INFOCUS

MAY
2017

AGTECH — ADVANCE AUSTRALIA AGRICULTURE

Digital change has been building in all aspects of our global economy for many years – including across Australian agriculture. There is extensive buzz around AgTech and its implications for our already booming agriculture industry. In 2016, there was a total global investment in AgTech of $3.2 billion and a 10% increase in global AgTech Venture Capital deals in a single year.

WHAT IS AGTECH?

Australian agriculture will see fundamental and unprecedented change over the next twenty years, brought on by a convergence of several factors:

- The rapid development of new technologies;
- The growth in use of data analytics;
- The unstoppable growth in demand for food and fibre by growing populations, particularly in rapidly modernising Asian markets;
- The upsurge in capital flows into the agri sector;
- The growth in consolidation of Australian farms;
- The relatively slower development of competing agricultural regions to hit forecast production levels;
- Australian agriculture's attractiveness to global partners and investors, though political stability, low exchange rates, and a world leading innovative industry.

The development in agricultural technologies will bring unprecedented change across the entire supply chain. Arguably, this will bring a great degree of change than the green revolution from the 1930's to the 1960's, where the growth of herbicides, pesticides and fertiliser saw agricultural productivity rise rapidly.

Examples of potential AgTech advancements include:

- **Big data:** Collection of available data on a range of factors including climate, yield, risk, offtake, commodity markets and forecasting to improve business decision-making and risk management;
- **Robotics and automation technology:** Automated steering technology and high precision positioning systems;
- **Imagery and sensors:** Soil and crop health data collected through sensors, remote systems and geo-mapping;
- **Digitisation and big data analysis:** Climate and soil predictions, optimisation of equipment performance, field monitoring;
- **Bio-engineering:** Seeds and chemicals to suit specific farm and/or climatic conditions;
- **Online retail:** Rising internet penetration and ecommerce sales is expected to grow; online grocery market, although smaller in size, is forecasted to grow by over 20% per annum in China, Australia & USA over the next five years;
- **Blockchain technology:** A unalterable, distributed database to record chain of custody and transactions which allows quick and seamless transfer of commodities;
- **Real-time financing:** Ongoing monitoring of livestock and crops allows greater leveraging of equity in commodities as well as being able to trigger sell orders in the paddock.

While the impact of AgTech across the agricultural supply chain is seemingly boundless, including the use of big data to bring producers and consumers closer together, growing access to capital and finance, and lowering producer risks, there are also clear and concrete benefits for on-farm productivity.

As Australian farmers facing the challenge of growing production and productivity in emerging economies, the need to continue to increase on-farm production and lower costs – or improve productivity – is becoming increasingly important. On-farm technologies such as robotics, sensors, genetic technology and the growing use and adoption of precision farming are all likely to play a role in helping Australian farmers access higher levels of productivity - and profit.

TRENDS IN PRODUCTIVITY IN AUSTRALIAN AGRICULTURE

Since the early 1900's, productivity in the Australian agriculture, forestry and fisheries sector has increased more than any other sector in the Australian economy, followed by the financial services and wholesale trade sectors. While productivity in agriculture is volatile due to seasonal conditions and global markets, the long-term trend prior to 2000 was to increasing productivity. However that trend has faded. Agriculture is the now only sector, apart for mining where productivity is lower in 2015-16 than it was in 2000. This trend is put down to a continual decline in farmers' terms of trade, representing a relative increase in input costs compared to prices received for outputs.

While labour inputs have continued to fall, and capital input has increased, the combined input by both capital and labour have remained relatively stable since 2000. Similar to the experience of other developed agriculture sectors, productivity has stemmed partially from the increased and improved use of intermediate goods. However multifactor productivity has increased by more than either the gross output index or the combined inputs index, indicating that another factor has played a significant role in the improved productivity of Australian agriculture from the 1960's to early 2000's.

By industry, productivity increases were strongest in the cropping industry in the 1980's, beef in the 1990's and sheep and dairy in the 2000's. However the catalyst for these productivity gains in each of these industries differs greatly, ranging from industry deregulation to lower trade barriers. For instance, the removal of the wool price reserve scheme in the 1990's resulted in an increase in cropping output and large declines in productivity in the sheep industry. Recent productivity in the sheep industry has come through lower output levels based on an even larger drop in inputs.

