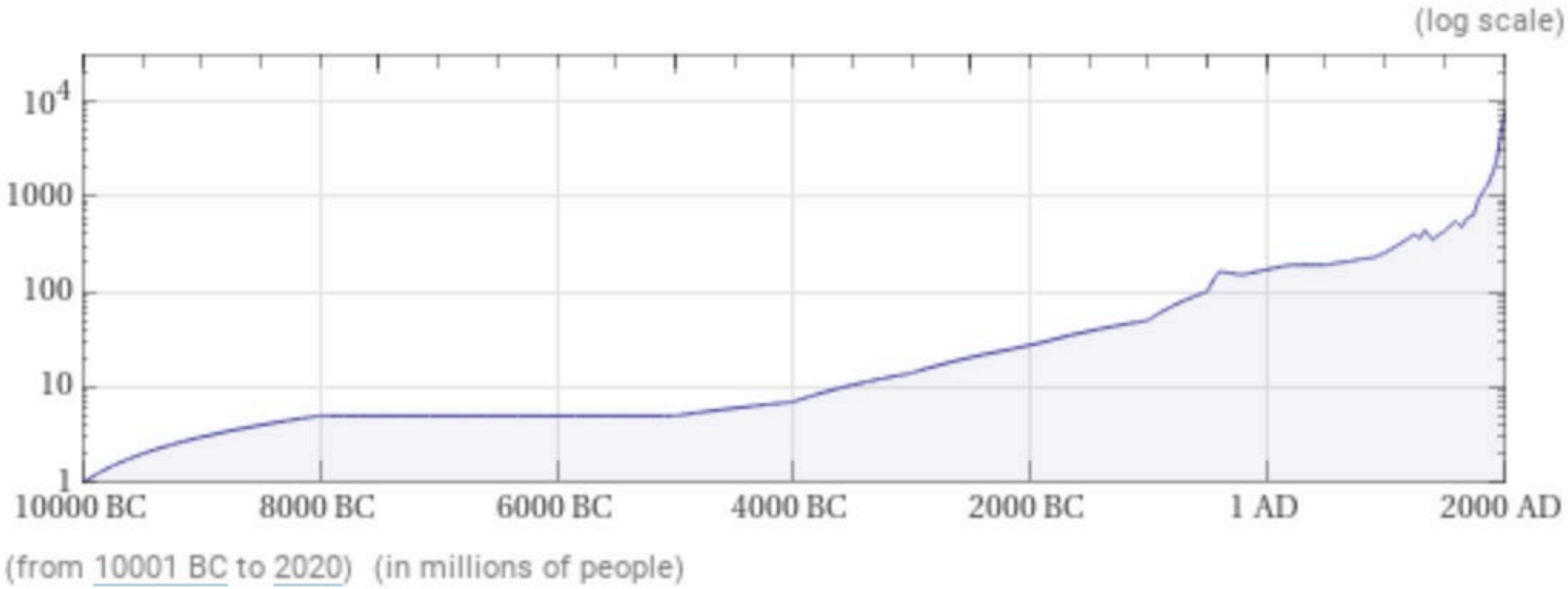
DSI-UNCTAD TA Project Agriculture Focus

Jasper Rees

djg.rees@icloud.com

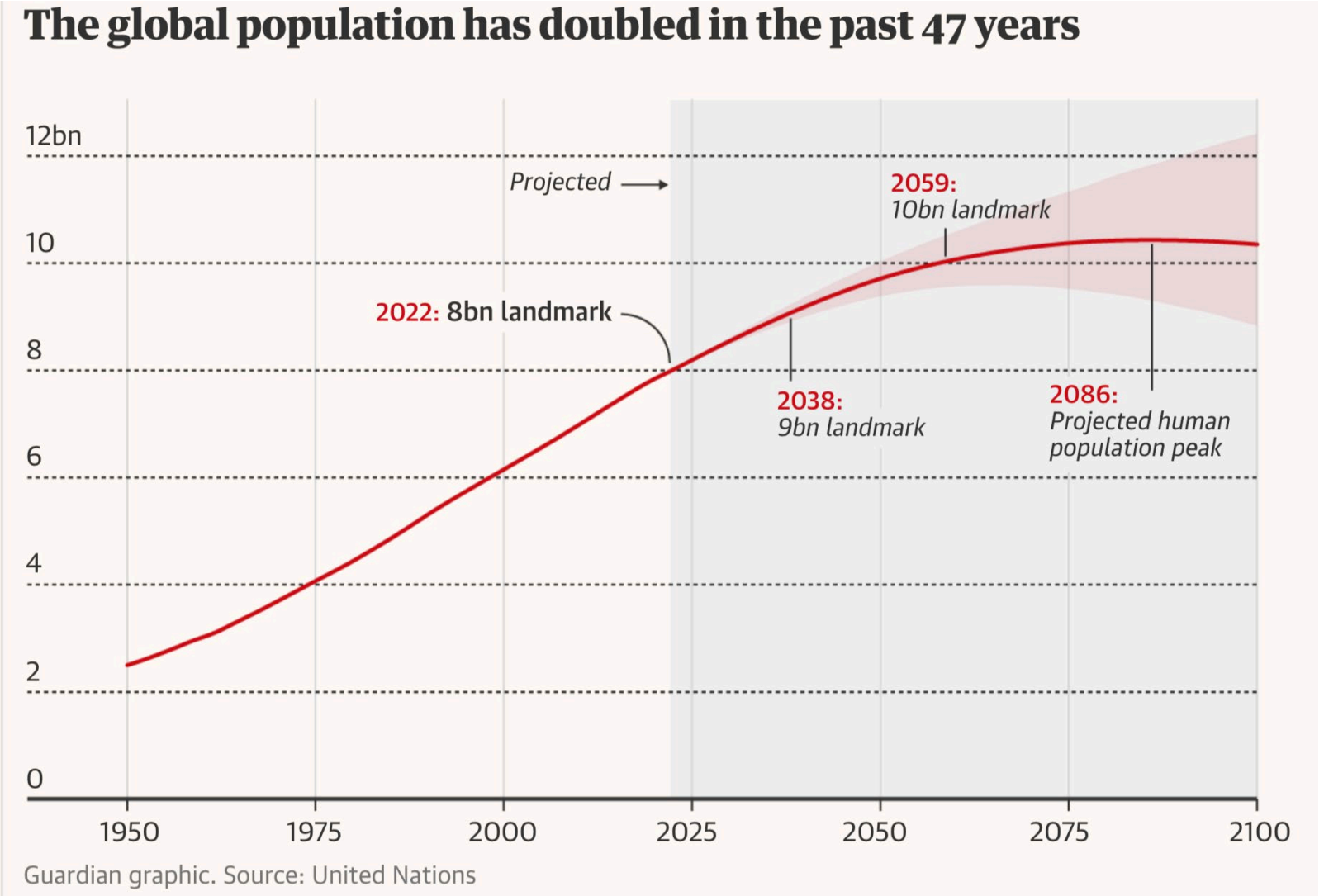
9 May 2023

Population of the world….. 10000BC to present



Data sourced from Wolframalpha.com

World Population – future models

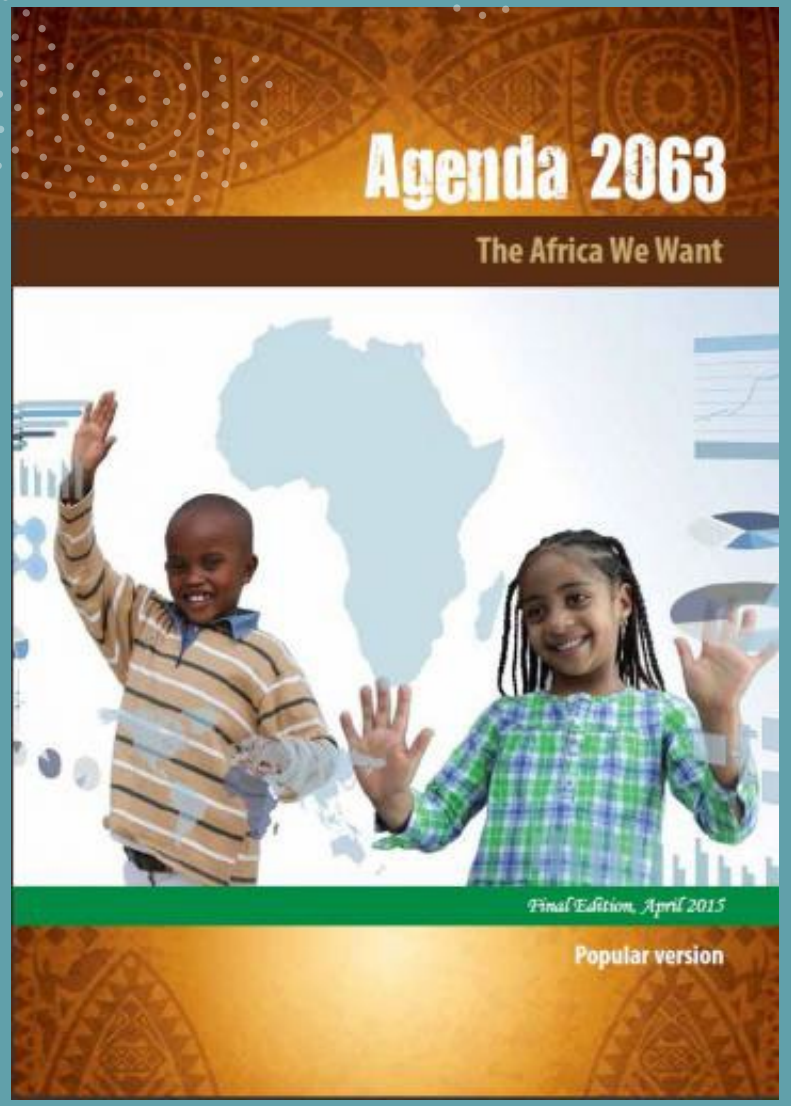


Sustainable Development Goals

Sustainable Development Goals

Sustainable Development Goals

Africa’s agriculture will be modern and productive, using science, technology, innovation and indigenous knowledge. The hand hoe will be banished by 2025 and the sector will be modern, profitable and attractive to the continent’s youths and women.



Consolidate the modernisation of African agriculture and agrobusinesses, through scaled up value addition and productivity, and by 2063:

- Completely eliminate hunger and food insecurity;
- Reduce the imports of food and raise intra-Africa trade in agriculture and food to 50% of total formal food and agricultural trade;
