Australian Private-Sector Investment in Australian and International Agriculture

Joanne Daly and Jeremy J. Burdon

Paper prepared for presentation at the "World Food Security: Can Private Sector R&D Feed the Poor?" conference conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, Australia, October 27-28, 2009

Australian Private-Sector Investment in Australian and International Agriculture

JOANNE DALY[1] AND JEREMY J. BURDON[2]

[1]CSIRO Agribusiness and [2]CSIRO Plant Industry
PO Box 225, Dickson, ACT 2602, Australia

It is easy to assume that the public sector dominates assistance to smallholders in the developing world, including in the provision of research and development. These proceedings have illustrated that this is not always the case and that the private sector can and needs to be engaged, even in early stages of agricultural development. In Australia, private-sector investment is low relative to that in many other developed countries. However, over the past two decades we have seen an increase in that investment through a variety of means, including the growth of rural research and development corporations and more recently, in public–private partnerships in plant breeding. This increase has enabled public-sector investment to shift to tackle emerging challenges for the agricultural sector. Both domestically and internationally, these new models of collaboration between the public and private sector are reframing agricultural research.

DR JOANNE DALY is an evolutionary biologist who was appointed Group Executive, CSIRO Agribusiness, in April 2007. She was the inaugural Chair of the Management Committee for developing the *Atlas of Living Australia* and in October 2009 was appointed Chair of the Governing Board of the Global Biodiversity Information Facility. After a PhD at the Australian National University she was a Fulbright Fellow at UC Berkeley. Daly joined CSIRO Entomology in 1983. From 2001 to 2003 she was on secondment to the Australian Government in the area of international relations in science and technology. In 2003 she was head of the National Research Priorities Taskforce. Dr Daly returned to CSIRO as Chief of Entomology in February 2003. In 2003 she received the Public Service Medal.

Introduction

These proceedings highlight the strong support that exists for private-sector investment in agriculture in developing countries. Previous contributors have demonstrated the need for strong partnerships between the private and public sectors to ensure that the whole food value chain is activated: from increasing on-farm productivity to ensuring that surplus food can be transported and stored safely, to the creation of markets.

The challenges ahead to ensure food security for the planet are considerable — food production needs to be doubled by around 2050 in the face of water and fertiliser limitations, restraints on carbon emissions, changing climate and an ever-increasing urban population. Food security has become a focus of governments, driven initially by a spike in food prices reinforced by diminishing food reserves; and now reinforced by changing climate scenarios (Stoeckel 2008; Msangi and Rosegrant 2009).

The traditional view of the provision of assistance to tackle challenges facing developing countries sees this function as the purview of the public sector through national governments or international aid agencies. Such a view is based on the premise that developing countries are in a situation of ‘market failure’. If this view can be questioned for developing countries then it is also worthwhile opening up the same issues regarding the provision of agricultural research and development (R&D) in developed countries. This paper explores some of these ideas in an Australian setting.

There are three issues to consider:

- business investment in agricultural R&D is growing and replacing some public-sector expenditure and this will influence how we respond to food security in the least-developed countries
- Australian overseas investment in R&D is undergoing renewal
- participation by Australian public-sector R&D in overseas agricultural work will be greatly enhanced and produce a more enduring solution if it is done in partnership with the private sector.

Trends in Australian R&D

In Australia, there is good evidence (Fig. 1) that growth in agricultural productivity over the past fifty years has been driven in part by domestic R&D (Mullen and Crean 2006). Yet both in Australia and overseas there has been a persistent decline in public-sector agricultural R&D over the same period. This decline is thought to have negative consequences for agricultural development in the least-developed countries that have relied traditionally on spillover benefits from developed country R&D (Pardey *et al*. 2006a).

A closer look at the data, however, indicates that the Australian situation is a bit more complex, with shifts occurring in the agencies responsible for that R&D. Total investment in agricultural R&D in 2004–2005 was AUD1.4 billion, a 20% increase in real terms since 1996–1997 (DAFF 2008, Appendix A, drawn from Australian Bureau of Statistics data 2006). The biggest change was a reduction in state government investment, falling from 53% of total investment in R&D in 1996–1997 to 38% by 2004–2005. At the same time, universities increased their proportion of the total from 16% to 23% and business investment in rural R&D increased from 8% to 17%. This upward trend in private investment in Australia is encouraging because it is starting from a relatively low base of less than half the level of other major OECD countries (Pardey *et al*. 2006b).

