The future role of government in the Australian agricultural R&D system

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Australia's research and development landscape has changed over the past 50 years

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Australia's agricultural R&D receives more than $1.4 billion annually and contributes about 10 per cent to the country's national innovation system.

As well as benefiting from local investment, Australian agricultural R&D also profits from R&D performed overseas, known as international spillovers.

The overall increase in public investment in agricultural R&D in the past 50 years can be divided into two distinct periods:

Post-World War II expansionary phase until the late 1970s.

Slowing growth until present day.

The increasing tendency for public under-investment in agricultural R&D

Hesitancy from farmers to directly invest in agricultural R&D

Reasons include:

- Relative importance of Australian agriculture has been declining.
- Assumption that government cutbacks will easily be replaced by private research funding.

Reasons include:

- Long time lags between initial investment and observed benefits.
- Necessary funding is beyond the capacity of most small-scale farms.
- Public good characteristics of research

Increasing global public expenditure on agricultural R&D is being driven recently by middle income countries

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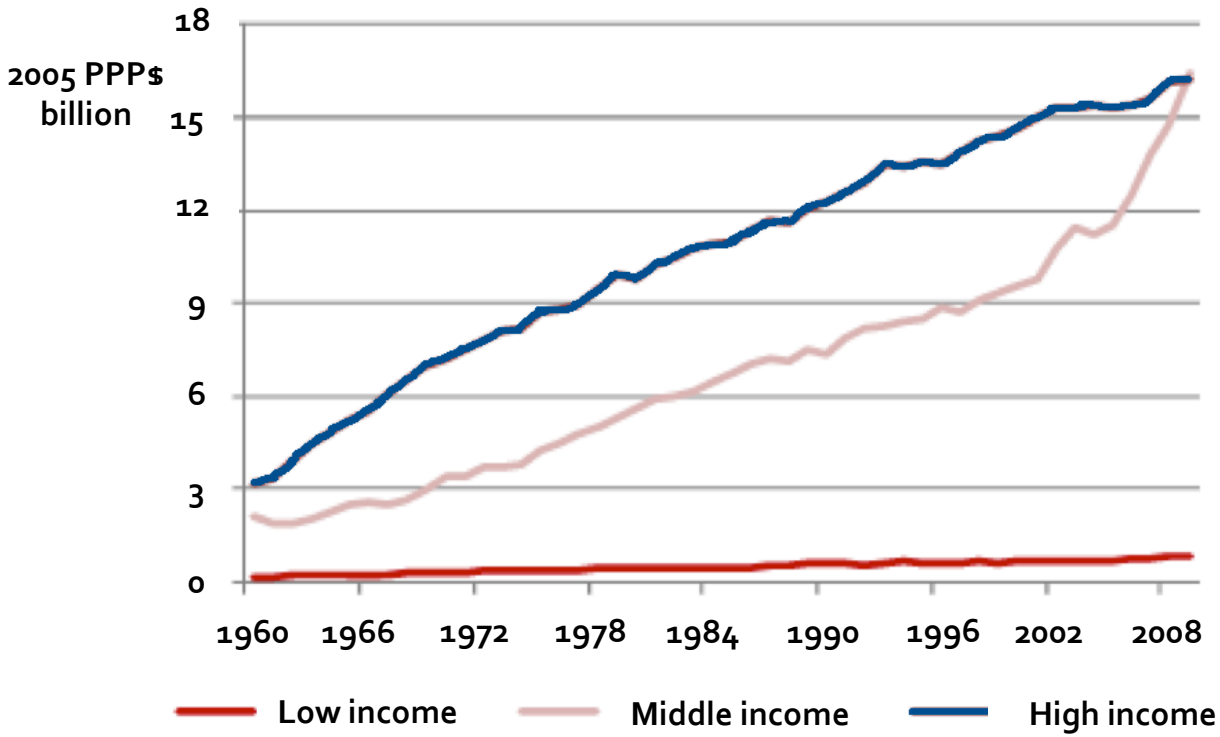
Global public expenditure on agricultural R&D



Between 1960 and 2008 world expenditure on agricultural R&D increased by $28 billion (2005 PPP), from 5.5 billion to 33.5 billion.