- Expand the introduction of modern agricultural systems, technology, practices and training, including the banishment of the hand-hoe;
- Develop and implement affirmative policies and advocacy to ensure women's increased access to land and inputs, and ensure that at least 30% of agricultural financing are accessed by women; and
- Economically empower women and youth by enhancing access to financial resources for investment.

The Malabo Declaration

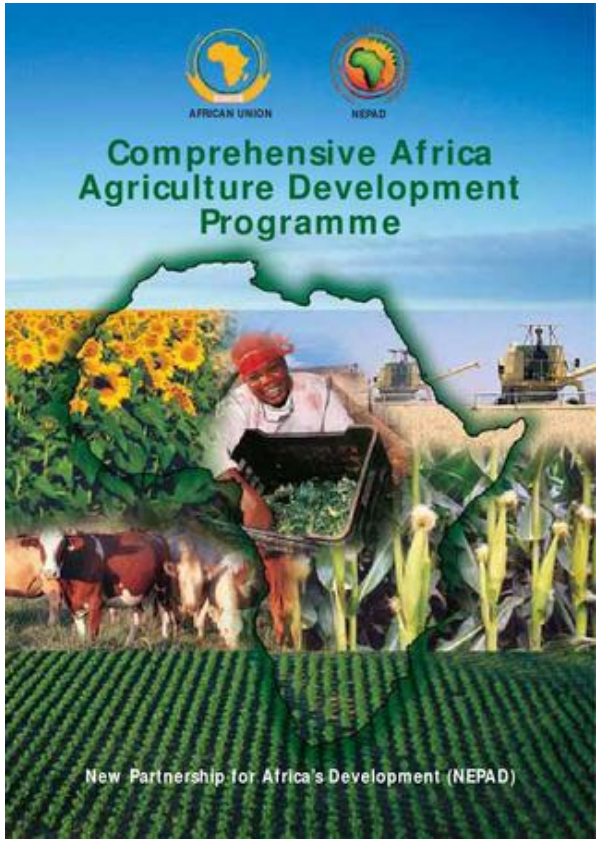
Transformation for Shared Prosperity and Improved Livelihoods

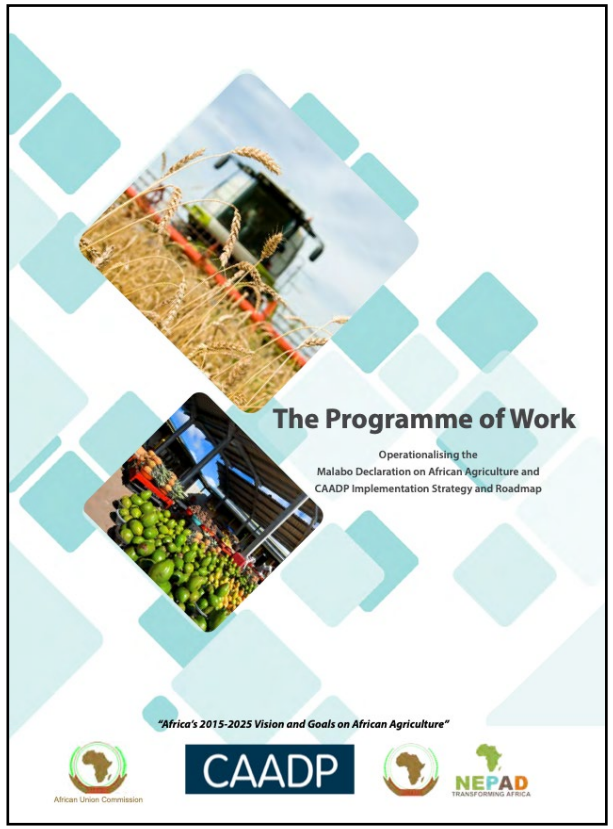
- **I. Recommitment to the Principles and Values of the CAADP Process**
- **II. Commitment to Enhancing Investment Finance in Agriculture**

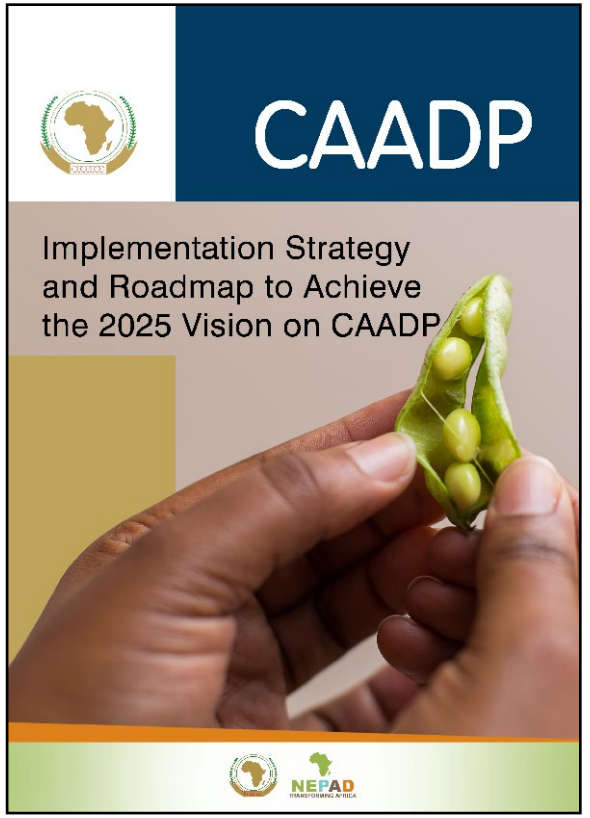
a) to uphold our earlier commitment to allocate at least 10% of public expenditure to agriculture, and to ensure its efficiency and effectiveness;

