Connected **agriculture.**

Agriculture is the foundation of developing economies.

As one of these economies, South Africa needs to ensure a healthy agricultural industry that contributes to the country's gross domestic product (GDP), food security, social welfare, job creation and ecotourism, while adding value to raw materials. But the health of the agricultural sector depends on the sustainability of farming methods. Farming practices must therefore not only protect the long-term productivity of the land but must also ensure profitable yields and the **well-being of farmers and farm workers.**

South Africa's population is growing at almost 2% per year. The population of 49 million in 2009 is expected to grow to 82 million by the year 2035. Food production or imports must more than double to feed the expanding population, and production needs to increase using the same or fewer natural resources. In addition, the demand for certain food types will shift as more people become wealthier.

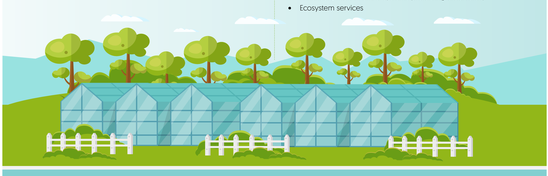
Sustaining **agriculture**

Sustainable agricultural practices **aim to:**

- Change the way land and water resources are managed, so that their long-term productivity is optimized and sustained
- Contribute to the economic and social well-being of all
- Ensure a safe and high-quality supply of agricultural products
- Safeguard the livelihood and well-being of farmers, farm workers and their families
- Maintain healthy, functioning agricultural ecosystems rich in biodiversity
- Mitigate and adapt to climate change

The benefits of sustainable farming **should be:**

- Reduced or predictable input costs
- Stabilized yields
- Reduced environmental pollution
- Reduced exposure to toxins
- Increased water use efficiency
- Living soils – increased soil fertility and/or nutrient-holding capacity
- Reduced soil erosion
- Carbon sequestration
- Enhanced, robust natural systems protecting biodiversity
- Ecosystem services



How technology yields **new growth**

Agriculture is seeing the birth of yet another revolution, at the heart of which lie data and connectivity

Artificial intelligence, analytics, connected sensors, and other emerging technologies could further increase yields, improve the efficiency of water and other inputs, and **build sustainability and resilience across crop cultivation and animal husbandry**

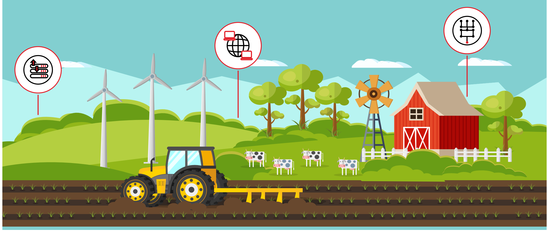
Current IoT technologies running on 3G and 4G cellular networks are in many cases sufficient to enable simpler use cases, such as **advanced monitoring of crops and livestock**

As connectivity increasingly takes hold, these tools will enable new capabilities in agriculture:

Massive Internet of Things (IoT)
Low-power networks and cheaper sensors will set the stage for the IoT to scale up, enabling such use cases as precision irrigation of field crops, monitoring of large herds of livestock, and tracking of the use and performance of remote buildings and large fleets of machinery

Mission-critical services
Ultralow latency and improved stability of connections will foster confidence to run applications that demand absolute reliability and responsiveness, such as operating autonomous machinery and drones

Near-global coverage
If LEO satellites attain their potential, they will enable even the most remote rural areas of the world to use extensive digitization, which will enhance global farming productivity

