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***Centres of Excellence –
Building Queensland’s R&D capacity
in a national framework***

Discussion Paper

Executive Summary

Agricultural output in Queensland is underpinned by strong productivity growth based on innovation. R&D is the engine room of innovation, and in the face of pressing challenges such as climate change, drought and skills shortages and a range of new opportunities, it is critical that investments are made in world-class R&D geared to the needs of Queensland industry.

DPI&F is the largest single provider of R&D to Queensland's primary industries, but the highly dispersed nature of DPI&F's regional footprint of R&D facilities is limiting its capacity to create truly effective centres of science excellence and impacting on its ability to derive maximum benefit from the resources invested in it by the Queensland Government.

A national framework for primary industries R&D is developing, where jurisdictions will take the national lead for particular areas of R&D based on a model linking national research, regional development and local extension based around centres of R&D excellence for integrated national delivery of R&D services. This will provide a focus on the imperatives of quality, critical mass and collaboration in science to derive maximum benefit from investments in primary industries R&D.

DPI&F is already re-aligning its Brisbane-based science investments based on an enhanced collaborative *centres of excellence* approach focussed on a small number of key centres. The next step is to examine opportunities to reconfigure its regionally based science facilities around a small number of strategically located centres of R&D excellence that effectively address regional needs, in particular the threats and opportunities facing Queensland agribusiness in the State's tropical north.

Collaboration with universities and other R&D providers will be explored in this process, taking a strategic approach in developing collaborative R&D centres. DPI&F is already exploring opportunities for a significant strategic alliance in R&D with James Cook University focussing on tropical aquaculture and fisheries R&D, biosecurity science, and R&D focussed on tropical beef and crop production.

Establishing collaborative R&D centres in conjunction with regional universities and other R&D providers will help unlock DPI&F infrastructure-based assets, provide increased flexibility to meet future industry trends, and drive new partnerships.

DPI&F RESEARCH AND DEVELOPMENT SERVICES – THE CHALLENGE

Innovation is driving profitability in Queensland's primary industries

Queensland's \$12.5 billion primary industries sector creates about 7 per cent of the gross state product and produces \$6 billion in exports. This economic output is powered by more than 30,000 agri-businesses employing over 125,000 Queenslanders. Much of this sector is located in regional parts of Queensland and provides a vital contribution to the rural economy.

A recent report highlights that productivity growth in Australian agriculture has been strong (up to four times higher) relative to other sectors of the Australian economy¹. A significant part of this productivity growth has come from the process of innovation - from research and development (R&D), from the commercialisation of new ideas and products and from the uptake of new technologies through extension.

Driving much of this innovation is the extensive R&D effort maintained by DPI&F. This R&D effort, backed by a progressive extension service, which links agri-businesses with the latest developments in domestic and overseas technology, has been responsible for many of the new technologies and products adopted by Queensland agri-businesses.

Queensland's primary industries are facing pressing challenges

While Queensland's primary industries sector has achieved sustained productivity growth to underpin its economic performance, the sector as a whole is facing major challenges - both threats and opportunities - that have the potential to make or break many agri-businesses. More than ever, innovation services are needed to help the industry deal with these threats while taking advantage of the emerging opportunities.

Threats include the forces of climate change, drought and salinity, as well as rising energy costs, a skills shortage across regional Queensland caused by declining enrolments in agricultural training courses, and the increasing threat of exotic pests and diseases, particularly from Australia's north and the South Pacific region.

Opportunities for industry growth include:

- the globalisation of agricultural trade, resulting in many new market opportunities for Queensland agri-businesses able to compete on the basis of high value, novel or more efficient products
- new agri-business technologies such as gene technology that are dependent on increasing levels of science quality and innovation, which have the potential to fundamentally increase primary industry productivity
- the increasing consumer demand for natural, healthy ethically produced products with minimal environmental impact
- the appearance of new revolutionary biologically based products including bio-materials, bio-fuels and bio-actives that are redefining traditional agricultural industries and providing Queensland businesses with new opportunities for growth
- agricultural development associated with the Northern Economic Triangle, which is projected to add \$285-\$650 million in annual production of tropical farm products. Much of this projected growth will be in the tropical beef and

¹ Australian Farm Institute (2007). Productivity Growth in Australian Agriculture: Trends, Sources, Performance.

horticulture industries, particularly in the Bowen and Burdekin regions of the State.

- the potential emergence of Far North Queensland (Cairns and Atherton Tablelands) as a major centre for high-value bio-industries such as molecular bio-pharming, agri-tourism, value-added food processing and novel tropical products.