Despite evidence of agricultural R&D's relationship to productivity growth, real rates of annual agricultural R&D spending have begun to decline in many high income countries, including the United States.

In comparison, many middle income countries such as Brazil, India and China have increased their commitment to agricultural R&D. Brazil, India and China now contribute 34 per cent to global public agricultural R&D spending.

Lower income countries are falling further behind on agricultural R&D spending.

This also hinders their ability to utilise the spillover benefits from other countries.

The long time lags associated with R&D mean that the research investments affecting productivity growth in the near future would have been made in the previous decade(s).

However, we should still aim for a revival of agricultural R&D spending to improve productivity.

Pardey, Alston and Chan-Kang (2012)

Australian public spending on agricultural R&D is declining as a share of the value of output

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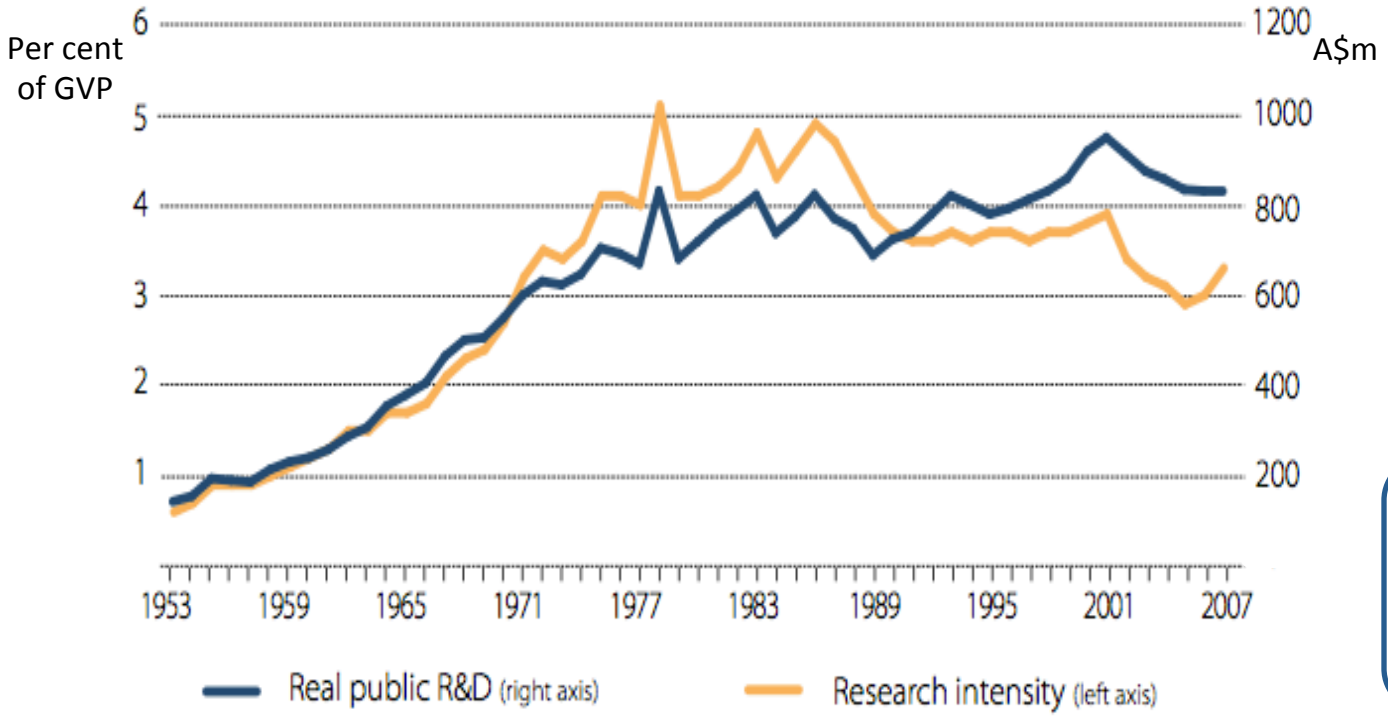
Real public R&D investment and research intensity in Australian agriculture



Until recently, more than 90 per cent of agricultural R&D in Australia was publicly funded, but it has since decreased to just above 75 per cent.

