

PARTNERSHIPS BETWEEN PUBLIC AND PRIVATE: THE EXPERIENCE OF THE COOPERATIVE RESEARCH CENTER FOR PLANT SCIENCE IN AUSTRALIA

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We discuss an innovative scheme, the Cooperative Research Centers Program, established by the Australian government in 1991, which has a major objective of delivering research output of direct benefit to Australian industries. We focus on one of the first of the centers to be established.

Key words: agriculture; biotechnology; Cooperative Research Center (CRC); Industry Associates; patents; research investment; research management; risk management

"If companies were interested in my research they'd come knocking on my door."
(From a university researcher, circa 1992)

Governments invest in research to bring benefit to society. Often, they fund universities and other public research agencies with this objective, either explicitly or implicitly. However, delivering commercially useful research is a constant challenge for those agencies. Early involvement of users is logical but perversely difficult for them. What initiatives can governments introduce to overcome this enduring problem?

This article relates the experience of the CRC for Plant Science (1991- 1998) which in its seven-year lifecycle expanded its company linkages from one to 26 and its commercial investment from \$78,000 per annum to \$1.1 million¹. We cover the Australian government's initiative, but concentrate on our Center's philosophy and management practices and its evolution in response to a changing environment. We highlight the practices we found worked - and do not gloss over those that did not.

The CRC Initiative - Its Background And Objectives

The CRC scheme represents one of the largest and most innovative shifts of research funding in Australia. Its origins lie in a late 1980's report to the Commonwealth government on a decade of investment in research and development (R&D) in Australia. That report drew a disturbing picture of decline. It traced investment, as a percentage of gross domestic product (GDP), falling in Australia from roughly 1.1% to 0.9%, against a rising trend in the rest of the Organization for Cooperation and Economic

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Development (OECD) nations from about 1.2% to 1.4%. Embedded in those unhappy data was the equally unpalatable news that most R&D was being both funded and performed by the public sector. Low private sector commitment to research also helped explain sub-optimal take-up of research output.

The government tackled this two-fold problem with the novel CRC Program, brainchild of the then Chief Scientist, Professor Ralph Slatyer, and enthusiastically supported by Bob Hawke, Prime Minister of the day. The Program had four aims - or pillars of wisdom - which have endured with relatively minor reconstruction despite two challenging bureaucratic reviews and five selection rounds since 1990. The aims are to:

- Contribute to national objectives . . . and the establishment of internationally competitive industry sectors through supporting long-term, high quality scientific and technological research.
- Capture the benefits of research by strengthening the links between research and its commercial . . . applications through the active involvement of the users of research in the work and management of the CRCs.
- Stimulate a broader education and training experience . . . through . . . involvement of researchers from outside the higher education system, and to enhance the employment prospects of students through . . . involvement in major cooperative, user oriented research programs.
- Promote cooperation in research, and through it a more efficient use of resources in the national research effort.

To give an idea of the Program's prominence, the Australian government now commits \$87.5 million per annum to 67 CRCs, whereas the Australian Research Council's Large Research Grants Scheme (a major source of university research funding) in 1997 allocated \$22.2 million. Industry has already made commitments to the CRC Program totaling more than \$400 million, a huge increase on its previous involvement.

The CRC For Plant Science

The CRC for Plant Science began in 1991 with a collection of academic scientists at the Australian National University and the CSIRO Divisions of Plant Industry and Entomology. The CRC for Plant Science was not aligned with any clear industry group but had one key corporate partner, Groupe Limagrain Pacific, a subsidiary of the French company Groupe Limagrain, the world's third largest seed company. Groupe Limagrain Pacific is a small biotechnology research company occupying rented laboratory space at the Australian National University. The staff of Groupe Limagrain Pacific proved to be excellent scientific colleagues and contributed a much-needed commercial reality into the strategic planning of the Center.

There was a vision among the founders of the Center that research focused on gene technology for plant based agriculture could form the basis of linkages with agribusiness. Because most of the Center's research was upstream of its eventual application, it was not always clear what specific products would eventuate and which companies might be most interested. However, the Center recognized that a major effort was required to establish effective industry linkages. A first step was the formation of the Center's Industry Associates Program. Letters of invitation were sent to 320 companies, with no attempt to select specific companies. Eighteen companies accepted the invitation and paid a small yearly fee that gave them access to the Center's research and education programs.

This number subsequently grew to more than 30. Workshops organized by the education and communication program of the Center played a key role in this strategy, especially the workshop, "Biotechnology for Decision Makers". Research managers from interested companies gained familiarity with new technology and had an opportunity to learn more about the research activities and capabilities of the Center.

The Center developed a philosophy of progressive engagement with its Industry Associate companies. The companies found the Center to be a comfortable environment in which to discuss their research needs. Unlike larger institutions, with their own agendas, establishing linkages with industry was a major objective of the Center. Two staff members accepted the role and enthusiastically pursued discussions with companies. The Center thus made a resource commitment to the development of research collaborations and to their effective management.