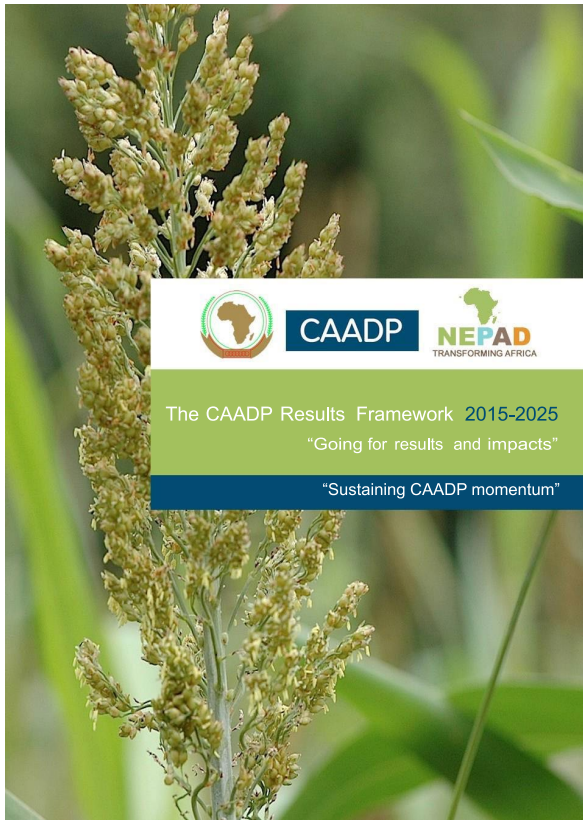
- **III. Commitment to Ending Hunger in Africa by 2025**
- **IV. Commitment to Halving Poverty by the year 2025, through Inclusive Agricultural Growth and Transformation**
- **V. Commitment to Boosting Intra-African Trade in Agricultural Commodities and Services**
- **VI. Commitment to Enhancing Resilience of Livelihoods and Production Systems to Climate Variability and other related risks**
- **VII. Commitment to Mutual Accountability to Actions and Results**
- **VIII. Strengthening the African Union Commission to Support Delivery on these Commitments**

CAADP

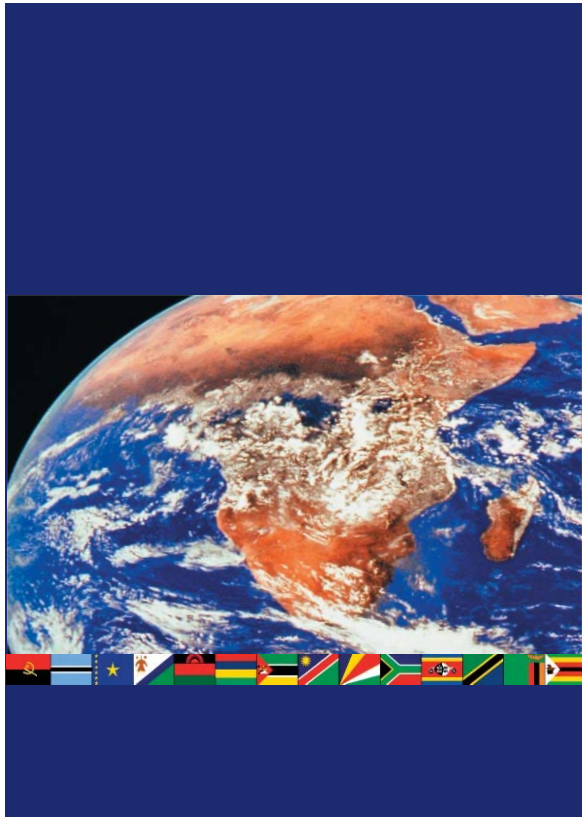

AFRICAN UNION
NEPAD
Comprehensive Africa Agriculture Development Programme
New Partnership for Africa's Development (NEPAD)

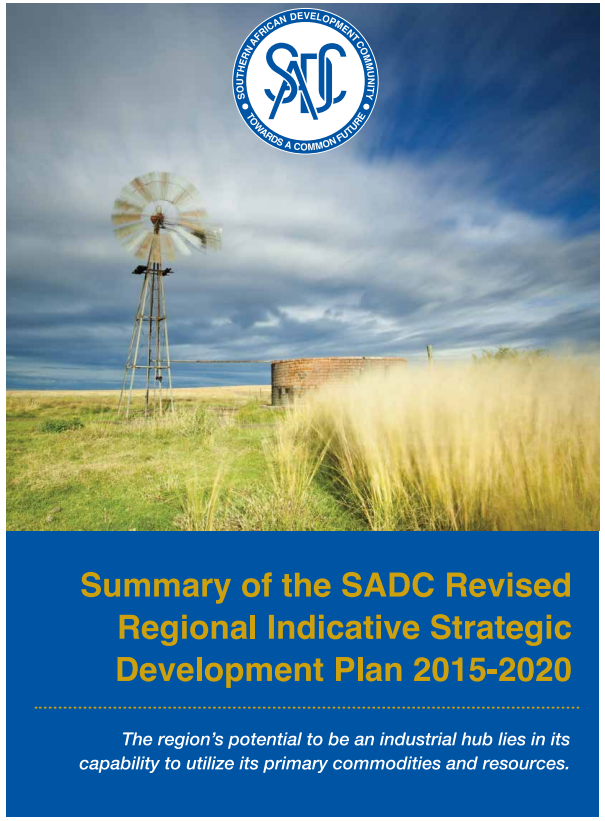

The Programme of Work
Operationalising the
Malabo Declaration on African Agriculture and
CAADP Implementation Strategy and Roadmap
"Africa's 2015-2025 Vision and Goals on African Agriculture"
African Union Commission
CAADP
NEPAD
TRANSFORMING AFRICA


CAADP
Implementation Strategy and Roadmap to Achieve the 2025 Vision on CAADP
NEPAD


CAADP
NEPAD
TRANSFORMING AFRICA
The CAADP Results Framework 2015-2025
"Going for results and impacts"
"Sustaining CAADP momentum"

