# CSIRO Submission 10/388

# Rural Research and Development Corporations

# Productivity Commission Issues Paper

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# Introduction

CSIRO is pleased to provide input into the Commission's consideration of the Rural Research and Development Corporations (RDCs). Our submission seeks to focus on the system-wide issues and the Research and Development (R&D) context in which the RDCs operate and includes some wider options for change, in addition to responding to the Terms of Reference and the specific questions raised in the Commissions Issues Paper.

This submission complements and extends the points made to the earlier Rural Research and Development Council (see Box below), and it also builds on our views expressed to the Cutler review of the Innovation System in 2008.

The key points CSIRO made in our recent submission to the Rural R&D Council (2010) were:

- The Rural Innovation System needs to be an integrated element of the wider national innovation system, and include a more cohesive and shared approach to funding and capacity building.
- It is critical to get a mix of public and private sector investment that both targets the highest priorities and ensures an appropriate balance of strategic versus near-to-market research investments.
- Institutional arrangements and investment mechanisms need to evolve if we are to tackle new challenges that require scale and connectivity across the innovation system.
- Opportunities to reduce transaction costs and duplication must be pursued vigorously, focussing on better role definition and a shared strategic framework. At the same time, it is important to stimulate and harness the intrinsic power of a "competition for the best ideas" across the entire rural R&D system.
- International collaborations and linkages need to be fostered to bring new technologies to producers and natural resource managers.

CSIRO welcomes this review. The RDC system has been in place since 1989 so after 21 years it is timely to consider how the RDC system as a whole, and the funding model in particular, can be repositioned to enhance Australia's response to emerging challenges and opportunities.

The Commission's review also coincides with the development of the *Strategic Investment Plan* for Rural Research by the Rural R&D Council (2010) and further evolution of the National Primary Industries Research, Development and Extension (RD&E) Framework. Collectively, these processes provide an opportunity to review the rural R&D system as a whole.

CSIRO takes a broad view of rural R&D system. We include research for both plant and animal production and research aimed at natural resource management and rural sustainability. Rural research must also have a view along the whole value chain to include downstream processing and manufacturing industries within the food and fibre industries. Hence, our comments in this submission seek to encompass rural research as a component of the wider innovation system as a whole.

## Key points

1. CSIRO notes that the RDC model has delivered exceptional benefits and productivity growth over many years through a strong alignment of R&D effort with industry priorities. However, rural innovation, the RDCs within it, and the research providers, must continue to evolve in response to major drivers:
    - Agricultural and food processing industries must adapt to the impact of climate change.
    - Opportunities exist for agriculture to underpin the wider bio-economy, in which on-farm production provides economic and environmental benefits beyond food production to include new biologically-based industrial feedstocks (e.g. plants producing new materials or industrial oils)
    - Agriculture (including forestry) can provide options and solutions for carbon sequestration in a carbon constrained economy.
    - Food security, biosecurity, water security and energy security are becoming dominant policy issues for governments around the world and are shaping public research agendas with a greater attention placed on system-wide effects.
    - There is increasing certainty about the link between declining rural productivity growth and declining investment in rural research.
    - In recent years, Primary Industry Standing Committee (PISC) has brought together rural R&D providers and educators with RDC funders and industry into a common planning framework. This National RD&E framework is gradually removing institutional barriers.

    CSIRO is responding to these challenges by providing a more strategic approach to its research investment processes by focussing on national challenges while seeking greater co-investment from industry on near-to-market or strongly sectoral aligned research.

2. We agree with many of the observations raised with the Commission and mentioned in the discussion paper:
    - The RDC model is widely regarded as successful, including by overseas competitors.
    - The RDC model encourages investments on-farm, in reflection that most of the levies are collected from primary producers.
    - There is a gap in funding for downstream activities in food processing and manufacture.
    - Collectively, the RDCs fund about a quarter of rural research in Australia. The RDCs are now becoming a major funding source for rural research.
    - The RDCs operate well within their sector specific boundaries, but in our experience have been less well suited to address cross-sector issues that are emerging as national challenges (water, sustainability, climate adaptation and mitigation, healthy soils etc).

- The Australian rural R&D landscape is complex and crowded with many funders and providers.

3. There are some signals for change in the overall system:
    - RDCs as major funders of the system have significant influence on, and leverage over R&D providers in their capacity to train and retain people and to maintain major infrastructure. Yet, the current system still encourages 'spot buying' of research in project-focused activities. Such an investment model was appropriate when RDCs were new and an 'add-on' to major investment. But 21 years later the RDCs collectively are a major investment lever so a new business model in which there is a shared responsibility for the sustainability of the rural R&D system is needed. CSIRO has a preference for forming strategic alliances or partnerships that foster this shared approach.
    - There is an opportunity to remove duplication and provide greater clarity of the role of the various parties, which should result in greater efficiency of the overall system.
    - Amalgamations and consolidations in farming enterprises, and the privatisation of government enterprise enterprises (e.g. breeding programs, post-harvest storage) challenge the market failure argument for public rural research investments in traditional areas of activity. Consideration needs to be given to how public research funds should be invested into the future.
    - Public funds are still invested strongly in underpinning science, and technologic breakthroughs in the rural sector will built on this science (e.g. genomics, informatics, biomaterials, climate science)
    - CSIRO believes that its role is to address the most pressing national challenges that require cross-disciplinary research at scale. To that end we are focusing our efforts in producing step changes in farm productivity, through advances in plant and animal breeding; through integrated farming systems; and through food manufacture of high value and nutritious food. We also have an emerging portfolio of activities in the non-food area of the broader bioeconomy that will expand the economic opportunities for rural industries while delivering environmental benefits.
    - Finally, there is an urgency to increase Australia's international engagement. Agribusiness is a global business and the problems of food security touch all humanity. Knowledge flow will be both into and out of Australia. The inflow brings technological advances and the outflow can be agricultural services and Australia's contribution to food security. Such global engagement needs an international rural research strategy.

