Economists’ thoughts on WA broadacre farming towards 2020

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Abstract

Farm businesses in Western Australia face a range of opportunities and challenges towards 2020. In the near term is the serious challenge of cost inflation and price volatility. In some regions this challenge comes atop a sequence of already poor years. In all regions in the longer term is the spectre of a changing climate and more expensive energy. Energy-intensive and trade-exposed broadacre farming will experience the challenges and opportunities afforded by new carbon markets. More farms are likely to become spatially diversified and flexible; to capitalise on seasonal, enterprise and market opportunities, whilst spreading risks. Greater separation of land ownership from land management is likely. Making farming in dry inland areas socially attractive will remain problematic as well access to affordable skilled and unskilled labour. Maintaining the human infrastructure support for agriculture will be both an opportunity and a challenge. In the near term there is an urgent need for R&D to deliver productivity gain to lessen the rate of increase in the unit cost of production of agricultural commodities. In the longer term successful R&D will remain crucial to agricultural productivity and prosperity.

Introduction

When we last reported our views on the current state and possible future of broadacre agriculture in Western Australia (Kingwell & Pannell 2005) we considered that in coming years the downward trend in the number of broadacre farms would continue with most remaining farms continuing to be profitable, due in significant part to successful R&D. We thought that many broadacre farms would continue to be highly diversified and that uncertainties about price trends would emerge due a range of influences such as changing energy costs, changes in agricultural protection, changes in agricultural productivity and impacts of unfolding climate change.

Of no great surprise to us, some issues have already emerged that we failed to predict, overlooked or gave little prominence to. We did say that “we recognise that changes unforeseen, at least by us, are likely to play important roles” and that “some of the future changes will not be predicted”.

So what are the current trends, including those we failed to foresee? What are the drivers anticipated to affect the nature of broadacre farming in the future? And how is broadacre farming in Western Australia likely to evolve? These are the questions briefly touched upon in this paper. The structure of the paper is to address each of these questions in turn; current trends, future drivers, and then some speculations.
Current Trends

A majority of the farm businesses in Western Australia remain profitable (BankWest 2007). In spite of several poor seasons in the 2000s in many agricultural districts, farm businesses in the broadacre region of Western Australia averaged a rate of return to capital of around 2% over the period 1999/2000 to 2006/7 (BankWest 2007). The top 25% of farm businesses averaged a rate of return to capital of 10% over the same period.

Across many parts of the broadacre region, rapid appreciation of farmland values has occurred during the 2000s (see Figure 1). This capital gain is a major boost to the wealth of farm owners who purchased some or all of their farmland in the 1990s or very early 2000s. Landgate data show that broadacre farms in Western Australia achieve average rates of capital appreciation typically 5 - 8% per annum (see Figure 2). For example, the shires of Esperance (Salmon Gums), Mingenew, Cunderdin, Mt Marshall and Williams shown in Figure 2 recorded compound growth rates in farmland values of 9.6, 8.8, 7.1, 5.2 and 4.2% per annum respectively over the period 1985 to 2006.\footnote{Based on fitting an exponential growth curve.}

![Figure 1: Distribution of rates of capital appreciation of farmland in broadacre shires of Western Australia: 1985 to 2006](image)

Source: A normal distribution fitted to calculated rates of capital appreciation of farmland in broadacre shires of Western Australia: 1985 to 2006. The time series farmland price data were supplied by Landgate.
Although broadacre farming in Western Australia has been profitable for most businesses, there has been a slow but steady decline in the number of farm businesses. There are now around 7913 farm businesses in the broadacre (wheatbelt) region (ABARE, 2007). The bottom quartile of farm businesses remain under sustained financial pressure and many of them will eventually leave the industry. BankWest (2007) data, for example, show that the bottom quartile of broadacre farm businesses in Western Australia generated a rate of return to capital of -10.1% per annum in 2006/7. Average equity for this group was 73%, so even if they are forced to sell up, many will have sufficient equity to greatly ease their family’s transition. The spread of farm equity, along with other measures of farm financial health for broadacre farming, are shown in Table 1.
Table 1: Distribution of broadacre farm performance in Western Australia: 2004/5 and 2005/6

