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**Making agricultural value chains more inclusive through technology and innovation**

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**Agro-processing, value chains, and regional integration in Southern Africa**



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# Making agricultural value chains more inclusive through technology and innovation

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**CCRED**  
CENTRE FOR COMPETITION,  
REGULATION AND  
ECONOMIC DEVELOPMENT

# Background

- Agriculture and agro-processing have the potential to:
  - contribute to growth (32% of Africa's GDP, employing 54% of Africa's population in 2018)
  - boost regional trade and investments
  - foster rapid industrialisation and economic diversification: 'Industries without smokestacks' (Newfarmer, Page and Tarp, 2018)
  - create jobs, eradicate hunger and poverty
- Agro-processing to food retail value chains are highly concentrated in the region; few large firms with market power control multiple levels
- Role for small and medium-sized players to increase contestation and offer greater diversity
- However, SMEs face high barriers to entry and expansion:
  - difficulties in accessing markets and finance
  - limited skills and training
  - lack of infrastructure such as storage facilities
  - lack of access to market information
- Technologies can help **overcome some of the barriers**, and facilitate **inclusion** of SMEs particularly in regional value chains

# Focus areas and methodology

1

Overview of technology use in food value chains internationally

2

Technology to facilitate inclusion in Africa – lessons from East Africa

3

The case of technology use in South Africa's citrus, dairy and maize industries

- What are some of the constraints to adopting technology in the SADC region?
- What policy responses can be considered?

## METHODOLOGY:

- Literature review on technology use in agriculture
- Extensive interviews and fieldwork as part of on-going CCRED research
- GVC framework used to understand how technology and innovation can facilitate upgrading and build dynamic capabilities

# Overview of technology and innovation in food value chains internationally

- Approach to innovation: launching new products, applying new methods, acquiring new resources
  - Successful exploitation of ideas (Lefebvre et al. 2015)
  - Radical or incremental in nature



## Production technologies

- Developing new varieties
- Crop pest technologies
- Precision agriculture
- Agricultural robots



## Sorting, packing and cold storage technologies

- Cold chain infrastructure
- Smart materials in cold chains
- Delayed ripening and ripening technology
- Process automation, machine learning and AI



## ICT, internet of things, digital platforms and big data

- Block chain
- Digital platform
  - However, may give rise to anti-competitive effects.
- Big data

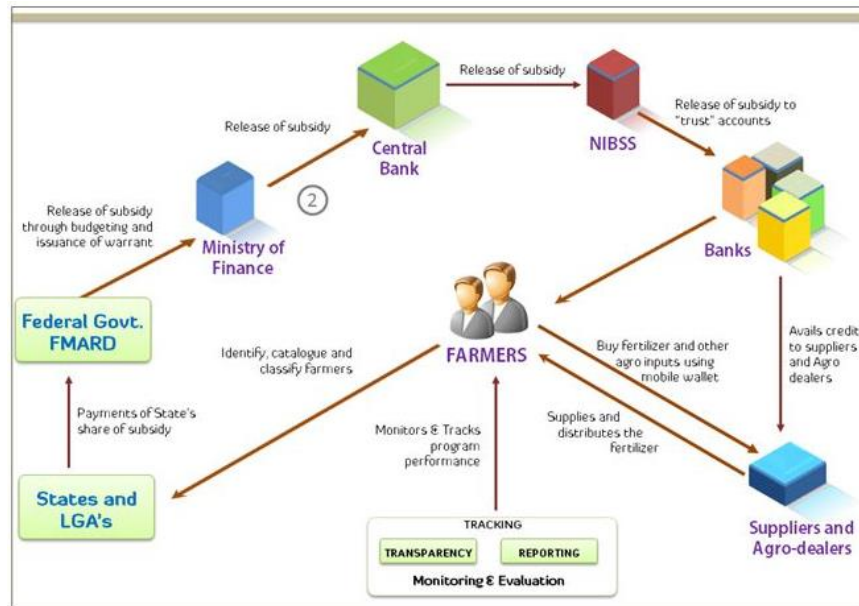


# Technology to facilitate inclusion in Africa – lessons from East Africa

## ICT Technologies to provide financing

- Less than 6% of bank lending goes to agriculture in Africa
  - Due to high cost of setting up banking institutions in rural areas; high market risk; lack of financial documentation and collateral.
- Several technologies have been used by companies to address these challenges in Africa:

### Nigeria's e-Wallet



Cellulant, Nigeria Inter-Bank Settlement System



# Technologies to facilitate the participation of SMEs in Africa

## Digital and ICT technologies to improve market access

- Difficulty for small suppliers to reach markets as they are faced with challenges:
  - meeting food safety and packaging standards
  - shortage of critical agriculture infrastructure for storage, transportation and warehousing
  - inconsistent quality, unreliable and untimely distribution
  - limited access to market information on demand and prices
- Some companies have used technologies to address these challenges in Africa:

**esoko**



# Climate-smart technologies in Africa

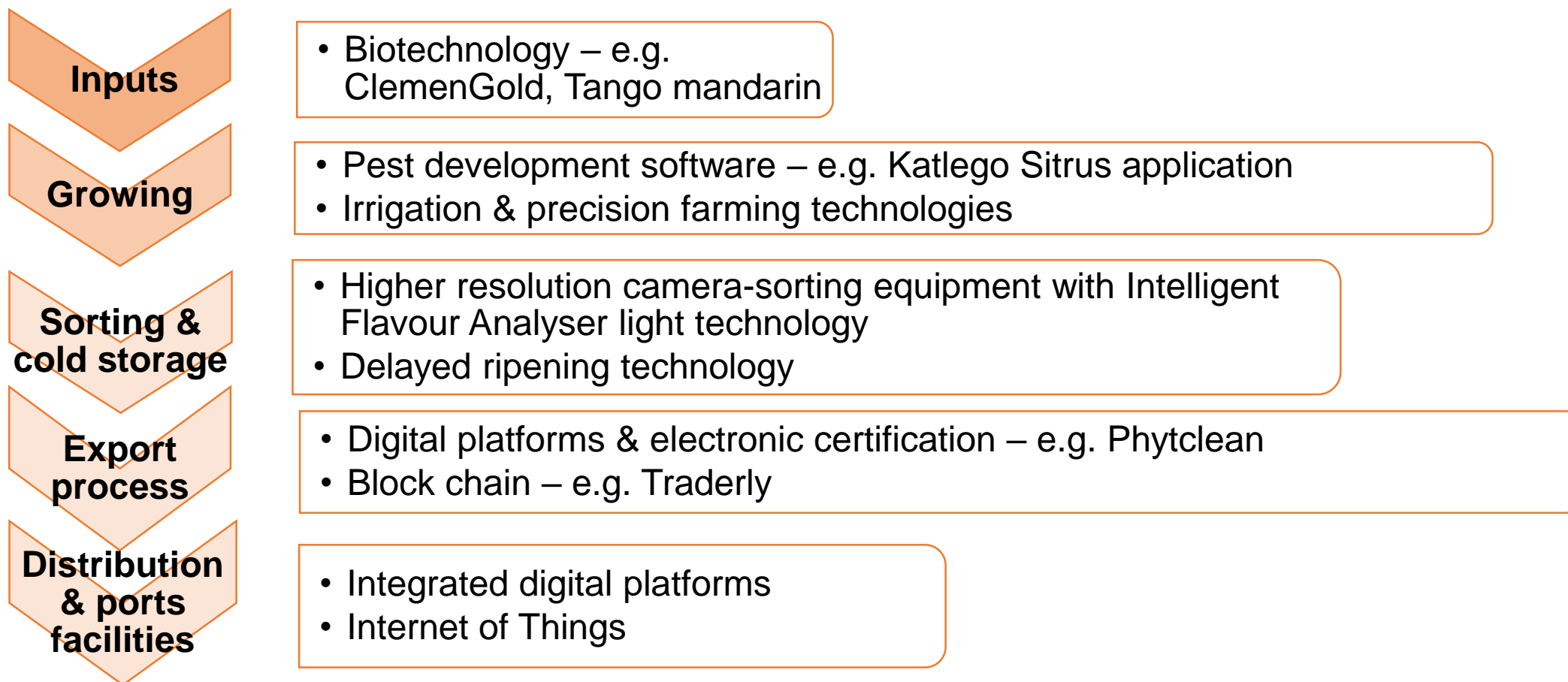
- Climate change has significant implications on where and how food is grow (rising temperatures, rising sea levels etc.)
  - Drought in SADC since semi-arid area (2014/15)
- Farmers have to adopt appropriate irrigation, drought-resistant seeds, use more plant chemical to mitigate climate change risks
- Some of the companies that employ technologies and mechanisms to mitigate the effects of climate change include:





# Technology use in South Africa's citrus industry

- 'Industrialisation of freshness' (Cramer & Sender, 2015)
- SA is the 2<sup>nd</sup> largest exporter of citrus in the world (R20bln in exports & employs 125 000 workers)
- Citrus has a well established industry association; strong R&D capacity and in-house technology



# Technology use in South Africa's maize industry

- Maize milling production process and technology remained largely unchanged over time, but there have been some important product and process upgrades
- Small and medium suppliers invest and make use of most technologies in Maize, although to a lower degree than large firms. E.g. optical technologies for cleaner maize

Function	Types of technology
Procurement	ICT technologies for market data and market trends
Maize grading	Graders and laboratories
Processing	Cleaning and conditioning; fortification machinery
Packaging	Automated packaging
Back office operations	Cloud computing and integrated reporting systems <ul style="list-style-type: none"><li>○ Social media for marketing</li><li>○ Digital payments</li></ul>



Examples of equipment in maize milling from CCRED fieldwork



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# Technology use in South Africa's dairy industry

- More diversified with different product ranges: characterised by more advanced technologies than maize milling
- Technology use necessary to meet food safety standards given delicate nature and perishability of dairy products
- But very expensive – e.g. no small players in UHT milk given high equipment costs and scale requirements



Examples of  
equipment in dairy  
processing from  
CCRED fieldwork



Innovation & Inclusion  
in Agro-processing  
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Function	Types of technology
Raw milk production	Feed technologies Cloud computing for record keeping
Dairy processing	Homogenisation equipment; Biotechnology and incubation chambers for value-added products such as cheese and yoghurt; Pasteurisation equipment
Packaging	Automated packaging (slicing, bottling, vacuum packing)
Back office operations	Cloud computing and integrated reporting systems; Social media for marketing; Digital payments

# Cautions and constraints to technology adoption



Be cautious of undesirable effects: **adverse incorporation** into value chains  
(incorporation without 'reaching a better deal')

**Exclusion** if technology cannot be accessed on favourable terms or if controlled by lead firms



Other **constraints** to technological adoption:

- High data costs
- Regulatory barriers to entry for mobile money products (banking license or partnering with existing banks requirements)





# Recommendations: facilitating technology adoption

- Build platforms to **integrate supply chains** and promote **traceability** – link suppliers, producers, relevant government departments, certification agencies, ports, logistics etc.
  - Can this be done at a regional level?
- Develop public **testing and research facilities** for developing new varieties
- Avail '**patient capital**' to foodtech startups, and provide **incentives** for technology adoption in VCs
- Competition authorities monitor possible **abuses of power by digital platforms**, and cooperate at a regional level
  - CCSA's paper on Competition in the Digital Economy; AfCFTA
- **Private sector partnerships**: current development of the South African Agriculture and Agro-processing Masterplan
- Better **coordination** between government departments, and regionally