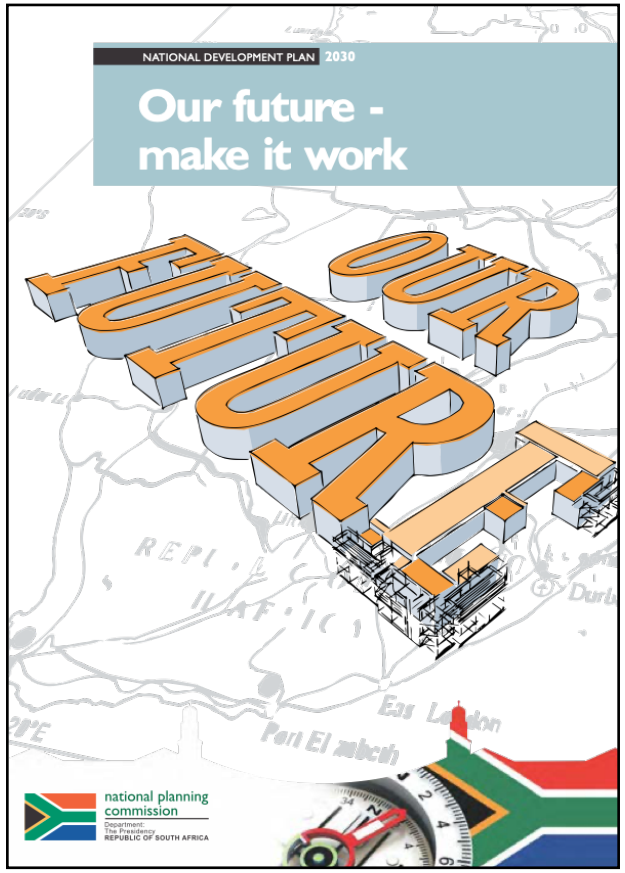
SADC - RISDP



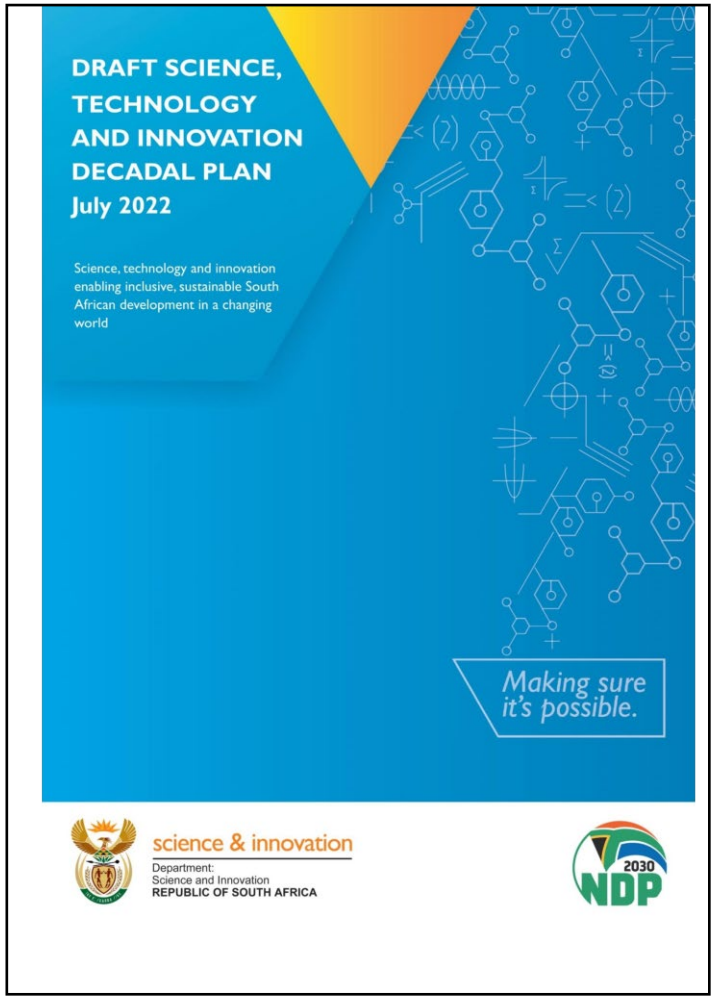

SOUTHERN AFRICAN DEVELOPMENT COMMUNITY
TOWARDS A COMMON FUTURE
Summary of the SADC Revised Regional Indicative Strategic Development Plan 2015-2020
The region's potential to be an industrial hub lies in its capability to utilize its primary commodities and resources.


SADC Regional Indicative Strategic Development Plan (RISDP) 2020–2030
October 2020
DEMOCRATIC REPUBLIC OF CONGO
Kinshasa
UNITED REPUBLIC OF TANZANIA
Dodoma
Dar es Salaam
Victoria
SEYCHELLES
Luanda
ANGOLA
MALAWI
Lilongwe
COMOROS
Moroni
ZAMBIA
Lusaka
MOZAMBIQUE
Harare
ZIMBABWE
MAURITIUS
Port Louis
Antananarivo
MADAGASCAR
NAMIBIA
Windhoek
BOTSWANA
Gaborone
Pretoria
Maputo
Mbabane
ESWATINI
Maseru
LESOTHO
SOUTH AFRICA
Cape Town

