

**Review of Future RD&E Infrastructure: Requirements for
Queensland Cropping Industries**

**Outcomes from Consultations with Plant Science
Professional and Technical Staff**

April 2009

FUTURE QPIF CROPPING FACILITIES

Summary

Workshops were held with Plant Science scientific staff to scope the possible RD&E infrastructure required for QPIF to better support the future of Queensland's cropping industry in the context of international, national, and regional opportunities. Future requirements were assessed based on current and future views of the major cropping regions in Queensland. The workshops provided input into the necessary science capability and potential infrastructure required for world-class crop research and development for the next 20 years.

This document does not give a definitive proposal for the location and type of future facilities. Instead, the data suggests an underlying generic theme of research infrastructure consolidation within specific agro-ecological zones throughout the state (Northern, Coastal, Central, and Southern). Some direction is also provided on the research capabilities required in each zone. The outcomes of the staff consultation have a high degree of consistency with the recently released draft AgForce document and provide an excellent starting point from which QPIF can negotiate with AgForce Grains, GRFL and other grains industry stakeholders.

QPIF field crop researchers differed in their specific views on future needs. However, they collectively welcomed reinvestment to replace or renew aging infrastructure, which in most cases is 30-40 years old. The broad themes captured from the two workshops and fourteen focus group meetings on the future QPIF regional infrastructure footprint for cropping RD&E are:

- Northern - a 'Centre of Excellence' (CoE) supporting a critical mass of scientific expertise. (QPIF is currently implementing the recommendations of the Tablelands review, designating Mareeba as the CoE with Walkamin as the major field research station supported by a small field site at Kairi – this investment will meet the future needs of cropping RD&E on the Tablelands).
- Coastal (north and south) – one general purpose facility in each coastal region with 1-2 field sites focussing on BSES linkages and sharing of H&FS sites for coastal cropping research.
- Central – one general purpose lab and major field site based on consideration of the potential future role of AACC Emerald.
- Southern – One primary Plant Science CoE in the Darling Downs area supported by one or more nodes of field research activity. This has been independently foreshadowed in the AgForce Grains paper and in the Minister's election commitment.
- Expanded use of co-operator sites to minimise the number of QPIF owned sites and to better link R&D with E as a strategy to improve the adoption of the latest technology and best practice.

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QPIF will require further detail around the proposed Plant Science Centre of Excellence outlined in the Minister's election commitment prior to entering into formal negotiations with the cropping industry. For example questions for further consideration include: what are the implications for location of the need for an adequate and secure water supply? What land area is required for field/sites? What level of laboratory facilities are required eg. general purpose; marker laboratory; glass houses?

Introduction

QPIF is currently reconfiguring its science facilities and effort under "A Fresh Approach". The aim of this process is to better address the future RD&E needs of Queensland's cropping industries by focussing resources into fewer, higher-quality 'fit for purpose' centres both regionally and through partnerships with Universities and other organisations. This process is being carried out under a national agenda through QPIF's participation in the creation of a national food and fibre RD&E system that will service Australian primary industries in future. QPIF's investment in and delivery of RD&E will be integrated into this system.

Initiatives announced to date under "A Fresh Approach" include the innovative \$8 million plan for the Atherton Tablelands, which includes building a new purpose built facility in Mareeba announced in October 2008 and a \$32 million injection into the beef industry to fund new and improved biosecurity and a network of world-class beef research facilities announced in December 2008.

QPIF has also formally entered into partnership discussions with the University of Queensland (UQ). QPIF believes a strong partnership framework with UQ and other universities is required to enhance the development and application of advanced sciences to address emerging primary industry-related challenges and opportunities. This will also expand investment synergies, better capture and retain international agri-scientific expertise, improve training for the food and fibre sector, and improve access to external funding.

During the recent 2009 election campaign, our Minister, Tim Mulherin, outlined the following commitments and future directions relevant to cropping science infrastructure:

- The development of a new \$5 million Queensland Centre for Advanced Agriculture that will deliver better agricultural environmental outcomes in Queensland, including climate change preparedness, water use efficiency and farm management systems.
- The establishment of a new Plant Science Centre of Excellence on the Darling Downs and a new Science and Training Precinct for Horticulture at QPIF's Research Station in Bundaberg.

Link to [Mulherin election commitments 2009](#)

The delivery of these commitments by QPIF will address some of the future RD&E infrastructure needs of Queensland's cropping industries and is consistent with the findings outlined in this report.