## Options for change

In the face of the drivers mentioned above, CSIRO believes the current approach to funding rural R&D needs to evolve. CSIRO would encourage the Commission to explore wider options for change in its Draft Report. This could be in a number of forms such as:

1. Encourage greater private-public partnerships to support longer term research and capacity building and to encourage rural innovation.
2. Consider significant increases in private sector co-investment through new levies, particularly to underpin research where there is not good evidence of market failure.
3. Amalgamate some of the Commonwealth matching funding into a single program to support cross-sectoral issues aimed at addressing national or global challenges.
4. Direct funding through existing R&D providers that have a proven track record of delivering projects of scale.
5. Amalgamate RDCs to increase efficiency.
6. Remove overlap with the CRC program.
7. Mandate specific R&D levy collection from food processors, support industries (e.g. grain traders, livestock exporters, agrichemical companies) and rural manufacturing industries.
8. Strengthen intellectual property policies to ensure stronger capture of benefits of public sector investments, particularly in public-private partnerships.
9. Create a robust and contestable funding mechanism for specific international engagements that deliver benefit to Australia.
10. Channel public funding towards the building of capability and infrastructure.

Exploration of these options would require consideration of the policy implications as well as some econometric modelling for the system as a whole.

# CSIRO's investment in agricultural research

CSIRO is largest institutional research provider in agriculture and food. The overall agricultural and food research budget for 2009/2010 is $315 M: $188 M appropriation funds and $127 M external revenue from non-CSIRO sources. This figure represents 29% of CSIRO's total budget. In addition, there is further research expenditure addressing rural environmental issues, such as climate science and research into water.

Our expenditure is allocated towards a broad set of portfolios that include three flagships (Food Futures, Sustainable Agriculture and Climate Adaptation) as well as CSIRO's core research portfolio in Plant Industry, Livestock Industries, Entomology and Food & Nutritional Sciences.

# CSIRO's response to the Terms of Reference

***i. The economic and policy rationale for Commonwealth Government investment in rural R&D***

We support the investment of public funds in areas of significant national challenge: increased climate variability and the impact of climate change more generally, as well as increasing global demand for food and the risk of significant impact on Australia's production system from breakdown of biosecurity.

CSIRO agrees with the points made in the Discussion Paper that significant public returns on past investment in rural R&D have been achieved, including sustained increases in productivity over the last 25 years, although productivity gains have stalled in recent years.

Investment in rural R&D has long-term multiplier effects in rural communities with prosperous rural industries injecting funds into associated industries, supporting the rural social infrastructure and providing positive knock-on effects to other local businesses with benefits for regional employment.

### *ii. The appropriate level of, and balance between public and private investment in rural R&D.*

The balance between the public and private investment should be considered on an industry by industry basis, taking into account that the fortunes of rural industries change over time due to variability in climate and global commodity market conditions.

### *iii. The effectiveness of the current RDC model in improving competitiveness and productivity in the agriculture, fisheries and forestry industries through research and development.*

Since its inception the RDC model has proven to be an effective research funding vehicle and has supported key research that has delivered productivity gains to the rural sector, and the nation more broadly. The model is the envy of research providers in other nations.

The levy system encourages innovation, outcomes and impact to be directed back to the original source of the levy which in most cases is a primary producer. This can leave a gap post-farm gate.

The current RDC model is reasonably well suited to support research that addresses industry specific needs, usually with a 3-5 year horizon. It is less well suited to medium to long-term, large-scale, multi-disciplinary national research issues. There are opportunities to improve the current model, particularly where it concerns cross-cutting industries that affect a sub-set of the rural industries or the entire sector (e.g. climate variability, water security, avoiding biosecurity breaches etc.).

Consequently, research into farming systems-wide issues or research that reaches across the entire food chain aiming at enhancing safety, quality and capturing premium prices often represents missed opportunities. With 65% of world food trade in substantially or elaborately transformed foods, Australian primary and secondary food processing industries have the potential to increase value addition within Australia (including regional centres). However, many of the RDCs do not maintain strong investments into food processing (although meat, horticulture and dairy have some focus here) and generally there is no levy collection from processors (although Horticulture Australia Ltd has some capacity to match contributions from this source). By not supporting a full supply chain approach, the effectiveness of the current RDC model is reduced by not building through-chain collaboration and partnerships in R&D.

However, adopting a longer supply-chain approach to R&D has its difficulties. Our experience is that due to differing business structures and commercial imperatives through the food chain (e.g. farmers; processors; storage & distribution; retailers and food service providers) the culture of research and the pathways needed to achieve outcomes and impacts differ significantly.

***iv. The appropriateness of current funding levels and arrangements for agricultural research and development, particularly levy arrangements, and Commonwealth matching and other financial contributions to agriculture, fisheries and forestry RDCs.***

CSIRO offers no comment on the appropriateness of the funding level, but suggests some possible modifications to the levy arrangements:

- Consider separation of 'near to market' from strategic, cross-sectoral public good issues - by splitting the industry and Commonwealth funds and changing leverage requirements (i.e. near to market research funded in full by industry; public good research co-funded more by public monies).
- Review of the three year moving average funding model or consider counter-cyclical arrangements for the government contributions; the current drought has been much longer than the 'buffer period' meaning available funds for RD&E have significantly decreased at a time when they are much needed to respond to the present climate challenges.
- Consider implementing a process of joint priority setting for RDCs to enhance synergies and prevent duplication of research effort.
- Look to improve connections between the applied research funded by RDCs with the discovery phase of innovation generated elsewhere in the innovation system.

***v. Impediments to the efficient and effective functioning of the RDC model and identify any scope for improvements, including in respect to governance, management and any administrative duplication;***

CSIRO believes there is a need for a specific mechanism to support RD&E on cross sectoral issues that are of national importance but not necessarily of high priority for individual primary industry sectors. Current arrangements for funding agricultural and natural resource management research probably leads to under investment in generic, cross-cutting, public good activities, e.g. many aspects of water related research.

At present, there are high transaction costs for research providers when trying to initiate cross-cutting projects and programs that need to involve multiple RDCs. There are also significant transaction costs in coordinating outcomes between RDCs. Indeed, uncertainty in gaining funding and complexity in synchronising proposals and reporting on outcomes are often disincentives to such activities.

Generally, RDCs have different administrative arrangements. A single granting mechanism operated by a shared secretariat with common templates, contractual arrangements and reporting requirements would reduce transactional costs for research providers.

The current model does not share the risks in capability development and infrastructure maintenance adequately with the beneficiaries of RDC funding.