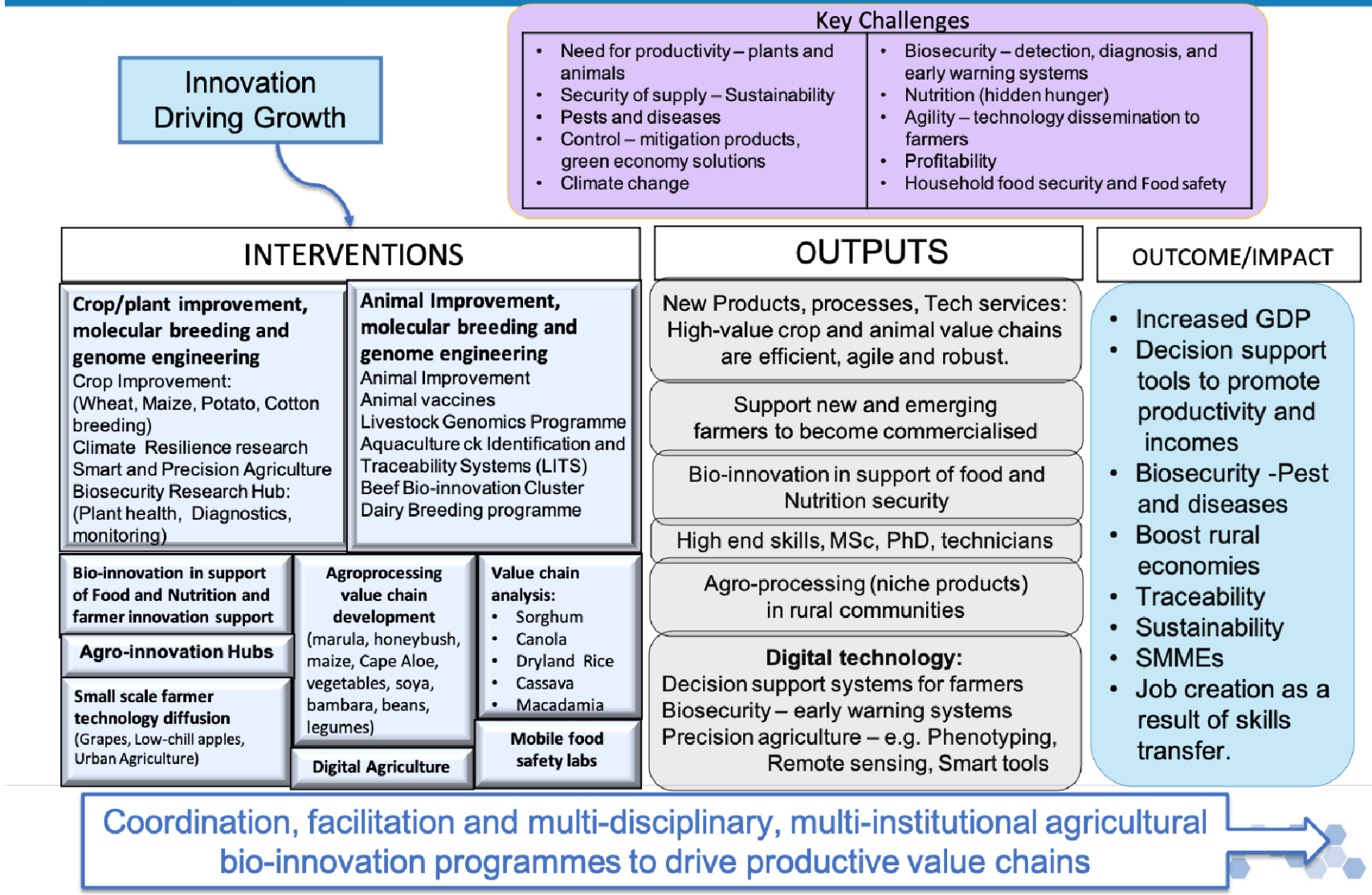
NDP and NACI Foresight Studies



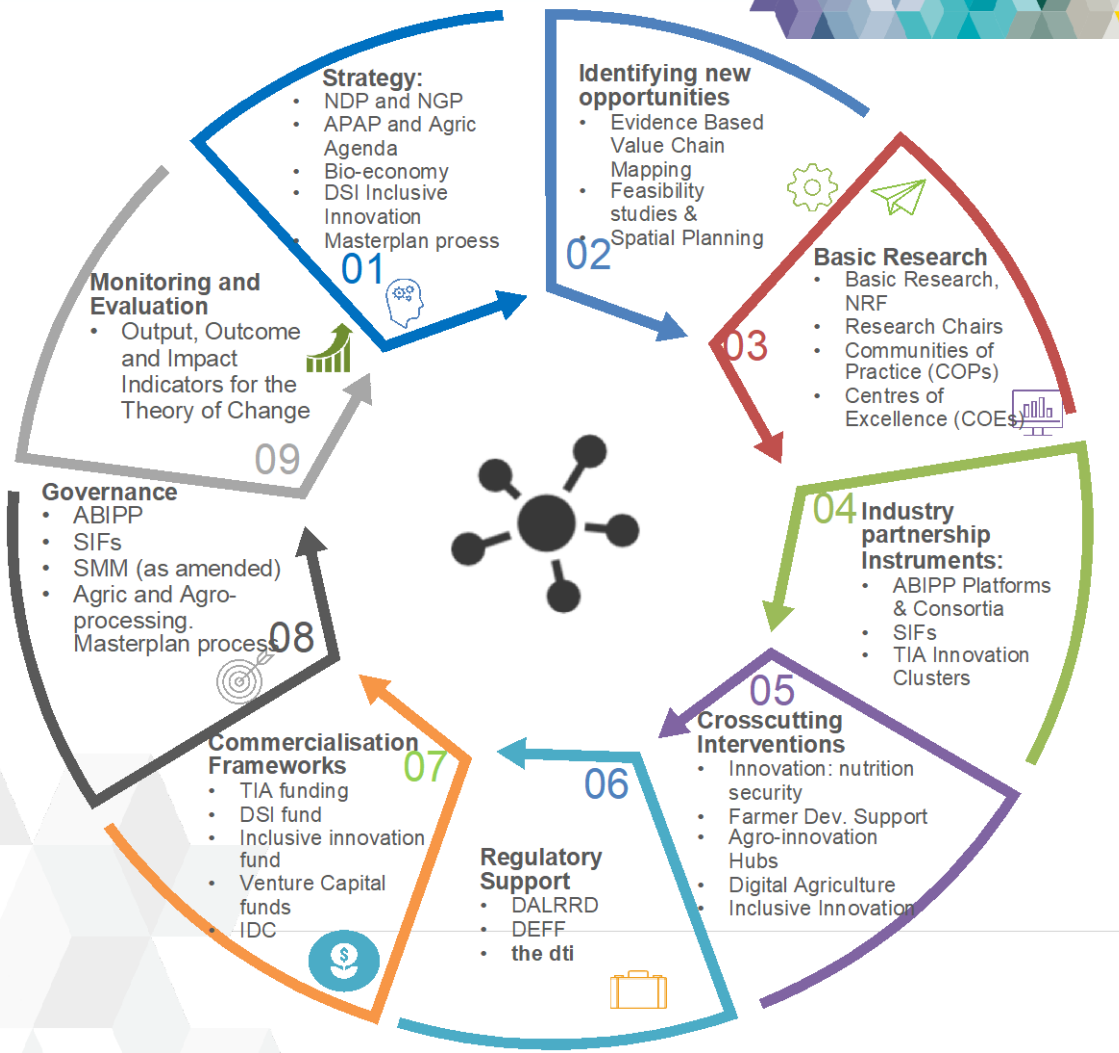
Key Agriculture Policies for SA



Theory of Change: Innovation Revitalising Agriculture



RDI in Agriculture: Key Implementing Mechanisms



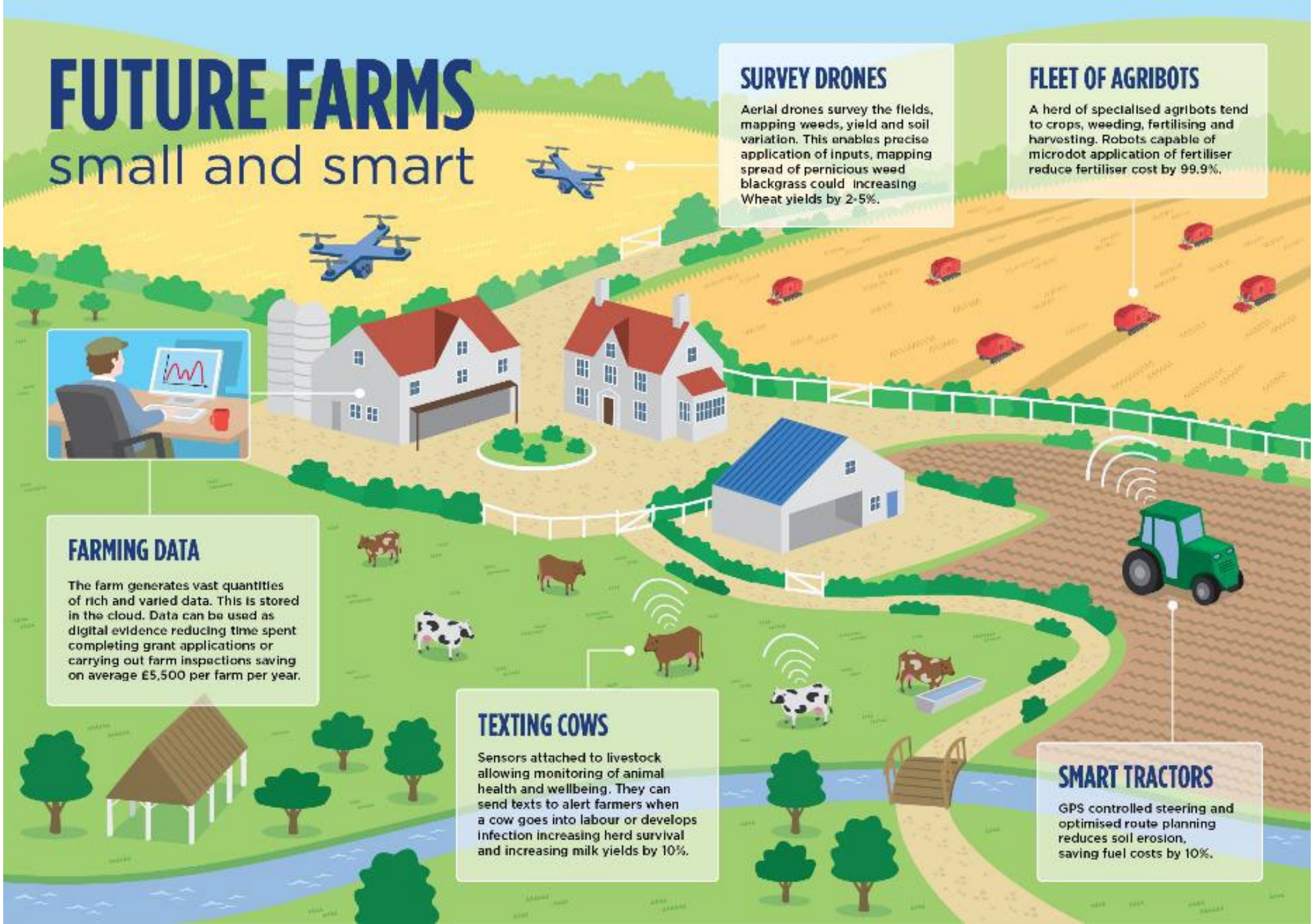
Crop and Livestock value propositions

National Agricultural Marketing Board, South Africa

Key Issues to consider for Agriculture and Energy TA

- Climate Change – heat and water
- Food Security (quality and quantity)
- Poverty Alleviation
- Employment
- Education
- Energy Security
- Emerging diseases (plant and animal)
- Water Management
- Soil and environment protection
- Africa integration

FUTURE FARMS
small and smart



SURVEY DRONES

Aerial drones survey the fields, mapping weeds, yield and soil variation. This enables precise application of inputs, mapping spread of pernicious weed blackgrass could increasing Wheat yields by 2-5%.

FLEET OF AGRIBOTS

A herd of specialised agribots tend to crops, weeding, fertilising and harvesting. Robots capable of microdot application of fertiliser reduce fertiliser cost by 99.9%.

FARMING DATA

The farm generates vast quantities of rich and varied data. This is stored in the cloud. Data can be used as digital evidence reducing time spent completing grant applications or carrying out farm inspections saving on average £5,500 per farm per year.

