Farm performance

Identifying the top performing regions of Australia
Lisa Chapman, Stephen Beare and Teresa Neeman

Increasing interest has been shown in establishing farm performance benchmarks in Australia. Nevertheless, it remains difficult to quantify the factors that differentiate top performing farm enterprises from the rest. Fluctuating commodity prices and seasonal conditions make it hard to identify longer term measures that indicate sustainable farm performance. There are also likely to be significant regional differences in obtainable performance and best practice.

In this article, regional measures of longer term farm performance are examined. These measures are based on the rate of return to capital investment on individual farm enterprises, drawn from ABARE’s annual survey of broadacre industries. Rate of return to capital can be used to compare financial performance across a diverse range of farm enterprises in Australian broadacre agriculture.

The first objective in the analysis was to identify regional differences in the level and variability of farm performance over the past decade. The second objective was to examine factors that are likely to have influenced the relative performance of Australian broadacre farms.

Differences in farm performance
To create a relative measure of the performance of broadacre farms, ABARE survey farms were ranked by rate of return to capital, including capital appreciation (ABARE 2000). Farms with a higher rate of return were given a higher rank. This ranking measure is more robust than an absolute measure as it limits the influence of extreme values at either end of the performance spectrum. Thus, observed differences in ranked measures of performance are more likely to

The higher performing broadacre farms were found to be concentrated in areas of the wheat–sheep and pastoral zones.

Top performing farms manage disproportionately large areas of land with lower than average land values.

Around 20 per cent of regional variation in performance was found to be independent of location, farm size and industry composition. This suggests that there may be scope for improving farm performance by adopting best management practices.
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represent what is being achieved by typical farms within a region.

For the years 1988-89 to 1998-99, ABARE survey farms were ranked according to the rate of return to capital they achieved in a given year. The ranks were then scaled to lie between zero and one, as the number of farms in both the sample and population vary between years. This procedure removed the influence of factors that have affected the overall agricultural sector over time, such as general changes in farmers’ terms of trade or widespread changes in seasonal conditions.

ABARE does not survey the same farms each year. Rotating the sample improves the reliability of estimates derived from the survey and reduces the burden placed on those willing to take part in the survey. Hence, it was not possible to calculate longer term farm performance measures for individual survey farms. To overcome this problem, ABARE uses geographic or spatial smoothing techniques to project average farm ranks to a fixed set of geographic locations (a grid) each year. It was then possible to calculate a mean rank over the eleven year period across Australia and create a map showing regional differences in relative farm performance.

Map 1 reveals distinct geographic patterns in relative farm performance over the past decade. On average, over the period 1988-89 to 1998-99 the top performing farms were located in areas of the channel country through the Northern Territory and Queensland, in northern South Australia and the wheat–sheep zone of Western Australia. In addition there were isolated areas of high performing farms located through the wheat–sheep zone in the eastern states. The poorest performing farms, on average, were located predominantly in the pastoral zone of Western Australia and in scattered areas throughout Queensland and Victoria.

Factors influencing relative performance

While a number of factors may influence regional performance in the short term, longer term differences are likely to reflect
one of two key factors. The first is the ongoing pressure for structural adjustment within agriculture from changes in the terms of trade for particular agricultural industries and the adoption of new, often more land extensive, production technologies.

The second factor is nonagricultural influences on the value of land. Land accounts for a large proportion of the total capital on each farm. The value of that land is therefore likely to have a significant impact on the calculation of rates of return to capital.

The majority of the lower performing farms were located in the pastoral zone of Western Australia. Sheep production is the predominant broadacre enterprise on farms across much of this area. In the early 1990s wool prices declined sharply and wool producers were taxed to cover the failed operation of the buffer stock scheme. At the same time, alternative production options in the region were limited as beef prices were also declining in both nominal and real terms. Despite some recovery in livestock returns in the latter part of the decade, these factors from the early part of the decade are likely to have contributed to the lower average farm performance observed over the decade in this region.

Higher levels of farm performance were recorded in the pastoral zone across the channel country in Queensland, areas of the Northern Territory and northern South Australia. Cattle production is the predominant broadacre industry in these regions, and returns to beef production increased over the past decade. The number of corporate farms in this region is considerably higher than in other regions of Australia. In general, corporately owned and managed farms report higher rates of return. Also, increased access to live cattle export trade in recent years and productivity gains through increased feedlotting and the success of the brucellosis and tuberculosis eradication campaign are all likely to have contributed to the higher farm performance in this region compared with other cattle producing regions (Ha and Chapman 2000).
On average, farms across the wheat–sheep zone achieved relatively high levels of farm performance. This is likely to reflect the suitability of land in this zone to cropping compared with both the pastoral and high rainfall zones. Over the past decade, returns to cropping relative to other broadacre production alternatives increased (Beare, Chapman and Heaney 1999). In addition, significant improvements in cropping technology and production methods occurred. These include better use of crop rotations, higher yielding crop varieties, the greater use of nitrogen fertilisers and the adoption of minimum tillage practices (Ha and Chapman 2000).

