



**Australian Government**

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**Department of Agriculture, Water and the Environment**

**National Youth Science Forum**

# History of Agricultural Revolutions

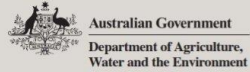
**Neolithic Revolution** – birth of agriculture over the past 10,000 years along plentiful river systems around the world from a warm stable climate since the ice age.

**The Age of Exploration** (1400-1600) - led to the movement of crops across the globe. Many of the crops grown today such as corn, beans, squash, potatoes, tomatoes, chocolate, peanuts and more originated from the Americas.

**Industrial Revolution** (1750-1900) – advances in crop rotation, farm enclosures, selective breeding and the triangular plough led to increased production that supported the movement of people to cities to work in factories.

**Green Revolution** (1960s) – the use of chemical fertilizers, increased mechanization and higher-yield crop varieties increased global food production by two and a half times

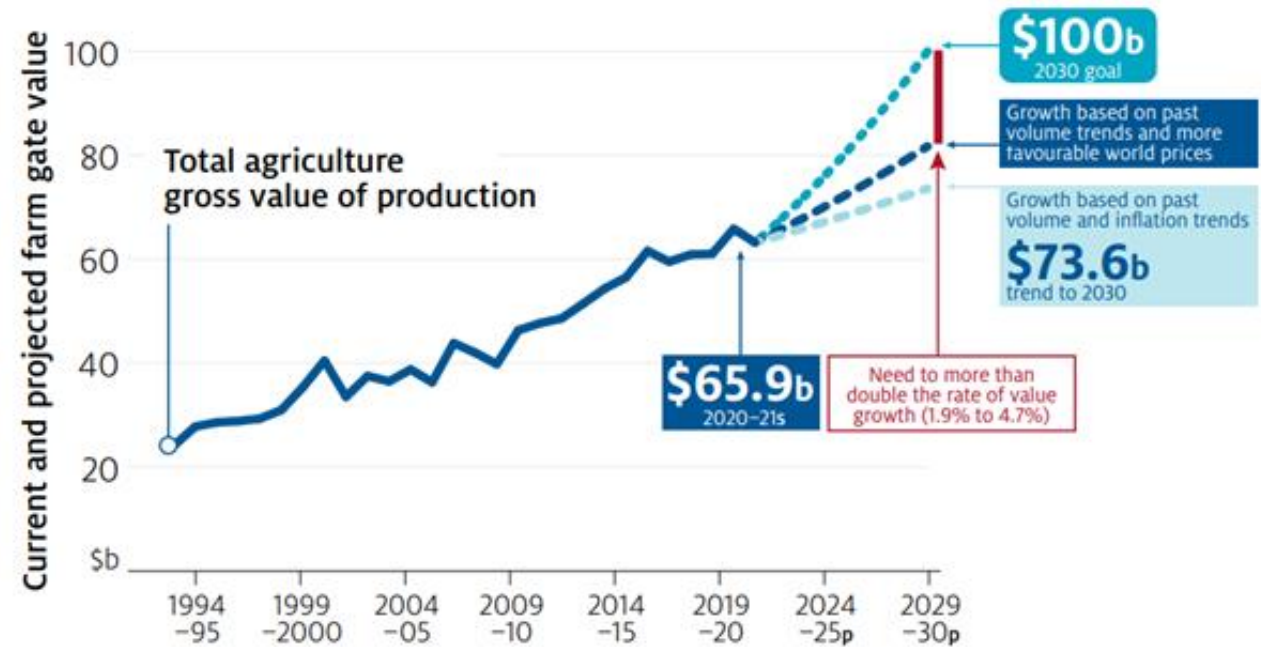
# The Ag2030 Challenge: Sustainable Intensification



## Delivering Ag2030

The Australian Government is setting the foundations for Australia's world-class farmers, fishers and foresters to rebound from COVID-19 and build toward the agricultural sectors' vision for a \$100 billion industry by 2030.

October 2020



Source: ABARES. Note: s Estimate. p Projection.

