

Comments on the PC Draft Report on the RDCs

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Thursday, 9 December 2010

Some key recommendations from the draft PC report are:

- A halving of the matching grant to the RDCs;
- The establishment of the RAA with funding of \$50m.
- Greater emphasis on research evaluation.

It seems that these recommendations were driven by:

- A view that it is hard to justify a rate of public contribution to rural research that is 5 times the public contribution to research in other industries;
- A view that at present public funds are not inducing sufficient additional research that delivers public as distinct from industry benefits and in fact are 'crowding out' industry funds;
- A degree of scepticism about past evaluations of the flow of benefits from R&D.

In my view two likely consequences were recommendations from the draft PC report into the funding of the RDCs adopted are:

- The level of public funding of agricultural R&D will decline (as intended by the PC) and that this reduced funding will most likely not be replaced from industry sources (as hoped for by the PC);
- There is a significant risk that the flow of public benefits from research in the form of improved environmental outcomes may diminish rather than increase as postulated by the PC recommendations.

Consequences for Investment Levels

Despite some dissembling in the PC report about adjustment periods, the likely consequence of a halving of the matching grant will be that public investment in agricultural R&D will fall once these changes have been made. Presently the RDCs invest almost \$500m, half of which, \$250m, comes from the matching Commonwealth grant. If the matching grant is halved, investment will fall by \$125m if there is no change in the levies collected by the RDCs. Offsetting this fall of \$125m is the investment in the proposed Rural Research Australia (RRA) of \$50m. The shortfall is about \$75m, roughly equivalent to shutting down the research arm of one of the large State Departments of Agriculture. So this is not an inconsequential change.

The PC hope that this reduction in public funds will encourage increased investment on the part of farmers. It cites the high industry returns to investment in research as the carrot for this increase. However many economists see the persistence of these high returns over decades as evidence of market failure and underinvestment from the viewpoint of both industry and society. There is little evidence that farmers have been willing to increase the

levies they pay despite the high returns. Further, because the benefits from research (particularly at a project level) vary so much across farms and through time, it is most likely that a uniform levy will be struck at a level much below the value of research to farmers in the aggregate (as argued by Alston, pers. comm.). The nature of a public good like R&D is that it is very difficult to devise schemes whereby the beneficiaries reveal their true willingness to pay, as every textbook tells us. The RDC levy mechanism is a marked improvement but not a panacea.

The PC also gives some examples of industries where farmers already contribute more than the 0.5% of GVP attracting the maximum industry. The cases the PC cite are where 'regions' (groups of farmers with similar farming systems) choose to contribute more to research which is directly relevant to them and yet later in the report the PC recommends against 'fine tuning' the RDC model to account for regional differences. The most prominent example the PC specifically cites is that of the voluntary contributions made to the BSES. My understanding is that these voluntary contributions are really payments made by growers for discounted access to BSES genetic material – hardly an untied R&D levy. It is somewhat surprising that the PC does not refer to the GRDC which I understand may be collecting levies at a higher rate than 0.5%. The PC also makes vague references to levy schemes in other countries which do not attract matching grants but in my experience most of these schemes relate to product promotion rather than R&D.

A further untested presumption in the Report is that provided industry funds a project because net benefits to it are positive then there is no need for any government funding. Perhaps there are cases where this happens. However it is not hard to imagine industry not investing to the extent or in a manner by which community benefits can be captured. Some sort of public private partnership is likely to be required to fully capture the non-rival benefits from the information delivered by the research that spills over to the community. Spillovers might be cheap but usually not free. A fuller explanation of the interplay between public and industry funding (or pricing) can be found in a paper by Lindner (AJARE June 2004) not referenced in the Report.

Econometric analysis from ABARE (Sheng, Mullen and Zhao, 2010) identified the slowdown in public investment in R&D as an important contributor with weather to the slowdown in the growth in productivity in Australian broadacre agriculture. I understand that ABARE will address the criticisms of this work by the PC and will also provide results confirming the high rates of return to public R&D from more recent econometric research which has the additional attraction of attempting to capture the impact of 'foreign' spillins.