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This report presents an overview of the types of experimental facilities that scientific staff consider are necessary to support QPIF's future delivery of research and development (R&D) for Queensland's cropping industries, in the context of enhanced service delivery and the "Fresh Approach". QPIF's current research infrastructure is shown in Appendix 3.

This report is based on input received from a cross section of QPIF's senior researchers during two workshops held in Toowoomba: the first an initial scoping exercise held on the 19 September 2008 and the second held on the 17 November 2008. Information for the second workshop was also obtained through a series (14) of small focus group sessions held with a broad cross-section of Plant Science professional and technical staff. All workshops were facilitated by Science Leaders and the General Manager, Plant Science. Representatives from AgForce Grains also attended the second workshop as observers of the process.

AgForce have also instigated independent visits to Plant Science research centres and research stations to form their own view of the current science infrastructure. To date they have visited Roma, Dalby, Emerald, Biloela, Hermitage Research Station, and Leslie Research Centre in 2008 and visited Kingaroy in January 2009. The visits to QPIF facilities have had the full support of QPIF management and usually involved brief presentations on the research being carried out at the facility, face to face discussions with staff and a tour of the facility. As a result of these visits, [AgForce Grains](#) have developed a draft discussion paper on future infrastructure needs for the cropping industry. The Grains Research Foundation Limited (GRFL) has also been kept informed of this review and intends to also develop a discussion paper. While there has been much consultation with the grains industry, it needs to be highlighted that at this stage there has been minimal engagement of the cotton industry, although the needs of the cotton industry were considered as part of the discussions by QPIF researchers.

While the review of future facilities has been made in the context of the National R&D Framework, a number of additional current and concurrent reviews involving future GRDC national priorities have implications for the Northern Grains region. These reviews include:

- Barley Breeding Australia Review (completed but not released)
- National Grains RD&E Strategy (currently being developed)
- Future Scenario Workshop for the Northern Grains Region (completed)
- GRDC review of Investment in the Northern Region (completed but not released)
- National Genetic Resource Centre - Crops (a national approach still to be implemented)

Other strategic (internal) documents circulated to staff and informing this review included:

- [Feedgrain & Fodder RD&E Program - 5yr Future Direction Document](#)
- [Grains, Cotton & Pulses RD&E Program - 5yr Future Direction Document](#)
- [Plant Science Business Plan 2008-2013](#)

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Process

The aim of this review exercise was to capture the broad views of scientific staff within Plant Science with respect to the footprint and infrastructure necessary to support QPIF's future RD&E in crop science.

The boundaries of the discussions included:

- start with a “clean-sheet” (*i.e.* the current suite of facilities were not used as the starting point);
- embrace the underlying philosophy of the science elements of a fresh approach *i.e.* new or enhanced Centre/s of Excellence (CoE) linked to University partnership/s with supporting field sites; and
- focus on the identified future priorities for accelerated growth in the cropping sector.

National Drivers of Grains RD&E

Implications of the National Grains RD&E Strategy (currently being developed)

This strategy is currently under development under the National RD&E Framework of PISC and PIMC with the process being lead by the GRDC and DAFWA. It is informed by the paper titled: ‘Consultation Paper for the development of an Australian Grains Industry Research Development and Extension Strategy’. This consultation paper provided the background to current and future perceptions of the Australian grains industry for the development of the National RD&E Strategy. The review team is currently carrying out a gap analysis of research capability as part of its review process. The nature and extent of GRDC investment will be critical to the support of future investment to grains research in the Northern Region.

QPIF Grains RD&E priorities

Future QPIF R&D priorities for the cropping industry are outlined in the 5-year Future Directions 2008-2013 documents for the [Grains, Cotton, & Pulses](#) and [Feedgrains & Fodder](#) programs.

Future priority areas of focus across programs were consolidated in the [Plant Science Business Plan 2008-2013](#) as:

1. [Genetic improvement](#) - developing and delivering enhanced genetics for field crops in Queensland, and
2. [Profitable and sustainable farming systems](#) – accelerating growth and resilience in field crop productivity via the design, development and delivery of effective and better integrated crop protection and farming system solutions.

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Future R&D success in these priority areas will need to be underpinned by skilled staff. This highlights the importance of the skilling, training and research partnership initiatives of QPIF under “A Fresh Approach”.