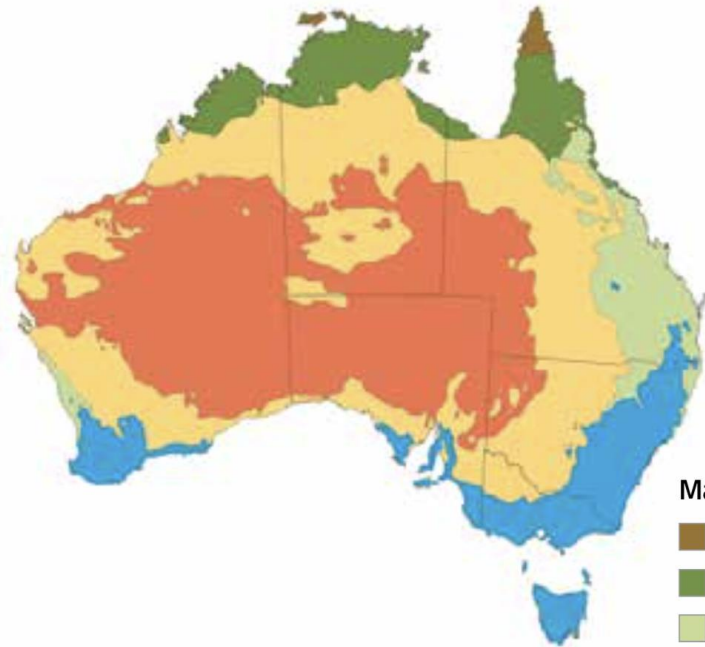
[www.awe.gov.au/agriculture-land/farm-food-drought/ag2030](http://www.awe.gov.au/agriculture-land/farm-food-drought/ag2030)

The Delivering Ag2030 plan sets 7 themes for action: trade and exports, biosecurity, stewardship, supply chains, water and infrastructure, **innovation and research**, and human capital

## **This challenge is not one challenge - it is many**

- **Climate Change**
- **Water conservation**
- **Protecting the Natural Environment**
- **Biosecurity**
- **New Emerging Markets**
- **Efficiency**

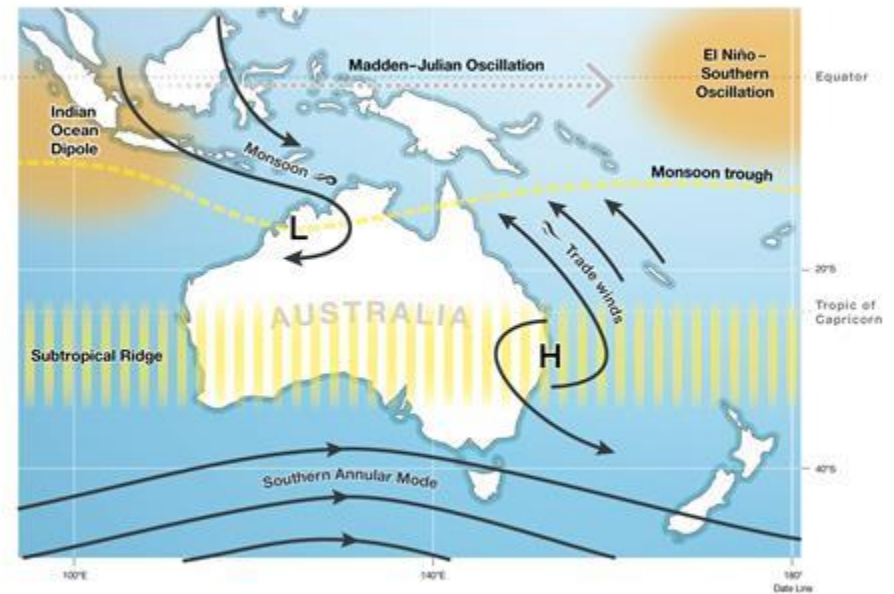
# Climate Change



- Major classification groups**
- Equatorial
  - Tropical
  - Subtropical
  - Desert
  - Grassland
  - Temperate

