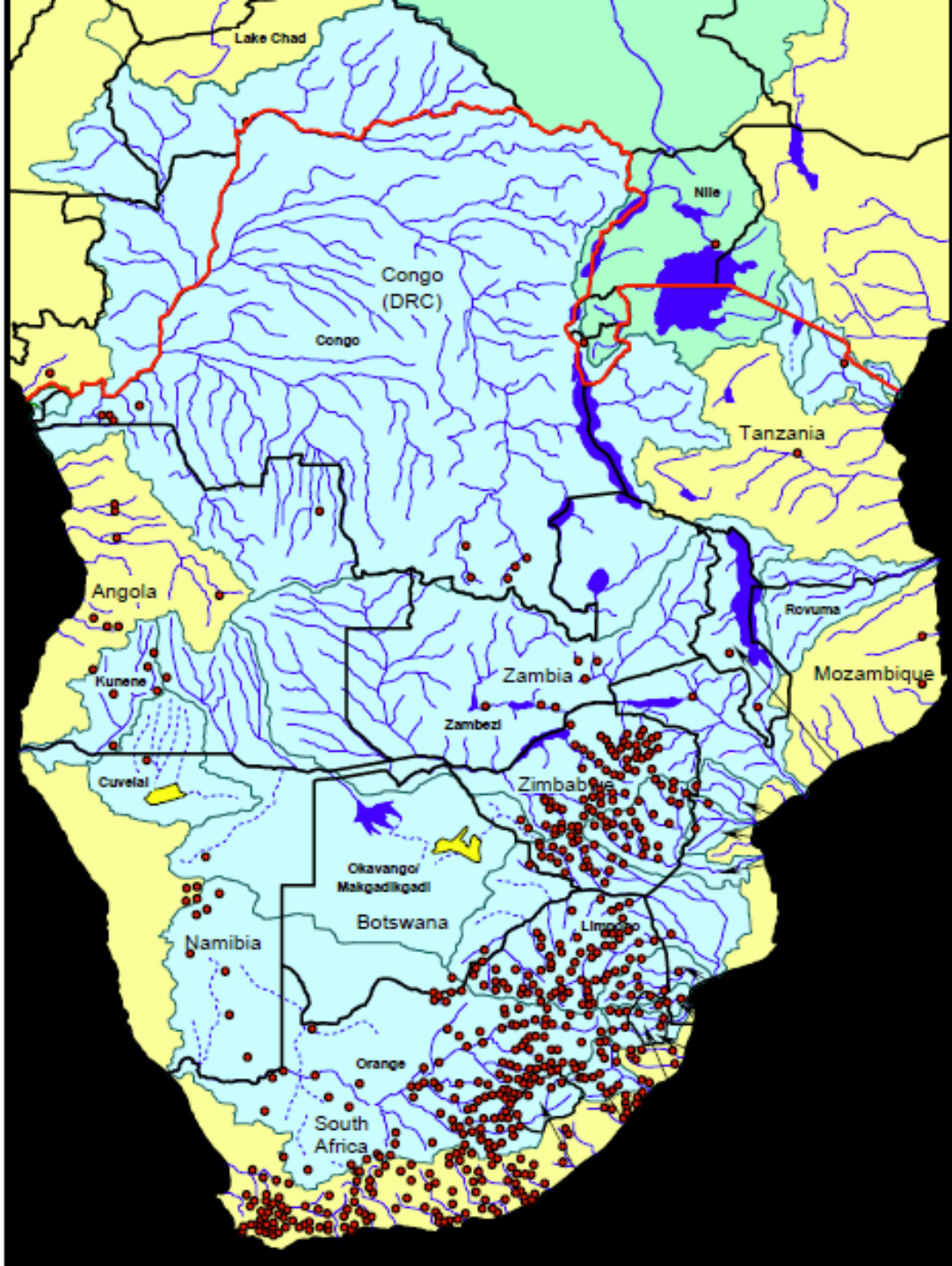
- Most of the irrigated area is concentrated in South Africa, Zimbabwe, Mozambique and Tanzania
- Over 60% of SADC's population reside in rural areas depending on rainfed agriculture
- High rainfall variability and climate shocks result in low crop yields, chronic poverty and food insecurity
- Irrigation offers opportunities for adapting to climate change

Large Dams in Southern Africa

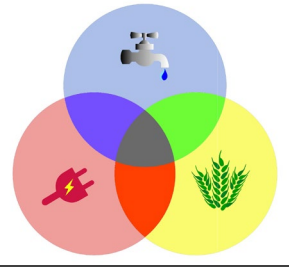
N.B. Large dam: Wall height > 15 m and/or Volume > 2 million m^3
(ICOLD, 1999)

- Africa has a total of 1,269 large dams; 827 (65%) of these are in the SADC countries
- SADC dams hold 37% of Africa's impounded water
- South Africa (#11) and Zimbabwe (#20) are listed amongst the top twenty countries in the world in terms of the numbers of dams built