The improvement in private-sector spending may well be a sign of maturity in agricultural R&D. It potentially signals confidence as private businesses believe that they can capture profits into the future. This frees government money to be applied to broader national challenges that threaten the very existence of profitable agriculture in this country. Certainly in CSIRO and in the larger state agriculture departments there has been a shift away from traditional on-farm productivity work towards more modern approaches made

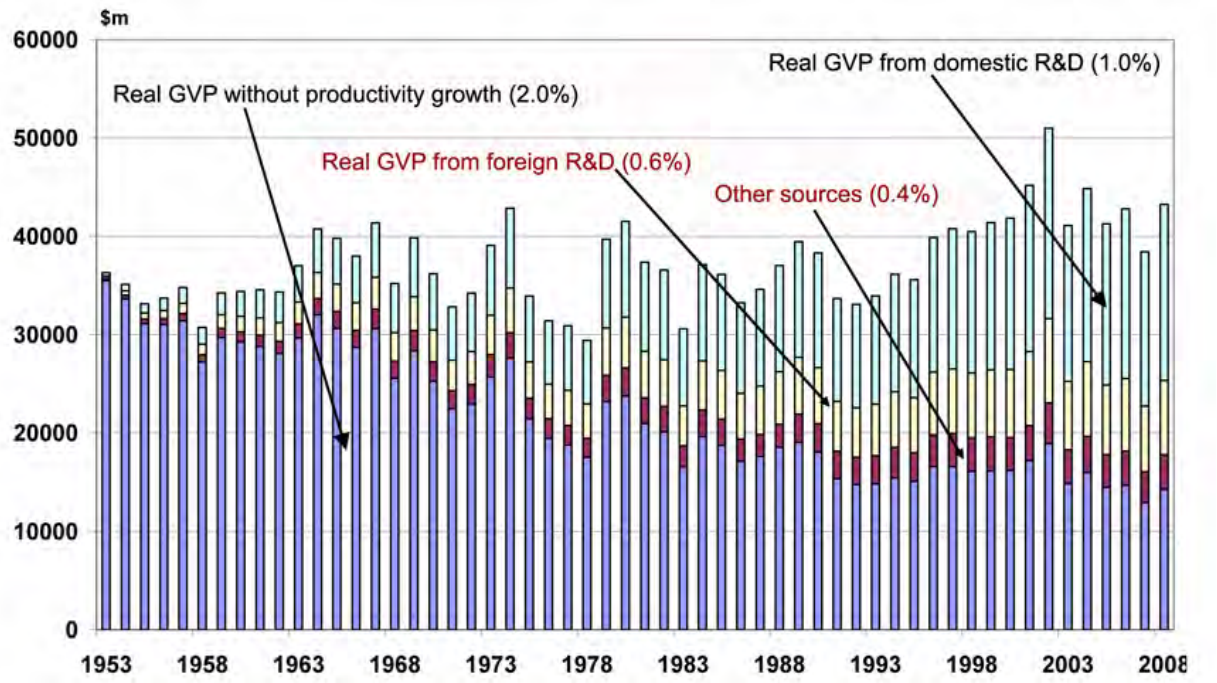

Figure 1. Sources of productivity growth (based on gross value of production) in Australian agriculture, 1953–2008 (Mullen and Crean, unpublished data, 2009; based on Mullen and Crean 2006)

possible through molecular biology. Other resources have been redirected to broader issues of environmental sustainability and the emerging issues around climate change, soil degradation, reduced ground water and restrictions on carbon emissions.

A number of indicators may explain some of the increase in business expenditure, and how it affects how basic productivity work is now funded in Australia:

1. Primary producers contribute private-sector resources through a levy system that underpins the rural Research and Development Corporations (RDCs)

Fifteen rural research and development corporations operate in Australia. The first of these bodies were established in 1989. The corporations are run by industry bodies, and collect levies from producers, based on production. These funds are matched by the Federal Government up to a statutory limit. R&D investments are directed at key priorities determined by the relevant industry and at cross-industry issues determined by the government. In this system, producers can invest their own resources in a collective way to harness and direct government investment in R&D to the benefit of their industry (http://www.ruralrdc.com.au/).

There was a 40% increase in real terms (estimated to be from AUD188 million to AUD267 million, in 2008 dollars) in such industry funds over the period 1996–2008. Most of this increase occurred up to the years during which the RDC model was reaching its full potential. Funds are estimated to have plateaued over the past seven to eight years (DAFF, unpublished data, 2008).

