Submission to the Future Drought Fund

December 2019
Cooperative Research Centres Association

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Background

The Cooperative Research Centres (CRC) Program is a significant component of the Australian Government’s innovation system. The CRC Program was officially launched in 1990 and the first CRCs were established in 1991. Since the program’s inception, the government has committed $4.8 billion in funding to support the establishment of 225 CRCs and 111 CRC-Ps, leading to a total of 320 major collaborations being funded over the program’s lifetime. In addition, there has been a total of over $14.9 billion in cash and in-kind contributions from partners.¹

The CRC Program was established to address a significant gap in business-research collaboration in the Australian innovation system. It aims to improve the competitiveness, productivity and sustainability of Australian industries, especially where Australia has a competitive strength, and in line with Government priorities. The Program is a competitive, merit-based one that supports industry-led collaborations which link researchers in both the public and private sectors with industry, government and the community and which address major challenges facing Australia, many of which are global challenges.

The CRC Program has been mission-driven since the outset. The model has proven to be highly effective in translating research into meaningful and useful policy outcomes at ground level. An essential characteristic of CRCs is the close interaction between researchers and end-users, with a focus upon research application and development towards use and commercialisation. Through the Program, innovative technologies, products and services have been developed, new and global markets are being accessed, and businesses have been able to increase their income, competitiveness and productivity. The CRC Program is one of the most successful Government innovation programs in the world, yet it accounts for less than two per cent of all Federal Government spending on R&D.

CRCs are managed in such a way as to deliver outcomes and are held accountable throughout the entire process. The overall activities of CRCs are actively overseen by the CRC management team and Board to maximise national benefits. This includes terminating, redirecting or accelerating projects in a way that is not part of the culture of most other programs.

The CRC Program consists of two elements:

- Cooperative Research Centres (CRC) are funded by grants, which support medium to long term industry-led collaborations of up to 10 years; and

- Cooperative Research Centres Projects (CRC-P) are funded by grants, which support short-term, industry-led collaborative research, leading to the development of important new technologies, products and services, up to three years.

In 2016, the CRC Program was expanded to develop the second element of the program - CRC-Projects (CRC-Ps) in response to recommendations made by the 2015 Miles review. This expansion in the scope and ambition of the CRC Program has been widely welcomed by industry and was a very significant change in the almost 30-year history of the program. The CRC-Ps were designed to enable smaller but highly practical and significant industry-research collaborations.

CRC performance

The CRC Program has been repeatedly reviewed and analysed and each time it has proven to significantly add

¹ Department of Industry, Innovation and Science, Factsheet, Cooperative Research Centres Program, Business.gov.au
to Australian innovation and to contribute to the national GDP. A study of the CRC Program by the Allen Consulting Group (2012) identified very significant economic, environmental and social impacts between 1991 and out to 2017:

- almost $14.5 billion of direct economic impacts are estimated to have accrued from CRC produced technologies, products and processes; and
- the CRC Program generated a net benefit to the economy of $7.5 billion over this period, or around 0.03 percentage points of additional GDP growth per annum.

The study also identified significant environmental benefits, including impacts on land, ecosystems, pollutants, natural resources, plants, animals and biodiversity, as well as social benefits.²

Overall, Allen Consulting concluded that the CRC Program has generated a net economic benefit to the community that has exceeded its costs by a factor of 3:1. Each dollar the government invests in the program is boosted by more than three dollars of co-investment by CRC partners.

According to the Miles Review, (2015) the CRC Program has been one of the main policy instruments for encouraging high quality, medium to long term collaborative research in Australia.³ The review also concluded that the program was valuable and effective and that it should continue its vital role in training the next generation of researchers and entrepreneurs, and inspiring cultural change in industry and research so that innovation and collaboration become the norm. The Review made a total of 18 recommendations, all of which were implemented by the Government.

Insight Economics, in its economic impact study, found that the CRC Program was delivering very clear net benefits for Australian economic welfare and that for each dollar invested in the CRC Program, Australian gross domestic product was cumulatively $1.16 higher than it would otherwise have been.⁴ Professor O’Kane noted the Program as iconic and highly influential, having been copied by several countries.⁵

The key differentiator of CRCs is their capacity to link multi-disciplinary efforts with actual end-users to build practical research solutions that can transform a whole sector. CRCs are built upon collaboration. They are unique in that they assemble multidisciplinary teams from across research providers to address market-driven research. A further defining characteristic of CRCs is close interaction between researchers and end-users, with a focus upon research application and development towards use and commercialisation. The CRC Program is a tried and tested mechanism for facilitating research collaboration - it allows end-users a key role in planning the direction of the research and furthermore, enables them to monitor and modify the research progress. This is in line with the aim of the Future Drought Fund to deliver programs through a user-based lens with a community-led or co-design approach and to provide funding of projects at a mixture of levels, such as the farm, regional or national level.