Equally important was the availability of new money to invest in research collaborations. This enabled the Center to co-invest in research collaborations with companies. The effect of this co-investment was to share the risks associated with research in plant gene technology. Even though the Center's research was targeted towards application, much of it was still upstream and was therefore perceived as risky. There were risks that the research might not deliver the desired outcomes and there were risks that commercialization of research output, especially that involving genetically modified plants, might be difficult. The risk sharing approach, coupled with R&D tax incentives, encouraged companies to invest in fundamental research in an environment where they had some confidence that the eventual output would be tailored to their business objectives. These companies accepted the scientific strategy of tackling fundamental research problems in model systems and then moving gene discoveries into crop plants of interest.

The Changing Environment

Time does not stand still and during its seven-year cycle, the CRC for Plant Science experienced change in three distinct areas:

- Society's expectations changed, that is, less "science for its own sake" was expected. This evolution did not sit too easily with upstream CRCs.
- Companies changed, as did the maturity of plant biotechnology and its position in the market.
- The CRC environment changed. That is, commodity CRCs emerged as opposed to technology centers.

We will deal with each of these changes in turn.

Changes in Expectations

Within a relatively short period, emphasis within the CRC Program turned to showing benefit from investment. The CRC Program appeared to be influenced by the political climate at the time where the concept was advanced that science should contribute to national wealth building. For a center focused more on fundamental research than immediate delivery of applications, we felt pressure to develop and strengthen linkages to industry. This pressure, though, was interpreted as a push to go along the course already charted but to hurry it up. The primary consequence was to shift our criteria for evaluating new research ideas to a greater emphasis on those that would develop industry linkages. This required scientists to sell their science, demonstrating to interested companies how

their upstream research could impact the business system of a company. Here, the Industry Associates program played a key role, finding companies willing to engage in these discussions.

Companies Changed - the Advent of Corporate Biotechnology

Changes at home were overshadowed by changes elsewhere. Companies were changing, plant biotechnology was advancing fast as business appreciation of its potential solidified and investment increased. The phrase “freedom to operate” was heard for the first time.

The CRC for Plant Science’s Industry Associates' Program grew rapidly during the first two years to include 26 companies by mid-1993. Any company could join, Australian or overseas. The \$625 they paid to be on our mailing list gave us a plausible reason to go door knocking and establish a dialogue. We learned about their business objectives and they about our research capacity.

In our experience of dealing with companies, the Europeans were more interested in the Center’s research than those we dealt with from the United States (U.S.). Australian firms, including local offshoots of multinationals, were eager and often championed the CRC's intellectual property within their own organizations. This may have been because U.S. companies had invested most heavily in biotechnology and germplasm development in the late 1980s and early 1990s. The Europeans and us were playing catch-up together.

We discovered that research capacity alone was not enough. Research concepts and unpublished data were sometimes interesting for our Industry Associates, but developing collaborative projects based on them was difficult. The breakthrough came when the CRC for Plant Science started to take out patents. Patents are property; property is valuable (or so prevailing wisdom then suggested), and therefore it can be traded. It was as if we had suddenly, almost magically, acquired a stack of chips and could get our feet under the card table. It was then that the tactic of progressive engagement started to pay off. At about the same time, intellectual property was recognized as a product of the Center.

Changes in the CRC Environment

By the mid-1990s inconsistencies had appeared in the government's expectations of the CRC Program. Were CRCs to aim for innovative science, or should they be industry-wide think-tanks? By 1995 there had been three rounds of CRC competitions with 15, 20 and 15 new CRCs being established, respectively.

Cooperative Research Centers were divided into six groups on the basis of their field (manufacturing technologies, medical, mining and energy, engineering, environment, and agricultural and rural-based products). There was a progressive move towards sectoral based conglomerations; for example, Quality Wheat, Sustainable Cotton Production, Petroleum and Viticulture CRCs were established. Despite the desirability of appearing as a sector-wide service agency, it sometimes proved difficult for nascent CRCs to get all major players in that sector to support them. Universal company support inevitably meant competitors had to sit at the same table and make common decisions on research investment - and why should Company X invest its dollars in work that Company Y could see and benefit from? Thus, through its desire to have whole industry sectors invest in R&D and high-level education, the CRC program created an environment where sometimes less than cutting-edge projects received common approbation. This perhaps worked to the advantage of technology-based centers, which were able to maintain secrecy between investing companies.

Developing A Portfolio

In 1991, mission statements and strategic plans, now commonplace in public sector research agencies, were held in equally high regard as false noses. The CRC Program, however, required individual CRCs, to develop them. The CRC for Plant Science did this with the assistance of its Industry Associates. The Center had to have a spread of activities to address the CRC Program's objectives - research, education, industry collaborations and enhanced inter-institutional collaboration. The strategic plan covered each of these activities, ascribing to them resources, objectives, milestones, and management practices.

The Center started out with a portfolio of pet research topics coming from within CSIRO or the ANU. This was not without merit as most of these projects were both very high quality science and were led collaboratively by teams of CSIRO and ANU scientists brought together, often for the first time, in collaborative programs. As industry linkages matured the portfolio changed in character with projects being defined as pre-competitive, collaborative, or application. Even at the Center's close, the research-driven projects probably predominated. Whatever the disadvantages of the research-push approach to project development in the early stages of the Center, it had an accidental effect of giving a large group of scientists a strong sense of ownership. A very productive sense of collegiality and commitment was generated which lasted throughout the Center's life.

