

Taking stock of agronomy research in Australia – a bibliometric analysis

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Abstract

A study by ACDA has shown that publications from Australian agronomists have been consistent in number over the 18 years analysed. The global share is trending downwards but this is balanced by increases in citations. There is a strong presence in the top cohorts of papers as measured by citations. Universities have substantially increased their share of publication output mainly at the expense of the government sector. These findings provide insight for the agronomy research community and research funders on the outputs by research providers and establish a platform for future research investment.

Key words

Agronomy publications, citation rates, ACDA

Introduction

Much has been written about agricultural research and development in agriculture including the reduction in funding globally (Pardy *et al.* 2013) and the decline in research intensity in Australia (Mullen 2007). There has also been a significant shortfall in enrolments in agricultural undergraduate degrees in Australian universities (Pratley 2012; Pratley and Acuna 2015) with acute shortages in areas of agronomy. There are flow-on effects to low numbers in research higher degrees accentuated by the outdated conditions for postgraduates and early career researchers (Pratley 2013). We have seen declines in state agency research and extension activity over a long period and prospects for that to be reversed are slim at best. Retirement of leading academic and consultant agronomists raises questions about the levels of performance of agronomic research in Australia and the prospects of future work. This paper considers aspects of long-term trends in output and relative performance in Australian agronomy as measured by publications in the Scopus database. These comprise peer reviewed journal articles, conference papers and books.

Methods

The Australian Council of Deans of Agriculture (ACDA) commissioned a bibliometric study of agricultural research from Australia and this paper reports aspects that relate to total global publications related to agronomy, undertaken by Science-Metrix, based in Canada. *Number of papers* was obtained using full-counting, i.e. each paper is counted once for each entity (e.g., country, organisations) listed. For example, a paper authored by two researchers from the University of Melbourne, one from the University of Sydney and one from the University of Toronto, is counted once only for the University of Melbourne, once for the University of Sydney, once for the University of Toronto, once for Australia and once for Canada. *Number of citations* is obtained using full-counting. Citations were counted for two subsequent years following the year of publication, i.e. citations were counted for 2005–2007 for a 2005 publication, as this results in the same citation window for all years and allows comparison of yearly citation trends. The global data were described as ‘Agronomy and Agriculture’ through Scopus and approximated to the Fields of Research (FoR) codes 701, 703 and 503 (agriculture and farm management, crop and pasture production, and soil science respectively).

Results and discussion

The numbers of papers published for the period 1996 to 2013 in agronomy and related areas are shown in Figure 1. Output has been steady for that period being around 500 per year with a peak output in 2005–2007 at around 600 annually. However when it is compared with production levels globally (Figure 2) it can be seen that Australia’s contribution has declined from a high of above 7% in the first few years to just above 3% in the period 2009 to 2013. This is clearly a substantial reduction in relative contribution to world knowledge in this area.

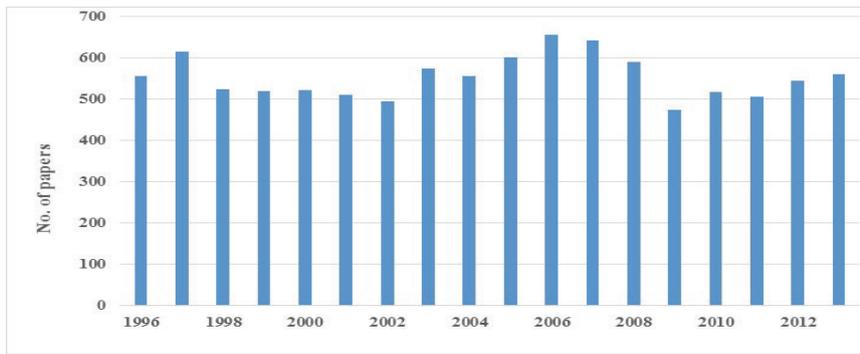


Figure 1. Number of papers published annually by Australian authors in agronomy and related areas for the period 1996-2013 (ACDA, 2015 unpublished)

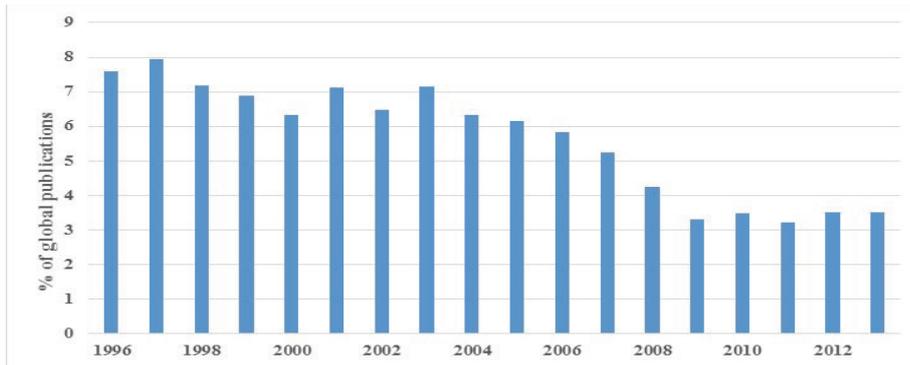


Figure 2. Proportion of global papers published annually by Australian authors in agronomy and related areas for the period 1996-2013 (ACDA 2015, unpublished)