***vi. The extent to which the agriculture, fisheries and forestry industries differ from other sectors of the economy with regard to research and development; how the current RDC model compares and interacts with other research and development arrangements, including the university sector, cooperative research centres and other providers; and whether there are other models which could address policy objectives more effectively;***

The Australian 'agricultural research landscape' has a multitude of research funders and research providers. Over the past two decades the number has increased with many new programs and new institutional arrangements, which are often preferred over support for collaborations between existing entities. While each of these has individual merit, and diversity of effort can foster innovation, when taken as a whole, the system has become complex and costly to administer for research providers.

In undertaking our strategic research agenda, CSIRO programs often involve collaborative arrangements across several funders in order to build scale.

There are efficiencies to be gained by greater coordination across the system but the RDCs should not be considered in isolation. There would be benefit in looking at all the players. This would, however, require a joint approach beyond the Primary Industries Standing Committee's review of Primary Industry National RD&E Framework and involve all government portfolios with a stake in rural research.

***vii. The extent to which RDCs provide an appropriate balance between projects that provide benefits to specific industries versus broader public interests including examining interactions and potential overlaps across governments and programs, such as mitigating and adapting to climate change; managing the natural resource base; understanding and responding better to markets and consumers; food security, and managing biosecurity threats;***

CSIRO believes that in general the RDCs have funded a good balance of projects that have delivered benefits to industries. However, as we note above, future research effort will need to move from a project focus to larger programs and initiatives. Given the 3:1 ratio of public to private investment in RDC research when leveraged through CSIRO or the Universities[1], we believe that there should be greater emphasis on longer term innovative research that will benefit the Australian economy broadly in addition a focus on the short term interests of a specific industry.

Again, the cross-sectoral issues provide some challenges in the current model. For instance, research into food safety, value adding through food processing and delivery of better public health through nutrition can have elements aligned to a particular primary industry, but in many cases there are significant spillover benefits to other

[1] Projects are often funded 50:50 between RDCs and public institutions. However, the RDCs funds are approximately 50% commonwealth matching funds. Thus, $1of industry levy leverages $3 of public funds.

industries, which can be captured with low incremental research effort. The current industry focus does not readily support cross-industry projects.

Research on zoonotic diseases (human diseases transmitted by animals) is another example. These diseases are at the intersection of human and animal health; and between medical and non-medical research. Finding appropriate support for research into these diseases that affect both public health and also rural livelihoods is challenging.

CSIRO suggests that a possible approach could be to create a new entity to support important cross sectoral issues such as climate change, water use in agriculture, biosecurity, food processing etc. Alternatively, DAFF could administer specific programs in these areas.

At times a gap can occur between publicly funded natural resource management (NRM) programs and the primary industries R&D funded through the RDCs and others. Opportunities for integration are probably limited by the current commodity focus. This is unfortunate because much NRM activity has a very close connection with farming systems. In the case of water security, better connection between the primary industries sector research providers and the national water reform process would be beneficial.

***viii. Whether the current levy arrangements address free rider concerns effectively and whether all industry participants are receiving appropriate benefits from their levy contributions.***

# CSIRO's response to Questions in the Issues paper

## *1. Rationales for government funding support*

***1.1. Why should government provide funding support for rural R&D? Does the basic case for such support rest mainly on wider (spillover) benefits for the community, or are there other important rationales that the Commission should take into account?***

Rural R&D faces a number of systems-wide challenges such as environmental stewardship, competition with subsidised exporters, and broader industry restructuring that are not serviced by farmers as individuals and thus require aggregation of funds and for a longer term strategic view to be taken. Moreover, there is an increased demand for food globally, and countries that are net exporters of food will be well positioned in the next 20 years. By 2030 the world's food supply structure will be very different. The decline in productivity growth could have significant impact on the economy.

In addition, it is unlikely that R&D on sustainability and environmental issues of broader community benefit would be undertaken in the absence of government funding support. This support also helps maintain capability which might otherwise be lost.

Many of the problems facing rural industries are not well serviced by government support for research from other funding avenues – e.g. university research funded through ARC grants tends to be basic research and is not sufficiently close to market to underpin the viability of the farming sector.

It is paramount that Australia can obtain and contribute to global innovation in order that it can attract critical technologies from other parts of the world and modify their application within the Australian farming environment.

***1.2. Is the case for government funding support for rural R&D stronger than in other parts of the economy and, if so, why? Do the various rationales apply with equal force to the RDC component of rural research as to the activities of, say, CSIRO and the universities? What specific evidence is there to indicate that projects funded by the RDCs have produced wider benefits for the community that are significant relative to those enjoyed by the industries concerned?***

CSIRO believes that government funding of rural R&D has been critical to maintain a productive and world competitive rural sector and supported regional economies than would otherwise be the case in the absence of government support of research. There are significant spillover benefits for the wider community by ensuring longer term food security and ensuring a sustainable production system that is capable of adapting to climate change. Moreover, the Government supports assists in maintaining broader economic viability in rural areas.

Furthermore, as more than 75% of the Australian landscape is owned and managed by farmers, rural R&D aimed at efficient and profitable technologies with a smaller environmental footprint also ensures the improved stewardship of the natural resource base.

***1.3. What are the practical constraints on basing government funding support for rural R&D around notions of private/industry benefits versus wider benefits, and/or on the degree to which government funding is likely to induce additional R&D activity? Could a naïve application of such an approach have unintended consequences? Where does the appropriate 'sweet spot' between principles and practice lie? For example, can the notion of industry versus wider benefits usefully be employed to determine that at least some R&D should either clearly be inside or clearly outside the government funding net?***

CSIRO's research investment process goes beyond a simple private versus public benefit approach in order to ultimately deliver benefits to the nation. We have established some significant public/private partnerships through our Flagships and our collaboration clusters. Increasingly, there is a need for more and deeper public/private partnership approach across the R&D system, beyond the CRC model, to deliver step changes in productivity such as those we are working to achieve through the Flagship program.

We support the movement of research investment from the public to the private sector once market failure has been addressed. Over the past two decades we have seen the

gradual privatisation of plant breeding of major commodities and of grain storage. This has enabled our public funds to be redirected into pre-competitive areas of work and other new and emerging issues such as climate change.