World class R&D geared to the needs of local industry, which is backed by cutting edge technologies, is sustainable and is sensitive to consumer demands will be critical to Queensland agri-businesses as they move to address these industry challenges and opportunities.

DPI&F is the largest single provider of innovation services to Queensland's primary industries and, in the absence of a strong local private sector innovation capability (compared to the United States and Europe), will continue to be a major source of new ideas and technologies for Queensland agribusinesses.

DPI&F's current regional infrastructure has limited capacity to address industry challenges

Over many years, DPI&F has built up a large and highly dispersed infrastructure across Queensland that supports R&D, extension, biosecurity and other agri-business services.

Currently, DPI&F's R&D activities are based around properties and facilities at more than 50 sites. This extensive regional R&D footprint has remained largely unchanged for more than half a century, and aging facilities have not kept pace with the changing nature and needs of industry. CSIRO with a similar number of sites Australia wide faced a similar problem in the early 1990s.

The highly dispersed nature of DPI&F's regional footprint of R&D facilities is limiting its capacity to create truly effective centres of science excellence. DPI&F also carries a significant financial burden in operating its widely dispersed facilities. Maintenance costs undermine the Department's capacity to invest in new strategic science opportunities and this disconnect is having a profound impact on the Department's ability to derive maximum benefit from the resources invested in DPI&F by the Queensland Government.

If the Department is to provide the leading edge support that industry needs to confront its challenges, then DPI&F needs to radically re-align its "smart science" investments.

DPI&F RESEARCH AND DEVELOPMENT SERVICES – THE FUTURE

The way forward – Regrouping into Centres of R&D Excellence

Here and overseas, public funding for science and innovation is increasingly focussed on the imperatives of *quality, critical mass* and *collaboration*. Cutting edge research in fields such as biotechnology and nanotechnology require quality researchers with internationally recognised credentials. This research requires critical mass to:

- realise economies of scale in costly laboratory infrastructure investments
- provide opportunities for intellectual and practical collaboration among researchers
- maximise the integration of research disciplines in solving multidisciplinary research problems
- provide world class teaching facilities for students entering industry.

Over the past ten years, funding programs for public sector R&D have focussed investment on fostering key *centres of excellence* that provide outstanding quality, critical mass and collaboration and are strategically positioned to support technology transfer to industry and secure commercialisation opportunities. This has been a focus with the Commonwealth Government’s “Backing Australia’s Ability” program and with the Queensland Government’s Smart State agenda.

In relation to primary industries, a strong consensus has emerged from the States and Commonwealth for the development of a National Primary Industries R&D Framework to ensure maximum benefit is derived nationally from collective public sector investments in primary industries R&D, through better coordination in priority setting, sharing of responsibilities to avoid overlap and duplication and integration of service delivery. The Framework, outlined in more detail in Appendix 1, proposes a more coordinated national agricultural investment platform where jurisdictions will take the national lead for particular areas of R&D based on a model linking national research, regional development and local extension based around centres of R&D excellence for integrated national delivery of R&D services.

Under the Queensland Government’s *Smart State* agenda, leading centres of excellence have been established and funded in a range of public sector research fields, particularly in the area of medical research and biotechnology. Universities and medical research institutes have been assisted to establish true centres of excellence providing state-of-the-art infrastructure, attracting high quality researchers, fostering collaboration with other science partners, increasing linkages with industry and considerably enhancing Queensland’s reputation as a national leader in innovation.

A major restructure of DPI&F’s Brisbane based science infrastructure is already underway to unlock DPI&F’s investments in the Brisbane region, and to re-align these investments using the collaborative *centres of excellence* approach. DPI&F’s Brisbane operations are being restructured around a small number of key centres, which will have true “critical mass” to meet the challenges facing the primary industry sector, undertaking R&D with state-wide and regional application that can be cost effectively addressed from Brisbane. These centres will also have state-of-the art infrastructure and most importantly will also involve collaboration with other science players, particularly CSIRO and universities.

The six key centres are:

- the Eco-science Precinct at Boggo Road
- the Food and Health Sciences Precinct at Coopers Plains
- the Queensland Centre for Crop Development at Redlands
- the Centre for Advanced Animal Science at The University of Queensland (UQ) Gatton
- the Bribie Island Research Centre
- UQ St Lucia (biotechnology and nanotechnology focus).

Each centre will provide Queensland agribusinesses with new and enhanced science and technology-based tools and will make the best use of the Government's investment in Brisbane based science supporting primary industries. These initiatives involve some disruption to staff and resources - as in many instances staff relocations are required - but the result will be much greater capacity in DPI&F's ability to respond effectively to industry needs.

