

A long-term view of Australian agriculture

History, future and lessons

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Past agricultural development brought great profit to rural Australia and contributed significantly to the national economy. However, it also led to negative impacts on land, water and biodiversity. Here we explore three possible futures for agriculture, and highlight some issues for ensuring future prosperity.

Water, water everywhere

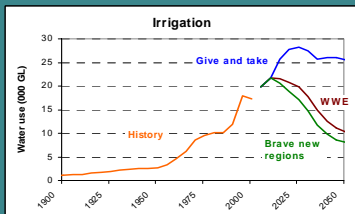
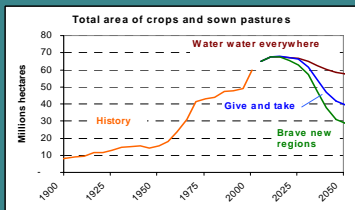
Invest in WUE of dryland cropping:
- increase yield & environment.
Expand crops in higher rainfall areas.
Land degradation slows its increase.
Decrease in area irrigated.
Increases in river flows and health.

Give and Take

Invest in irrigation infrastructure:
- north: reinvest, reform, reduce use
- south: EXPAND!
Reduce area of dryland agriculture.
Increases in land health, but
southern rivers remain stressed.

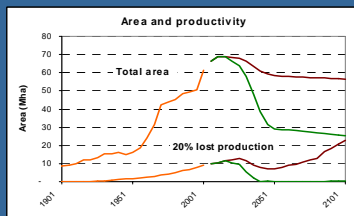
Brave new regions

Contract dryland and irrigated agriculture to most resilient areas.
Reinvent lower impact agriculture.
Develop novel landscape services.
Inc. land & river health and amenity.
Attract "non-rural" industries.



1. Can the past rate of growth in resource use be sustained?

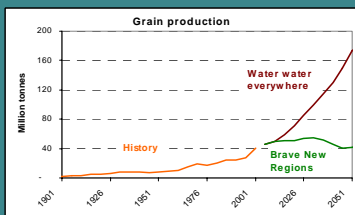
- For the last 150 years agricultural land and water use has doubled every 35 and 25 years respectively.
- This increase has been fundamental to past growth in production, but it cannot continue due to resource limits.
- Future growth in crop production must increasingly come from better use of available rainfall, higher rainfall cropping and more intense rotations.
- Could these changes be sustained, and what external impacts would they have the land, water and biodiversity?
- Alternatively, growth in *value*, rather than production could come from better management, retiring less productive areas, more resilient farming systems, developing the value of ecosystem services.



Total area of crops and sown pastures, and a measure of land degradation. The 100yr scenario period illustrates the insidious degradation with intensive use.

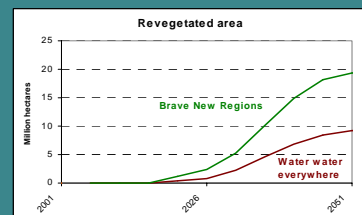
2. Future degradation

For the last 150 years half the cropping estate has been in use less than 35 years and *relatively* unaffected by soil degradation. In the future new additions can no longer dilute the aging stock of cropland, hence managing degradation could become a *greater* issue. This will affect the environment more than production, as new varieties, practices and increased inputs will probably more than compensate for yield losses.



3. Production vs the environment

By-in-large, more agriculture (graph above) gives more production (left), but leads to more degradation (above) and less opportunity to invest in biodiversity (right); This environment–production trade-off must be recognised, and can be addressed with novel institutions, eg environmental incentives & markets.



Scenario planning

This analysis was based on exploratory scenario planning techniques augmented by detailed physical modelling. We surveyed long-term and recent trends; recent economic forecasts for agriculture; past rapid changes; past and "emerging" and local and global drivers of change. Based on those analysis, and workshops, scenarios stories were devised and then iteratively modelled and revised.

Australian Stocks and Flows Framework

The scenarios were enumerated in the Australian Stocks and Flows Framework, CSIRO's highly disaggregated physical model of the Australian Economy. For agriculture it includes: 12 crop/pasture types, dryland and irrigation, inputs, 4 degradation types, 58 regions, a 140 year history period and 100 year scenario capability. Graphed outputs are 5-yearly averages.