There needs to be a mechanism to encourage resource allocation to downstream activities to encourage broader innovation downstream that will lead to alternative and potentially new economic value.

***1.4. What factors might mute the strength and/or timing of any increase in private funding in response to a withdrawal of public funding for industry-focused R&D? How important in this context are:***

- ***divergences between the point in the supply chain where the research is funded and conducted, and the point where most of the benefits of that research are realised?***
- ***the long lags before many of the benefits may be realised?***

Some of these factors include:

- The size of the market in Australia for many commodities (especially horticultural crops) is too small to support private investment in agricultural research, and Australia's variable climate and poor soils represent a high level of risk that private investors are less likely to accept. The growth of the oilseeds industry in Australia over the past two decades is an example of an industry that has grown to considerable size after public sector investment into disease resistant varieties (in Victoria).
- It is relatively easy for farmers/producers to value an input trait or management process that has direct input/value for agricultural production. However, it is more difficult to get producer buy-in for an output that delivers primary benefit further down the supply chain post-farm gate and does not directly return benefit to the grower or when there are more pressing issues such as drought or income management.
- Fragmentation of particular industries (i.e. those with many individual farmers but with few industry bodies in place) could result in a long lag phase between the withdrawal of support and development of any replacement funding mechanism.
- Private funding of research by large individual firms will primarily be invested overseas unless we have a significant 'edge' in terms of quality of research capabilities and germplasm, which is sought after by large agribusiness companies.

***1.5. Are differences in the benefits that individual producers receive from RDC-funded R&D likely to constrain their collective willingness to offset any reduction in government funding through increased levy payments? Are there other features of the levy system, or any regulatory issues, that discourage private investment in rural R&D?***

In general, farmers take a very regional or landscape-wide approach to research issues and their adoption, whereas some of the key science issues are national in scale. RDCs at present can balance a regional versus a national approach to their industry issues. In some cases Voluntary Contributions (VC) are still an important means to fund specific research work, but the benefit needs to be demonstrably direct to that

VC contributor; that is, specific issues may attract VC funds, but broader cross-sector issues probably will not.

***1.6. How important is it that government contributes to the cost of maintaining core rural research skills and infrastructure? Without that support, how specifically would the capacity to adapt overseas technologies to meet the particular requirements of Australia's rural sector be compromised? What role do RDCs play in maintaining core rural R&D capacities?***

CSIRO highly values its co-investments with RDCs. In addition to providing research outcomes, our co-funded projects assist us to retain core research skills and infrastructure required to support future rural RD&E activities.

Maintaining RD&E capability is a major issue for all research providers given short term funding cycles, retirements and skilled people moving out of science into other sectors, and lack of graduates in key areas of science from Australian Universities. We note that RDCs now fund about a third of total rural R&D in Australia thus there is an increased responsibility for sharing responsibility for capability development. This is not only true for early career researchers but also for mid-career researchers who need ongoing support to sustain a career.

There is a need for a better system of national retention of capabilities and processes to develop future talent. This could be done by establishing open arrangements between institutions and research funders to support building research capability to ensure Australia maintains at least a minimum core capacity.

The research funders, like the RDCs, will need to recognize and support the scientific cohort in ways that foster the attractiveness of research as an occupation.

The cost of rural research may well rise, but without a dynamic and committed scientific workforce, Australia could end up with a research framework without the quality and capacity required to deliver much impact. Moreover, RD&E capability will be required regardless of whether the research effort is specifically aimed at addressing local/regional agricultural and environmental issues, or to assess and adapt overseas technologies.

Acquiring research outcomes from overseas efforts have their place, but most of the issues that Australian rural industries face are either specific to Australia or require customised solutions. Overseas technologies do not always directly translate to Australian conditions (just as technologies for tropical Australia will differ from technologies for temperate Australia). Without the appropriate regional evaluation and adaption capability, effective technologies may be missed or inappropriate and less efficient approaches may might be introduced to the detriment of the local industries and the environment.

Moreover, without Australia making a contribution to the R&D in rural areas, as well as contributing our fair share to international research efforts, we will not 'buy a seat at the table' to enable timely access to international research.

***1.7. What importance should be placed on outcomes-based rationales for government funding support for rural R&D, such as enabling Australia's rural industries to meet increased global competition; facilitating adjustment to climate change; furthering food and bio-security objectives; and fostering regional development? Is there a risk that seeking to use government funding to drive specific outcomes such as these could distort the pattern of R&D investment and thereby reduce the overall returns to the community?***

CSIRO believes that clearly articulated and measurable outcomes-based rationales for government funding support are critical if we are to achieve significant improvement in rural productivity while sustaining our resource base. Indeed, delivering impact on key national priorities through clearly articulated and measurable outcomes is fundamental to how CSIRO manages its research portfolio.

We also acknowledge critical the role of 'investigator-led' research to deliver national benefits.

***1.8. Should the level of public funding have any regard… ?***

## *2. Is the RDC model fundamentally sound?*

### Some overarching system-wide issues

***2.1. How effective is the current rural R&D and extension framework, and is the role of the RDCs within that framework appropriate and clearly defined?***

CSIRO acknowledges that in the past there were deficiencies in the institutional coordination across the existing RD&E framework. Therefore, we strongly support the efforts under the auspices of the Primary Industries Standing Committee (PISC) activities to clearly define and improve the rural RD&E framework.

State Government bodies have been reducing their extension activities. In some industries the extension component is being supplied by consultants, but this is largely limited to the high value crops. Loss of extension experience and capability is a significant issue that may hinder adoption of research outcomes, and some investment by all RDCs should be specifically directed towards it. Some RDCs support aspects of capacity building, training and education. However, there is scope to expand these responsibilities which will have flow-on community benefits from RD&E and enhance the rate of on-farm adoption of new technologies.

There are good industry support networks in place in some areas, but private extension in Australia could be catalysed by establishing a system of government business grants to match industry investment and facilitate the development of private extension provision. Thus, Governments could catalyse the establishment of the extension capacity, and then the mode of operation is that industry pays for specific extension services. Governments could also support some 'train the trainer' activity

through State agencies and/or the University sector (New Zealand is experimenting with this model).