Image courtesy of the Bureau of Meteorology

## Australian climate influences





# Climate Change



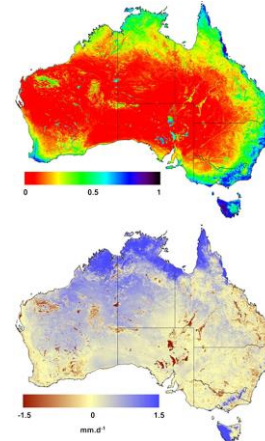
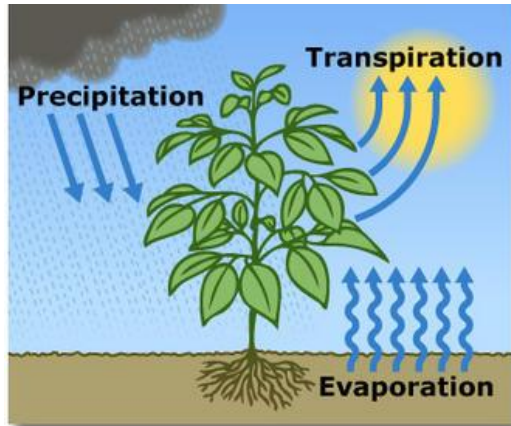
Doomsday seed vault, Svalbard, Norway (photo courtesy of Global Crop Trust). [Svalbard Global Seed Vault - Crop Trust](https://www.croptrust.org/en/seed-vaults/svalbard-global-seed-vault)



[www.awe.gov.au/agriculture-land/forestry/national/climate-change-research/adaptation](http://www.awe.gov.au/agriculture-land/forestry/national/climate-change-research/adaptation)

Research on new varieties for new climates

# Water Conservation



<https://blogs.worldbank.org/water/thin-air-and-seen-space-estimating-evapotranspiration-using-satellites>  
Measuring evapotranspiration with satellites



<https://cottonaustralia.com.au/cottons-water-use>  
More efficient water systems for agriculture, the environment and the community

[Explained: Water allocations and cotton - YouTube](#)



# Water Conservation

## Controlled Environment Agriculture (CEA)



[www.greencamel.com.au](http://www.greencamel.com.au)

Green Camel AgTech works by maximising the efficiency of product per litre of water and square metre used, the facility is compact and highly productive.



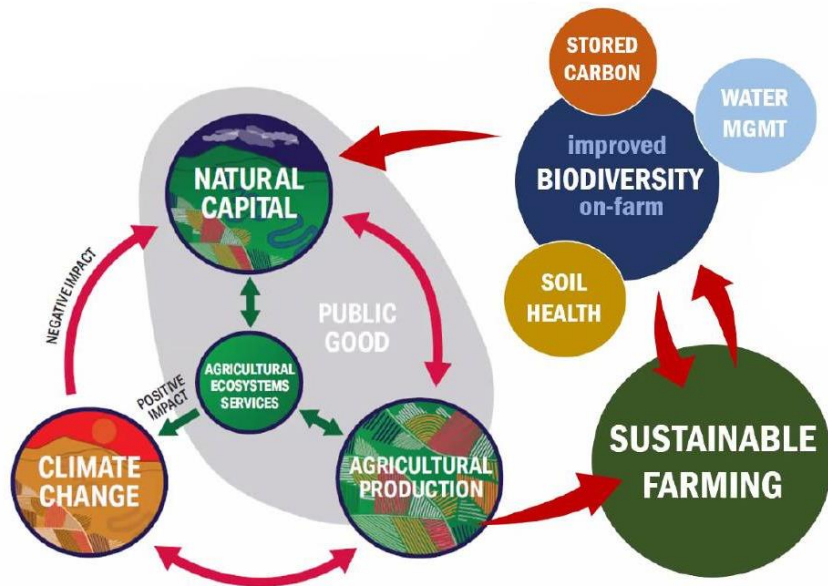
[www.thefarmermagazine.com.au/vertical-farming-a-revolution-in-food-production-that-more-farmers-are-adpating/](http://www.thefarmermagazine.com.au/vertical-farming-a-revolution-in-food-production-that-more-farmers-are-adpating/)

Vertical farming allows for small crops such as high-value lettuce and herbs to be grown inside within urban and peri-urban environments reducing the transport costs and risks of pest infestation



# Protecting the Natural Environment

## Supporting farmers to protect biodiversity



[www.awe.gov.au/agriculture-land/farm-food-drought/natural-resources/landcare/sustaining-future-australian-farming](http://www.awe.gov.au/agriculture-land/farm-food-drought/natural-resources/landcare/sustaining-future-australian-farming)

The Agriculture Stewardship Package is working to develop market arrangements and kick start private investment in farm biodiversity and other sustainability opportunities.