Outcomes

A summary of discussions from the first workshop is shown in Appendix 1 (further details at [Workshop 1](#))

This first workshop was restricted to Plant Science senior leadership, senior research staff and investor representatives. It looked at current and future cropping in Queensland in the context of agro-ecological zones (e.g. Semi Arid tropics (Burdekin, Bowen, Richmond; Wet Tropics (North of Rollinston); Central Highlands/Dawson/Callide; Inner Downs/ Western Downs) and identified future cropping trends in each zone. Further discussions focussed on current and future issues that would impact on the future of cropping in Queensland.

The issues identified were wide ranging and included issues such as climate change, sustainability and biosecurity to supply chain management. The future cropping and issues impact data was then used to inform a discussion on the future science infrastructure. Each of the three groups approached this task from a different perspective but in general looked at infrastructure in the context of northern, coastal (northern and southern), central and southern areas of the state. The approach and detailed responses of each group is shown in the table in Appendix 1. While there were differences in opinion, some consistent trends emerged across groups.

In the northern region there was a preference for a CoE on the Tablelands (Mareeba) with a supporting field site (nursery and pathology). New investment in Northern (Tablelands) infrastructure focussed on Mareeba as the CoE and Walkamin as the major field site was subsequently announced by the Minister in October 2008.

In coastal areas there was a focus on linking to infrastructure already in place such as that currently utilised by H&FS, BSES, CSIRO/UQ. In the Central cropping area there was identified a need for one major field site with possible linkages to the Emerald AACC site as an option for consideration. Southern infrastructure was the most controversial with options including a “Virtual Science CoE “ based on current hard infrastructure sites (Warwick, Toowoomba, Gatton) with a field site on the Central Downs; a Science CoE based at Gatton; and a Science CoE on the Darling Downs. Comments supporting the location of infrastructure are also included in the Table in Appendix 1.

A summary of discussions from the second workshop is shown in Appendix 2 (raw data and presentations at [workshop 2](#)). There was considerably more input from all research staff to this workshop. A series of focus group capability meetings (14) was held across Plant Science and this data was included in the workshop discussions through presentations of summaries of the focus group meetings. The workshop also reaffirmed the Plant Science strategic priorities and again, as in workshop 1, the data was used to inform discussions on the future resources required to deliver on science priorities.

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Table 1 provides a summary of the focus group data (link to [focus group data](#)) and includes information on general issues arising from the focus group discussions; identification of future capability and infrastructure and science linkages (partnerships). The group session on the future infrastructure footprint was approached differently by each Group. A summary of the outcomes of this session is shown in Table 2.

While there were differences in opinion, some consistent trends emerged across groups which were similar to the outcomes from the first workshop. That is: the need for:

- a science CoE in southern Queensland with 1-3 QPIF owned field sites
- one general purpose facility in NQ (Tablelands), CQ, and Coastal, QLD with 1-2 QPIF owned field sites in each region.

It was also recommended that where possible there could be better use made of co-operator sites.

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Appendix 1: Summary of outcomes from Workshop 1

Workshop documentation used in this summary can be found at ([workshop 1](#))

This first scoping workshop looked at the future crop production in context of the following agro-ecological zones:

Semi Arid tropics (Burdekin, Bowen, Richmond)

- Sugar – dominant but static crop changing from monoculture to one increasingly using rotations. Ethanol production from sugar may be a factor but probably not a major product.
- Grains – Probably minor production only; lack of information on how these will fit in the tropical system.
- Summer pulses – important in rotations and will need infrastructure to support their production.
- Pulses – Will increase in the future; an increasing need for IPM (weeds, disease, insects) and information on how they fit the cropping system
- Cotton – Expected to increase and will require system information, IPM, environmental impact knowledge under the Reef Management Plan
- New cropping – possibilities include rice, horticulture crops, other C sources for ethanol production and pastures but impact likely to be minor.

Wet Tropics (North of Rollinson)

- Sugar – as per semi arid tropics
- Horticulture – Dominant horticulture environment will have an impact on IPM of grain crops; will require knowledge of these systems in a tropical environment which in turn will require supporting infrastructure.
- Tree crops – issue of competition for land
- Maize – minor crop only but increasing slowly with major issues likely linked to disease and IPM
- Soybeans – minor crop but grown for forage not grain
- New cropping – possibly hemp, bamboo and cellulosic crops such as sorghum and sugar for ethanol production.