<table>
<thead>
<tr>
<th>Equity ratio at 30 June</th>
<th>2004/5</th>
<th>2005/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 per cent</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>90 – 100 per cent</td>
<td>40</td>
<td>36</td>
</tr>
<tr>
<td>80 – 90 per cent</td>
<td>12</td>
<td>17</td>
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<tr>
<td>70 – 80 per cent</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>60 – 70 per cent</td>
<td>7</td>
<td>11</td>
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<tr>
<td>Less than 60 per cent</td>
<td>8</td>
<td>6</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Farm capital at 30 June</th>
<th>2004/5</th>
<th>2005/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $500 000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$500 000 to $750 000</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>$750 000 to $1 000 000</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>$1 000 000 to $1 500 000</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>$1 500 000 to $3 000 000</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>Greater than $3 000 000</td>
<td>44</td>
<td>63</td>
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<table>
<thead>
<tr>
<th>Farm business profit</th>
<th>2004/5</th>
<th>2005/6</th>
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</thead>
<tbody>
<tr>
<td>Less than –$50 000</td>
<td>28</td>
<td>44</td>
</tr>
<tr>
<td>–$50 000 to –$25 000</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>–$25 000 to 0</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>0 to $25 000</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>$25 000 to $50 000</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Greater than $50 000</td>
<td>33</td>
<td>26</td>
</tr>
</tbody>
</table>

Source: ABARE broadacre farm survey data

The corollary of the decline in the number of farm businesses is that farm size is increasing. Cattle (2006) and subsequently Cattle & White (2007) examined BankWest farm level data for the period 1995/1996 to 2005/2006. They found that wheatbelt farms in Western Australia have grown to exploit economies of scale (Figure 3). These researchers applied the methodology of Morrison et al. (2004) who studied farms in the Heartland region of the USA. Morrison et al. found cereal and livestock farms were getting bigger to benefit from both economies of scale and improved technical efficiency. That is, larger farms had lower average costs and were more technically efficient. Similarly Cattle (2006) and Cattle& White (2007) found that the majority of wheatbelt farms in Western Australia operate at high levels of technical efficiency and experience increasing returns to scale. There is no evidence, however, that larger farms in Western Australia have improved technical efficiency. In fact, there is weak evidence to the contrary.

Larger farms are often characterised by a diversity of soil types, landscapes, locations and enterprise array. This places high demands on the time and skill of the farm manager. Large farms can be more complex to run, requiring more sophisticated management or at least greater reliance on advisory services.
Figure 3: Relationship between farm size and scale economies (SEC) for Western Australian broadacre farms

Source: Cattle (2006)

Prosch & Jose (2003) comment on modern farming:

“Today, the ability to assimilate an overload of data into decision making information is difficult. The decision framework is also becoming more complex. The complexity of management challenges includes customer relations, price risk management, environmental regulatory compliance, zoning regulations and nutrient management.” (p.1)

One of the responses to the increased array of enterprise and production technology alternatives is for many farmers to concentrate on wheat production. The relative profitability of enterprises, combined with the reliability of performance of modern cereal varieties, has encouraged many farmers to switch away from sheep production into crop production. Australia’s sheep flock in 2007 is the same size as it was in 1924 and in Western Australia sheep numbers have gradually lessened since the early 1990s, falling by over 40 percent in the last 15 years. (see Figure 4).

The shift away from sheep production into grain production has caused more farms to become more specialised, as reported by Cattle (2006) who used a Herfindahl index as a measure of farm diversification. He also found that technical change does not appear to have been significant in the wheatbelt from 1995/1996 to 2005/2006. No substantial movements in the production frontier through time due to technical change were found.
The main current issue affecting farm businesses is cost inflation, and in some regions this is compounding an already poor seasonal outlook. Fuel and fertiliser prices (Figures 5 & 6) have risen steeply in recent months, in spite of an appreciated Australian dollar. Of additional concern is the possibility that currently very high commodity prices could return to levels consistent with longer term trends. Under these conditions many farm businesses would face a pronounced downturn in their profitability; especially in crop dominant marginal farming regions.