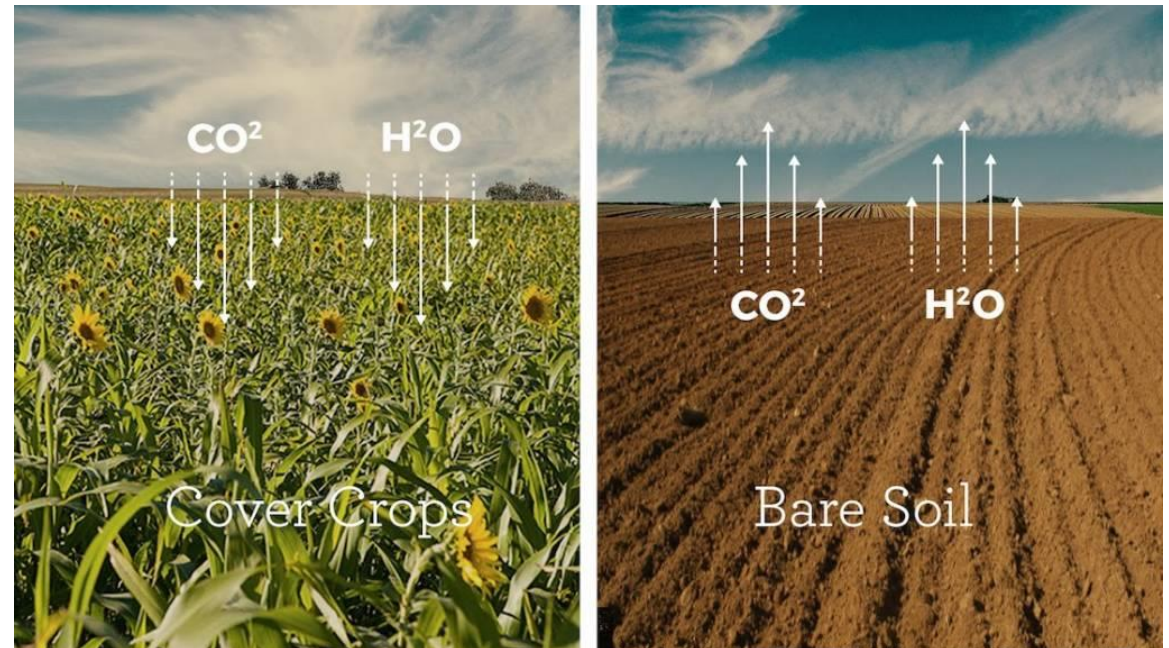
# Protecting the Natural Environment

## Regenerative Agriculture



<https://soilsforlife.org.au>

Soils for Life supports Australian farmers in regenerating soil and landscapes, to build natural and social capital, and transform food and fibre systems.



<https://regenfarmers.com.au>

Regenerative Australian Farmers assists Australian farmers to adopt regenerative agriculture practices and access benefits from the Australian Government's Emission Reduction Fund



# Biosecurity

## New Technologies to monitor and control pests

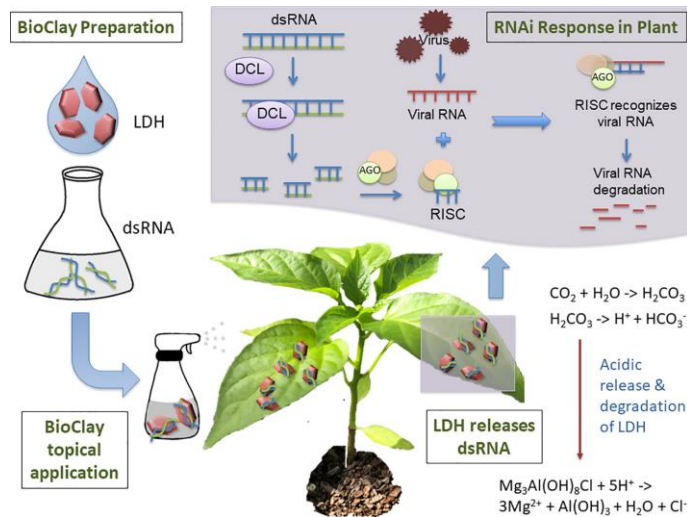


<https://imappests.com.au>  
Monitoring airborne pests and diseases to aid on-farm pest management