Sources: AQUASTAT Database (FAO, 2005); WCD, 2000



Gaps and opportunities

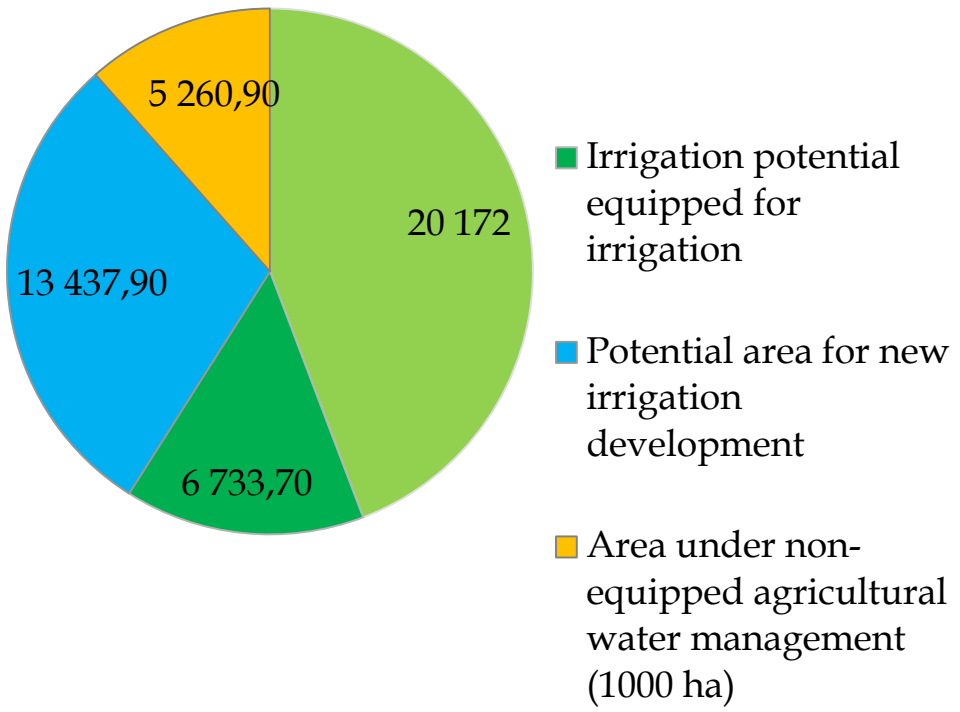


- Water, energy and food requirements - water scarcity, energy shortages and food insecurity
- Increased dam infrastructure can be used to generate hydro-electricity
  - Invest in irrigation infrastructure should consider energy requirements
  - Failure of Smallholder Irrigation Schemes due to huge electricity bills
- Increasing irrigation capacity for food and nutrition security
- Alternative crop choices for improved livelihoods
  - Drought tolerant indigenous crops with low water use
  - Biofuels???
    - Competing with food security
    - Rainfed vs. irrigated production of biofuels

Options for increasing agricultural productivity through irrigation

- Increasing land area under irrigation
- Integrated water management
- Alternative water sources
  - Ground water??
    - How much is actually available?
    - Is it sustainable given declining rainfall – recharge rates?
    - Energy requirements for pumping ground water?

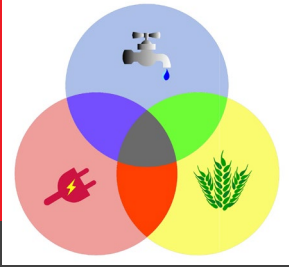
Irrigation potential area and area under water management in SADC (x 1000 ha)



Improving irrigation and water use efficiencies and water productivity

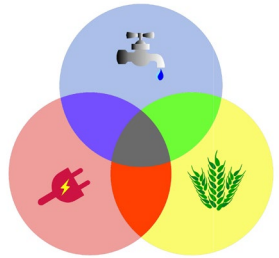
- At a field level, improvements in water productivity
  - agronomic, engineering, management and institutional strategies
- Rain water harvesting and soil water conservation technologies
- Improved varieties with high water use efficiency
- Improved agronomic practices – best practice management
- Diverse cropping systems e.g. intercropping
- Improving water use efficiency
  - Use of micro-irrigation systems (drip and sub-surface irrigation) in place of macro-irrigation systems (overhead and sprinkler type irrigation)
  - Irrigation scheduling e.g. deficit irrigation can increase water productivity
  - Supplementary irrigation

Energy and agriculture



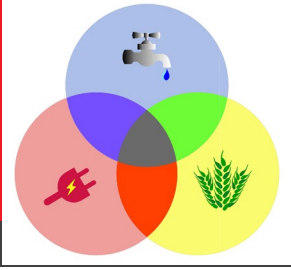
- Agriculture accounts for only 5% of total energy consumption in SADC
- Main sources of energy for agriculture
  - Electricity (5%),
  - Biomass (61%),
  - Oil products (17%), and
  - Coal (16%)
- Frequent energy shortages and blackouts
- More energy is required to increase irrigation capacity
- Consider investments in building dams
  - Increase water available for irrigation
  - Dams can be used to generate hydro-electricity
  - But significant energy outlays required in dam construction!

Recommendations



- Develop capacity for water storage through dam construction
  - Consider maintenance vs new dam construction
- Broaden the energy base through pursuing sustainable and renewable energy sources to increase energy supply
- Exploit untapped groundwater resources
- Prioritise human capacity development
- Adopt the water-energy-food nexus approach
- Align interventions with the Sustainable Development Goals (SDGs) 2, 6 and 7

Conclusion



- It is feasible to increase area under irrigation in southern Africa
- If done correctly, this could sustainably increase food production and improve food security
- Targets to increase area under irrigation should be balanced with available water and energy resources
- The inclusion of small-scale farmers through investments in small-scale irrigation schemes will assist in the development of resilient food systems and strengthening small-scale farmers' capacity to adapt to climate change and variability
- There is a need for human capacity development to ensure that small-scale farmers are equipped to take advantage of the investments
- Adopting a WEF nexus will allow for better coordination of agricultural interventions and sustainable improvements in agricultural productivity

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