Private sector investment in Australia has strongly increased since 2000, to about 25 per cent.

The ratio of private to public investment remains below the OECD country average, where R&D expenditure is shared roughly equally between public and private sources.

In terms of investment value, over the past 50 years public investment in agricultural R&D in real terms in Australia has increased from $131 million in 1952-53 to $778 million in 2006-07.

While total expenditure on agricultural R&D has doubled from 1966 to 2007, since the 1970s the share of public expenditure in agricultural R&D has been steadily declining.

Research intensity (investment as a per cent of agricultural GDP) peaked at 5 per cent in the late 1970s but has since fallen, to just above 3 per cent. This reflects a decline in state government investment.

Sheng, Mullen and Zhao (2010)

Although agricultural production has not changed dramatically over time, the terms of trade exhibit a long term downward trend

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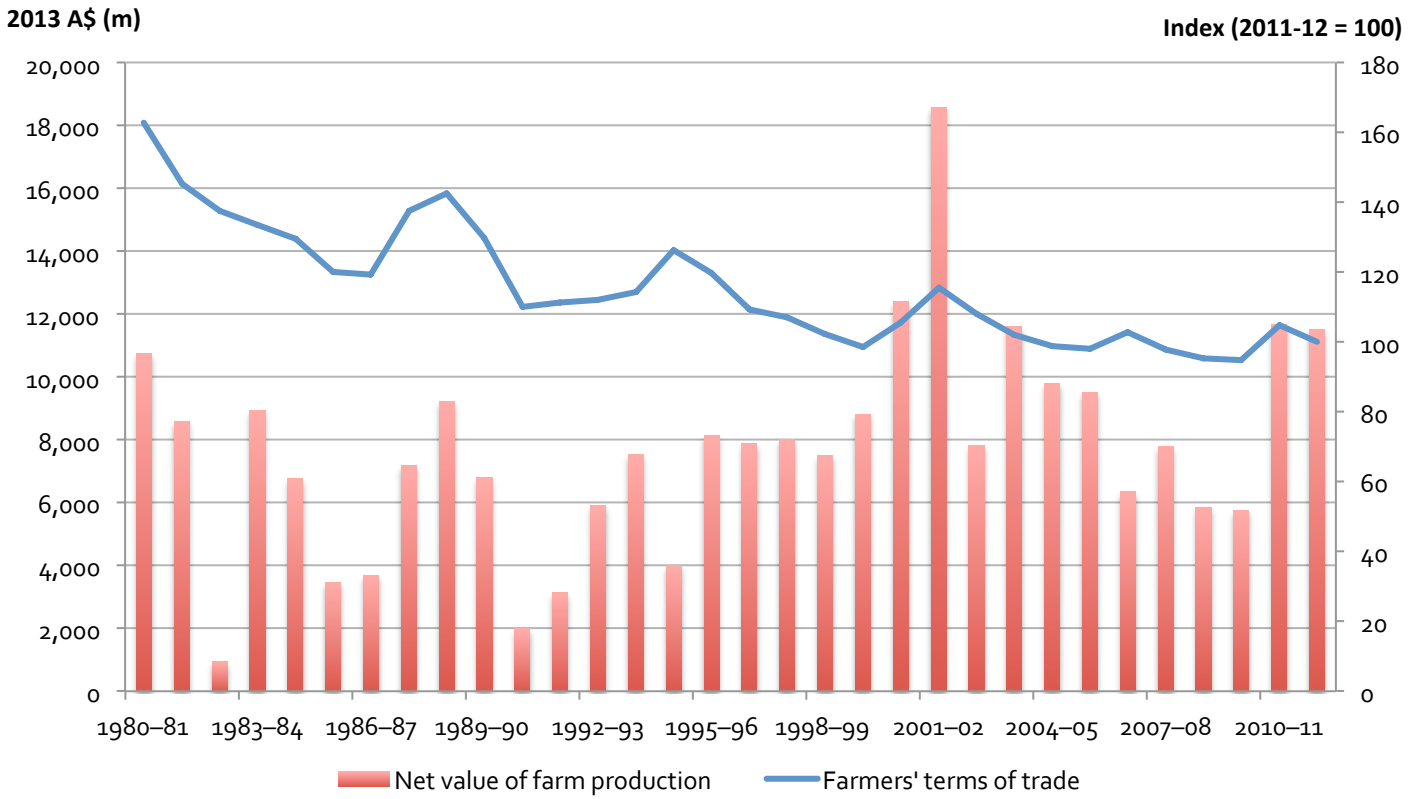
Terms of trade and net value of farm production in Australia