<https://eng.unimelb.edu.au/ingenium/water-security/monitoring-crop-growth-from-the-skies-above>

Drones and aircraft can help farmers check the health of crops and monitor for plant diseases



<https://qaafi.uq.edu.au/bioclaysustainablecropprotectionhub>

RNA-based bio-pesticides result in reduced chemical inputs, increased crop productivity, green credentials, sustainability, market access and capacity building, all of which will contribute to a more profitable and competitive food and agribusiness sector.



# Biosecurity



## New Technologies for biosecurity at the border

[www.invasives.com.au/news-events/our-edna-research-program-making-real-impacts-for-the-biosecurity-sector/](http://www.invasives.com.au/news-events/our-edna-research-program-making-real-impacts-for-the-biosecurity-sector/)  
eDNA is being used to track high priority plant pests



[www.awe.gov.au/biosecurity-trade/policy/australia/biosecurity-3d-x-ray](http://www.awe.gov.au/biosecurity-trade/policy/australia/biosecurity-3d-x-ray)  
3-D X-rays and advanced algorithms are being developed to automatically detect biosecurity risk material at airports



[https://haveyoursay.awe.gov.au/biosecurity-innovation/news\\_feed/the-plant-innovation-centre-at-post-entry-quarantine-pic-peq](https://haveyoursay.awe.gov.au/biosecurity-innovation/news_feed/the-plant-innovation-centre-at-post-entry-quarantine-pic-peq)

High Throughput Sequencing will allow dozens of genetic tests to be performed at a time improving detection of plant diseases so they are not allowed into the country.

## New Emerging Markets



### The potential of Wild Harvest Agriculture

[www.agrifutures.com.au/wp-content/uploads/publications/14-115.pdf](http://www.agrifutures.com.au/wp-content/uploads/publications/14-115.pdf)

Kakadu Plum is a growing wild harvest industry in Aboriginal communities



[www.cdu.edu.au/riel/research/australian-native-rice-commercialisation](http://www.cdu.edu.au/riel/research/australian-native-rice-commercialisation)

Can Australian native rice be wild harvested economically?

# New Emerging Markets



## Alternative building materials

[www.abc.net.au/news/rural/2019-12-08/carbon-neutral-hempcrete-homes-building-in-popularity/11769446](http://www.abc.net.au/news/rural/2019-12-08/carbon-neutral-hempcrete-homes-building-in-popularity/11769446)

Hempcrete, the combination of lime, water and hemp is being used to create eco-friendly homes



# New Emerging Markets

## Meat Alternatives: Plant-based meat & Cellular Agriculture



[www.theguardian.com/food/2021/sep/11/how-the-sausage-gets-made-the-serious-business-of-fake-meat](https://www.theguardian.com/food/2021/sep/11/how-the-sausage-gets-made-the-serious-business-of-fake-meat)