A key factor behind the Brisbane based changes has been the readiness of a range of science partners to work with DPI&F to achieve critical mass and co-operative approaches to industry needs. DPI&F's major partners in the Brisbane based re-organisation include other Government agencies (Department of Natural Resources and Water, Environmental Protection Agency), UQ and CSIRO.

By working with science partners in collaborative centres of excellence, resources can be integrated, key sites and locations with industry relevance strengthened and new R&D undertaken with cross disciplinary input. Delivery of vocational training and teaching services for students can also be enhanced by combining services and support systems.

The next step – Establishing regional DPI&F centres of R&D excellence

Taking account of its Brisbane experience, DPI&F is now moving to reconfigure its regionally based science infrastructure around a small number of strategically located centres of R&D excellence that effectively address regional needs, in particular the threats and opportunities facing Queensland agribusiness in the State's tropical north. These centres will be closely linked with service provision from the proposed DPI&F Agribusiness Smart Service Centres and where appropriate will utilise Australian Agricultural College Corporation facilities and resources to support the development, application and uptake of new technology and practices developed through R&D programs.

A range of regional partners with potential to form collaborative centres through joint investments, co-location and joint appointments exist, including James Cook University (JCU), UQ, CSIRO, Central Queensland University, Queensland University of Technology (QUT), the Australian Institute of Marine Science (AIMS), the University of the Sunshine Coast (USC), and the University of Southern Queensland.

Regional university infrastructure provides particular opportunities for DPI&F. There is already an extensive regional university presence in agricultural science, and universities attract funding that is not directly available to DPI&F, such as the funding programs of the Australian Research Council. Collaboration with universities and other R&D providers will therefore facilitate strategic opportunities to leverage further Commonwealth and industry investment. DPI&F is already exploring opportunities for a significant strategic alliance in R&D with JCU, and examining opportunities for further linkage with UQ and USC.

DPI&F will take a strategic approach in developing collaborative R&D centres, taking into account the needs of the sector and the strategic fit and synergy with R&D collaborators in terms of scientific skills, knowledge and facilities.

Active engagement with JCU is focussed on formulating the scope and nature of a strong collaborative alliance including possible governance arrangements. Several key business areas including tropical aquaculture and fisheries R&D, biosecurity science, and R&D focussed on tropical beef and crop production have been identified, and DPI&F and JCU are developing business cases for collaboration in these areas. It is anticipated that a formal collaborative agreement will be developed between DPI&F and JCU when these details are compiled.

Benefits of the proposed collaborative alliance with JCU include consolidation and coordination of R&D capacity and capability with opportunities for co-location of staff and facilities, additional scientific input and leadership, particularly in relation to tropical agriculture, forestry and fisheries, better access to streams of Commonwealth funding, increased involvement of post-graduate students in fields of research relevant to primary industries, and increased presence and credibility in north Queensland.

Establishment of collaborative R&D centres in conjunction with regional universities and other R&D providers will make expensive investments in future laboratory infrastructure more cost effective, foster intellectual and practical collaboration between scientists, encourage cross fertilisation of research disciplines in solving multi-disciplinary research problems, improve capacity to attract and retain outstanding staff, and provide high quality training for students entering primary industries. This will help unlock DPI&F infrastructure-based assets, provide increased flexibility to meet future industry trends, and drive new partnerships.

Developing a strategic collaborative approach to R&D centres will not only strengthen Queensland's primary industry science capability in the short term, but will also position DPI&F to examine even closer relations with the university sector in terms of models for the development and delivery of R&D. In the future, this could include Queensland government support for universities assuming primary responsibility for components of agribusiness R&D in Queensland, with DPI&F focussing primarily on providing a suite of other services which support agribusinesses in Queensland.

DPI&F will examine the feasibility of establishing key regional R&D centres in both north and south Queensland focusing on R&D to support Queensland's tropical and subtropical plant and animal production systems in the context of the National Framework for Primary Industries R&D. Such centres will encompass knowledge generation and innovation in tropical and subtropical agricultural production systems, including aquaculture, horticulture and forestry, fisheries and marine science, and biosecurity science underpinning primary industries, human health and the environment.

Proposals for regional R&D centres of excellence and the potential for collaboration with other R&D providers in addition to that proposed with JCU will be examined in more detail in developing DPI&F's investment blueprint for future R&D facilities. This will include detailed consultation with stakeholders and negotiations with prospective R&D providers over the next 12 months to fully scope the opportunities. The development and implementation of these R&D centres will involve an on-going process of disposal of aging assets and reinvestment in new cutting-edge infrastructure in partnership with other R&D providers.