The current cost inflation that is feeding into general cost and wage inflation is reducing the real prices of agricultural commodities. Hence, the cost-price squeeze that has typified decades of agricultural activity may return. In our last foray into agricultural speculation (Kingwell & Pannell 2005) we stated:

“With moderation in world population growth now evident, continuing technological progress in developed countries (e.g. biotechnology), and evidence of improving agricultural productivity in many parts of the developing world, we judge that continuing declines in real prices of agricultural commodities over the next 30 years are likely.” (p. 555)

Whilst this statement may well turn out to be true, it is correct to say that over the period 2006 to 2008 the cost-price squeeze reversed, with agriculture experiencing a healthy terms of trade, mostly due to historic upward movements in grain prices. Very recent cost pressures, however, are once again likely to squeeze the profit margins of farm businesses. Whether the squeeze abates or not will be determined by several influences, as mentioned below.
The rapid rise in grain prices since mid-2006 has been due to many factors and most analysts, including ourselves, failed to anticipate the heights grain prices would reach. Population
increases, economic growth in China and India, increased costs of grain production, greater
demand for feed grains, the switch of some grains into biofuel production and serious drought
in some regions, all placed upward pressure on grain prices.

The trend of falling grain stocks that commenced in 1998/9 looks set to continue into 2008/9
and international concerns have been voiced about food security in many regions. Malthusian
views have again surfaced at a time when costs of agricultural production are escalating. There
are analysts who foresee a period of prolonged favourable terms of trade for agriculture; others
are less optimistic.

**Future Drivers**

Towards 2020, what emerging or on-going drivers will affect the nature and profitability of
broadacre farming in Western Australia? The drivers are likely to include:

- international policy changes in trade and emissions control. Will there be little or
  substantial progress in reducing agricultural protection in Europe, the US and Japan? Will
  increased national concerns about food security lead to protectionist national agricultural
  policies that inhibit rather than encourage agricultural trade? Will international markets for
  carbon emissions and offsets be established; and what might be their impact on agricultural
  production and land use?

- national policies regarding water, climate change, environmental protection and agriculture.
  For example, an emissions trading scheme for Australia currently is scheduled to commence
  in 2012 and agriculture, although initially likely to be outside the scheme, will nonetheless
  be affected by it firstly through higher prices of fuel, transport, chemicals and transport and
  energy-related services and secondly, by increased competition for use of agricultural land
  as emission offsets. When agriculture is eventually covered by the scheme the extent of
  agriculture’s emission reduction challenge could further transform land use and the relative
  profitability of various farm enterprises.

Figure 7 displays greenhouse gas emissions from agriculture in Western Australia and
includes ‘business as usual’ projections. The white arrow in the figure is the 2050 policy
 target of a 60 per cent reduction in sectoral emissions; consistent with stated national and
 state government policy announcements. To reduce or offset agricultural emissions is a
 major technical and economic challenge.

- climate change impacts; locally, nationally and internationally. The rate, spatial extent and
  severity of climate change are very difficult to predict, but it is possible that it will test the
  adaptive capacity of agricultural systems and their supply chains. Suffice to note at this
  stage that the south-west of Western Australia is identified in most climate modelling
  projections to experience an increasingly less favourable environment for the production of
  most traditional agricultural commodities. Hence there is a major scientific and economic
  challenge to identify resilient, profitable farming systems and create supportive supply
  chains.
Figure 7: ‘Business as usual’ greenhouse gas emissions from the various components of Western Australia’s agricultural sector: 1990 to 2006 (actual), 2007 to 2050 (projections). The white arrow represents the current policy target of a 60% reduction in emissions by the year 2050 from the base year of 2000.

Source: DAFWA and Nous Consulting

- The rate of development of agriculture in developed and developing countries. If there is an acceleration of productivity growth prompted by current high commodity prices, there will be production outcomes that ease the current upward pressure on prices. Such progress could generate large social benefits. Based on the performance of world agriculture up until the late 1990s, Coates et al (1998) predicted that by 2025, of every 20 people living, 5 would struggle to get enough food and would suffer recurring famine, 12 would get enough food but would not be very prosperous, and 3 would have a wide variety of food types available and most easily afforded.