***2.2. Does the significant number of entities, research programs and funding pools cause problems? For example, are there areas of major R&D overlap or gaps? Does any focus on 'leveraging' contributions across the various funding pools cause inefficiencies or perverse outcomes, or does it incentivise desirable behaviour?***

CSIRO believes there are two areas to focus attention towards:

(1) Institutional complexity.

The plethora of individual funding schemes for R&D can dilute research effort and result in initiatives being sub-scale with short time horizons. As a result, research providers spend time and resources trying to build the funding base necessary to undertake larger scale R&D projects to address major national challenges and opportunities. This increases the transaction costs of research.

Fewer, larger, longer-term grants or investments are needed if we are to address many of the broader challenges (and opportunities) facing Australia. Simplifying the number of funding bodies and initiatives will significantly increase direct investment into science by streamlining the administrative and governance burden that results from the many structural arrangements currently in place.

CSIRO is striving to shift its research portfolio to larger programs of activity that are jointly funded in strategic alliances with major research funders, and/or industry and with other research providers.

(2) Leverage.

As noted by the Cutler review of the Innovation Systems, much of the external funding involves leveraging of the core government funding. This tends to focus research on sector needs (often short-term) and can remove core public funding from the strategic research that it was intended to support, distorting the roles of research and development providers. This situation is exacerbated by funding not covering the full costs of research and research infrastructure and can place significant administrative burden resulting from the complex partnerships and leveraging arrangements. This funding results in marginal costing by the research providers and can lead to the cross-subsidisation of research through other means.

The solution to these mixed signals could come from an explicit set of principles that address the role and purpose of different forms of public sector funding; such principles could provide guidelines for co-investment decisions when public sector organisations work with the business sector and clarify the arrangements for such co-investment to make them less costly and more transparent.

***2.3. Is there sufficient oversight of, and coordination and collaboration between, the different components of the framework? Are there any particular difficulties created for the RDCs by the current arrangements?***

CSIRO strongly supports the National Primary Industries RD&E Framework noting that it is still "work in progress" albeit is now building significant momentum and industry-wide support. However, it is a difficult process and will take quite some years to implement.

The Climate Change Research Strategy for Primary Industries, operating under the broader national framework, is a first start towards substantial collaborative effort across many R&D funders, but there is need to expand the scope and inter-sectoral collaboration into other related areas, particularly in regard to natural resource management issues that are critical to support the rural sector, e.g. research undertaken on long-term strategic responses to drought and water scarcity at a broad cross industry level.

***2.4. Does the framework facilitate strategic assessment of R&D needs across the whole of the rural sector?***

- ***Does it encourage consideration of whether available funding is going into the right areas from Australia's point of view?***
- ***Is there an appropriate mix between longer-term and broadly applicable R&D and shorter-term adaptive research, and where in this context should the RDCs be focussing their activities?***

The National RD&E Framework and the National Strategic Investment Plan being developed by the Rural R&D Council will go a long way to address clarity of roles of the various elements of the overall framework.

Australia needs a mix of longer and shorter term research. Who should pay for this is a policy question. Whatever the policy, it is essential that all parts of the spectrum are covered and no particular part should have excessive leverage across other parts of the system.

***2.5. Is the framework sufficiently flexible to accommodate future changes in circumstances and requirements? What impacts have recent initiatives to improve the framework had on outcomes thus far? What are likely to be the particular implications of recent and prospective changes to the framework for the RDCs?***

CSIRO believes the National RD&E framework has sufficient flexibility to enhance coordination and collaboration while retaining operational freedom for its component organisations. It is noted that all RDCs have now signed the Statement of Intent. It is too early to judge whether will deliver lasting outcomes, particularly if there are further prospective changes to the RDC model.

In the immediate term, the Framework has been instrumental in fostering much better dialogue between the parties to assist in collective decisions-making. Further work is now underway to look at harmonisation of processes across the various parties to the Framework, which could lead to significant efficiency gains.

***2.6. Are there significant gaps in the data base …?***

***2.7. Is there sufficient emphasis on the evaluation of outcomes and sharing the lessons learned? Are there any particular lessons for the RDC model from developments in other components of the framework?***

CSIRO believes a lot more can be done in regard to overall evaluation and sharing of lessons learned across the framework. We have commented further on this aspect in the sections below.

In general, however, it should be sufficient at this stage to encourage consistency at the policy level in approaches to undertake evaluations and not prescribe particular methods or approaches. It would be inappropriate to assume one particular evaluation method is appropriate for the ex ante evaluation of all R&D beneath the RDC umbrella. Approaches and frameworks need to be tailored to meet the needs of specific industries, and specific outcomes (economic, social and environmental).

## Specific strengths and weaknesses of the RDC model

***2.8. Are there any reasons to argue that the RDC model is no longer fundamentally sound? Or can deficiencies in the model be addressed through more minor modifications to the current requirements?***

CSIRO's overarching response is that the current RDC model is still valid. Indeed, the RDC system in Australia is the envy of international industries. However, we reiterate our earlier points in regard to the limitations of leading and supporting cross-sectoral R&D and high transaction costs when working across multiple RDCs.

***2.9. If more fundamental changes might be warranted, what form could these take? How difficult would it be to replicate the strengths of the RDC model within such approaches? Is there scope for 'halfway' house approaches that would harness the respective strengths of the RDC model and alternatives to it? Are there any overseas approaches that are particularly instructive?***

As highlighted earlier in our response, CSIRO would encourage the Commission to explore other scenarios in its draft report, and we have provided some suggestions towards this at the beginning of our submission.

***2.10. Are there other major changes required to the role of the RDCs? For example:***

- ***Do the current levy payment and governance arrangements for the RDCs lead to an excessive focus on R&D effort within the 'farm gate' and, if so, how might this be addressed? If there are prospective, high payoff, research opportunities further down the value chain, why are these not being taken up by processors and other downstream stakeholders?***
- ***Is overlap with the work of the CRCs largely complementary, or are changes warranted to either or both programs to reduce that overlap?***

***Will the new guidelines for CRCs make it more difficult to get new rural CRCs approved and, if so, what are the implications for the future role and activities of the RDCs?***

- ***If State Governments continue to wind back their role in R&D and extension, should the RDCs be seeking to fill the gap, or are there private players that could effectively fill this role?***

CSIRO would suggest:

- There would be benefit from increased attention and resources for whole of value chain solutions. A stronger value-chain perspective would be helpful by incorporating food processors into the RDC model or having other means to fund this research.
- In areas where strategic research is required, scale really matters. Currently, some funding for cross-RDC activities are now coming directly through DAFF to CSIRO where we have proven capabilities to manage national programs through partnerships (e.g. soil carbon and our Flagship clusters). This model could be extended to other areas.
- It would be helpful to strengthen the coordination role through the Council of RDC Chairs. For example, this could include a single secretariat to administer a coordinated granting process on behalf of a number of industry-specific boards.
- CRCs have filled important gaps but do not replace the work of the RDCs which have a strong role in representing the needs of their industry sector and leveraging activities to address them.
- There is a need to consider mechanisms for NRM related research in rural industries with the cessation of Land & Water Australia. This could occur through a greater focus by the remaining RDCs in this area utilising some of the public matching funds.