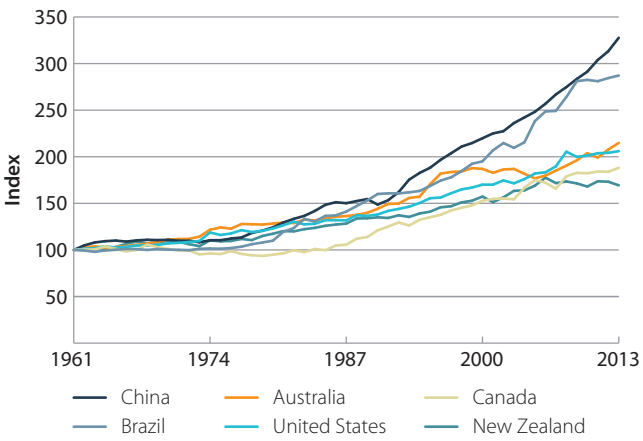
AUSTRALIAN AGRICULTURE ON A GLOBAL SCALE

Australian agricultural productivity has performed well against its global counterparts in recent years and since the early 1960's, has increased marginally more than other major developed nations up until 2013. While Australian productivity declined slightly relative to other developed nations during the early 2000's, in recent years productivity relative to other developed nations has grown strongly. However productivity growth in the emerging economies of Brazil and China has increased dramatically in comparison since the early 1990's.

In both emerging countries and developed agriculture industries, productivity has come through the increase in output, rather than a decline in inputs. However in developed nations, there has been a noticeably slower increase in inputs than in emerging economies.

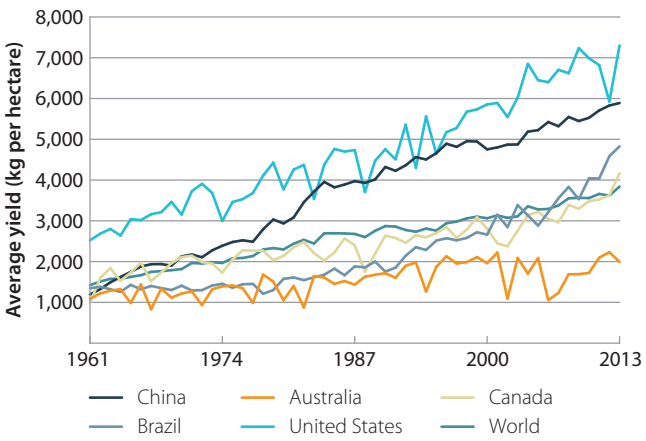
However while Australia's overall food production levels, particularly livestock, are strong, growth in yield in Australian cereal crops (wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains) is lagging other countries, indicating that increases in harvests have come primarily through expansion in cropping land. This is also, in part, due to the persistent yield gap between different cropping and seasonal areas in Australia.

TOTAL FACTOR PRODUCTIVITY



Source: USDA

CEREAL YIELD



Source: OECD

TECHNOLOGY'S CONTRIBUTION TO AGRICULTURAL PRODUCTIVITY IN AUSTRALIA

It has been well documented that there have been many changes to Australia's economy which have heavily impacted and increased productivity in agriculture, including the deregulation of commodity markets; research and development; and the lowering of trade borders leading to greater competition with lower cost producers.

What is not often asked is how have those productivity gains been achieved and what role has improving technology played? Productivity statistics from the Australian Bureau of Statistics show an ongoing gap between change in gross outputs, and change in combine labour, capital and intermediate goods indicating gains were made from improvements in processes, methods and technology.

Productivity gains in agriculture are often linked to economies of scale stemming from farm consolidation. According to ABARES, productivity gains from the reallocation of resources from smaller less efficient farms to larger farms accounted for over a third (34.5 per cent a year) of broadacre productivity growth between 1989-90 and 1999-2000 and two-thirds (66.7 per cent a year) between 1999-2000 and 2009-10, partly offsetting the effects of declining on-farm productivity.

However further research has found farming is a constant, or possibly decreasing, returns to scale industry, meaning that productivity gains would not actually result from farm consolidation alone. Instead, productivity gains are a result of greater access to technologies such as cropping machinery or dairy shed technology which comes with larger farms and more secure cashflows (Sheng et al. 2011). In short, productivity increases in agriculture have been driven primarily by technology.

ANZ analysis shows that:

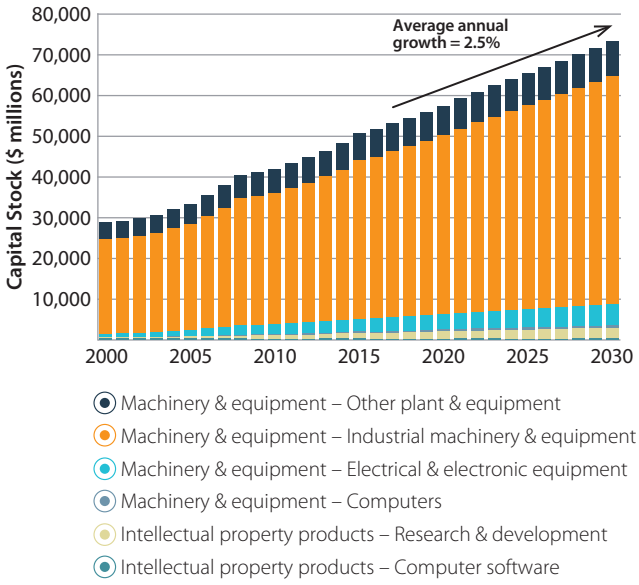
- Since 1995-96, 62% of increase in output is not a result of increases in inputs, and can be attributed to consolidation leading to greater access to technology;
- For every 1% increase in capital in the agriculture industry, there is a 1.5% increase in technology-based productivity gains.