TEXTING COWS

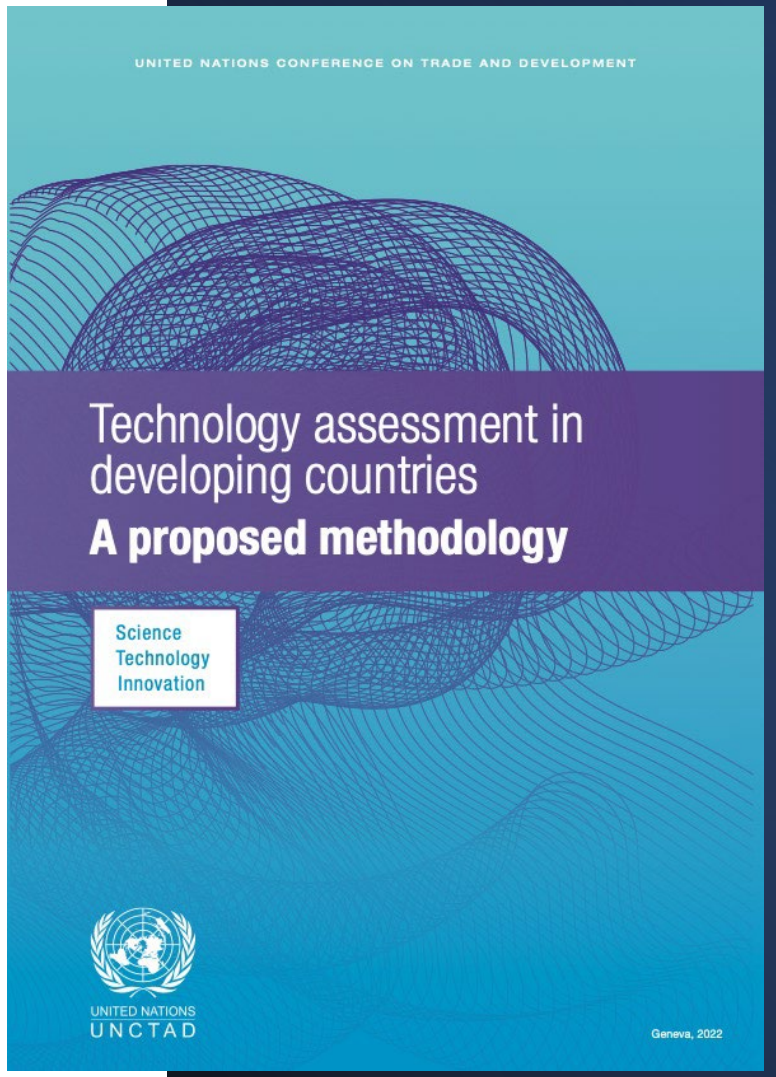
Sensors attached to livestock allowing monitoring of animal health and wellbeing. They can send texts to alert farmers when a cow goes into labour or develops infection increasing herd survival and increasing milk yields by 10%.

SMART TRACTORS

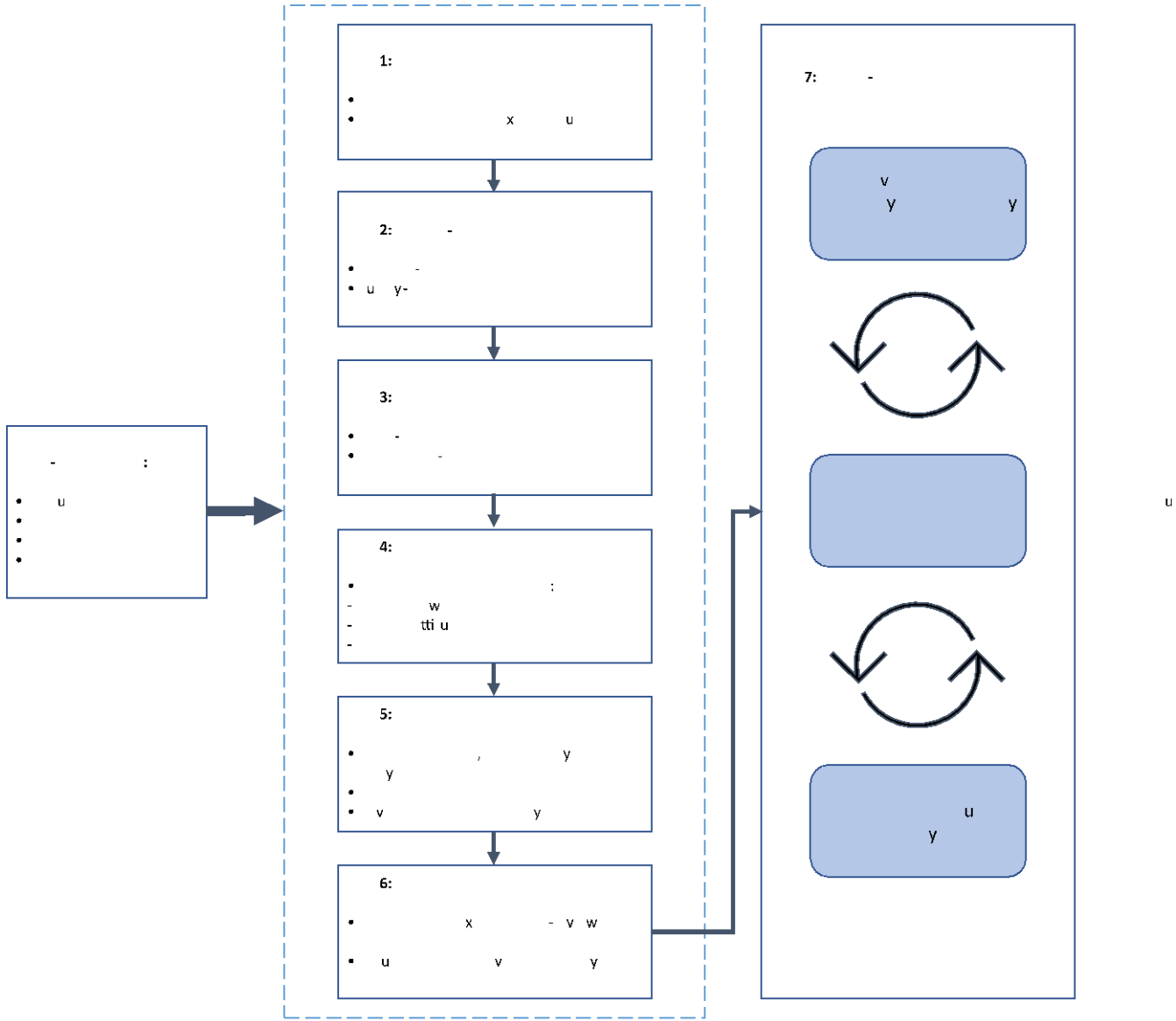
GPS controlled steering and optimised route planning reduces soil erosion, saving fuel costs by 10%.

What is Technology Assessment?

- Technology assessment is a problem-oriented process that examines the opportunities and risks as well as the societal effects when a technology is introduced, extended or modified.
- Technology assessment is therefore an important tool to inform policymakers, to encourage public dialogues about technology and development and to help frame supportive policies to minimize risks and maximize benefits.