### *2.11. Do RDCs manage Intellectual Property issues effectively? In particular, do their current approaches give rise to any difficulties for bringing new technologies to market? Can any shortcomings in this area be readily addressed within the current model?*

CSIRO has noted that different RDCs and other organisations have different understandings of the strategic value of intellectual property (IP) rights, manage them in different ways and take different approaches to negotiating collaborative arrangements involving the development of IP or the use of background IP. Sometimes this can be a result of a misunderstanding of the role of IP in supporting research impact. The costs involved in overcoming these differences can be significant.

It is important to recognise the strategic value of IP arrangements, particularly in public/private sector partnerships, where there is potential for significant impact through joint investments.

CSIRO believes that IP ownership is best kept simple and clear and should reside in entities that are best placed to exploit it. On the other hand, all parties who have participated in the creation of the IP should participate in benefit share of its

exploitation. Protracted and expensive commercial discussions over IP rights can result when parties do not have a common understanding of the distinction between IP ownership, benefit sharing and IP management responsibilities or in situations where trust has not been developed.

## *3. Funding level issues*

***3.1. What principles and benchmarks should the Commission …?***

### Some particular considerations

***3.2. Is there evidence to suggest that available funding prevents RDCs from investing in R&D which could provide a significant payoff to the wider community; or, alternatively, that RDCs are investing in some projects expected to generate only very modest returns? What does the fact that some RDCs have built up significant surpluses indicate about the availability of worthwhile projects to invest in?***

CSIRO believes that there are a large number of socially worthwhile projects that could be undertaken and with quality researchers to conduct the work with significant community benefits.

Surpluses may not be an indication of a lack of suitable research. They can buffer RDCs against fluctuating incomes. Climate variability (i.e. variability in annual seasonal conditions) as well as changing profitability in some sectors make it imperative for RDCs to develop surpluses in good years, to ensure that the research capability can be maintained without boom and bust fluctuations in investment but smooth out any year-to-year variation in funding due to market and seasonal volatilities.

***3.3. If the focus of most of the RDCs is on industry-specific …?***

***3.4. Are there particular features of the rural sectors…?.***

..

### The allocation of public funding across RDCs

***3.5. Is there any need to rebalance the Government's funding contribution across the individual RDCs? For example, do the general appropriations for the RIRDC and the Fisheries RDC give too much or too little weight to the somewhat different nature of the R&D projects that they fund?***

As noted earlier, CSIRO notes that important cross sector issues tend to be underfunded compared with industry-specific areas, some rebalancing might be needed here given the national research priorities.

***3.6. Does the RDC model and, in particular, the RIRDC industry umbrella arrangement appropriately cater for the research needs of emerging***

***primary industries? If not, what should be changed? In allocating government funding to the industry RDCs, should any account be taken of differences in the longer term competitive prospects of those industries, or their potential for productivity improvements? Alternatively, does basing the government contribution on the value of industry output provide an appropriate means to calibrate contributions given the inherent risks in trying to pick winners or losers?***

The RIRDC model does provide a mechanism for investment in emerging industries that do not have the ability to generate significant levy funding. CSIRO notes that the needs of emerging industries tend to be at the applied end, and that some 'discretionary' funding for these emerging industries might be needed to avoid market failure rather than basing government contribution solely on the value of industry output.

## *4. Improving the RDC model*

### Ways to enhance governance arrangements

***4.1. Where do the main opportunities for enhancing the current governance regime lie? Does the fact that some RDCs seem to have more satisfied stakeholders than others provide any insights on how to improve governance arrangements, or are such differences mainly due to the nature of the industries concerned? What changes might be possible to reward (or punish) good or (bad) governance without risking perverse outcomes?***

Elsewhere we have argued that streamlining governance arrangements can reduce costs and enable cross-sectoral work.

***4.2. More specifically:***

- ***What practical impacts (positive and negative) have the national and rural research priorities had …?***
- ***Does feedback from the Government on strategic and annual plans …?***
- ***What is the scope to improve the effectiveness of RDC boards…?***
- ***Are there any significant conflict of interest issues …?***
- ***Are there aspects of the governance arrangements …?***
- ***How useful are the Statutory Funding Agreements…?***
- ***To what extent would governance be simplified…?***
- ***How effective are current industry consultation protocols? Are all of the key stakeholders routinely consulted, or at least provided with adequate opportunity to make their views known? Should the legislative requirement for some RDCs to consult with particular peak industry***

***groups be scrapped and replaced by a more generic requirement simply requiring consultation with an appropriate range of stakeholders?***

CSIRO has observed that the effectiveness of current industry consultation protocols varies between RDCs. However, industry consultation remains a key feature of the RDC system and has been effective at bridging communications between researchers and industry and aligning R&D with industry needs.

- ***What are the benefits and cost of the combination …?***

## Increasing administrative efficiency

***4.3. What scope is there to reduce the costs of administering the RDC model without diminishing the outcomes it delivers?***

CSIRO notes that there is considerable scope to reduce administrative duplication between RDCs, increase harmonisation and reduce costs. This could be as simple as introducing standard contracts and legal templates.

There is also a case for more standardisation of general documentation and related processes across RDCs. Currently each RDC has its own unique protocols and formats for submission of proposals, supporting software, decision-making cycles, legal contracting and reporting requirements, which significantly adds to complexity and transaction costs for research organisations.