Enhancing links with industry was set as a major objective. Some extraordinary goals were set. At the first annual retreat (when all the Center scientists and invited industry guests – secrecy and intellectual property having reluctantly been added to the lexicon - traveled to the Snowy Mountains for three days of peer review and tennis) the question was put, "What level of industry investment should be aimed for?" Jim Peacock, Co-Director, suggested \$1.25 million. Everyone thought this objective challenging, but achievable, and then he added " . . . per year". A strategic plan was then developed to achieve this and other equally resistible goals.

History shows that we never quite achieved the magic \$1.25 million per year, but with that as a goal we strove to develop partnerships that would achieve it. In the second to fifth years the cash we received rose by an average of 66% per year and eventually reached a plateau of \$1.1 million per year. Interestingly, at the CRCs beginning we saw cash contributions as the principal measure of success. Progressively, we realized that in-kind contributions from these partnerships were just as significant. They proved the companies were locked-in, gave us access to invaluable technologies and facilities we could not hope to match and tuned our research output for the market. In the final years we estimate that companies were putting the equivalent of \$1.6 million per year of management, research staff and facilities into our joint ventures in addition to their cash contributions. Thus, in the final two years companies were putting about two and three-quarter million dollars into the CRC - a staggering, and at the outset unanticipated, figure - twice the Australian government's CRC grant contribution.

Some of the mechanisms developed at the CRC for Plant Science were:

- The Industry Associates scheme, which became a model for the CRC Program as a whole and was used, in various incarnations, by others as a method of initiating links.
- The Industry Associates scheme, however, was only the first step in the process of progressive engagement. A component of the CRC for Plant Science budget was allocated by the board for the scheme to.

- A quarterly newsletter was produced (the first for a CRC) and widely circulated within the agribusiness industry.
- Key CRC staff began visits to Industry Associate companies; the process allowed us to learn more about their business while explaining our capacity.
- A dollar-for-dollar risk mitigation scheme was set-up to get companies used to establishing joint projects. It proved very attractive.
- Part of the process of constant renewal that came with the CRC culture was that projects without external Industry Associate backers had a two-year life. They were then reviewed and either evolved or were replaced. There were always more good projects than funds available. The cut was real and young postdoctoral fellows felt the harshness of this process. However, it made all the scientists involved appreciate the demand of pitching their projects at a different audience. Customer focus was introduced. The up side of this was that there was a regular timetable for project review and companies became aware that there were strategic times to prepare their investments.

Legal Issues And Intellectual Property

CRCs can be unincorporated joint ventures, establish themselves as companies, or follow the hybrid path where the partnership remains unincorporated but a company is established to hold the intellectual property. Companies involved in downstream CRCs argued for incorporation. This was not as necessary for an upstream CRC, and the CRC for Plant Science used the unincorporated option. Roughly half the CRCs, largely those with a public good mandate or in which CSIRO is a major player, are so constituted. In the period 1990 - 1998, intellectual property became a significant indicator of success. The CRC for Plant Science used separate patent and contract lawyers. A Melbourne patent attorney efficiently handled the specialist activity of assessment and submission. Contract law was another matter; a number of ways to develop contracts with companies were tried. It proved difficult to get right.

As the Center was unincorporated, both the Australian National University and CSIRO partners had to be satisfied with and sign off every contract. Yet neither was made the prime agency and consequently was unable to give the negotiations the immediate and personal contact they required. Consequently, commercial law firms would be engaged to advise during negotiations and write each contract. The old saying “take two lawyers and expect three opinions” was proven again. It was only in the Center’s last two years that an efficient *modus operandi* was devised. A specialist contracts firm in Canberra was engaged, with a partner who consulted for, and was trusted by, both CSIRO and the Australian National University. This proved a boon for us during contract negotiations. They became faster, the process was clearer and the understandings on the CRC side were far better.

If We Had Our Time Again

Not all the practices we used stood the tests of time and those of us involved in management learned a great deal. In retrospect, there were some evolutionary blind alleys and some processes that were driven more by compromise than logic.

Firstly, industry collaborative research (indeed any sort of collaborative research) is not everyone's cup of tea. Researchers, who cannot commit to the tradeoffs necessary to achieve true collaboration, should not be induced into such a scheme with the lure of extra resources.

Secondly, there are times when placing too high a value on maintaining collegiality is counterproductive. Our Center should probably have evolved faster towards a line-management or skills-matrix decision making process. It is a common theme in management texts that managers (and the system of management) should go through development as the staff becomes more skilled and more committed. We should, with hindsight, probably have undergone a management restructuring in our fourth or fifth year with the parties being willing to concede control (and veto powers) in different areas. The type of organizations centers were expected to be in 1998 were probably closer to small to medium sized enterprises than traditional research laboratories. The challenge is to make the small to medium sized enterprises a research-friendly environment.

Endnotes

¹ All figures are converted from Australian dollars (\$A) into United States dollars (\$US) using the exchange rate of \$A 1 = \$US 0.625.