Central Highlands/Dawson/Callide

- Winter grains – has increased and will be a dominant but static crop in the future with issues around risk management of variable production and pest management.
- Summer Grains – a dominant crop now and in future
- Pulses – an important but minor crop with the possibility of some reasonable increases in production
- Cotton – currently a minor crop unlikely to increase dramatically.

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Did not get to discuss the Inner Downs/ Western Downs areas.

The next discussions focussed on Issues that would impact on the future of cropping in Queensland. The following issues were identified (in no particular order):

- Crop options (impact of climate change) same but management will be different and % will change
- Tropical / Coastal area mix – potential to change (growth areas / dynamic Areas)
- Grain Storage – management of feed grain / supply chain mgt (GMO)
- IPM aspects across the changed Management of Crop/Land Mixed and climate change
- Genetics to keep pace with Dynamic system
- Natural resource base in Southern / Central area decreasing with possible option of moving north
- Risk Management
 - (i) New area options/frontiers
 - (ii) Traditional area – incremental productivity gains
- Linkage to livestock industry
- Biosecurity/Climate Change overlay
- Mining/Urban impacts
- Biodiversity Management – Demo Sustainability
- Capability of Human Capacity to address Issues e.g. Crop protection expertise regionally
- Carbon Pollution Reduction Scheme
- Sustainability
 - Resources base – Soil/Water
 - Biodiversity
- Livestock – Cropping and beef Industry needs to co-develop
- Global market drivers Vs domestic drivers
- Reef – environmental footprint (Social licence in a Catchment focus)
- Farm Business Structure – Size/owners
- Genetics
- Financial Mgt Services in Agribusiness – Contractors/Agro's
- Regional demographics changing
- Any Services from Agribusiness more than financial - public face of QPIF, extension, agronomists etc
- Supply Chain Drivers – Food Value/Value Add

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The workshop broke into three groups and using the above issues and other data such as the 5 year strategic program plans etc. as background discussed the potential future infrastructure needs with a focus on the: functionalities needed (skills required, who- QPIF +/- Partnerships, field site requirements, laboratory requirements, alternatives – leased/co-operative farms); non-location issues (training, Centre of Excellence); flexibility in the North, Central, South and Coastal areas. Individual group discussions are summarised in the following table:

Group 1	Areas			
	Northern	Coastal	Central	South
	<ul style="list-style-type: none"> • Have a COE node with science expertise (for pest incursions) • COE to be located at T'ville (JCU or Cairns to attract staff) • Use field site on Tablelands for expts and lease land as required • Mareeba possible location 	<ul style="list-style-type: none"> • No real plant science presence • Use Northern expertise to feed this area • Link into other organisations H&FS, BSES, CSIRO – Gatton; UQ – Gatton; 	<ul style="list-style-type: none"> • Major field site – house equipment, technical support, operate as a fly-in fly-out from COE • Biloela or Emerald – favourite options for field site e.g. AACC site? 	<ul style="list-style-type: none"> • Plant Science COE (Virtual centre required) • Toowoomba, Gatton, Warwick (Brick sites) • Central / Downs Field site (owned research site) – plus • Gatton provides UQ link • Toowoomba – main plaque site – office, labs, glasshouse • Central Downs FS – away from civilisation – good H2O • Draw in activities with NW NSW (Warwick)
Group 2	Areas			
Took a GxMxE approach	Northern	Coastal	Central	South
	<p><i>Genetics:</i></p> <ul style="list-style-type: none"> • Focus on the Burdekin (JCU link) • Tablelands – options from review (nursery field sites and pathology) <p><i>Management:</i></p> <p>Nodes as per genetics</p>	<p><i>Genetics:</i></p> <ul style="list-style-type: none"> • Use BSES linkage and H&FS sites for Coastal node <p><i>Management</i></p> <p>Nodes as per genetics:</p>	<p><i>Genetics:</i></p> <ul style="list-style-type: none"> • Emerald (no alignment) – hubs for equipment and technical support; hire multiskilled high-profile scientist to support this regional work <p><i>Management</i></p> <p>Nodes as per genetics:</p>	<p><i>Genetics</i></p> <ul style="list-style-type: none"> • need one central hub for all breeding – Gatton – site houses the herbarium, gives UQ linkage, use the existing land resource; • Regional field site <p><i>Management</i></p> <p>Nodes as per genetics:</p>
<p><i>Additional Comments:</i> All selected sites need air travel access; Site attractiveness a high priority for staff; Questions were raised about the suitability of Gatton as a central breeding site. Comment that soil/climate too different; focus earlier generation work for foliar disease.</p>				