High rates of return to agricultural research

The issue of the rates of return to agricultural research is an important one. The Report, most reluctantly in view of the length at which it qualifies that findings of relevant studies, accepts that there is some evidence of high returns to investment. At the risk of being self serving, it needs to be pointed out that while some evaluations of research are little more than 'window dressing exercises', the findings of significant studies pointing to high returns have been published in leading economics journals across the world.

There has been a long history of evaluating the impact of agricultural research particularly in Australia. The Report does not point to a similar body of analyses of the impact of publicly funded research in other areas of the economy. This would be useful information to

complement the Report's finding that agriculture receives 5 times the public funding of other sectors as would a review of the structure of sectors of the economy such agriculture making market failure in the delivery of research more or less likely.

As the Report points out an area for improvement in evaluating the impact of agricultural research is in better accounting for environmental and social impacts. No doubt skills will improve as more such analyses are undertaken as has been the case in assessing economic impacts. The PC might have made a real contribution both to its own understanding of agricultural research and to this area of identifying and valuing environmental and social impacts had it undertaken its own intensive investigation of an R&D induced technology like conservation farming which is reputed to have large economic and environmental impacts. It might have simultaneously assessed the capacity of the public sector and industry to fund and provide the infrastructure for such research. It would have been a good case study.

Consequences for Environmental Outcomes

The recommendation that RDCs be left to pursue productivity focussed research and public good research be transferred to RRA is based on a naive view that agricultural research projects are easily classified into those that deliver industry goods and hence should be funded by the RDCs and those that deliver public goods which should be funded by the proposed RRA. In reality most agricultural research delivers public and industry benefits jointly, admittedly to varying degrees. Moreover improved environmental outcomes are more likely to be attained by incorporating resource management strategies in a technology bundle that is profitable for farmers to adopt. The development of such technology bundles is less likely if the responsibility for research is arbitrarily split between the RDCs, who are concerned about the incentives facing farmers to adopt technologies and the RAA, which is less likely to have such concerns. The PC report recognises the importance of adoption to capturing the benefits from R&D but does not specifically identify pathways for adoption of RAA R&D.

While I support the establishment of RAA my expectation is that the research outcomes from such a body may be towards the 'basic' end of the spectrum which while having the potential for high returns to investment, will require further development before incorporation into technology bundles attractive to farmers unless farming practices developed by RAA are imposed through regulation. Hence it is not at all certain that such a shift in resources from RDCS to RAA will result in higher social returns to investment.

I think it is important the RDCs continue to pursue better environmental outcomes within profitable technology packages and hence suggest present funding levels continue with a requirement that the RDCs appoint a government member to their boards, as was formerly the case, to keep the interests of the public to the fore.

Evaluation of Research Impacts

The PC report makes a strong and welcome recommendation about the need for ongoing evaluation of the economic, environmental and social impacts of R&D. There are two points I would like to make here. First, and of least consequence, while the PC has identified the evaluation work already underway by the CRDC and ACIAR, the ongoing evaluation work of economists within the State Departments goes unrecognised. I am most familiar with work

done within the former NSW DPI which can be found at:
<http://www.dpi.nsw.gov.au/research/areas/biosecurity/economics-research/reports>.

However similar bodies of work have been undertaken within the Victorian, Queensland and WA Departments. I point this out not only because this body of work lends support to evidence that returns from agricultural R&D have been high but also to point out that economists, scientists and research managers in these Departments are already addressing issues raised in the report about the need to better align the funding of research projects with where the benefits flow.