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³ Miles, D, 2015 Growth through Innovation and Collaboration: A Review of the Cooperative Research Centres Program, Canberra
⁴ Insight Economics, 2006 Economic Impact Study of the CRC Program, Insight Economics Pty Ltd
⁵ O’Kane, M, 2008 Collaborating to a Purpose, Review of the Cooperative Research Centres Program, Commonwealth of Australia
CRCs are structured in such a way as to emphasise flexibility, allowing them to evolve and develop as the needs of the community and the research partners change. Given the nature of drought resilience in the context of agriculture, this is a critical characteristic and vital to ensuring that the needs of end-uses are best met.

CRCs require co-investment and are made up of government grants, participant cash input, non-staff in-kind benefits and FTE value.

Figure 1: Contributions to CRCs

As testimony to the success of CRCs in agriculture, we can cite the Sheep CRC, the Invasive Animals CRC, the Cooperative Research Centre for Polymers (CRCP), CRC Care and CRC for Spatial Information.

- The design of the Information Nucleus Flock by the Sheep CRC was central to their work in delivering new and far-reaching genetic information and data for genomic predictions of sheep breeding values. While traditional production traits were also measured, new consumer-orientated eating quality traits, such as tenderness and intramuscular fat were a prime focus. In 2016, the Sheep CRC launched the popular RamSelect app which made it even easier to select superior genetics specifically matched to flock needs. Furthermore, ASKBILL, a system of sheep well-being predictions, was designed to forewarn and forearm sheep producers against risks of cold snaps and parasite outbreaks, as well as better manage their pasture base in order to meet production targets. ASKBILL provides timely and accurate predictions of sheep wellbeing and productivity using a combination of historic weather records, short and long-range weather forecasts, biophysical models for stock and pasture production, and on-farm measurements and flock information. During the lifetime of the Sheep CRC (2001-2019), the gross value of the sheep industry increased by almost 50 per cent despite the national flock decreasing in size by more than 40 per cent over this period. On a per-sheep basis, the real gross value of production had increased 2.6-fold.

- The Invasive Animals CRC collaborated with industry partners to bring the first new predator bait to market in half a century. The CRC also made great strides in boosting biocontrol of rabbits and began measures for release of a carp biocontrol virus.

- BASF has licensed new soil wetting technologies co-developed with the Cooperative
Research Centre for Polymers (CRCP) to help Australian farmers improve water efficiencies and increase yields. More than five million hectares of Australian soils used for cropping are susceptible to water repellence. This water repellence causes rainfall-runoff, poor furrow efficiencies, patchy seed germination and therefore reduced crop yields. The wetting agents are applied in a band to the surface soil directly above the seed, concurrently with the seeding operation, where they significantly improve water infiltration in the soil, reducing run-off losses and increasing the extent of moisture retention in the developing root zone.

- **CRC CARE’s National Remediation Framework (NRF)** was recognised and supported by the Heads of EPA in October 2019. The NRF, which harmonises best practice approaches to contaminated site clean-up across all Australian states and territories, is forecast to deliver a minimum five per cent reduction in total costs, amounting to more than $200 million through to 2026. CRC CARE’s work has saved its industry participants millions of dollars annually. A 2019 economic impact review estimated that spread across the entire sector this amounts to more than $5.4 billion of economic benefit to Australia - a return of almost $9 on every dollar invested by government and industry.

- **CRC Spatial Information’s Satellite imaging-based pasture monitoring system, NRM Hub**, now serving 650 grazing properties covering more than 60 million hectares, processes 30 years of satellite imagery including the latest image in 30 seconds delivered to the grazer through a simple app. The CRC, in conjunction with many partners, has identified 30 per cent improvements in pasture productivity.

**Funding CRCs is not limited to the Department of Industry**

The CRC program comes under the remit of the Department of Industry, Innovation and Science but it is a whole-of-Government program (indeed, the first two funding rounds were run from the Department of Prime Minister and Cabinet). The government-commissioned review of the program, the 2015 Miles review, concluded in recommendation 18 that other government departments should fund CRCs in areas under their remit. An obvious example of this is the Defence CRC, Trusted Autonomous Systems DCRC. It is in this context that we are submitting a proposal to the Department of Agriculture for the funding of CRCs under their Future Drought Fund. We present here our proposals for three projects which would fit very well with the strategic priorities of the FDF.