- Changes in energy prices and energy-related inputs. Dunlop et al. (2004) noted that, “Evidence suggests that in the coming decades oil consumption will overtake global oil supply capacity.” Will comparable energy sources become available at comparable cost within the next decade or will energy users pay more for increasingly scarce current sources of energy? Will the current shift in agriculture toward bioenergy production continue? As the cost of energy and energy-related inputs rises then high-input farming systems may not be economically sustainable. The cost of transporting farm inputs and outputs will unleash changes in spatial comparative advantage, benefiting some farmers whilst harming others.

- Downside risk management. Although continued investment in productivity improvement is essential to underpin the viability of various farm industries, the management of weeds, pests and diseases and incursion threats is also required. These problems represent downside risks to farm and industry profitability. Reducing the economic costs of these biological threats is an on-going activity for farm businesses and their beneficiaries.
• Funding levels for R&D. There has been a questioning over taxpayer support for some agricultural R&D (Productivity Commission 2007). It is conceivable that there could be reductions in the level of funds offered through the existing rural R&D corporations, perhaps with changes in the number and operation of those corporations. Conversely, given recent hikes in food prices, governments may see a need to increase investment in R&D to underpin agriculture’s role as a reliable source of low-cost, healthy and ethically produced food and fibre; as well as a source of foreign exchange earnings based on use of renewable resources.

• Biotechnology. Notwithstanding its relatively modest impact so far, there may be dramatic breakthroughs in the application and adoption of biotechnology. Moreover, there are signs of favourable shifts in voter attitudes regarding gene modification technologies (Cormick, 2008), so increased use of these technologies in agriculture appears more likely than it did even three years ago.

• Social challenges. Shields and Wooden (2003) note that many people in rural areas express greater satisfaction with their lives than do city people. Nevertheless, a number of factors have contributed to an exodus of families (both farming and non-farming) from rural areas. In inland rural regions, countering the social, economic and government policy pressures that encourage depopulation is extremely difficult. Often attempts to reverse a local decline are at the expense of an adjacent region.

Making the farming lifestyle attractive to the next generation of farmers and their potential spouses will be a major challenge.

• Human infrastructure provision and capacity-building. Farmers are diminishing in numbers and as a proportion of the State population; and farming has become a less and less familiar activity to metropolitan populations. Accordingly the pool of local people with agricultural knowledge and affinity with farming is shrinking. This poses problems for attracting future workers into servicing the farm sector; as researchers, advisers, field staff and students.

Some speculations

After examining the views contained in various studies (Coates et al., 1998; Karpin, 1995; Coopers and Lybrand, 1995a, 1995b; Kohl, 2001, Kingwell 2002), Kingwell and Pannell (2005) drew several inferences as to the possible nature of broadacre farming towards 2025. Many of these inferences plus some additions are listed below. Future broadacre farming may well be characterised by:

• fewer, larger farms and fewer people employed directly in farming;
• farm families seeking a balance between protecting their financial viability whilst making the lifestyle of farming attractive to their next generation;
• maintained diversification of business activity (a mix of farm enterprises and off-farm investments). The role of farmland as a supplier of renewable energy and source of greenhouse gas emission offsets is likely to increase towards 2020. Broadacre farming could also play an important role as a provider of water run-off for environmental flows into river systems. In some regions the role and value of wildlife corridors may become greater. Spatial diversity of farm locations and enterprise mixes may also play a role in future farm business activity, especially in light of climate change, season variability and continuing commodity price volatility;
• increased demand for and supply of animal and aquaculture feeds. This will mostly arise from the burgeoning middle-classes in India and Asia and their increased per capita consumption of meat; and the increased cost of wild-caught fish.
• continued production growth from yield improvement and new technologies. Biotechnology, particularly in the plant sciences, increasingly will underpin productivity improvement and new product development. Market acceptance of many biotechnologies will further improve with emergence of plants offering environmental and health benefits;
• changing dietary patterns, increasing incomes and shifts in population structures in many countries will be increasingly important market drivers;
• broadacre farming will maintain its emphasis on exports, productivity improvement, product and market development. Farmers will continue to invest in improvements in technical and scale efficiency, and pursue input and product innovation;
• participation in supply chains as an equity partner as well as a raw product supplier will be an emerging option for farmers;
• the relative importance of agriculture in the nation's economy will continue to decline, although towards 2020 its absolute contribution will continue to increase;
• greater commitment to sustainable farm practices reflected in regulatory and market incentives;
• greater emphasis on quality assurance, production certification, identity preservation, environmental amenity, supply chain management and food safety;
• risks surrounding contract and marketer relationships and consumers' perceptions of food health, safety and environmental impacts will remain important;
• greater use of contract services by farmers (e.g. machinery management, plant and animal health services, information management services, labour training and management);
• greater separation of land ownership and land management;
• continuing difficulties in gaining access to reliable and skilled labour. In response there is likely to be further use of labour-saving technologies, in-built skilled technologies, robotic and intelligent technologies; perhaps complemented by imported ‘guest workers’ assuming immigration policies change. As farm sizes increase and children spend more years off-farm in formal education, then farm businesses are likely to depend more on hired labour and/or labour-saving technologies. So labour management and purchase of labour-saving technologies that improve farm profitability and facilitate farm management will be an increasingly important part of farm management.
• greater dependence on electronic technologies and electronic management;
• effects of climate change largely addressed through incremental technological improvement, plant breeding and design and introduction of novel farming systems. However, depending on the severity of future climate change, agriculture could experience large adjustment costs.

**Implications for R&D**

We suggest that the foregoing discussion has the following key implications for agricultural R&D in Western Australia.

• A healthy R&D sector remains crucial for continuing productivity improvements to ensure the ongoing economic health of broadacre farming. As shown by Mullen (2007), productivity growth driven by agricultural R&D underpins the economic prosperity of
farming; not withstanding all the associated benefits for the food sector and consumers. The corollary, however, is that if the performance of R&D falls, then the long-term prospects for agricultural prosperity are worrying and prices of some foods may be higher than they otherwise would be.

- Increasing farm sizes, more time pressures on farm managers, and rising costs of skilled farm labour reinforce the benefits of labour-saving technologies. Further innovation in such technologies may be warranted or perhaps changes in labour policies more strongly advocated.

- Climate change, season uncertainty, input cost inflation, emerging carbon markets and new biotechnologies all have various implications for the relative profitability of crop versus livestock enterprises. Future R&D needs to foster an understanding of what those possible impacts might be. Such knowledge may aid the resource allocation decisions of R&D funders and practitioners. However, history tells us that it is unwise to be highly prescriptive. A portfolio of R&D activity is highly desirable, to underpin flexibility and responsiveness to anticipated and unanticipated problems and opportunities.

- In the very near term the community’s attention will be drawn to the rising cost of food. Hence, there is an opportunity to re-visit the need for R&D to deliver productivity gains that lessen cost of production of agricultural commodities. Local consumers share in the benefits of such improvements. Farm and supply chain efficiency will be crucially important.

- Community regard for the environment will be maintained. Hence R&D to develop new systems and technologies that are both profitable and environmentally beneficial will remain of high importance. In addition, research to assist the prioritisation of environmental protection in rural regions will also remain a priority.
The particular Herfindahl index ($H$) used by Cattle (2006) to determine the level of farm specialisation was based on Purdy et al. (1997). The index lies between zero and one; a value near one indicates a highly specialised farm whilst a value near zero indicates a highly diversified farm. The index was calculated as the sum of the squares of the proportion of farm income from crops, livestock and other sources.

$$H = \sum_{j=1}^{n} \left( \frac{I_j}{Y} \right)^2$$

where $I_j$ is the value of income derived from source $j$ ($j = \text{cropping, livestock or other}$) and $Y$ is total farm income.