This leads to the more substantive point that the PC report has focussed on ex post evaluation and says little about ex ante evaluation. While ex post evaluation might be valuable from an accountability perspective, research managers have to be forward looking in managing their portfolios. In the past, research managers have largely allocated research resources on the basis of the likely economic impact of the proposed research and the scientific merit of the project and research team. The productivity record suggests that they have been successful. Now resource allocation takes place in a more complex decision environment where views about the role of government have narrowed and the environmental and social impact of resource use by agriculture are more recognisable.

It seems to me that at least as many resources should be devoted to ex ante as post evaluations where ex ante analyses are unlikely to be exhaustively quantitative but focus on helping research managers to identify in a timely, cost effective and sometimes largely qualitative manner the main economic, environmental and social impacts of new technology, a likely path to adoption and how benefits are likely to be distributed between industry and the community. Research managers with these skills will make better judgements about their portfolios and be better able to explain to those with limited understanding of the nature of agricultural research, the likely outcomes from their portfolio for the industry and for the community.

Data on Investment in Research and Extension

The PC Report laments the lack of data on investment in research and extension so much so that very little data is provided in the Report on trends in some categories of investment about which there is some information. While I agree that more needs to be done in collecting high quality data on public and private investment in research and extension at the level of major enterprise and cross-cutting issues like pastures or conservation farming for example (and I am aware this is a priority for PISC), the PC would have to be fastidious in the extreme to deny the broad trends evident in the data from the ABS survey of R&D.

In addition (and again at the risk of sounding self serving), using methods similar to those used by the PC to assemble data for 2008-09, I have assembled a database on public investment in agricultural R&D back to 1953 (although relying on ABS data heavily in recent decades). The process I used was described in Mullen, Lee and Wrigley (1996). The dataset is publicly available but as far as I am aware has not been used by the PC.

The broad trends evident in this dataset include:

- Public investment in agricultural R&D has been stagnant in real terms since the late 1970s;

- Public research intensity has declined over this period from about 5% to just over 3%;
- The share of R&D provided by State Departments has fallen from more than 50% to less than 40%. The share accounted for by CSIRO has also fallen with the shares of the universities and the business sectors growing. Because total public funding shows little trend this diminution in share represents a real contraction on the part of State Departments and CSIRO. Some providers are reluctant to admit to this.

In the table below I have updated my series to incorporate data from ABS' 08/09 survey. There was a major change in how the data were reported with some items formerly reported under the animal and plant socio economic objectives now reported under the environmental objective. With help from the ABS I have been able to add back to plant and animal research codes now classified as environmental. However I am mindful of the warning from ABS that there is almost certainly some degree of inconsistency between the series because respondents may have changed the way they interpret the 'revised' survey instrument. Of course the joint nature of the outcomes from agricultural R&D has meant that the classification of expenditure against different socio economic objectives has always had a subjective element to it.

The columns on the left of the table are for public and business R&D for the agriculture, forestry and fisheries sector expressed in real 2008 \$s. The column on the right is real public investment agriculture only – the series in which I have traditionally had most interest. The big increase in business R&D in the 06/07 data came for a change in the sampling frame used by the ABS.

While investment by business has increased since 06/07 there has been a sharp decline in public investment in R&D both for the AFF sector and for agriculture alone. Previously declining direct investment by the public sector has been offset by steadily increasing investment by the RDCs. However investment by the set of RDCs with interests in broadacre agriculture have declined from over \$500m in 04/05 to under \$390m in 08/09 (in 2008\$s), no doubt under the influence of the long run of poor seasons.