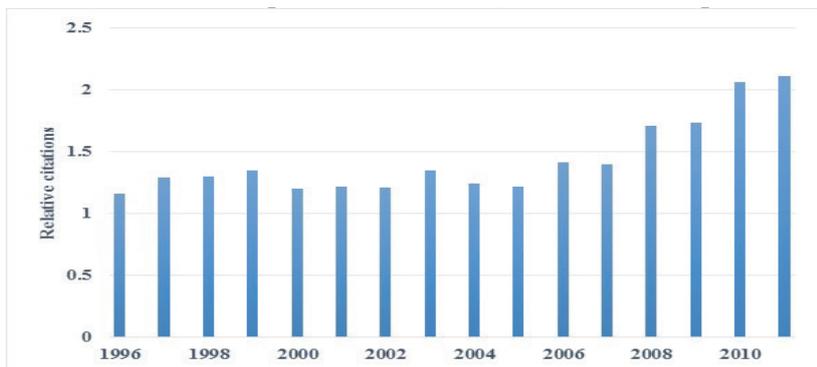


Figure 3 Relative global citations of Australian agronomy publications for the period 1996-2011 (ACDA 2015, unpublished)

In contrast however analysis of citations of Australian agronomy publications shows that our agronomy is well regarded internationally being always above 1.0, the global average (Figure 3). From about 2006 onwards the relative citation index has increased, being in excess of 2.0 in the last two years of measurement. This would appear to be a positive trend but may also reflect greater electronic access to Australian papers, the lack of a parochial journal with the CSIRO journals taking an international position, or academics chasing higher impact factor journals through the influence of the ERA process (Excellence in Research in Australia).

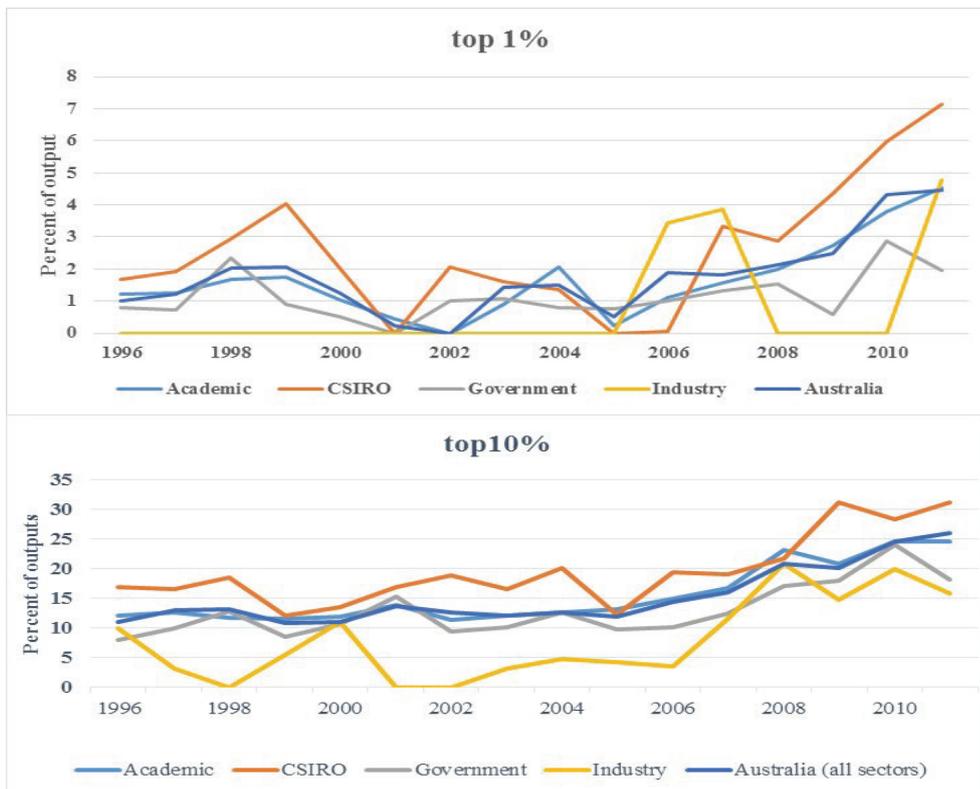


Figure 4. Relative global performance of Australian agronomy and related publications as measured by citations for the period 1996 to 2011; a. in the top 1% (top) and b. in the top 10% (bottom) (ACDA, 2015 unpublished)

Further analysis of the quality and potential impact is the proportion of papers in the top global cohorts. In the top 1% of cited papers (Figure 4a), Australian agronomy has performed at better than the world average in most years with CSIRO regularly being well above the average, 6 to 7-fold in the last two years of the study. There is a noticeable upward trend for Australia in the top 1% in the most recent 5 year period. In the top 10% of papers cited (Figure 4b), there is a clear above average performance with a strong upward performance in the last 5 years of the study period with about one quarter of the papers in the top 10% being those recorded as Australian. CSIRO leads the way but all main sectors are well represented in recent years at that high performance level. This does suggest that agronomy research in Australia is having a strong impact on agronomy research more widely.