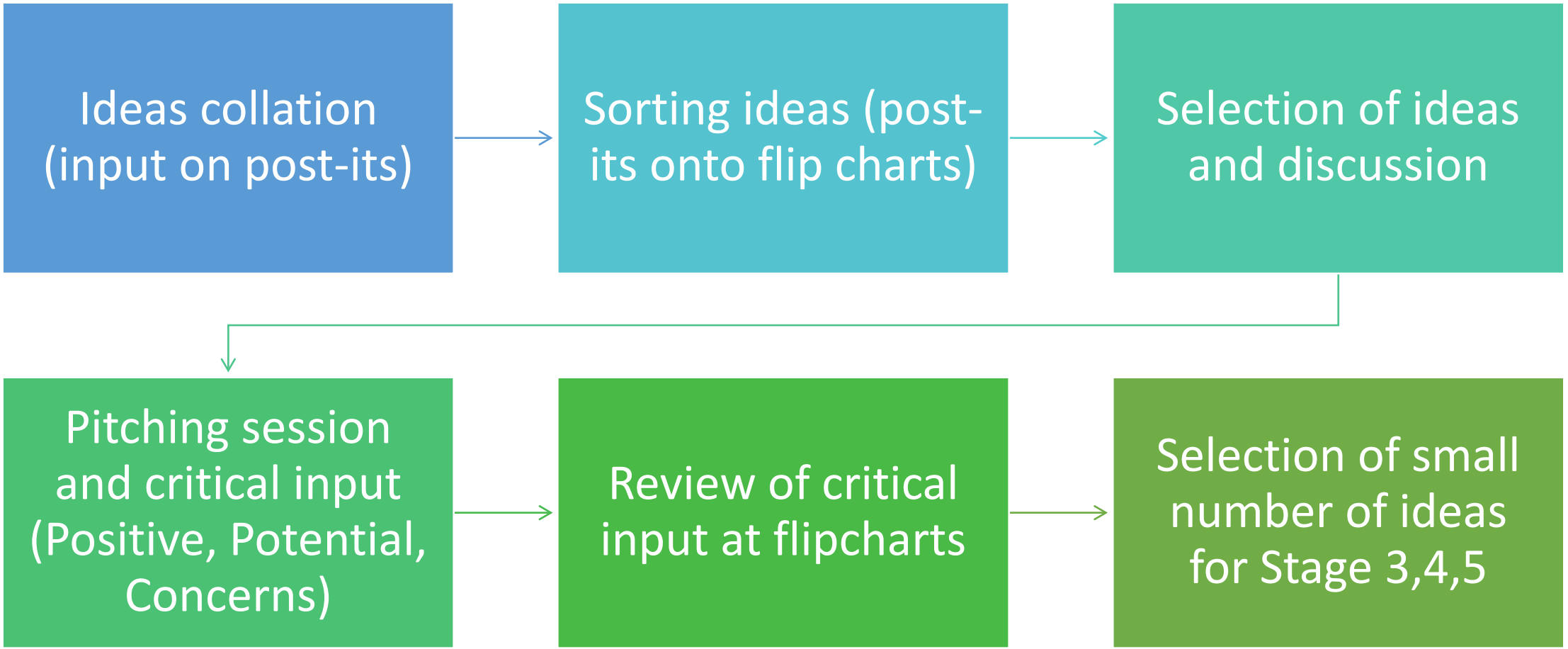


Summary of key steps of Technology Assessment (TA) project design



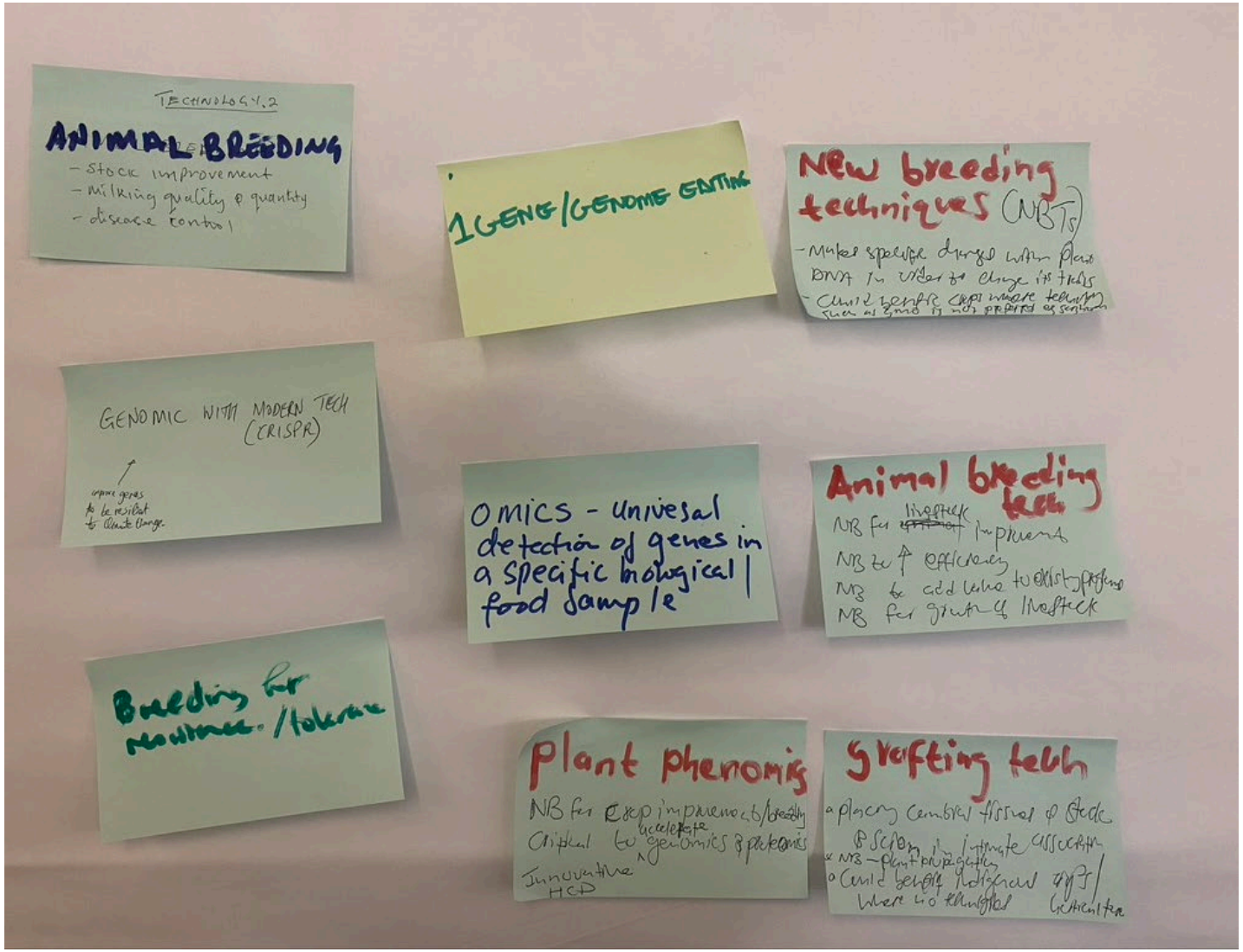
Source: UNCTAD

Step 2 Workshop Process




science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

Ideas Generation



Sorting and Selection

Precision Ag	AI/ML	Circular economy	:limate resilianc	Biotechnology	Food	Agroprocessing	Energy
Water use efficiency	Drones	Waste Management	crop adaptability	Animal Breeding	Food Safety	Nixtamalization	Waste Valorisation (Bioenergy)
Fit-for-purpose water saving tools (irrigation control and monitoring)	machine learning	Food waste valorisation	agric land use changes	Genomics Technologies including CRISPR/Cas	Integrated Food systems	Biofortification	Microgrids
Automation in agric	hyperspectral imaging		Pest management (less persistance) (smart pest management)	Genomics Technologies including CRISPR/Cas	Tools for traceability (muzzle, iris ident, linked to GPS)	Alternative nutrients	Solar PV - power supply and shelter (? Agrivoltaics?)
Smart co-botic labs (collaborative robotics)	blockchain			Gene editing	Tech to impact future control strategies in food and agric		Biogas Economy (Sewage to power in towns)
digital decision support systems	Internet of Things			Omics -detecion of genes in biological/food samples	Artificial meat		Floating PV panels
	Marketplace Apps			New Breeding techniques			Agri-voltaics
	Regional Climate Monitoring Digital-Twin			Animal Breeding			Green Hydrogen
				Grafting tech			Biomass gasification
				Plant Phenomics			
				Breeding for resistance/tolerance (Animals and plants			

Topics for Pitching Session presentation

- Permaculture for small scale farmers (inter/multi cropping systems)
- Traceabilty technology for animals - muzzle, iris, GPS tracking
- Omics for Food Industry - appliations for food quality and safety
- Tools for traceability (farm-to-fork level tracking tools - eg DNA sequencing)
- Agricloud Hub Technologies - big data and models integrated into smartphone app
- Collaborative Robotics Research Labs (water, soil, food, etc, automation technology)
- Energy - Green Hydrogen