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Group 3	Area			
This group focussed on the following areas of expertise: <ul style="list-style-type: none"> • Crop protection • Grain Quality • Predictive systems 	Northern	Coastal	Central	South
	<ul style="list-style-type: none"> • Lab on the Tablelands (Mareeba) 			
<p><i>Additional Comments:</i> Library of resources at Bogga Road; Partnerships (UQ, Gatton; UQ St Lucia; Biosecurity; NSW DPI; USQ, CQU, CRC); Extension/Education (High school/VET/Uni interaction for a transitional career pathway); Delivery (accreditation of consultants via ACCC; remote delivery of skills to Agribusiness e.g. e-diagnostics e.g. video node access for clients to engage scientist, in field image via email to scientist in central lab). Tech staff located regionally; grower trial sites. Succession planning important. People and skills critical -Programming, resource economics, modelling (farming system and population dynamics). IT capacity.</p> <p>Recognised a need for key QPIF-owned field sites (pest and disease inoculation) and grower co-operator sites but did not specify where?</p>				

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Appendix 2: Summary of outcomes from Workshop 2

Workshop documents and presentations used in the preparation of this summary can be found at ([workshop 2](#))

The process for the second workshop included:

- Presentation of summaries of the 14 capability focus group meetings:
- A session to reaffirm the Plant Science strategic planning data through discussion on the top five science focus areas for plant science for the future?
- Identification of future resources required to deliver on the science focus areas.

Table 1 provides a summary of the focus group data and includes information on general issues arising from the focus group discussions; identification of future capability and infrastructure and science linkages (partnerships). Link to: [Focus group data](#).

The group session on the future infrastructure footprint was approached differently by each Group. A summary of the outcomes of this session are shown in Table 2.

Group 1				
SQ	Genetics, crop protection, water)	High level		Centre of Excellence (genetics, crop protection, water)
CQ	Regional adaptation (RA) of genetics and crop protection and resource management (RM)	Local Adaptation		One facility including field site
NQ	RA and resource management	Local adaptation		One facility including field site
Atherton Tableland	RA/RM	Local adaptation		One facility including field site
Coastal/ Burnett / Northern	RA/RM/Soil CoE	Local adaptation; special soil expertise		One facility including field site

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Group 2				
SQ				<p>Centre of Excellence with: Crop gas exchange facility;</p> <p>Irrigation system; Lysimeters; Rain-out shelters; Remote sensing; Plot equipment; Glasshouses, Polyhouses, growth rooms; Labspace (purpose specific); Chemical Storage; Cold Storage; Office Space; GM; Sickplots</p> <p>Marker/Biotech Lab;</p> <p>Land - DPI owned sites (x3)</p> <p>Reliable, managed isolated for path etc</p> <p>Research Storage facilities; Insectaries, cages etc; Path facilities culturing storage; Quality labs (grain and forage)</p>
CQ				<p>Facility with: Irrigation system; Rain-out shelters;</p> <p>Plot equipment; Glasshouses, Polyhouses, growth rooms; Lab space (purpose specific); Chemical Storage; Cold Storage; Office Space;</p> <p>Land – DPI owned sites (x1-2)t</p> <p>Reliable, managed isolated for path etc; Insectaries, cages etc; Path facilities culturing storage; Quality labs (grain and forage)</p>
NQ				<p>Facility with: Irrigation system; Plot equipment ; Glasshouses, Polyhouses, growth rooms; Lab space (purpose specific); Chemical Storage (1,2,3); Cold Storage; Office Space; Sick plots; Marker/Biotech Lab</p> <p>Land - DPI owned sites (x2)</p> <p>Reliable, managed isolated for path etc; Insectaries, cages etc; Path facilities culturing storage; Quality labs (grain and forage)</p>