**Proposed CRCs**

The government is to be commended for its commitment to investing in strengthening drought resilience in response to the ongoing drought crisis. In investing in a wide range of programs, activities and projects, the Fund will no doubt have an enormous impact on enabling all those affected by drought to adapt and transform in order to become more resilient to the effects of drought and to adapt to changing conditions. The Future Drought Fund reflects the commitment by the Department of Agriculture to address issues arising from drought. We argue that some of this money if invested in CRCs, will deliver essential results which will contribute to invaluable policy implementation at the ground level which will be highly beneficial not only to the agricultural sector but to the Australian population as a whole.

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6 Miles, D, 2015 *Growth through Innovation and Collaboration A Review of the Cooperative Research Centres Programme*. 
We would like to submit to the Future Drought Fund under the provision they have made to support initiatives that strengthen the drought resilience of Australian farm businesses and communities.

The CRC Association submits that CRCs are extremely well placed to undertake end-user driven, collaborative research and to achieve the purpose of the fund to “enhance the public good by building drought resilience”. It becomes clear from any reading of the FDF Consultation Draft that the mission of CRCs aligns quite significantly with many of the FDF key priorities. The capacity of CRCs to unify a consolidated effort around large-scale problems and to deliver public good impacts through end-user focused research coincides with the priorities of the FDF. The Fund requires that the benefits generated by the funding of projects be public and should be able to be accessed and/or shared by many rather than be captured solely by individual businesses or industries solely for private commercial gain. The knowledge generated from CRCs is widely disseminated and is made freely available in the public domain. Furthermore, a stated condition of the Fund is that the benefits should outweigh the costs. These requirements are exactly in line with the culture of CRCs which are user-driven and generate benefits to communities and to Australia as a whole with lasting and enduring outcomes.

The CRC Association proposes three potential Cooperative Research Centers in the area of drought. The proposed CRCs fit in extremely well with the three strategic priorities of economic resilience, environmental resilience and social resilience, as outlined in the Drought Resilience Funding Plan. However, in keeping with the CRC philosophy of end-user driven research, these proposals would necessarily require development and commitment from those most affected by drought. We believe core funding in these areas on the part of the FDF would attract additional investors, leveraging FDF investment. Without FDF initiation, it seems unlikely that any other investor would take the lead.

The broad areas we have identified as being most pertinent and which correspond to the strategic priorities of the Future Drought Fund are as follows:

- **National planning**: An Agricultural Outlook CRC which would involve the development of more accurate predictive tools for farming and agriculture and coordinate data sources enabling better decision-making. This would focus upon satellite-based estimation and forecasting and the ability to forecast current and future yield at farm, regional, state and country level. This addresses the first strategic priority as outlined by the Fund, which addresses growing self-reliance and performance. It deals specifically with improved weather information regarding drought risk, such as early warning systems, seasonal forecasts, future climate projections and impacts for agriculture. The proposed CRC will also address the objective of the Fund to expand technologies available to farmers to respond to risks such as drought. Research development and capabilities in the area are rapidly improving. For example, our ability to predict future feedstocks has vastly improved with satellite technology and is set to further improve.

- **Grazing and the ability to manage stock**: In preparing for drought, the issue of grazing management and stocking density is highly relevant. This corresponds to the second objective of the Fund of enhancing the public good by building drought resilience through programs that will grow the self-reliance and performance of the agricultural sector as well as the objective of improving natural resource management of agricultural landscapes. The old adage for coping with drought is “sell and repent but sell anyway”. Managing stocking rate is a major issue that interacts with natural resource management. Holding onto stock in the hope of rain can cause significant long-term damage to soil. The Sheep CRC’s ASKBILL program incorporates science and data previously impossible to manage into a decision support tool. Products like ASKBILL could form the basis of further sophistication of decision-
making support for land management. There have been many changes in science and technology in recent years which have vastly increased our knowledge and therefore our ability to predict weather and other adverse occurrences as well as given us the tools through developments such as artificial intelligence, to render farm decision-making more efficient and effective. For example, we now have a wealth of invaluable data on soil moisture, weather prediction and performance. However, in parallel to this, there is a significant gap in integrated data and a lack of optimal application which farmers rely on for essential, everyday decision-making. It is this crucial gap that our proposed CRCs wish to address and alleviate.

- **Community resilience in the face of drought**: Mental health and strategic decision-making. This corresponds to the third objective of the Fund of enhancing the public good by building drought resilience through programs that maintain and improve the well-being and social fabric of rural and regional communities. The Fund is proposing to support this objective by assisting communities to upskill and adopt innovative approaches to drought resilience, including community planning and supporting the use of existing and new networks to improve community wellbeing. A further aim is to support community wellbeing activities to increase social networking, support and social engagement. CRCs are very well placed to share research results and knowledge with other communities. This objective is about supporting communities to undertake planning, projects and activities that will build their social resilience. Technology has the potential to narrow the gap in mental health services between cities and our rural communities. Drought takes its toll on the mental health of rural communities. Coping with the stress of drought is an important role of the FDF. It is not effective or efficient to take measures at the height of a crisis. Well researched mechanisms, implemented with end-user involvement would be more cost-effective and efficient in the long-run.