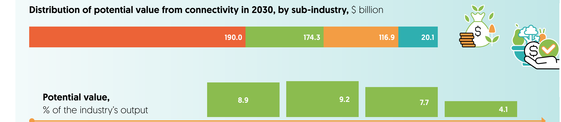


Connectivity spectrum and value proposition

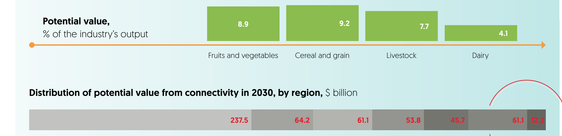
Short-range (eg RFID/Bluetooth)	LP-WAN (eg NB-IoT, LoRa, Sigfox)	Fiber / DOCSIS 3.x	Wi-Fi 6	Low-to mid-band 5G	High-band 5G (eg millimetre wave)	LEO constellation
Short-range, efficient, device-to-device connectivity, storage, and identification	Low-power, low-maintenance networks that support high densities of connected devices	High-speed, low-latency fixed networks that support other connectivity	Next generation Wi-Fi with improved speed, device density, and features to increase device efficiency	High-speed, low-latency cellular connectivity overlay on existing 4G infrastructure	Highest-speed, low-latency and highly secure cellular connectivity	Global coverage with significantly reduced latency vs existing satellite offerings
Assists produce growers to overcome spoilage issues. Using short-range technology, it is possible to monitor temperature and shelf life of perishable items at every stage of the cold chain, and allow both producers and buyers to be notified of custody and conditions of shipments.	Facilitates low-bandwidth data transmission over long distances. Considering that farms operate on typically large areas of land, LPWAN is perfectly poised to enable effective IoT solutions in the agricultural industry. **- Long term monitoring - Dense area coverage**	Fiber-optic internet is not susceptible to inclement weather conditions. Fiber Internet signals do not degrade due to electromagnetic interference.	Farmers can check data and conditions on their smartphones and tablets, and the system is compatible with other Wi-Fi-enabled technology. **- Real-time data - Low operational cost - Increased crop yield**	**Low:** This type of 5G can travel long distances, and when combined with midband and high-band frequencies, low-band 5G will be 10 or more times faster than 4G speeds. **Mid:** While midband 5G is wider than low-band 5G with more capacity to transport larger amounts of data, it can't travel as far.	To monitor soil moisture is designed to help improve yields while using less water. **It is estimated 5G will be able to connect 10 times the number of devices as 4G within a set area (like a farm), significantly increasing the data available to the farmer.**	This constellation helps monitor farmlands remotely.

Agriculture connectivity could unlock **more than $500 billion in GDP by 2030.**

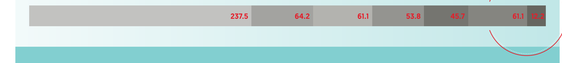
Distribution of potential value from connectivity in 2030, by sub-industry, $ billion



Potential value,
% of the industry's output



Distribution of potential value from connectivity in 2030, by region, $ billion



A number of advanced connectivity use cases have the potential to **radically transform many aspects of farming by 2030.**

Smart-crop monitoring
Connected irrigation and nutrient-distribution equipment based on connected sensor data and imagery analysis, aimed at optimizing resource usage and crop growth through real-time, precise, location-dependent adjustments.

Drone farming
Drone surveillance and remote interventions based on image analysis and connected sensors communicating with the drone could provide better remote monitoring of large areas and enable remote interventions to boost yield, reduce losses from pests, and optimize deployment costs.

Smart livestock monitoring
Individualized feeding-and-care plans based on connected-body sensor data and movement tracking, aimed at detecting illnesses early and providing each animal with its optimal feed and medicine mix to maximize growth.

Autonomous farming machinery
Self-operated machinery and robots able to perform targeted interventions based on connected-sensor data, GPS data, and imagery analysis, aimed at optimizing resource usage, reducing labor requirements, and boosting yield through more precise and individualized interventions.

Smart building and equipment management
Prescriptive maintenance and real-time environmental adjustments, aimed at improving performance and extending useful life of farm equipment and other assets, as well as decreasing risk of mold, fire and other threats.

Implications

- The specificities of the conditions faced by the agricultural practices in drylands systems are other contexts where the new technologies may offer relevant added value
- However, the new technologies and approaches related with the smart agriculture are **not exempt of risks and vulnerabilities**
- The new technologies and approaches bring **new solutions and perspectives**, but are not exempt of negative consequences for the sector and for the farmers
- Also, **some possible threats** underlie the application of these new technologies, most especially those linked with ethics, since aspect such as confidentiality or integrity might be at risk

For more information contact your Account Executive or click on Book a meeting.

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