APPENDIX 1. NATIONAL PRIMARY INDUSTRIES RESEARCH DEVELOPMENT & EXTENSION (RD&E) FRAMEWORK

PROGRESS AND IMPLICATIONS FOR QUEENSLAND

Summary

Research and development and associated extension (RD&E) in primary industries are critical to maintaining the competitiveness of Australia's primary industries. The resources devoted to this RD&E need to be applied with maximum efficiency and effectiveness, as competition for funds becomes tighter.

The National RD&E Framework for Primary Industries is based on the principle of National research and Regional development and extension. The Framework has been endorsed by State and Federal Ministers, and widely discussed with stakeholders. A number of sector plans are being developed, outlining each jurisdiction's area of strategic focus. Under the Framework, Queensland will focus research investment on major strategic areas, and work collaboratively with other jurisdictions.

Background

The innovation derived from RD&E in primary industries in Australia has been a major driver of productivity growth and improved sustainability and underpins competitiveness of these industries. Collectively PISC (Primary Industries Standing Committee) agencies spend in the order of \$1 billion annually on primary industry RD&E and the efficiency and effectiveness of this investment has been a focus of PISC for many years.

In September 2003 PISC established an R&D Subcommittee to:

- (a) demonstrate the return on current investment and potential for future investment;
- (b) identify agreed strategic investment priorities for the future;
- (c) review capability and capacity nationally;
- (d) assess the various models for R&D;
- (e) assess the various models for commercialisation; and
- (f) recommend improved national and inter-jurisdictional arrangements and decision making frameworks to improve return on investment through improved priority setting, efficiency and effectiveness.

In April 2005, PIMC (Primary Industries Ministerial Council) endorsed the PISC concept of "National R with Regional D&E" and requested a consultation phase. The concept recognises that basic and strategic research (R) can be provided from a distance, with regional adaptive development (D) and local extension (E) required to facilitate uptake of innovation by industry.

In July 2005 a discussion paper on a national RD&E framework for primary industries was circulated for consultation with stakeholders. Extensive consultation occurred with a range of stakeholders, including rural industry leaders, R&D funders and providers.

In April 2006 PIMC agreed to a set of principles to guide further inter-jurisdictional work. These principles provide individual agencies with the freedom to operate, which allows them to reassess and reposition their RD&E capability for greater impact while understanding the developments in other jurisdictions. The PIMC *Principles for Developing a National RD&E Framework* are:

- (a) PIMC agencies should cooperate and work with industries to encourage the establishment of a more efficient and effective RD&E system capability nationally

- for primary industries drawing on industry led initiatives and government led broader cross-sectoral frameworks as necessary;
- (b) PIMC agencies should share information, plans and priorities for investment in RD&E to facilitate collaborative effort;
 - (c) RD&E funding levels should at least be maintained for primary industries and investments, including from savings, should be re-directed to improve the capability of the national system in priority areas;
 - (d) PIMC agencies should facilitate access to national research capability (people, infrastructure and information) by industry and R&D partners across Australia;
 - (e) PIMC agencies should support processes involving all the main participants in primary industries research to refresh the rural R&D priorities and to encourage more consistent and rigorous monitoring of performance of R&D targeting and delivery;
 - (f) the important role of regional development and local extension is recognised as facilitating rapid uptake of innovation; and
 - (g) PISC should report regularly on progress in the development of the national RD&E system and priorities for action.

The PISC R&D Subcommittee convened a workshop on 13 June 2007 to discuss opportunities and impediments to national collaboration on RD&E. It was attended by State and Territory Government representatives, senior officials from most rural research and development corporations (RDCs), CSIRO and a representative from national university agriculture schools.

A number of recommendations to assist RD&E collaboration were agreed at the workshop, the most significant of which was to develop an integrated, national research plan for climate change in primary industries. A joint strategy team was established to develop the national climate change research plan, including mapping existing activity, identifying gaps and identifying strategies for adoption of research and communication.

Discussion

The notion of collaborative RD&E amongst agencies is now well established. However, to date there has not been a mandate to implement a broad-based national agenda in a structured way or to a specified timeframe. The proposed priority RD&E areas for Queensland, and the national role proposed, are shown in Table 1.

In April 2007, Ministers discussed the potential need for a broader national plan to provide a more comprehensive, structured approach and to accelerate the program of work.