One of the consequences of the long-term investment of public funds in agricultural R&D through this model is that Australian producers have obtained significant additional benefit through leverage of co-investment from research providers. Thus, of the about AUD490 million of new money spent by RDCs in 2007–2008, 45% was government funding (DAFF, unpublished data, 2008). When this money was invested in public institutions, most of it would have been matched with further public-sector investment from the institution. It is hard to get exact figures, but in situations where RDCs are paying 50% of the total cost of the project one dollar of producers' money can leverage up to $3 of government money. In the long term, it can be hard for public research organisations to sustain their core capability and infrastructure in such a co-investment model. Indeed, CSIRO (2008, p. 16) noted in its submission to the *Review of the National Innovation System* (2008) that the co-investment model employed by the RDCs was diverting scarce resources away from strategic research towards more close-to-market work.

2. Aspects of public-sector R&D have been privatised

This has been evident over the past two decades in areas such as stored grains, and in wheat, cotton and sugar breeding. This shift from public to private sector has at times been accompanied initially by a drop in investment in public-sector R&D as the new companies grappled with the reality of making a profit. This was particularly evident in industry investment in CSIRO's Stored Grains Laboratory during the 1990s (J. Daly, unpublished data). Nevertheless, such moves do have the potential to free up public-sector investment. Privatisation of breeding programs allows public institutions to move their efforts into pre-competitive research in breeding.

3. Gradual emergence of private-sector farm advisers in the agrisector

With the reduction of public investment in extension — particularly evident in the cotton industry but also horticulture and the grains industry — private-sector advisers have emerged. This area has a lot more potential to grow, but already in the grains industry almost 50% of growers use consultants.

4. The strengthening public–private partnerships between global life science companies and public-sector R&D in Australia

Such partnerships have a strong focus on basic research in plant breeding using modern technologies. They are common overseas. Recent public announcements include the CSIRO/Bayer CropScience alliance in cereals; and the Department of Primary Industries Victoria/Dow AgroSciences alliance in canola, both of which have been announced in the past six months. In Australian cotton breeding, CSIRO has established strong relationships with trait providers and other IP owners (e.g. Monsanto, Bayer CropScience) to bring important benefits such as Bt insect resistance to Australian growers.

These partnerships are important as they support basic productivity research but with a clear eye to the route to market, allowing both the company and the R&D provider to capture benefit. Specific contractual obligations that protect the interests of Australian producers are characteristic of these alliances.

5. Direct investment by firms into agricultural R&D

This investment complements these public–private partnerships — Australian Bureau of Statistics (ABS) figures indicate private-sector investment of the order of AUD100 million a year (ABS 2009). This figure does not take into account direct expenditure of overseas companies into the Australian public sector.

If we summarise the domestic situation, we can see a gradual rise in private-sector investment through a variety of means over the past two decades in Australia. This increasingly sophisticated arrangement of private-sector investment provides a strong backbone that builds on strong institutional public-sector funding. In particular, we are seeing an increased investment in breeding and productivity work by the private sector as these are areas in which the potential for value capture is among the greatest.

Australian investment in overseas R&D

Australian overseas investment in agricultural R&D is undergoing renewal. In May 2009 the Australian Federal Government announced a new $460 million program, 'Food Security through Rural Development', to be delivered by its lead development agencies, AusAID (the Australian Agency for International Development) with assistance from ACIAR (Australian Centre for International Agricultural Research). Two of the three target areas in this program are 'Lifting Agricultural Productivity' and 'Improved Rural Livelihoods'.

There is also renewed institutional interest in overseas research for development, including by CSIRO, although given the constraints on public-sector funding, there is a need for investment models to be modernised. Co-investment models are not always the optimal way of funding overseas work if that work is predominantly knowledge diffusion rather than core research. Modern science investment may be better funded on a program basis encompassing a number of projects, in which the co-investment ratio employed is commensurate with how much of the work is consultancy versus research.

Emergence of new and renewed institutional arrangements in developing countries results in overseas development work being mutually beneficial — this is essential as modern biotechnology and simulation science come to dominate R&D in developed countries. Historically, developing countries would send their best students to developed countries for study. Many would not return. The building of in-country institutional capacity (see below) has the potential to train high-calibre students where they are most needed.

Finally, sophisticated multi-lateral partnerships are also supporting multi-institutional arrangements. These are described elsewhere in these proceedings by a range of authors.

Private–public partnerships in overseas agricultural R&D

How then can we tie these two issues together — the maturing of the Australian agricultural R&D sector with renewed Australian interest in international development work?