GROWTH IN TECHNOLOGY IN AUSTRALIAN AGRICULTURE

The current uptake in 'technology' related capital in Australian agriculture (including electronic equipment, industrial machinery, computers and intellectual property) is growing at a faster rate (2.5%) than the increase in overall capital which includes other assets such as sheds, silos or transport machinery (0.5%), showing a growing interest and recognition of the benefit of a range of new technologies.

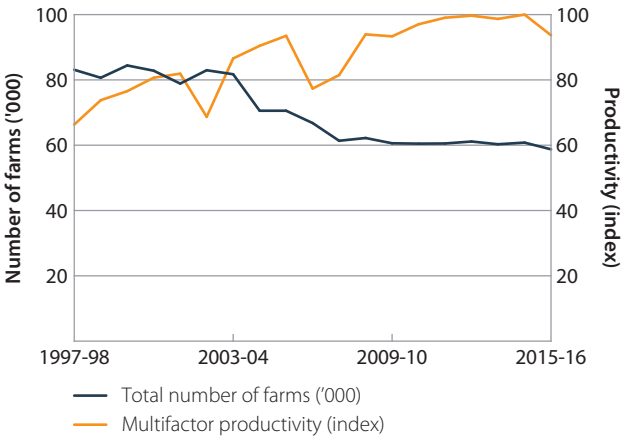
At the current rate, Australian farming is on track to increase technology-related capital stock almost 42% by 2030 to $73.3 billon.

FORECAST UPTAKE IN TECHNOLOGY-RELATED CAPITAL STOCK



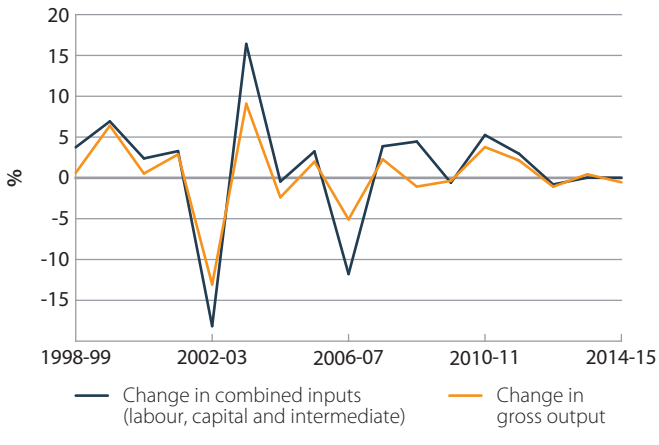
Source: ABS

FARM CONSOLIDATION AND PRODUCTIVITY



Source: ABS

AGRICULTURAL INPUTS AND OUTPUT



Source: ABARES

What could this uptake in capital, and technology related capital, mean for Australian agriculture? What if future capital investment resulted in even greater productivity gains – or is investment misdirected?

ANZ analysis has looked at three different capital growth scenarios, productivity growth and global demand for food to analyse the impact of technology on productivity and the Australian farming sector and our share of exports to 2030.

ANZ MODELLING – INCREASING CAPITAL AND PRODUCTIVITY IN AUSTRALIAN FARMS BY 2030

	Base Case	Moderate Case	Aggressive Case
Capital stock growth	0.5% p.a.	1.0% p.a.	1.5% p.a.
Global demand for food	0.9%	1.4%	1.9%
Productivity growth	1.0%	2.0%	3.0%
Australian Agriculture Sector by 2030			
Gross Value-added	$73.9B	$85.1B	$97.6B
Cumulative Value-added growth	$177.0B	$293.4B	$417.5B
Share of global exports	1.5%	1.8%	2.1%

SIZE OF VALUE-ADDED BY INDUSTRY BY 2030

	Base Case	Moderate Case	Aggressive Case
Dairy	$4.51B	$5.2B	$6.0B
Grains	$14.6B	$17.0B	$19.6B
Beef	$16.1B	$18.6B	$21.5B

anz.com

Australia and New Zealand Banking Group Limited (ANZ) ABN 11 005 357 522. 05.2017 21518