***4.4. Are there too many RDCs and, if so, how might this number be reduced? How big are the potential downsides of amalgamations, such as loss of focus and the increased challenges of dealing with a more diverse, and possibly hostile, range of industry stakeholders? Would wider application of the RIRDC approach be a means to reduce total administrative overheads, while still allowing individual industries to retain their 'research identity'?***

CSIRO notes that the sector by sector approach is appropriate in many cases. We have commented earlier that this can lead to less investment in cross-sectoral issues. Furthermore, the tripartite administration costs of joint RDC, CRC and research institution projects are highly inefficient.

There is an argument for reducing the multiplicity of funding bodies and for initiatives to move towards fewer, but larger-scale funding mechanisms with streamlined governance, reporting, and performance management mechanisms and with quantifiable performance benchmarks. Simplifying the number of funding bodies and initiatives will significantly increase direct investment into science by streamlining the administrative and governance burden that results from the many structural arrangements currently in place.

Simple economies of scale suggest that the smaller RDCs may be less efficient. As suggested earlier, there would be a case for amalgamation of a number of the smaller RDCs under a RIRDC type umbrella with specific industry consultation at a level

below the Board. Alternatively, the use of common administrative arrangements may allow smaller RDCs to maintain their independence but reduce their overhead costs.

***4.5. Are there examples where ineffective collaboration and coordination across the RDCs has lead to a significant wastage of administrative resources? Are there unrealised opportunities for greater sharing of skills amongst the RDCs? Are there other features of the RDC operating environment or governance regimes which lead to unjustified escalation in executive salaries, board fees, infrastructure costs, overheads and the like?***

As a research provider, CSIRO notes that engaging with numerous different RDCs, each with their own proposal submission processes, forms, supporting software, legal agreements, reporting requirements etc. increases complexity and reduces efficiency.

## More robust ex post project evaluation

***4.6. Do the program-wide benefit cost ratios emerging from the two evaluations so far appear reasonable in the context of previous quantitative work and other more qualitative indicators of what the RDC model has delivered for farmers and other stakeholders? How do the numbers compare to those emerging from evaluations by individual RDCs (both before and after the event) and for comparable projects by other research entities such as the CRCs and the CSIRO? If there are significant differences, what are some of the possible reasons for them?***

Ex post project-level evaluation can provide valuable information about the actual and expected returns to investment in particular projects. As well as project-level evaluation, it is necessary to complete portfolio-level, organisation-level and whole-of-RRDC-level evaluation to ensure a complete picture.

CSIRO notes that the benefit-cost ratio results of ex post impact evaluation work completed by the RDCs compare favourably with those from other research entities. However, the appropriateness of a single metric – in this case – a single economic metric such as benefit-cost ratio should be questioned as some research seeks to achieve more than economic returns. Social equity and sustainable rural livelihoods are also important research outcomes.

***4.7. Are there particular methodological issues that need to be addressed? For example:***

- ***Has the project sampling process been sufficiently random? Have evaluations given sufficient weight to failed projects, especially those terminated at a relatively early stage?***
- ***Has there been adequate recognition of the contribution of the core R&D and/or background knowledge on which adaptive research work sponsored by the RDCs is based?***
- ***Has proper account been taken of the implicit subsidies embedded in some of the research services provided to RDCs by State governments, universities and the CSIRO?***

- ***Has there been sufficient rigor and consistency in the way in which 'counterfactuals' for individual projects have been constructed?***
- ***Has adequate account been taken of the potential for projects with long payback periods to be rendered less valuable or obsolescent by the next wave of research effort? Should there be more focus on returns in the medium term?***
- ***Have the assessments assumed levels of adoption which can be supported by previous experience?***
- ***Has there been sufficient sensitivity analysis in regard to all of the key influences on reported project returns?***

CSIRO suggests that two methodological issues should be addressed:

- The evaluation of applied research projects should appropriately acknowledge the sunk cost of investment in basic and strategic research. There is often inadequate acknowledgement of the contribution of the core R&D and/or background knowledge on which adaptive research work, sponsored by the RDCs, is based.
- It is also important to acknowledge that research is, by nature, a risky business, and that one cannot accurately forecast in advance which areas will deliver significant returns, so a risk management approach to R&D investments is required.

***4.8. Should the next stage of the evaluation process provide for follow up…?***

***4.9. Is sufficient data already collected to allow for these sorts of improvements and refinements to the evaluation process? If not, how might any gaps be addressed? For instance, when undertaking stakeholder surveys, should RDCs solicit more information on the farm-level impacts of specific R&D outputs to feed into the evaluation process?***

For both questions above, CSIRO suggests that there are significant gaps in the data sets available to establish benchmarks and demonstrate what value-adding impact has been delivered from investment in particular fields of research, for example, water research. It would important to encourage:

- Regular and longitudinal collection of data on research investments and associated impact, preferably by an independent provider such as the Australian Bureau of Statistics;
- Improved coordination of data management between RDCs and other players in the innovation system; and
- Relying on project level evaluation is insufficient. Instead program or sector level evaluation (including econometric modelling) is also required to ensure efficient, effective and appropriate investment in different fields of R&D.

***4.10. Are any changes required to the governance regime for RDCs to encourage improvements in evaluation protocols and methodologies? Should there be greater efforts to encourage consistency in the approaches adopted by the individual consultants employed by RDCs to undertake evaluations? What would be the most cost-effective way of providing for regular independent scrutiny of the evaluation process and its outcomes? Should evaluation outcomes be 'reality tested' with stakeholders?***

Changes to the governance regime to encourage consistency in the approaches adopted to undertake evaluations should provide consistency at the policy level, and not prescribe particular methods or approaches. It would be inappropriate to assume one particular evaluation method is appropriate for the *ex ante* evaluation of all R&D underneath the RRDC umbrella. Approaches and frameworks need to be tailored to meet the needs of specific industries, and specific outcomes (economic, social and environmental).