Areas with farms recording relatively low performance are scattered throughout the high rainfall and wheat–sheep zones in the eastern states. The location of these regions suggests that land values may be a key factor contributing to the lower farm performance.

Land values expressed in dollars per hectare were ranked across ABARE survey farms for the years 1988-89 to 1998-99. Again, the ranking process removes general movements in land prices between years and provides a robust estimate of relative land values over the period. These annual ranks were projected to a grid of geographic locations and then averaged. When mapped, the average ranks show strong regional patterns in land values (map 2). Land values were highest in the high rainfall zone. Land values decline moving inward, through the wheat–sheep and then the pastoral zones.

Agricultural land values are likely to reflect a combination of factors. First, they reflect the productive agricultural capacity of the land, which is generally related to rainfall levels and patterns as well as soil types. Second, land values reflect the competing use for land in industries outside of agriculture and the subcommercial use of agricultural land. Agricultural land in high rainfall areas may also be suitable for plantation forestry, while land located near regional centres offers amenity values and better off-farm employment opportunities.

High land values in the high rainfall zone are contributing to the low performing regions seen in map 1. In particular, a number of the low performing areas in the high rainfall zone and eastern edge of the wheat–sheep zone are located near cities and towns including Adelaide, Melbourne, Ballarat, Albury and Canberra. In regions where there are higher land values that reflect the competing uses for land in industries outside of agriculture, rates of return are likely to be correspondingly lower.

Characteristics of top performing farms

When examining factors that differentiate top performing farms from the rest, differences in the size and value of farm properties were examined using additional survey information. The share of total land area, the share of the total capital value of that land and the share of cash receipts earned by the top performing farms were compared with the share held by the bottom performing farms (table 1).

A graph of land area, land value and farm receipts across the entire spectrum of farm performance provides further insight into the characteristics differentiating top and bottom performing farms. In figure A farms are ranked from top to bottom on the horizontal axis. The cumulative shares of land areas, land values and cash receipts are given on the vertical axis.

The top performing 10 per cent of farms were found to manage nearly a third of the total land farmed in Australia, hold around a quarter of the total value of broadacre land and earn 28 per cent of farm receipts. The share of farm area is greater than the share of land value for the top performing farms. This suggests that the top performing farms

<table>
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<th>Performance indicators for farms ranked by rate of return</th>
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<tbody>
<tr>
<td>Broadacre land area %</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>Performance group</strong></td>
</tr>
<tr>
<td>Top 10 per cent</td>
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<td>Top 20 per cent</td>
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<td>Top 40 per cent</td>
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<tr>
<td>Top 80 per cent</td>
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alter the physical and financial environment in which farm businesses operate. Seasonal conditions and farms’ exposure to variable commodity and input prices may result in considerable variation in financial performance from year to year and within regions. Some of these factors are beyond the control of farm operators while others can be managed through the structure and operation of the farm business.

Regardless of seasonal conditions and commodity prices, some farms may outperform others because of the way in which they have structured their operations. Where this variation is substantial, there are greater potential gains from the use of farm benchmarks and the adoption of best practice.

To establish useful farm benchmarks it is first necessary to understand the underlying cause of observed differences in farm performance. From a statistical perspective, it is possible to identify three types of variation: that which is constant within a region but varies over time (temporal variation); that which is constant over time but varies within a region (spatial variation); and that which is a mix of both temporal and spatial variation. For example, commodity price movements that affect all farms may lead to temporal variation and differences in farm management may lead to spatial variation. However, commodity price changes that affect some farms more than others will lead to mixed variation.

Temporal variation in farm performance

A range of factors can influence regional farm performance. These include factors that manage large areas with lower than average land values. In these regions, lower land values may have promoted faster structural adjustment, such as the development of more land extensive agricultural production.

The shares of farm area and land value of the middle performing farms are roughly equal. The far right section of figure A shows the area and value shares of the poorest performing farms. While the top 80 per cent of farms manage around 80 per cent of the farm area, they hold around 90 per cent of the total value of broadacre land in Australia. The top 20 per cent of farms earn over 40 per cent of total receipts in Australian broadacre agriculture, while the bottom 20 per cent of farms earn around 7 per cent of total receipts.