The farmers' terms of trade have decreased by 39 per cent between 1980 and 2008.

Strong productivity growth in agriculture has helped to offset this decline and has driven profitability.

Worsening terms of trade indicate that input costs rise at a faster rate than the farm-gate price farmers receive, but Australian farmers are price-takers and cannot individually influence these prices; this forces farmers to adapt in order to continue to operate.

Total factor productivity growth in Australian agriculture is strong but lags that of the United States

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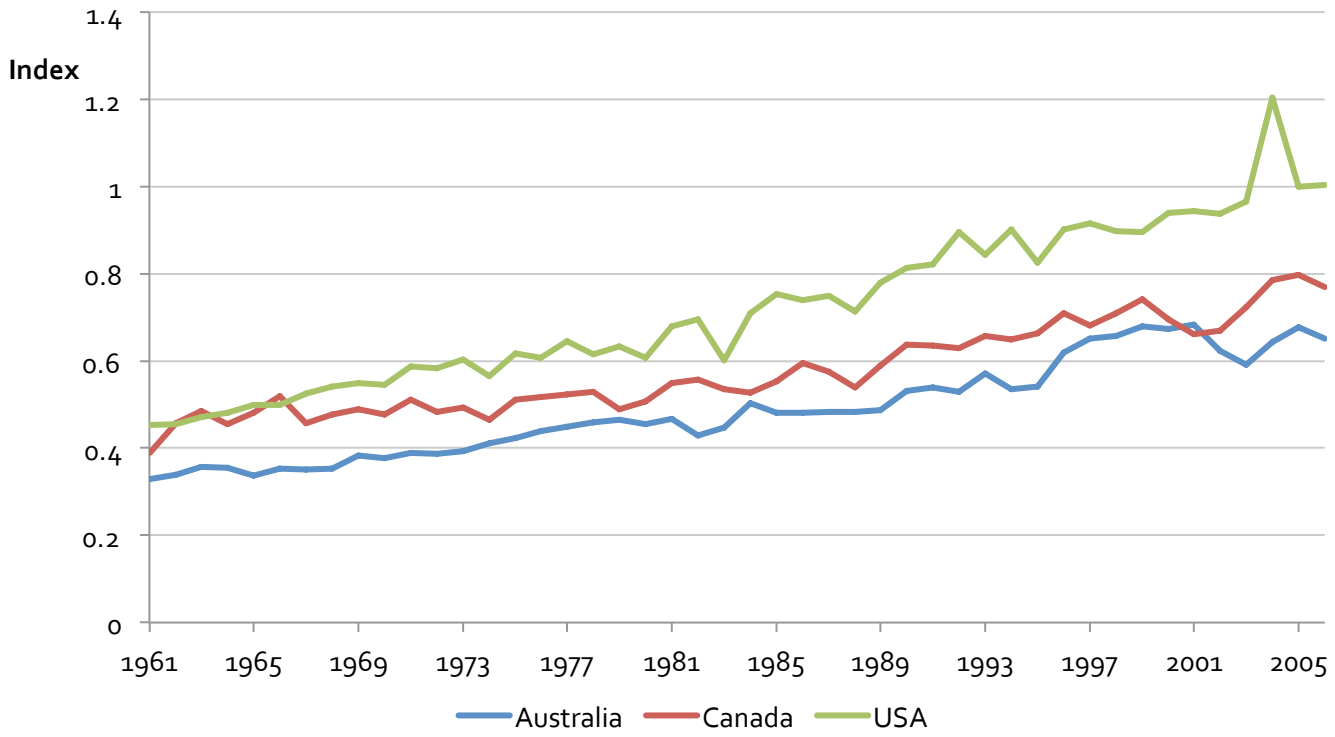
Agricultural total factor productivity levels: Australia, Canada and the United States