The new Australian Government supports the current co-investment funding formula for investment in rural research and will invest an extra \$15 million in climate change research. The Government intends to establish a coordinating Rural R&D Council to ensure more effective multi-sector facilitation and prioritisation of RD&E investment. The Council will develop an Australian Strategic Rural R&D Investment Plan with a national reporting framework and detailed performance measures against an agreed list of national priorities.

Sector Analyses

The PISC R&D Subcommittee is developing a number of sector strategies in partnership with the relevant RDCs. Some clear trends are already evident from this work. Sectors can be grouped into three broad categories, distinguished by the sector distribution, the distribution of research capability and the nature of the D&E capability, as follows:

- i. **Localised:** This is typically an industry distributed in a relatively discrete area, which is supported by R capability close at hand and where D&E is also provided locally.

- ii. **Distributed:** This is an industry distributed widely across much of the nation, supported by a number of R capabilities (usually linked) with D&E provided in each relevant jurisdiction.
- iii. **Cross-sector:** This research capability benefits all industries and delivers benefits across the whole nation and is supported by a number of linked specialised capabilities with D&E provided in each jurisdiction.

In general, jurisdictions favour maintaining capability that supports their strategic priorities. A range of emerging priorities (typically cross-sector) and budget pressures prohibit the retention of less important capability. Decisions are required to ensure adequate coverage of research capabilities in the future and access for primary producers across Australia to the collective research outputs of PISC agencies.

It is also clear that if the substantial resources invested by government and industry in R&D are managed cooperatively, a more efficient, effective and comprehensive capability would be possible. Effective implementation of this change program needs to proceed within an agreed national RD&E framework.

The outcomes achieved by executing the Framework would include:

- i. Agencies will retain/build capability in fields strategically important to them and, at the same time, cooperate with others to build theirs to provide for a more comprehensive national research capability.
- ii. Research capability will become more collaborative, specialised, have larger critical mass and perhaps be less distributed across the nation. Efficiency and effectiveness of RD&E will be markedly improved overall, although some additional costs could be incurred providing national linkages and to support delivery of regional development and local extension.
- iii. The national research capability would be the 'discovery' component of a wider innovation agenda that spans and supports development and extension. As a consequence, to facilitate rapid uptake of new technologies, research developed in one area of the country would be available in other regions where the industry is located.

Implementation Considerations

The Framework raises a number of operational issues to be addressed and agreed by the parties, such as:

- i. How will industries in different jurisdictions gain access to research generated nationally?
- ii. How will this be resourced?
- iii. How will intellectual property (IP) be managed?
- iv. How will capability gaps be addressed?
- v. What will the reporting and oversighting arrangements be?
- vi. How will industry stakeholders across Australia have input to priority setting?

The PISC R&D Subcommittee will continue working on solutions to these issues, engaging with RDCs, other R&D providers and industry stakeholders on each issue. For example, much IP is owned jointly by R&D providers and RDCs, and ensuring that IP is available for use under the new arrangements is critical. In relation to capability gaps, there is an important link between R&D providers (employers of research personnel) and universities (trainers of future research scientists).

The scale of the proposed transition is considerable, and it is expected to take at least five years to reach full implementation.

Table 1. Proposed DPI&F investment priorities for future R&D in the context of the national primary industries RD&E framework

<p style="text-align: center;">LEAD</p> <ul style="list-style-type: none"> • High priority areas for recurrent and infrastructure funding <p>(including Joint leadership)</p>	<p style="text-align: center;">PARTICIPATE</p> <ul style="list-style-type: none"> • Recurrent funding for tightly specified or geographically based areas of R&D in the context of a national program • Limited infrastructure investment; disinvestment might be considered 	<p style="text-align: center;">LINK</p> <ul style="list-style-type: none"> • Recurrent funding focused on linking national program outcomes with services for Queensland agribusinesses • Infrastructure disinvestment to be considered
<p>Beef (joint) Sugar (BSES) Summer grains Summer pulses Tropical & subtropical fruit and nuts Tropical vegetables Tropical forestry Integrated pest & disease management (tropical) Weeds (tropical) Climate change adaptation Modelling & predictive systems</p>	<p>Wheat Cotton Dairy Pigs Poultry Tropical aquaculture Tropical amenity horticulture Fisheries Animal welfare Animal health technologies Plant health Irrigated water use management Fragmented landscapes (peri-urban) Pastures (farming) Platform technologies (Biotechnology etc) Food science</p>	<p>Winter pulses Oilseeds Barley Rice Sheep Temperate aquaculture Temperate vegetables Temperate fruit and nuts Temperate amenity horticulture Viticulture, wine & grapes Temperate forestry Dryland water use management Salinity</p>