Australia's capacity to offer support to least-developed countries will be enhanced greatly if our public institutions work overseas in partnership with the private sector. While it is appropriate for the public sector to focus on providing aid in areas of immediate need for food and nutrition, public–private partnerships will work best if they are directed at developing enduring solutions to food security. Indeed, while some may assume that modern agricultural sciences may not have a lot to offer to these poorer farmers, public–private partnerships can actually assist poor farmers leap-frog agricultural advances, in the same way that developing countries have leapt over land-lines in telecommunications and moved straight to mobile phones.

Consider a couple of examples:

1. Not-for-profit private sector

Application of gene technology in poor countries is challenging. However, some organisations are rising to meet these challenges. Thus, the African Agriculture Technology Foundation (AATF) is a 'not-for-profit' organisation based in Nairobi. It acts as a broker for smallholder farmers in sub-Saharan Africa to deliver technology to them in public–private partnerships. AATF is funded by a variety of private-sector donor organisations and partners with both the private and public sector. For example, in West Africa, it is working towards insect-resistant cowpeas using gene technology. It is also assisting the relevant countries develop the appropriate infrastructure for regulation and marketing. The totality of the project is seen in Table 1.

Table 1. The West Africa Cowpea project (see http://www.aatf-africa.org/)

AATF's[A] roles
• Negotiating intellectual property access to insect resistance gene • Negotiating access to improved seed • Licensing of seed and technologies for distribution • Taking the licensor/licensee responsibilities • Ensuring seed production and availability • Providing technology liability protection • Ensuring social acceptability of improved cowpea varieties • Developing markets
Partners involved in the project
• Network for genetic improvement of cowpea for Africa • International Institute of Tropical Agriculture • Monsanto Company • The Kirkhouse Trust • National agricultural research systems in West Africa • CSIRO • US Aid • Rockerfeller Foundation

[A]African Agriculture Technology Foundation

AATF procures its expertise globally. Monsanto is providing the transgenes, Australian researchers at CSIRO are carrying out the gene transformation of cowpea, and others are assisting in the necessary field trials.

2. International R&D agencies

Centres of excellence are being established in Africa. The first of these is BECA (Biosciences Eastern and Central Africa), also based in Nairobi (http://www.africabiosciences.org). It was established by an initial investment of more than CAD30 million from the Canadian Government and has ongoing support from international development money and not-for-profit donor organisations. BECA aims to develop and apply bioscience research expertise to produce technologies that help poor farmers secure their farms and livelihoods.

Its management is under the stewardship of ILRI (International Livestock Research Institute). Australia is currently exploring means of providing support to this centre in a variety of ways. Our own institution is also looking at developing deep R&D connections with BECA — not in the old-fashioned somewhat lopsided way in which the developing country sent its students to Australia to do their training, but in a much more symmetrical relationship where Australian researchers spend time in Nairobi with BECA to do joint work in top facilities.

These examples demonstrate two roles for the private sector: not only as a financial donor to enable work to be done but also as providers of technology in ways that will benefit farmers.

Barriers to further involvement

Deeper engagement by the private sector in the least-developed countries requires some barriers to be overcome. One is the vexed issue of intellectual property (IP) protection and its transparency, a challenge because many developing countries do not have a patent system that supports innovation well. It is virtually impossible to know the true scope of patent protection in the developing world, making the positive side of the patent system (teachings through disclosure) inaccessible to the public. This makes investment decisions by both public and private sectors risky, and can make licensing problematic.

There are many possible solutions to this issue. Australian researchers are playing a key role internationally in developing frameworks that will assist the least-developed countries. Professor Richard Jefferson from Cambia (based at Queensland University of Technology) is a strong advocate of patent transparency and opportunities for more open-source licensing of key IP in biotechnology (Jefferson 2006). With the assistance of a variety of sponsors, including the Bill and Melinda Gates Foundation, he has championed the establishment of the 'Initiative for Open Innovation' (Cambia 2009). This new global facility is dedicated to making the world's innovation systems more transparent, inclusive and navigable. For the past ten years, Australia has hosted Cambia's patent lens (www.patentlens.net), the most popular non-profit global patent search facility. These facilities are of value to both developed and developing countries.

In a second initiative, Young Global Leaders from the World Economic Forum are promoting a Global Responsibility License (J. Moody, pers. comm., 2009). They are attempting to create a standard license for IP for development purposes. The focus of the project is to unlock IP to benefit the one billion poorest people in the world. This project has already received interest from a number of large patent-holders.

