Building resilience in agriculture and possible RDI interventions (Water-Energy Food Nexus)

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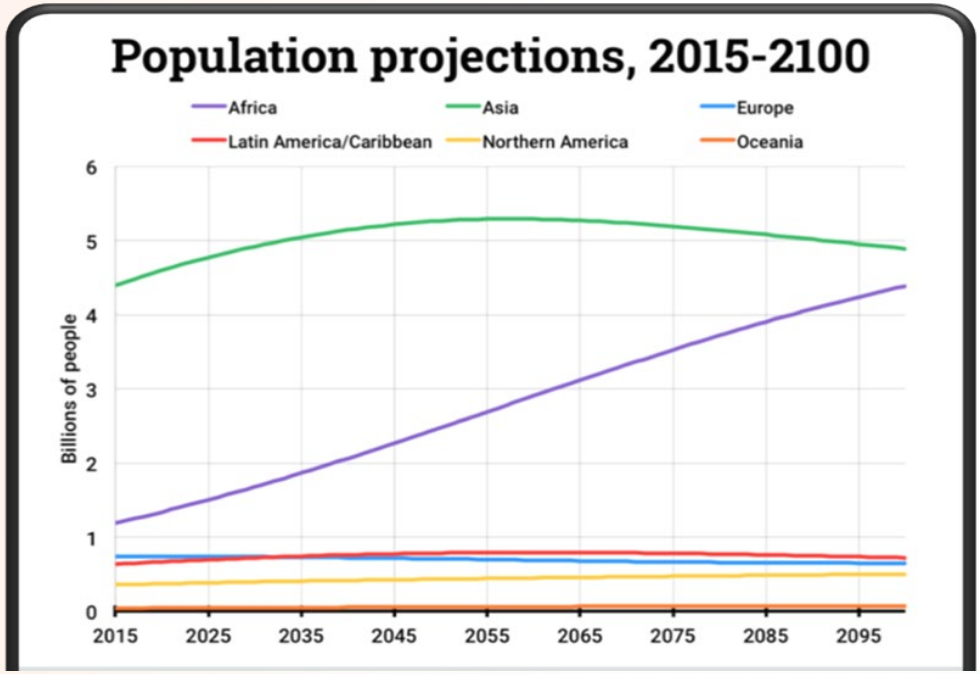
WRC Mpumalanga Provincial Partnership Support

11 September 2024

Why we need resilience?

- By 2050, global population is expected to reach 9 billion. 70% more food will be needed
- In 2030, 47% of the world's population will be living in areas of high-water stress, southern Africa will be the most affected
- By 2030 humankind will need 30% more water, 40% more energy and 10% of existing crop land for biofuels
- Agriculture accounts for roughly 70% of water use