Australia's international competitiveness has decreased in comparison to the United States due to rising input costs in Australia.

However, agricultural productivity growth has helped to offset these costs.

Further pursuing productivity growth through the implementation of input saving technologies and processes will improve Australia's competitiveness.

Australia's agricultural TFP has been below that of the United States and Canada.

The annual growth rate of TFP between 1961 and 2006 was 1.6 per cent for Australia, behind the United States' 1.8 per cent and higher than Canada's 1.2 per cent.

Private sector investment in agricultural R&D has played an important role in the United States' TFP growth.

Being a smaller nation, Australia relies more on public agricultural R&D investment and international spillovers.

Sheng, Nossal and Ball (2013)

Productivity growth has increased the real gross value of agricultural production in Australia over time

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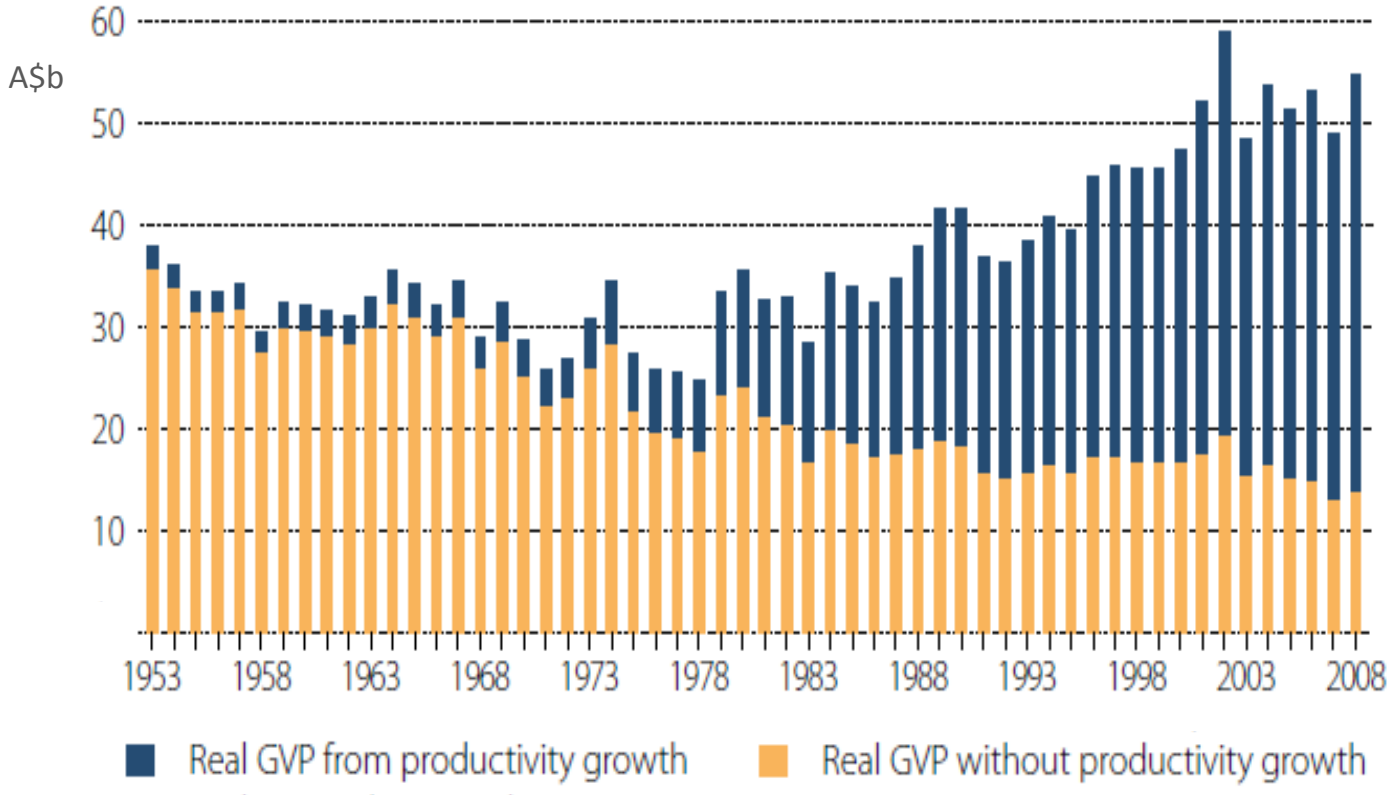
Contribution of productivity growth to the real gross value of agricultural production in Australia