Public-sector institutions in Australia will need to ensure that contractual relationships with global life science companies not only protect the interests of Australian farmers to access IP partly paid for by Australian taxpayers, but also ensure that these arrangements do not exclude access for the least-developed countries.

It is important that we solve this issue around IP and biotechnology. Modern bioscience is relevant to poor farmers. It can greatly speed up breeding, even if the final product is not genetically modified. United international efforts are required for emerging global issues such as control of the wheat rust UG99. International consortia are working together using state-of-the-art science to provide germplasm that is resistant to this pathogen (BGRI 2009).

The way ahead for Australia

While Australia has reduced its public-sector funding in some of its more traditional areas of productivity research, investment remains strong in the areas of greatest challenge, not only for Australia but also for the globe. We are starting to see re-investment in productivity research on the back of private–public partnerships with global life science companies. This breeding activity is being more directed using knowledge available from genome maps.

There are challenges to increasing our overseas presence. There still are mixed views about the merits and importance of international work in public-sector R&D providers in Australia. An internet search of the web sites of major R&D providers shows they are often coy about their international work. Moreover, local industry is also vocal at times about potential competition if Australian researchers assist other countries improve their agricultural production.

We must find our voice in Australia for international development work and also develop better investment models for Australian researchers as the current project-based co-investment approach is under strain. A diminishing workforce and student base also provide challenges to increased activity. These gaps can be filled through international partnerships.

Finally, we suggest that public-sector investment should be directed towards a sustainable future. In such a model, public R&D funds would start with a strong focus on basic productivity issues but over time should aim to draw in private-sector investment in areas in which there is no longer market failure. In this way public funds can be gradually redirected to emerging problems.

We are convinced that Australian R&D has a significant role to play in contributing to solving food security issues in least-developed countries. Success will depend on the public sector being able to partner with the private sector in all its guises: from not-for-profit donor organisations to global life science companies.

Acknowledgements

The Australian Farm Institute gave permission to reproduce Figure 1. Gail Reekie assisted with the background material.

References

ABS (Australian Bureau of Statistics) 2009. *Research and Experimental Development, Businesses, Australia*. Publication 8104.0, The Bureau, Canberra, 37 pp.

BGRI (The Borlaug Global Rust Initiative) 2009. *A Resource for Scientists and Policymakers about the Rusts of Wheat*. http://www.globalrust.org/traction

Cambia 2009. *Initiative for Open Innovation*. http://www.openinnovation.org/daisy/ioi/home.html

CSIRO (Commonwealth Scientific and Industrial Research Organisation) 2008. Submission to National Innovation System Review, 90 pp. http://www.innovation.gov.au/innovationreview/Pages/SubmissiontotheReviewA-D.aspx

DAFF (Department of Agriculture, Fisheries and Forestry) 2008. Submission to the National Innovation System Review, 27 pp. http://www.innovation.gov.au/innovationreview/Pages/SubmissiontotheReviewA-D.aspx

Jefferson, R.A. 2006. Science as a social enterprise: the CAMBIA BiOS Initiative. *Innovations* **1**(4)**,** 13–44.

Mullen, J. and Crean, J. 2006. *Productivity Growth in Australian Agriculture Trends.* The Australian Farm Institute. http://catalogue.nla.gov.au/Record/4083171

Msangi, S. and Rosegrant, M. 2009. *World Agriculture in a Dynamically-Changing Environment: IFPRI's Long-term Outlook for Food and Agriculture under Additional Demand and Constraints*. Background paper for High-Level Expert Forum on 'How to Feed the World in 2050', FAO, Rome, 12–13 October 2009. 27 pp. http://www.fao.org/wsfs/forum2050/wsfs-background-documents/wsfs-expert-papers/en

Pardey, P.G., Alston, J.M. and Piggot, R.R. 2006a. *Agricultural R&D in the Developing World*. International Food Policy Research Institute, http://www.ifpri.org/publication/agricultural-rd-developing-world

Pardey, P., Alston, J. and Beintema, N. 2006b. Agricultural R&D spending at a critical crossroads, *Farm Policy Journal* **3**(1)**,** 1–9.

Review of the National Innovation System (2008) http://www.innovation.gov.au/innovationreview/Pages/home.aspx

Stoekel, A. 2008. *High Food Prices: Causes, Implications and Solutions.* RIRDC (Rural Industries R&D Corporation) Publication No. 08/100, Barton, ACT, Australia, 24 pp.