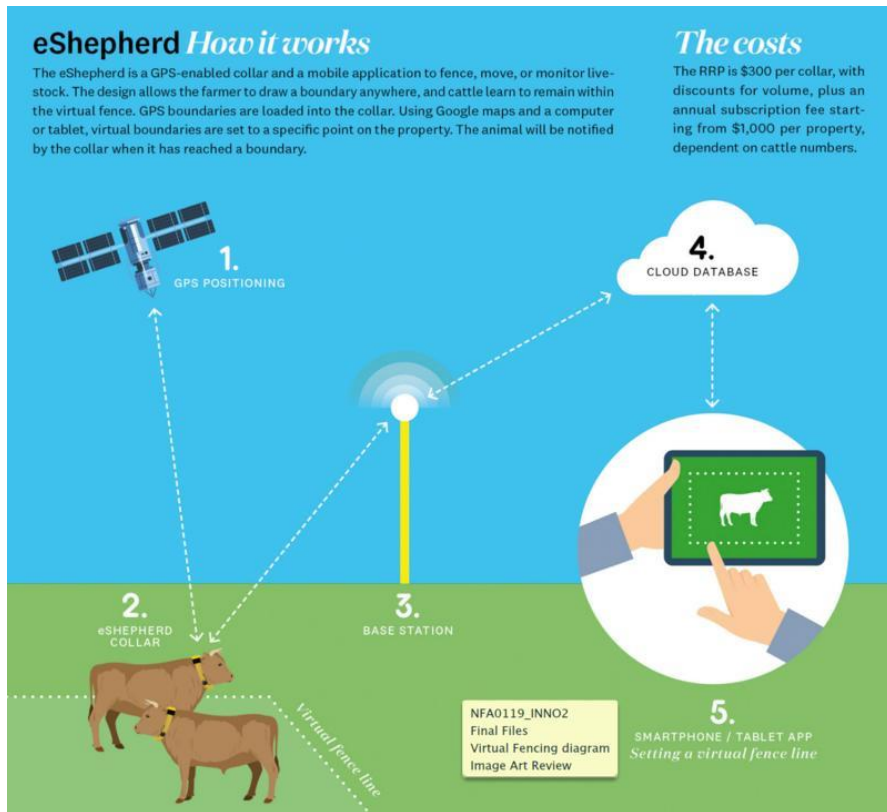
Animal-free meat alternatives are finding new economic markets

[www.cellularagricultureaustralia.org](https://www.cellularagricultureaustralia.org)

Cellular agriculture allows meat to be grown in a lab to build a more resilient food system

# Efficiency

## Fenceless farming



[research.csiro.au/livestock/our-focus/nutrition-and-welfare/esheperd-virtual-fencing/](https://research.csiro.au/livestock/our-focus/nutrition-and-welfare/esheperd-virtual-fencing/)

Virtual fencing allows greater freedom for animals and greater control for farmers

## Solar farming



Sheep grazing and solar farming (photo: University of Qld) [Australian-guide-to-agrisolar-for-large-scale-solar.pdf](https://www.cleanenergycouncil.org.au/wp-content/uploads/2017/07/Australian-guide-to-agrisolar-for-large-scale-solar.pdf) ([cleanenergycouncil.org.au](https://www.cleanenergycouncil.org.au))



# Efficiency

## New innovations for Energy Efficiency and Automation



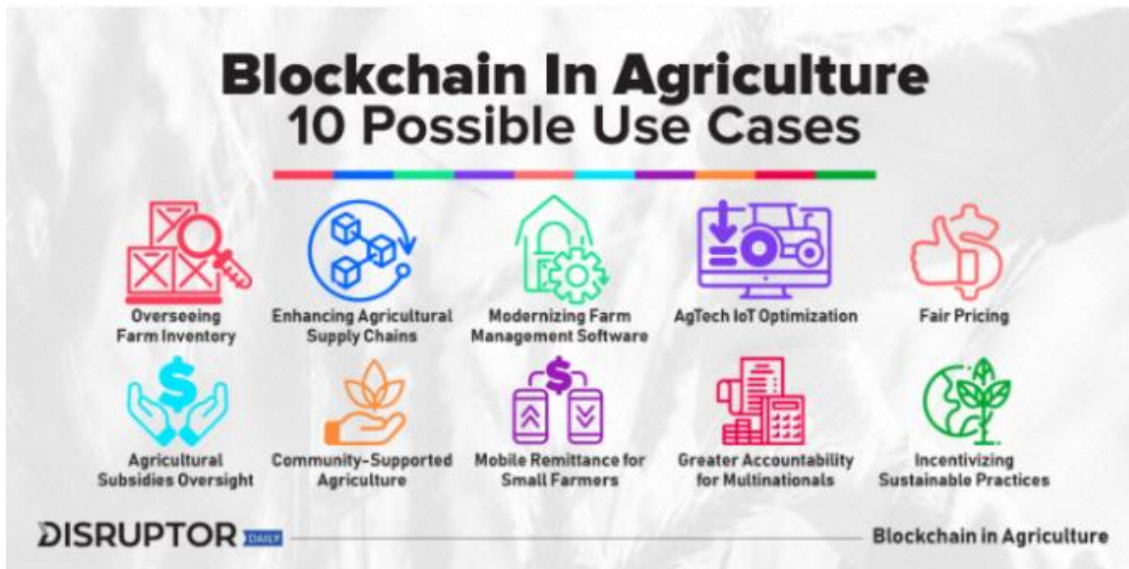
<https://interestingengineering.com/worlds-first-fully-electric-tractor-could-outclass-all-rivals>

The latest fully electric and autonomous tractor could prove revolutionary for the agricultural industry.