Improvements in agricultural productivity growth result from:

- Product innovations (for example new crop and livestock types and breeds).
- Process innovations (for example new cropping equipment, improved weed, pest and disease management and better irrigation and water use).
- Organisational innovations (for example new approaches to labour use).

There is a positive correlation between investment in agricultural R&D and productivity growth.

More than two-thirds of the current real value of Australian agricultural output can be attributed to the rapid productivity growth that has occurred since the early 1950s.

Public and private investment in agricultural R&D has kept productivity growth rates in agriculture high.

Sheng, Mullen and Zhao (2012)

Agricultural productivity growth may be hindered by a steep rise in the average age of farm owners and managers but the age of farm workers is more balanced

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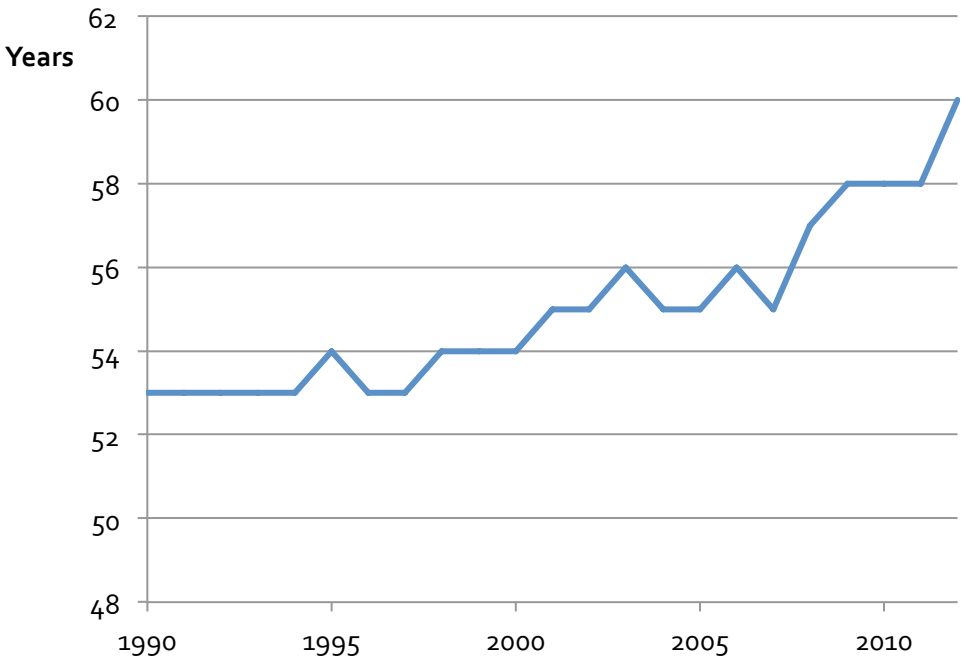
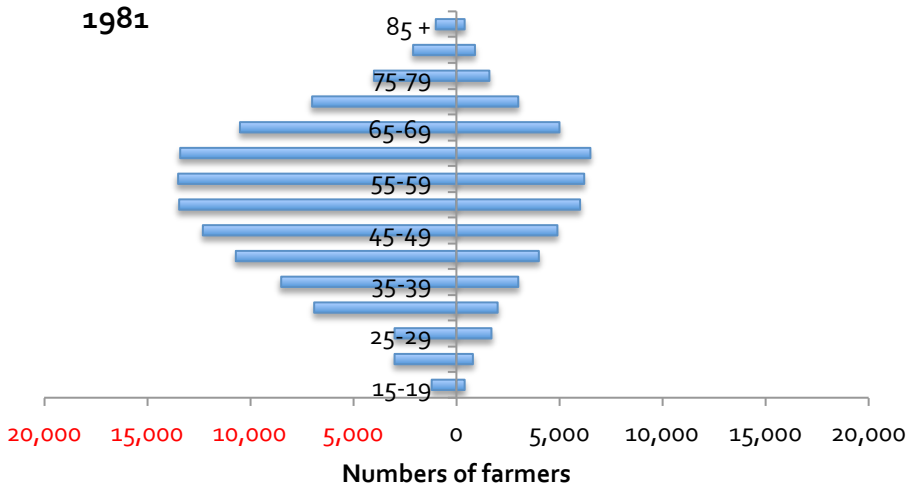
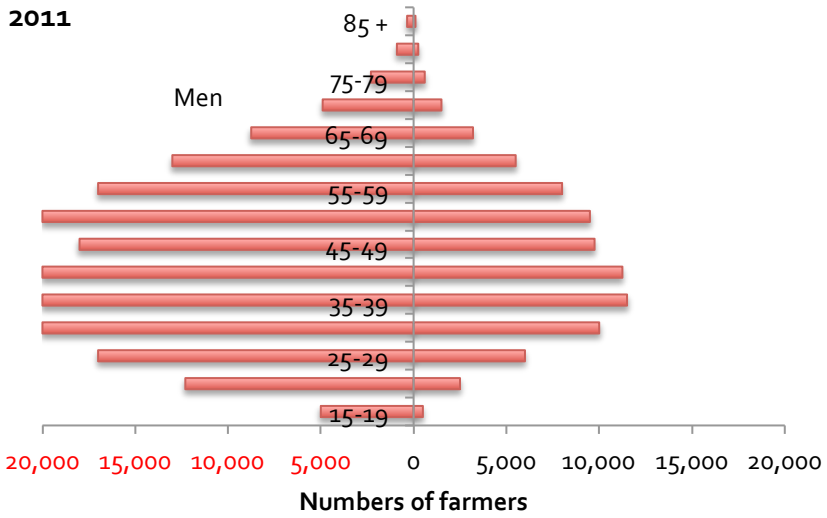
Average age of farm owner/manager



Farm worker demographics





The average age of farmers has been steadily on the rise since 1980.

While not always the case there is a tendency to become less adaptable and to resist new ways of doing business as age increases beyond a certain point.

Consequently, farm population demographics may be exerting a negative effect on innovation in agriculture.

Data source: ABARES (2013)

Agricultural productivity may also be hindered relative to other industries by the level of educational attainment in the farm community