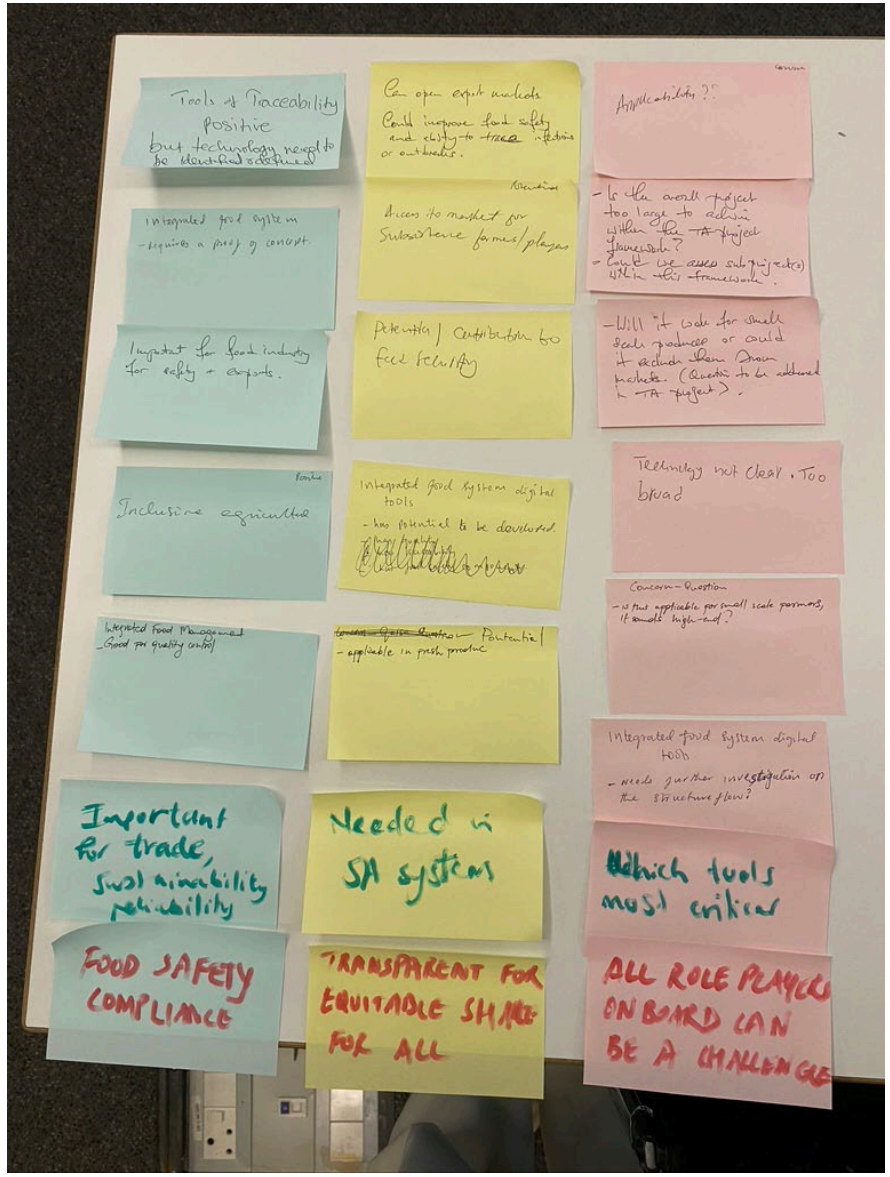
Pitching session for PPC input

- 3 minute pitching session
- Motivate why topic is interesting for TA study
- Emphasis on suitability, not why the topic is of interest to the presenter
- Suitability addressing existing policy/legal/regulatory space, with an emphasis on forward looking topics, and social and economic impact issues

PPC: Positive, Potential, Concerns

- No Negative input
- Everyone to complete comments in each category
- Comments to be brief but helpful
- Concerns, phrased as a question (not negatives)
- Colour coded on post-its for rapid sorting for each topic

PPC Output


Tools of Traceability
Positive
but technology needs to be identified & defined
Can open export markets
Could improve food safety and ability to trace
Integrated food system
- requires a proof of concept
Important for food industry for safety + exports.
Potential Contribution to food security
Inclusive agriculture
Integrated food system digital tools
- has potential to be developed
Integrated Food Management
Good for quality control
- applicable in fresh produce
Important for trade, food traceability reliability
Needed in SA systems
FOOD SAFETY COMPLIANCE
TRANSPARENT FOR EQUITABLE SHARE FOR ALL
Which tools most critical
ALL ROLE PLAYERS ON BOARD CAN BE A CHALLENGE
Technology not clear. Too broad
Concern - Question
- is not applicable for small scale farmers, it would high-end?
Integrated food system digital tools
- needs further investigation on the structure flow?

Omics for Food Industry - applications for food quality and safety

Positive	Potential	Concerns
Very powerful technology solution	tracking of food fraud and adulteration	Is this affordable
major social implications and importance in terms of food safety and market access	can use for pathogens and traceability as well	Is it scaleable
great idea	upcoming technologies	Is there a legal framework in place
track down food prodiucts that are sold to township and rural markets	QR code and label readers linked to origin of food products	How outspread (widespread?) is the technology
good idea	empower food inspectors	How do you enforce good practice of correct labelling by human actors?
precise analysis of ingredients of processed foods	small production lines get the same output because of acccess to tech	Links to food safety, quality and monitoring?
		How to rectify questionable ingredients?

The final selection

- Complete set of PPC data shared with team by email
- All steering group and expert group members asked for input for selection of TWO topics for agriculture for TA process
- Majority of input was for:
- **Tools for traceability**
- **Omics for Food Industry**

Tools for Traceability (Animal traceability in particular)

- The traceability of food from its source at the farm to its sale to the consumer is increasingly an important topic both for food origin, food safety, food identify, and the monitoring and regulation of animal welfare. Increasingly, particularly in export markets, the ability to trace food products back to the individual producer is an important factor in quality control and the price paid for the final product to the producer and by the consumer.
- There are a range of tools for traceability, from labelling and barcoding, the use of blockchains, through to analysis with genetic markers, and clearly these vary greatly in terms of cost and technical complexity. Therefore, part of the TA project will be to explore the perspectives of actors and stakeholders in the food industry in order to obtain insight into the optimal application of product tracking, and the best way to provide the consumer with reliable information as to the origin of their food and therefore on the methods of production, processing and handling through the supply chain.
- However, this is a largely unregulated space, where there is opportunity to add significant value if appropriate new technology and policies are implemented. The TA project is therefore intended to explore the possibilities and value of traceability technologies to the full value chain of a range of products, and potentially result in recommendations for the development of policy, regulation and legal instruments in this area.

Omics for Food Industry - applications for food quality and safety

- The application of Omics technologies in the food industry will enhance analysis in areas such as food quality, food identity, food adulteration and fraud, and food pathogens. This will in turn allow the development of new and improved policies, regulations and laws that will strengthen the reliability of food chains, and ensure the safety of consumers.
- Omics technologies include genomics, proteomics, metabolomics, with supporting expertise in bioinformatics. The two major technology platforms are DNA sequencing and mass spectroscopy, though other methodologies are also relevant. The primary focus is on the high throughput generation of large datasets that can be used for in depth analysis in a wide range of applications, and from which a small subset of biomarkers can be derived to develop cost effective tests, often with the aim of achieving point-of-use diagnostics that can be used without requiring accredited laboratories and highly trained staff.
- The objective of the TA study is to explore the viability, relevance and acceptability of the application of Omics technologies within the food value chain from producer to consumer, in order to determine what the policy, regulatory and legal issues are as seen from the perspective of a range of stakeholders. This will inform the Government and private sector as to the strategic approach to this emerging area, and help identify the challenges and opportunities that should be prioritised in both the policy and laboratory practice areas.