# Efficiency

## Blockchain and Internet of Things (IoT) technologies



[www.fao.org/e-agriculture/news/blockchain-agriculture-10-possible-use-cases](http://www.fao.org/e-agriculture/news/blockchain-agriculture-10-possible-use-cases)

Blockchain as a method of securely controlling and tracking data has many potential applications in agriculture

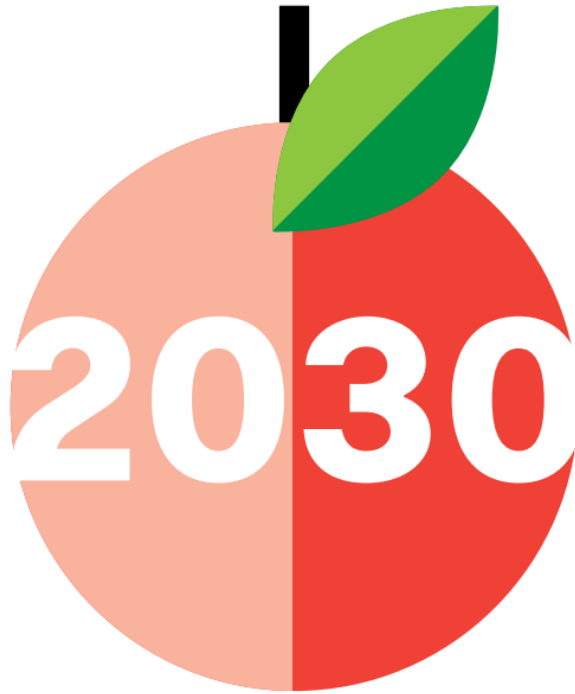


<https://agriculture.vic.gov.au/farm-management/digital-agriculture/internet-of-things-in-agriculture>

Internet of Things (IoT) technology allows devices such as pumps, sensors, and tractors to be connected to a network to provide information in real-time.

# Efficiency

## Reducing food waste



[www.awe.gov.au/environment/protection/waste/publications/national-food-waste-strategy](http://www.awe.gov.au/environment/protection/waste/publications/national-food-waste-strategy)

DAWE's National Food Waste Strategy includes examples of innovative Australian food waste solutions



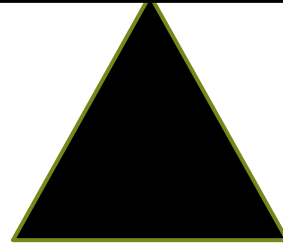
Here's just one example:

[www.naturalevolutionfoods.com.au/story/](http://www.naturalevolutionfoods.com.au/story/)

Queensland producers Natural Evolution Foods are transforming misshapen, oversized, spotted, unsaleable bananas into gluten-free banana flour and resistant starch dietary fibre.

**Intensification**

**Sustainability**



**Market Trends: Value in sustainability and quality**

**So how will farms look in the future?**

**How will we find the balance between  
intensification and sustainability?**



# There is not one solution, there are many

- **Climate Change:** plant genetic resources for poor growing conditions
- **Water conservation:** more efficient water systems
- **Protecting the Natural Environment:** regenerative agriculture practices and supporting farmers to protect biodiversity
- **Biosecurity:** new technologies to monitor for pests and treat pests directly
- **New Emerging Markets:** wild harvest agriculture, alternative building materials and alternative meat industries
- **Efficiency:** novel animal grazing, automation of machinery, new information technologies, waste reduction

## The Challenge

The challenge is for us to increase our farmgate production across Australia to \$100 billion dollars a year by 2030 sustainably and consistently.

This challenge requires a new agricultural revolution.

We need your ideas...

Develop a pitch  
Propose a new method  
Create an innovative idea

**Questions ????**