We believe that vital, user-based, collaborative research of this nature could undoubtedly benefit from the CRC model. In line with the strategic objectives and requirements of the Fund and with the culture of CRCs, our recommendation would be to place the proposed CRCs in a regional centre in order to increase possibilities for collaboration and end-user involvement. The funding of drought-related CRCs under the FDF would also promote and maximise competition of ideas and capability to deliver optimal solutions in a manner that is superior (or at least equivalent) to other forms of competitive grant funding.

As outlined above, funding for CRCs has opened beyond the Department of Industry, Innovation and Science, paving the way for other departments to support the development of CRCs in their areas. Furthermore, due to budget constraints and the fact that the funding for the CRC Program has not expanded to account for the instigation of CRC-Ps in 2016, it is not possible to fund all proposed CRCs. The support of the FDF would allow the application of the CRC model to research issues in the area of drought management.

The CRC model brings cost efficiencies, good governance and, critically, a rapid path to impact for Departmental investment in this space. Rather than building new funding mechanisms in which to design end-user, mission-driven research, leveraging CRCs brings massive impact quickly under a proven model. Utilising an established, effective model such as the CRC, a lot of time and money building governance infrastructures that would in effect replicate what CRCs already do very well, could be saved (delivering real-world, large-scale, end-user focussed research with impact). Furthermore, a more expansive program of CRCs is required if we are to genuinely address drought resilience in a holistic and efficient manner. Funding just one CRC in drought management under the program itself risks delivering a piece-meal solution. By reserving funding for multiple CRCs under the FDF, a more impactful, extensive solution to drought management could be achieved.
Appendix 1: Further examples from CRCs

The Food Agility CRC has provided the following comments, which provide a further example of how a CRC or CRC-Project approach could make a positive contribution.

Australia lacks a drought resilience decision support system that enables biophysical ‘what if scenarios’ that factor in temporal weather patterns. Food Agility is engaging with start-ups and researchers whose emergent IP has high impact potential to deliver short-term drought response results and build farming system resilience over time. We believe that getting to a proof-of-concept stage to demonstrate impact offers promising return on investment for the FDF. If Food Agility and partners had the capacity to incentivise farmers to participate in prototyping this style of Drought Resilience DSS, a pilot could reveal impact potential. As important co-benefits, such a pilot could deepen:

- **Natural Capital** – Data analytics can reveal a better understanding of how enhanced natural capital maps to increased financial and environmental sustainability. This will help bankers and insurers to continue to support farmers through the leaner drought times and could underpin new products that better reward reduced risk.
- **Human Capital** – Better flowing data, information and the skills to use it would greatly enhance our social resilience through drought, positioning empowered farmers to bounce back better when water flows.
- **Supply Chain Resilience** – Increased capacity to manage variability across entire supply chains, disrupting investment plans, adaptive operating models, and drought-strained farming systems.

Food Agility is eager to explore a proof-of-concept project cluster along these lines. Food Agility could host Kaggles that bring together data analysts and farm-scale data within a trusted ecosystem of start-ups whose tools can place promising algorithms into the hands of farmers with decision support apps. Short trials, rapid industry feedback loops, de-risked visibility on impact potential, lean methods – this is our culture which supports further scale-up of industry-led research and commercial pathways for technology partners.

The following comment is from CRC Association Associate Member, the Australian Pork Research Institute.

The (ongoing) drought has had, and continues to have, a major negative impact on the total cost of production, and hence the profitability, of the Australian pork industry. The Australian pork industry relies (solely) on Australian-grown cereals and, with the exception of mainly soybean meal, Australian-grown protein-containing feedstuffs, for diet manufacture and feeding. Through the drought, and currently, the Australian pork industry has sought alternative ways to mitigate the impacts of drought on feedstock supply by exploring the use of novel and inventive feedstocks and implementation of cost-saving production and feeding management strategies. Whilst these mechanisms cannot fully substitute for the high price of wheat, for example, they have reduced the magnitude of the increase in the cost of production producers faced, and hence allowed our producers to ‘hang in there’. Therefore, and whilst the Australian pork industry cannot do anything to mitigate drought per se, it does require R&D investment into strategies to deal with the impacts of drought to make the Industry more prepared and resilient to climatic variations such as drought and rain events.
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