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4IR AND WATER-SMART AGRICULTURE IN SADC: A WATCH LIST OF KEY TECHNOLOGICAL ADVANCES

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HORIZON SCANNING

A **foresight tool** that deals with the 'not (quite) yet'.

'What early signs of change - what weak signals or seeds of the future - that are visible today, could become more prominent over time?'

For this study: scanning of **patent- and innovation/start-up databases**, review of **peer-reviewed journal articles** and **grey literature**.

Not only what is scientifically or technically possible, but also how it can be **adapted to the specific regional context**.

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Teosinte, the wild ancestor of maize, which was domesticated in tropical southern Mexico around 7,000 B.C.

Representation of an early Agricultural "small cob" maize grown in the Tucson basin around 2000 B.C. Although there is not enough data to accurately illustrate its form, archeologists speculate that it was small and not a reliable food source until much later.

Popcorn, the hard-kernelled early corn grown in the Southwest.

Chapalote maize has both popcorn kernel varieties, and the less-hard flint kernels.

Tohono O'odham 60-day flour corn, probably similar to a type of Hohokam maize that appeared around A.D. 500 and may be a type found in Dempsey's pit house site.

Modern Tohono O'odham June dent corn appearing post-Spanish contact, probably the late 1700s.

Sweet corn from a local supermarket.

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Gene editing techniques like **CRISPR** allow researchers to **cut out bits of DNA to control traits**. Based on a natural process.

Differs from transgenic engineering:

- Doesn't introduce foreign genes (at least not yet),
- Plants practically indistinguishable from traditional selective breeds,
- Simpler, faster and cheaper to do,
- Not as tightly controlled by a few companies. Possibly more accessible.

Companies and researchers jumping on-board.

Regulators divided:
Europe's courts regulate gene-edited plants as GMOs; US does not regulate techniques that mimic natural processes. **Africa? SADC?**

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From smart cities to smart farms, using GIS, sensors (satellite, drone etc), IoT, data, AI…

E.g. FruitLook uses **satellite technology to provide weekly, semi-real time information** on crop growth, crop nitrogen and evapotranspiration deficits to fruit farmers in the Western Cape, allowing them to save on inputs like water, fertilizer and electricity.

Challenges include **prohibitive cost, low connectivity, lack of knowledge and skills**. This limits accessibility, uptake, use of these technologies.

Innovations:

- **Communicate advanced information** to farmers **using basic tech interface**.
- **Technologies** like LPWAN for IoT **overcome connectivity, energy, cost challenges**.
- **Business model innovation**.
- **Better risk modeling** allows for **innovations in credit provision and insurance**.

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Controlled environment agriculture (incl. indoor farming, hydroponics) holds the **promise of breaking free from seasonal/climatic limitations** that bind traditional farming. Could help to **localise food production**, esp. **in urban areas**.

To date, however, **only possible for certain niche crops**. While they use much **less water**, they are **very energy-intensive**.

Advances and solutions:

- **Energy-efficiency.**
- **Business model innovation**.

Substantial growth projected in future. Co-founder of Plenty: “we’re now at a point where the tech matches the need; technology has caught up with the vision”

Implications for Africa? SADC?

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RECOMMENDATIONS

- Infrastructure
- Anticipatory regulation/regulating for innovation
- Research/R&D
- ICT4D, Ag4D
- Business model innovation

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