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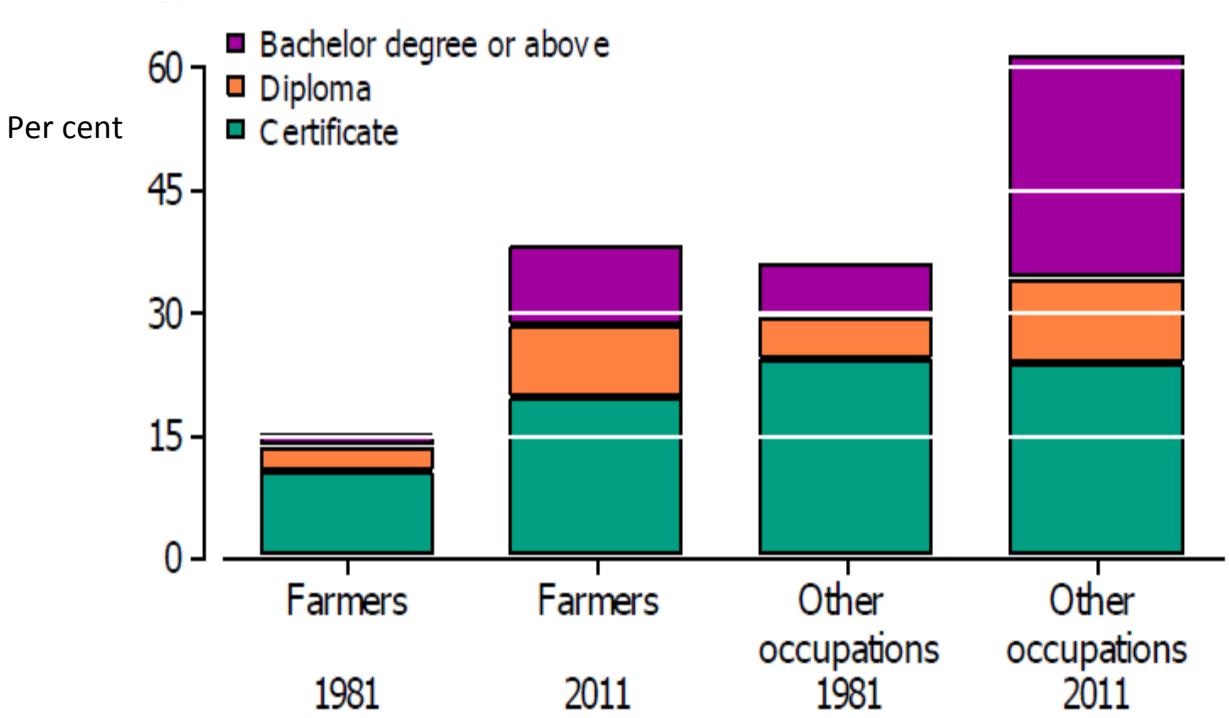
Non-school qualifications by occupation



As international spillovers are important to Australia it is imperative to maintain a high level of education so that R&D improvements can be utilised.

The absorptive capacity associated with increased education and knowledge may also increase the uptake of international spillovers.

While there has been an increase in the number of farmers with higher education qualifications over the past 30 years, agriculture still lags behind when compared to other occupations.

Australian agriculture is also behind international competitors in terms of educational achievement and below the national average across all industries for secondary and tertiary education.

Australian Bureau of Statistics (2012)

We have seen that R&D has a positive effect on agricultural productivity, but investment is stagnating. So what needs to be done?

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- As the resources boom slows and governments struggle to bring budgets back into surplus there is less prospect that governments will commit more funds to agricultural R&D in the foreseeable future.
- University agriculture faculties and research institutes are also under funding pressure.
- Therefore we need to establish an agricultural R&D model that employs available funds more effectively, rather than relying on/hoping for increased funding.
- This could be achieved by focusing the research effort into a few key research institutes where economies of scale can be attained and utilized. Is it possible to obtain agreement to rationalise agricultural teaching and research in Australian universities?
- Or should we encourage the establishment of two or three private research institutes that focus on the highest priority areas in agriculture, exploited economies of scale and work closely with key universities but are independent of the higher education system?
- The private research institutes would be owned by the agricultural industry but be governed by professional and independent boards.
- Cooperation and strong linkages between the institutes would avoid doubling up on research areas and increase positive outcomes. RDCs would continue to make their own choices about where to spend their research dollars but over time (assuming that the new institutes were competently managed) we might expect the RDCs to direct a growing share of their funds to the industry owned research providers.