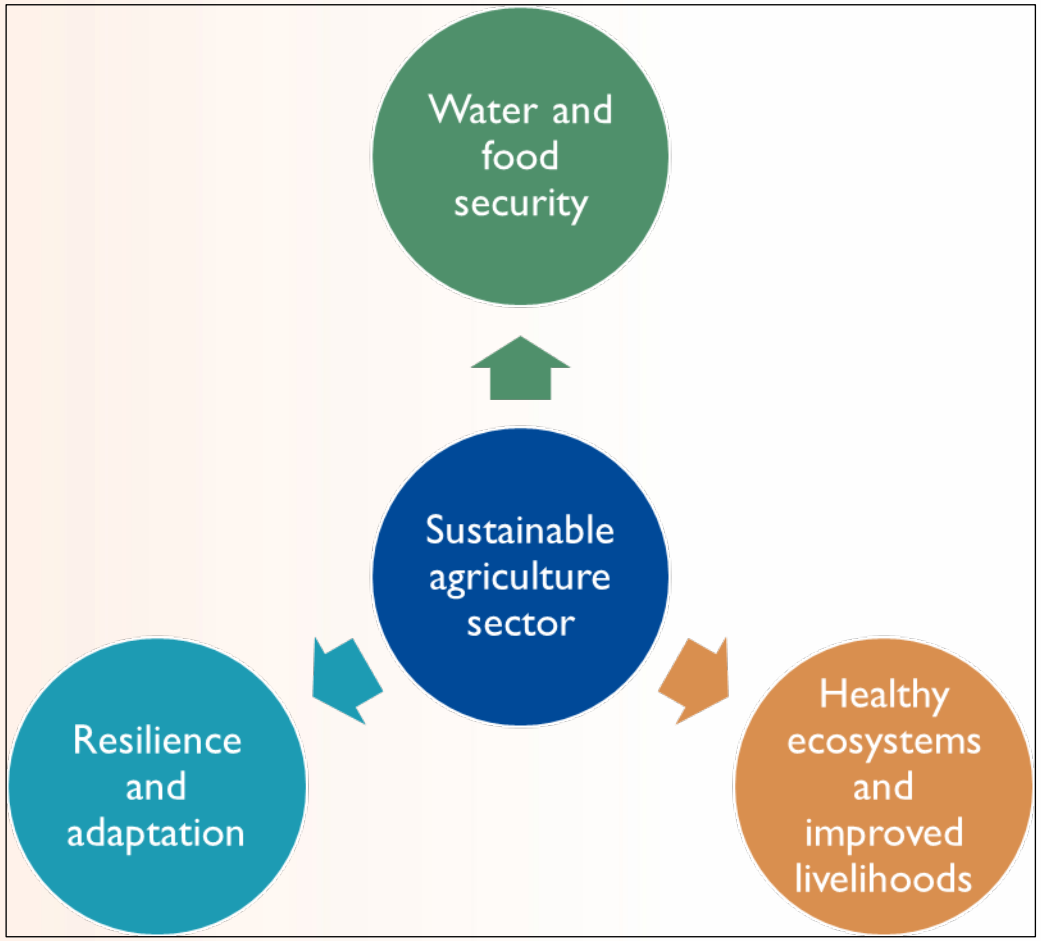


Projections indicate that agricultural productivity will need to double from current production levels by 2050 to feed a projected population of about 80 million people in South Africa in the same period.

To counter the triple challenges of water scarcity, land degradation, and food insecurity, agriculture must become more crop-water productive, efficient, and environmentally friendly.

Towards sustainable water use in the agriculture sector

- A priority of the National Development Plan (NDP) is to increase resilience and agricultural productivity and ensure food security
- The NDP seeks to expand area of land under irrigation land
- However, 98% of South Africa's water resources are already allocated
- 62% of available freshwater resources are used for agriculture, mainly for irrigation



The challenges require transformative and integrated solutions to achieve sustainability

The WRC is actively funding research promoting climate-smart agricultural practices

- **Increased productivity:**
  - produce more with fewer resources
  - better food to improve nutritional security
  - boost incomes
- **Enhanced resilience - reduce vulnerability to drought, pests, and diseases**
- **Reduced emissions**

Selected water-use efficiency innovations developed through WRC funding

Innovation title	Innovation description
Development and testing of a smartphone application for predicting near-real-time water requirements of fruit tree orchards	The project developed a mobile phone application (both android and IOS) that use agro-meteorological data to predict crop water requirements for apple orchards seven days in advance.
Development of a risk-based approach for assessing livestock watering and aquaculture water quality guidelines	Software-based tools (Technology demonstrators) that provide water quality guidance on fitness for use to aquaculture water users and animal (livestock) watering users.
Developing a smartphone app for small-scale fish farmers and government aquaculture extension officers	Smartphone app (Buna Africa) for small-scale fish farmers and government aquaculture extension officers.
The bag system	A climate-smart production system, the bag system can cultivate a considerably higher number of crops using less water.
Water use and physical as well as economic productivity of indigenous herbal teas in the winter rainfall region	A crop water use model under different scenarios of climate change.
A rapid object collection and analysis tool (ROCAT), which is used to estimate water use	The application of national scale remotely sensed evapotranspiration (ET) estimates to quantify water use and differences between plantations in commercial forestry regions of South Africa
web-based and GIS-enabled WEF nexus integrative model	Developed a WEF nexus model or tool that is web-based and GIS-enabled