	Public AFF \$,000 2008	business AFF	Total AFF	public Agriculture	GDP deflator
1976/77	703,235	6,708	709,942	605,842	22.0
1978/79	797,972	9,198	807,169	692,745	25.9
1981/82	906,515	3,776	910,291	778,188	34.9
1984/85	1,008,466	10,708	1,019,174	878,918	43.5
1986/87	1,087,284	25,115	1,112,399	940,191	49.0
1988/89	1,051,205	40,447	1,091,653	901,693	58.3
1990/91	903,731	50,646	954,377	737,941	63.7
1992/93	952,356	108,417	1,060,773	819,873	65.8
1994/95	939,538	95,440	1,034,977	778,237	67.2
1996/97	996,748	84,907	1,081,654	810,859	69.7
1998/99	1,061,015	109,853	1,170,868	858,079	70.6
2000/01	1,143,493	135,421	1,278,915	948,628	75.5
2002/03	1,059,601	150,019	1,209,619	873,828	80.0
2004/05	1,000,261	194,228	1,194,489	832,849	85.9
2006/07	991,589	270,063	1,261,651	829,219	93.8
2008/09	849,662	307,309	1,156,971	685,873	104.4

In the process of adjusting the 08/09 ABS data I noticed codes 960904 and 960905 which related to 'Farmland arable cropland and permanent cropland land Management' and 'Farmland arable cropland and permanent cropland water Management'. In the 06/07 survey these codes were represented by the single code 770802. Public investment against these two codes amounted to almost \$85m in 2008\$. These codes appeared against the environmental socio-economic objective in both surveys and hence I have not added this amount back when adjusting the data as described above. Were this whole amount added back, public investment would still show a decline.

However there is some chance that given the extensive revisions of the survey instrument, institutions may have interpreted the questions such that in 08/09, investment is reported against environment that was previously reported against plant and animal research (economic development). I have not had the resources to enquire of the ABS if there had been a marked increase in investment against these codes over the 2 surveys. If so, this may be weak evidence that respondents are classifying some research against the environmental objective previously reported against plant and animal research objectives.

Other Concerns

In my view one of the threats to the RDC model is the continuing rundown in capacity in research providers such as CSIRO and the State Departments. Traditionally the RDCs have commissioned research from the State Departments whereby the RDCs provide operating funds in the form of salaries for temporary research assistance, travel and other operating expenses and the State Department made a contribution, usually in-kind, in the form of experienced research supervision by its permanent staff. The rundown in capacity in at least some of the large departments means that the RDCs are finding it more difficult to commission research in this manner.

The PC has not addressed this issue perhaps because it is on the periphery of its terms of reference.

Some Responses to Comments on Mullen in Appendix B

I understand that ABARE will be responding in detail to misunderstandings about the Sheng, Mullen and Zhao paper and will provide new results from even more sophisticated econometric analysis attempting to account for sources of productivity growth other than domestic public investment in R&D. However there are two comments about my previous work that I should respond to. First a careful reading of the Mullen papers will reveal that broadacre TFP has been regressed against the appropriate measure of R&D, investment in broadacre R&D (more exactly a knowledge stock assembled from investment in broadacre R&D), an issue queried by the PC on page 255.

Second the Mullen 2007 paper contained two approaches to considering the returns to investment. The main part of the paper was an econometric analysis of the relationship between broadacre TFP and public investment in broadacre R&D and other factors. No assumptions were imposed on the rate of growth in TFP in this part of the analysis as implied by the PC on page 251. In the second part of the paper an attempt was made to decompose the sources of broadacre productivity growth. This analysis examined high and low scenarios for that part of TFP which might be attributable to public investment in broadacre R&D growth based on the empirical record of TFP growth in the sector. Note that this approach made some allowance for sources of TFP growth other than domestic research and extension and still the returns to public R&D were expected to be strong.

Conclusions

There is evidence emerging that productivity growth at least in the large broadacre sector of Australian agriculture is falling and that stagnant public investment in R&D explains some of this decline. At a time when rapid productivity growth is required to meet the challenges of feeding a still growing world population and climate change, it seems important to at least maintain investment in agricultural R&D. Conducting an experiment in reducing public investment in the hope of increasing private investment seems extremely risky. There seems little evidence that the returns to research are diminishing nor that the private sector is being 'crowded out' and hence it seems most likely that joint public/industry funding mechanisms will have to be at least maintained if a level of investment in agricultural R&D that is desirable from the viewpoints of both industry and society be attained.