## More effective coordination and collaboration

***4.11. Are there significant opportunities for additional collaborative research effort across the RDCs which would have significant payoffs? If so, where specifically do these unrealised opportunities lie and why do they still exist? For example, are some of the RDCs unnecessarily siloed and reluctant to work with others on value adding areas of common interest? Or is it simply that these collaborative projects are expected to provide a lesser return than other project options within each silo?***

There are big R&D opportunities to lift rural sector productivity by:

- Tackling large-scale multi-sectoral issues through a multi-disciplinary research, e.g. meeting the challenge of achieving a whole-of-catchment approach to the economic and environmental sustainability of regional agribusiness (e.g. across forests, paddocks, ponds and sea cages).
- Sharing of common and often expensive research platform technologies and infrastructure and applying these across across a range of species to trigger rapid change. For instance, pig, sheep (meat and wool), beef and dairy research foci are all now strongly focussed on animal genetics and genomics. There are many research synergies across these species.

However, we note that major problems requiring a large-scale response can be difficult to put together under competitive funding programs offering small amounts of funding for short-term research. Greater collaboration between RDCs to deliver larger, more substantive programs over longer time periods would enable more substantive outcomes.

***4.12. Is there scope for RDCs to do more collaborative work with overseas entities? Are there any particular features of the current arrangements that discourage such collaboration?***

CSIRO notes that Australia contributes less than 3 per cent of the world's new knowledge but needs to gain access to a much larger share. Hence, it is vital that Australian rural industries and rural researchers move more strongly to position themselves in the international innovation network. The business case for public support based on spillovers is even stronger internationally than it is nationally as global linkages need to be supported and well funded if we are to access world-class technology, knowledge, people and capital for the benefit of Australia.

For instance, CSIRO has achieved some access to the European Framework Program for agricultural research based on the strength of our science. The potential benefits are significant, partly due to the size of the overall European research activity. However the transaction costs are high and the interaction with other parties in the program is complex (distance does matter). A more targeted funding program with sufficient support towards partnerships with overseas centres of excellence could deliver significant benefits to Australia.

The growing trend in global knowledge generation and rapid spillovers (e.g. genomics) means that access to leading-edge technologies and adapting them to local circumstances to address Australian issues is already a priority. International engagement could be enhanced by increasing funding for researcher mobility whilst removing non-financial barriers and including relevant international engagement as a performance criterion for publicly funded research. The focus should be on collaborative partnerships.

***4.13. As a mechanism for encouraging coordination and collaboration…?***

***4.14. To what extent will the National Primary Industries R&D and extension framework, once fully implemented, be likely to improve broader coordination and prioritisation of the research task and facilitate its execution in an efficient and effective manner? Will it provide flexibility to cater for future changes in the composition of the rural sector, or could it tend to lock in the current levels of funding support and infrastructure relevant to individual industries? How might the activities of the Rural R&D Council best add value to the overall effectiveness of the rural R&D effort?***

CSIRO believes that the National Primary Industries RD&E framework may provide direct benefits in terms of stronger coordination within individual commodity sectors. However, it is less clear that there will be significant benefits from the cross sector strategies, especially where significant progress may be dependent on institutional change or reform (e.g. the creation of entities to lead and fund important cross sectoral RD&E in areas like water use in agriculture, climate change, biosecurity and food). It is evident from the Food and Nutrition cross sector strategy that the food processing industry does not invest significantly in public research although there is significant capability available at a national level that supports that sector.

As the various parties adjust to the National Framework and either exit or build their R&D capabilities, further interdependencies are likely to evolve, which will facilitate greater coordination and priority setting at a national level. This may likely be underpinned by the National Investment Strategy that the Rural R&D Council has been tasked to develop.

However, the process could lock in certain institutional structures and arrangements and lead to less flexibility over time. As agricultural industries are always responding to market signals and stochastic events such as disease and drought, industry responsiveness, flexibility and resilience are the key attributes that must be maintained for the future.

## Improving the levy arrangements

***4.15. What are the relative merits of compulsory and voluntary levies…?***

***4.16. Are the arrangements for collecting the levy and channelling these…?***

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***4.17. Are the processes for amending levy rates unduly cumbersome …?***

***4.18. Could the basis for the matching government contribution be modified so as to give better effect to the underlying rationales for public funding support? For instance, would it be desirable to pay a higher contribution on classes of R&D with a demonstrable focus on wider community benefits, offset by a lower rate on R&D with an industry-specific focus? Is there any case for differentiating the rate of the matching contribution between start up or high growth rural industries and more mature industries?***

The co-investment/collaborative research model used by RDCs requires research providers to cover a considerable share of the costs of the research that the RDCs are purchasing. When Government funded research providers are performing 'near to market' research through RDCs they do not receive full industry funding. Thus, the rural producers are supplementing funding they have received from government by further leveraging public funds from research providers.

CSIRO notes that this is inconsistent with the principles articulated in the Productivity Commission report from 2007 on public support for science and innovation. It should not be the primary role of public sector R&D agencies to subsidise industry. Yet the leverage requirements of some programs, particularly those associated with the RDCs can result in public sector appropriation funding being used to perform near-market research which, in effect, subsidises particular industries.

An alternative approach for the RDCs is to separate the producer levy from the matching Commonwealth funding and to use these separate funds for different purposes; i.e. the producer derived levy could be used to fund research work that is commercialisation-ready while the public contribution would be put towards fully funded, longer term, higher risk and more strategic research aimed at addressing the national challenges faced by agriculture as a whole.

Alternatively, the public funding could be channelled through DAFF or require a separate body to administer. This would simplify the system through greater role clarity. However, the current arrangements have been effective in sustaining Government investment in rural R&D.

***4.19. Should there continue to be scope for RDCs…?***

***4.20. Should processors generally pay a levy for R&D? If they were required to do so, what is the likelihood that they would simply pass the cost back down the line to the primary producer? Does this happen in those industries where processors currently pay a levy?***

CSIRO considers that if processors contribute a levy, it would encourage more whole-of-chain setting of research priorities and deliver solutions with potential major advantages for the sector.

***4.21. Is there any evidence of a significant mismatch between the regional distribution of levy payments and the regional distribution of the benefits from the ensuing R&D, for particular RDCs or across the program as a whole? Would an explicit effort to more closely align the two materially reduce the overall return to the community from the RDC program?***

CSIRO is not aware of any evidence to show a significant mismatch between regional levy payments and research benefits. However, a regional approach to the allocation of R&D funding may not be optimal because national or international investments can be the best way to provide a benefit for a region even though the R&D is not done in that region. This is a particular case in point for CSIRO where the skill base is distributed nationally and research teams are assembled across regional and disciplinary boundaries to address a particular research challenge.