The orchard water use APP

- A smartphone app that forecasts the water requirements of apple orchards from one to seven days in advance
- The app ensures that they do not under-irrigate or over-irrigate their crops, thus saving water, without affecting production
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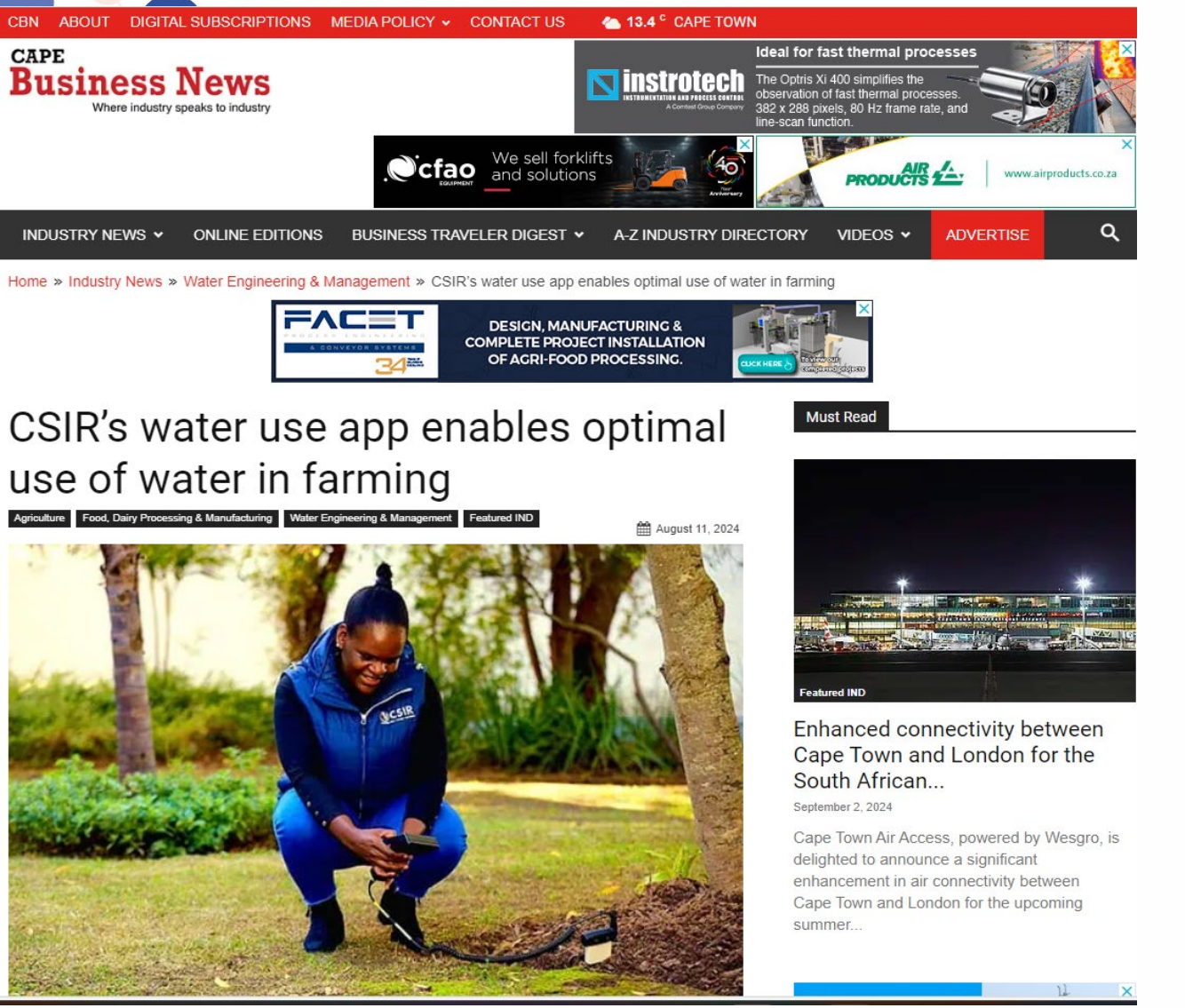
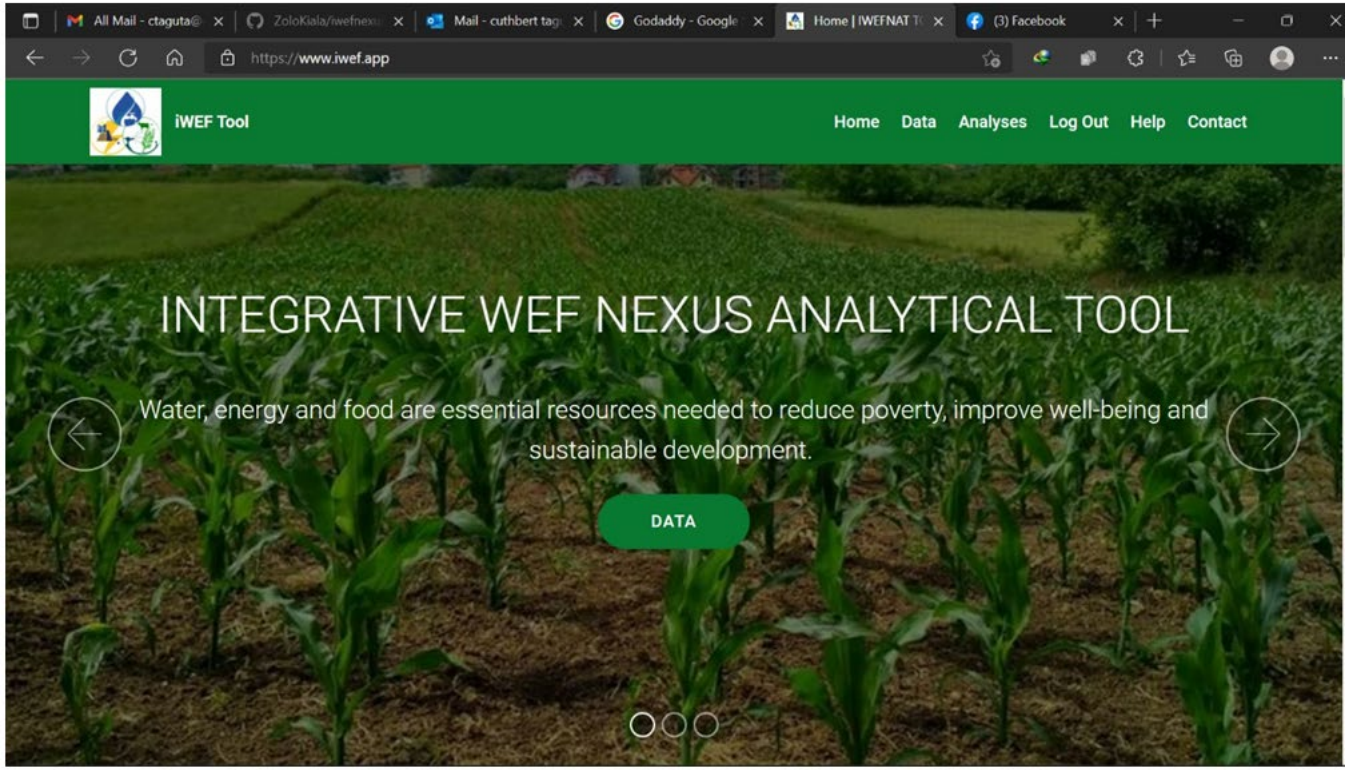
- If there's too much water, there's no oxygen.