These findings are consistent with the regional patterns in farm performance and land values seen in maps 1 and 2. The top performing farms were located predominantly in the pastoral zone where farms are large and land values are low. With the exception of low performing farms in the Gascoyne and Pilbara regions, the other low performing regions were located in the high rainfall zone and eastern edge of the wheat–sheep zone where farms tend to be of a smaller size and land values are high.

Variability in farm performance

A range of factors can influence regional farm performance. These include factors that
The areas of low variability in performance throughout the wheat–sheep zone are likely to reflect the wider range of production alternatives available to farmers in those regions compared with those in the pastoral and high rainfall zones. A wider range of production alternatives allows greater enterprise diversity and more options to respond to changes in both seasons and prices. In particular, the low variability observed in these regions over the decade is likely to reflect the ability of farmers in these regions to switch from sheep production to cropping as wool prices fell. In the northern cropping areas the opportunity to crop over the summer months may also have increased the ability of farmers in that region to maintain income levels despite unfavorable seasonal conditions and poor commodity prices in some years.

Broadacre agriculture in the pastoral zone is characterised by extensive grazing of native pastures and only limited cropping. With limited production options available to them, farms in this zone are likely to face more variable returns. This is likely to explain the areas of high variability in this zone.

**Spatial variation in farm performance**

The measure of temporal variability presented in the previous section does not capture differences in performance between farms. A separate statistical analysis was conducted to examine regional variability in farm performance. Farm ranks were again computed, for each year, on the basis of rate of return for five regions: the pastoral zone; the southern cropping zone; the northern cropping zone; the western cropping zone; and the high rainfall zone. The location of each of the five regions is shown in map 4.

Total variation in performance within a region was estimated and compared with variation at the national level (table 2). A proportion of this variation accounts for differences between individual farms within
Regional variability in farm performance

<table>
<thead>
<tr>
<th>Regional variation</th>
<th>Cross sectional variation</th>
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<tbody>
<tr>
<td></td>
<td>(as a % of national variation)</td>
</tr>
<tr>
<td>Pastoral zone</td>
<td>137</td>
</tr>
<tr>
<td>High rainfall zone</td>
<td>82</td>
</tr>
<tr>
<td>Southern cropping zone</td>
<td>100</td>
</tr>
<tr>
<td>Northern cropping zone</td>
<td>99</td>
</tr>
<tr>
<td>Western cropping zone</td>
<td>100</td>
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The statistical technique used is known as a random effects model, which was estimated using Proc Mixed in SAS. The ranks were normalised to ensure the statistical validity of the model. For a detailed explanation see Verbeke and Molenberghs (1997).

Each region. This cross sectional variation is likely to reflect differences in farm structure and management practices as opposed to relative commodity price movements or differences in seasonal conditions within a region.

Variation between farms in the pastoral zone was found to be 37 per cent higher than variation at the national level. The higher than average variability across this region is likely to reflect both the limited range of viable production alternatives as well as considerable variability in seasonal conditions that can occur in a given year across this large region.

In contrast, variation between farms in the high rainfall zone was found to be 18 per cent less than the variation at the national level. This is likely to reflect the relatively strong influence of high land values compared with the other regions and reasonably consistent climatic conditions across the zone. Variation between farms within each of the three cropping zones was found to be similar to the variation between all broad-acre farms at the national level.

In each region a significant percentage of the total variability in performance between farms was found to remain constant over the
eleven year period. This constant distribution of performance within regions may reflect differences in farm structure and management practices. With the exception of the high rainfall zone, this pure cross sectional variability was around 20 per cent. This variation was largely independent of location and hence factors such as farm size and enterprise composition. In the high rainfall zone, however, the cross sectional variability was lower at around 16 per cent. This may reflect a higher degree of similarity between the small livestock farms that dominate the zone.

Concluding remarks
By exploring regional differences in the level and variability in farm performance it was possible to investigate the factors that are likely to be differentiating top performing farm enterprises.

The higher performing broadacre farms were found to be concentrated in areas of the wheat–sheep and pastoral zones. On average, the lower performing farms were located in the high rainfall zone. The top performing farms were found to manage disproportionately large areas of land with lower than average capital value. They were also found to be earning disproportionately higher cash receipts.

Total variability in farm performance was found to be higher in the pastoral zone compared with the wheat–sheep and high rainfall zones. These differences are likely to reflect a combination of factors including seasonal conditions and fluctuations in commodity prices that are beyond the control farm operators, as well as other factors that can be managed through the structure and operation of the farm business.

Variability over time was found to be lower in the wheat–sheep zone where the greater range of production alternatives is likely to enhance the ability of farmers to respond to unfavorable seasonal conditions or fluctuating commodity prices.

Within region variability in farm performance, at around 20 per cent for most regions, suggests that there may be some scope for improving farm performance through the adoption of better farm management practices.

References