In terms of the generators of output in Australia, Figure 5 shows publications for the three major sectors CSIRO, universities and government. There is a very strong upward trend from the university sector over the period and a noticeable decline in output from the government sector. These trends may be a partial reflection of the movement of research activity from state governments to universities as has happened in Tasmania and Queensland for example. It also reflects the focus in universities on the ERA process and the need to be stricter on Field of Research coding of projects. CSIRO has also experienced a steady but modest decline in number of publications across the period of study.

Within the university sector there are many contributors. Figure 6 shows the top 20 universities with respect to agronomy publications with the period split to observe the changes in output with time. The University of Western Australian is the standout performer with over 700 papers in the last 9 years. There are 7 universities with over 200 publications over the last period. The data show that most universities increased performance from the early to late period with Charles Sturt University in absolute terms being the major improver.

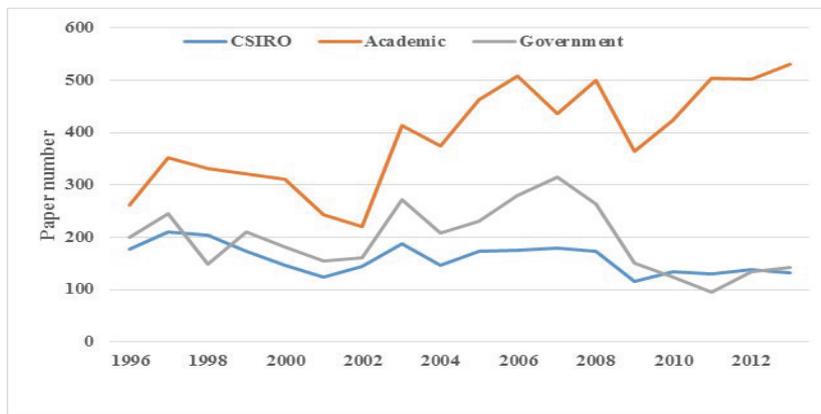


Figure 5. Numbers of publications from CSIRO, universities and government in Australia over the period 1996-2013 (ACDA, 2015 unpublished)

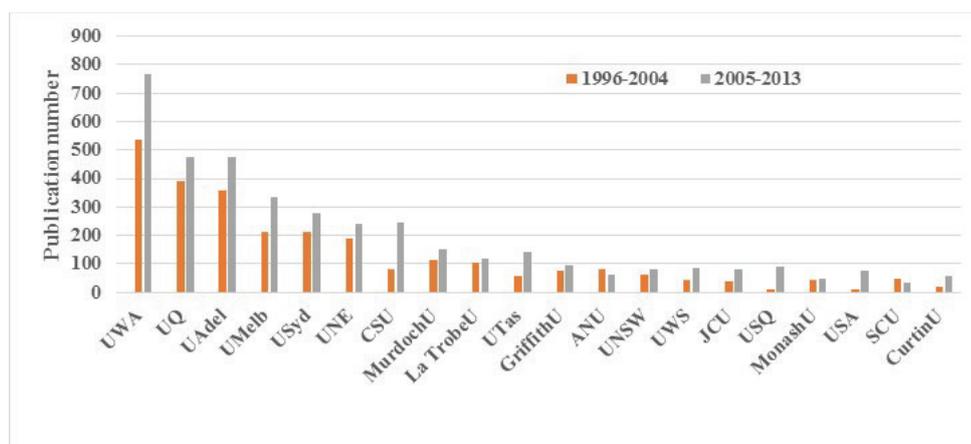


Figure 6. Publication numbers in agronomy and related areas for 20 universities for the periods 1996-2004 and 2005-2013 (ACDA 2015, unpublished)

Conclusions

Australia has performed consistently in the global agronomy publication arena and there is strong evidence that its output is of high quality based on its relatively high citation rates and continually strong, presence in the top echelon of papers. Of concern is the downward trend in relative output over recent years and the loss of ‘market share’ globally. This is somewhat balanced by the increased citation rates received by Australian papers. There has been a marked increase in Australian publications in the second half of the period and the relative outputs between sectors has changed with universities assuming a greater proportion at the expense of government agencies, a trend likely to continue. Overall agronomists can be pleased that their work is so well received internationally.

References

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