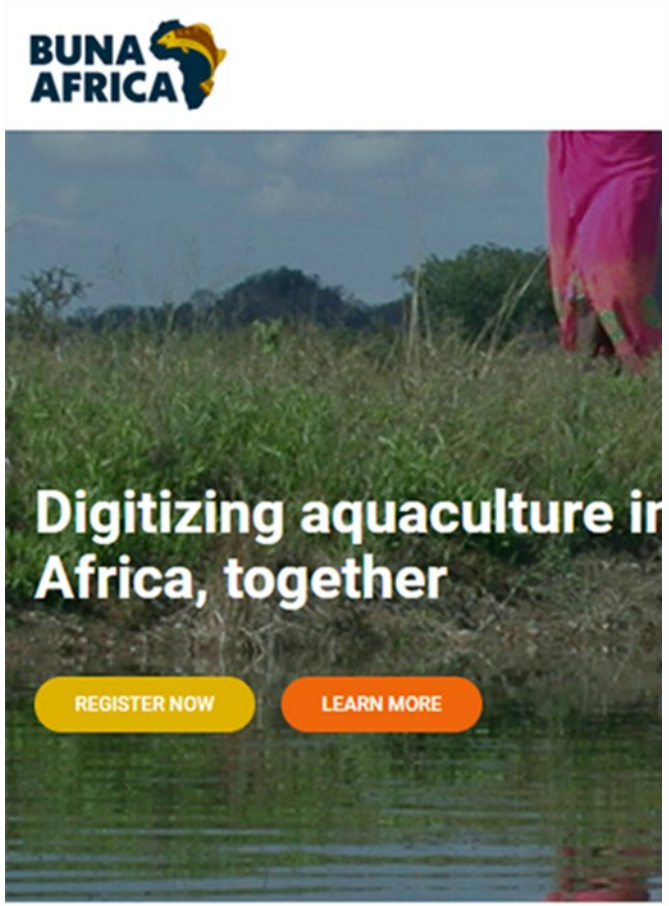


Dr Mpumi Mobe, senior researcher at the CSIR using a handheld HydroSense II system to measure volumetric water content of soil.

iWEF model home page



Livestock and aquaculture

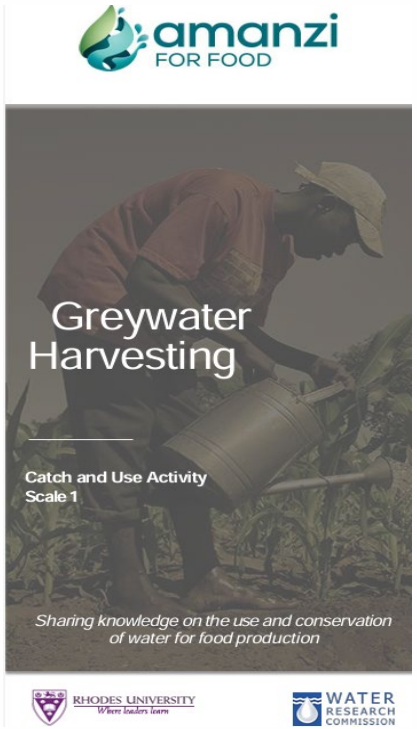


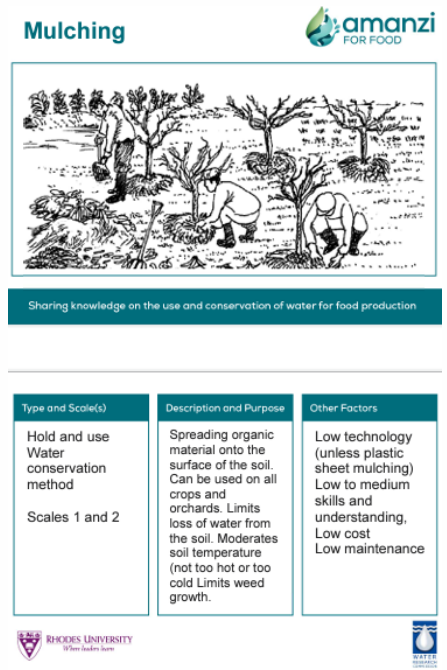
Amanzi for food for small scale farmers

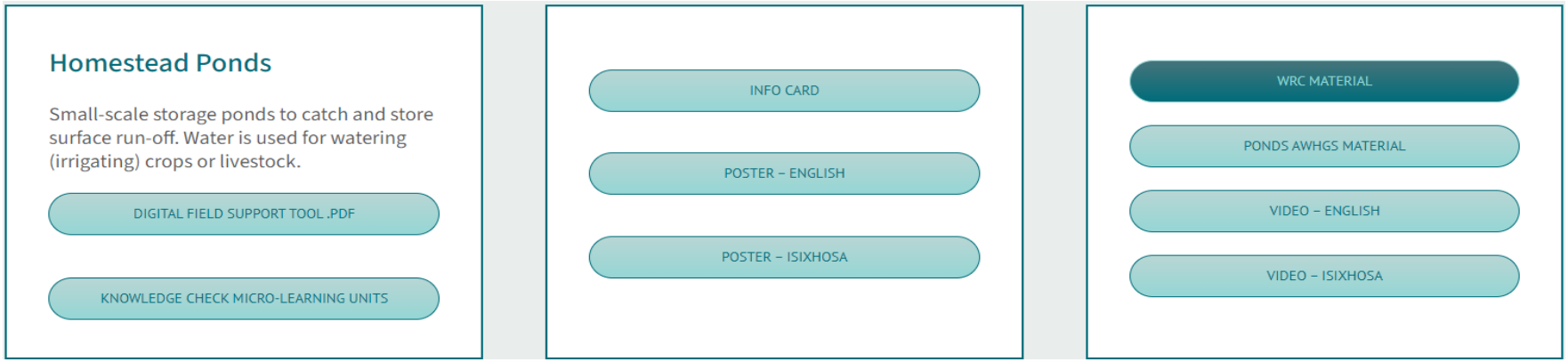
- The Climate-Smart Innovation Tool - support and evaluate climate-responsive curriculum innovation in agricultural education.
- Climate-Smart Agriculture (CSA) is an approach aimed at increasing agricultural productivity, enhancing resilience to climate change, and reducing greenhouse gas emissions.
- Integrates economic, social, and environmental dimensions, CSA addresses food security and climate challenges simultaneously.

https://amanziforfood.co.za/

- Catching Rainwater Practices
  - Greywater Harvesting (recycling, re-use)
  - Roof Water Harvesting
- Storing Rainwater Practices
  - Homestead Ponds
  - Roof tanks
- Holding Rainwater Practices
  - Mulching
  - Trench beds







Climate-smart agricultural practices – small scale farmers

WRC funded projects in Mpumalanga

"*Farmer-led Agricultural Production Interventions through Sustainable Farming Practices for Underutilized Indigenous Crops by Rural Communities in Mpumalanga*."

- To support smallholder farmers and facilitate cultivation research, technology transfer,
- Capacity building for underutilized indigenous crops with communities within the Mbombela Municipality

WRC funded projects in Mpumalanga

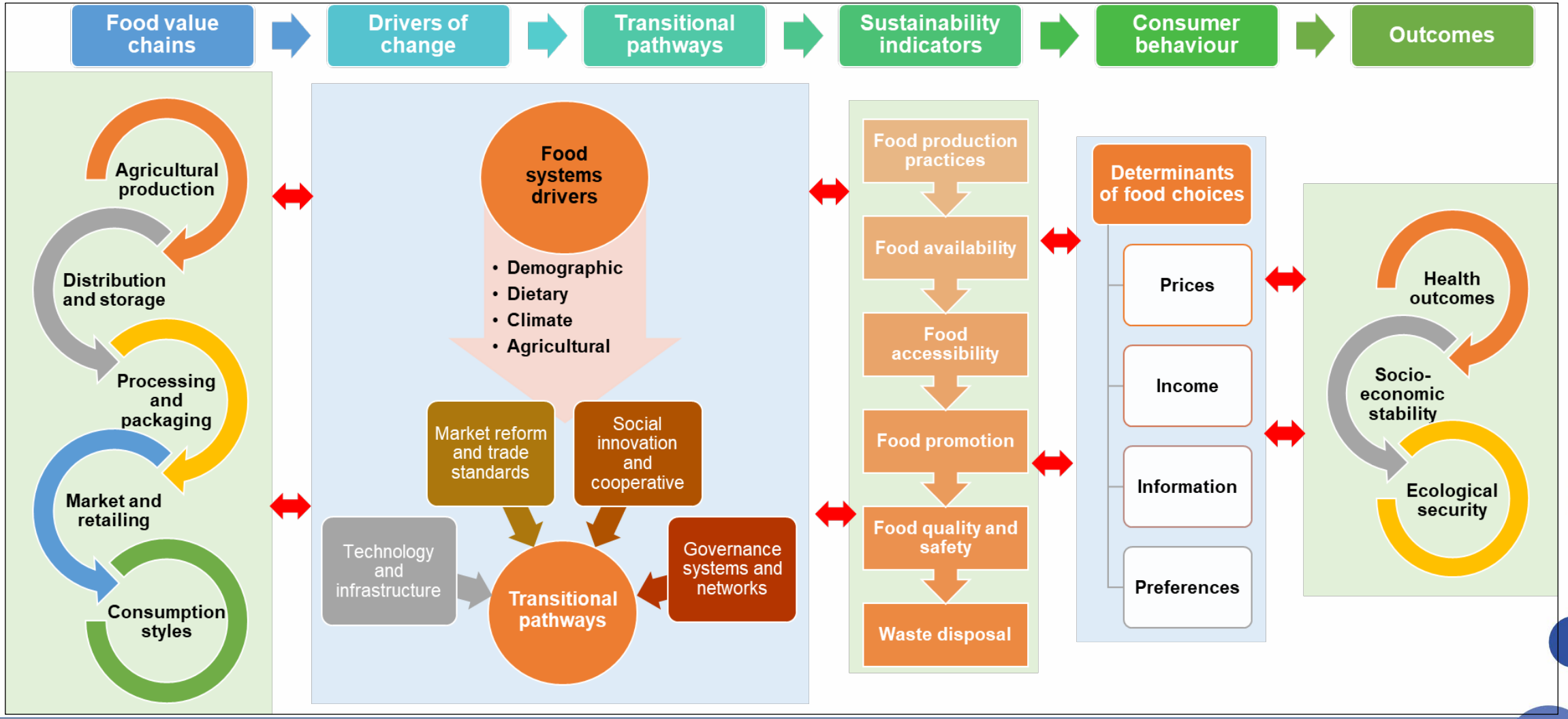
WRC-Old Mutual-UMP school gardens Project - Food security and nutrition project **-Thandanani Primary School**

- Complement school feeding programmes
- Enhance nutritional status and learning achievements of learners
- Encourages home production ---food and nutrition security
- Re-introduce African leafy vegetables

WATER USE – YIELD RELATIONSHIPS OF SELECTED INDIGENOUS FRUIT TREE SPECIES
MARULA ORCHARD – ARC Mpumalanga

- Which species have the highest domestication and/or commercialization potential?
- How would these perform under management?
- How are these species likely to respond to future climatic conditions?

Pathways towards achieving sustainability of food systems



Conclusions

- More still needs to be done to enhance the uptake of these technologies
  - In climate modelling, mapping irrigated areas, weather forecasting, and operationalising these
- Whilst increasing the land under irrigation is a prerequisite to enhancing food and water security,
  - Policy should adopt holistic and integrated approaches when implementing irrigation strategies to avoid policy spillovers or attain unintended outcomes.
- Innovations that promote water use efficiencies are critical for the resilience and adaptation
- Recognise trade-offs and synergies associated with irrigation expansion

WATER RESEARCH COMMISSION

THANK YOU