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Group 3				
				Location of facilities based on: <ul style="list-style-type: none"> • Agroecological Zones / not Regions • No “Regional Delivery” – can still deliver • Co-location and integration based on science needs identified by focus groups • Funding models to accommodate integration across disciplines • specialist centre for discipline
Group 4				
NQ	Crop Protection W+P+E	Basic Need + H+FS	PO-W, PO-E, PO-P + TO's	General Lab, glasshouses, Field Sites
	Crop Improvement	Local adaptation	TO support Physiologist	Ditto
	Water	High Level	Res. Agronomist Irrigation Specialist	Ditto
	Soil	High Level	Res Agronomist Soil Scientist TOs	Ditto
CQ	Crop Protection W+P+E	W+P+E, Basic need	PO-W, PO-E, PO-P _ TO support	
	Crop Improvement	Local Adaptation	TO support Physiologist	
	Water	Mid-Level	Res. Agronomist	
	Soil	Mid – Level	Res. Agronomist	
SQ	Crop Protection W+P+E + Post Harvest	High Level Core Capacity	Ecology 1 PM Molecular Taxonomy	CE
	Crop Improvement	High Level Core Capacity	Geneticists	CE; glasshouses
	Water	Mid – level	Res. Agronomist	
	Soil	Mid-Level	Res Agronomist	
			Biometry Engineering Bioinformatics	

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Appendix 3: Current location of QPIF Grains Infrastructure

There are a total of 17 sites where grains R & D and associated vocational training is currently undertaken (excluding Universities) in Queensland. This includes 9 research stations and 2 field experimental sites throughout Qld (all agencies). QPIF also undertakes grains R & D at a further 2 laboratories/office sites. There are a further 4 Australian Agricultural College Corporation properties/campuses where some form of grains-related training is undertaken. QPIF is currently updating its evaluation of the value of the facilities.

Property	Lead agency	Land area (Ha)	Physical characteristics	Current research
Ayr Research Station	QPIF	43	<p><i>Research Station</i></p> <p>Ayr Research Station is located 5 km from Ayr (100 km south east of Townsville). The Station undertakes RD&E in tropical tree crops, dry tropics horticulture, beef, and the integration of rotational crops within a sugarcane system. The research station supports sorghum research during the winter period. The development of farming systems for cotton is under investigation along with developing rotational crops with sugar cane as important issues for Sustainable Farming Practices. Following closure of Little Drysdale St Office, a new glasshouse and technical facilities to support R&D were constructed on this site. It now supports all R&D. Staff onsite together with conference, laboratory and administration facilities.</p>	<ul style="list-style-type: none"> • GRDC Wheat pre-breeding project for adaptation in non-traditional areas • Contract maize, sorghum and sunflower trials <p>Other Plant science projects on-site</p> <ul style="list-style-type: none"> • CCCRC 1.03.30. Burdekin cotton [plus 6 projects supporting tropical horticultural industries]

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<p>Biloela Research Station</p>	<p>QPIF</p>	<p>281</p>	<p><i>Research Station</i></p> <p>The Research Station was established in 1923 by the Queensland Government and the Queensland Cotton Corporation to assist the development of newly opened land for agricultural crops, especially cotton. The Station consists of 280 ha of irrigable, alluvial land on the Callide flood plain just to the north of the town of Biloela. Biloela is currently the base in CQ for Plant Science Research associated with crop improvement programs in sorghum, pulses (chickpea & mungbean), wheat, barley and oats. It is also the location for the Tropical Crops and Forages Collection (TCFC) – part of Australia’s National Genetic Resources collection.</p>	<ul style="list-style-type: none"> • GRDC Sorghum Breeding (CQ part) • Breeding food & livestock wheats (CQ part) • Reinvestment fund: Sorghum reverse genetics, (CQ part) • CQ Farming Systems (row configurations) • GRDC Australian chickpea breeding (CQ part) • GRDC National mungbean (CQ part) • MLA Breeding oat varieties (CQ part) • GRDC DAQ00110 Barley Breeding Australia • Contract wheat & durum breeding trials & wheat physiology (CSIRO) • GRDC DAQ00131 Australian Tropical Grains Germplasm Centre
<p>Bundaberg Research Station</p>	<p>QPIF</p>	<p>32</p>	<p><i>Research Station</i></p> <p>Bundaberg research station was established in 1985 to undertake research into small crops, tree crops and grain crops in the form of glasshouse and field trials. Grains-related R & D is currently restricted to 1 staff member. Horticultural production in the Bundaberg has continued to increase in recent years, and this site is likely to incur future growth as a consequence of increased R & D investment by industry and associated stakeholders.</p>	<ul style="list-style-type: none"> • GRDC Red soils farming systems imitative, component • GRDC Wheat and barley grain defect [plus 9 projects supporting tropical horticultural industries]

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Dalby AACC (main campus)	AACC	1289	<p><i>AACC property (training)</i></p> <p>The Dalby campus specialises in board acre and crop production; intensive and extensive livestock production; rural business and engineering. The campus incorporates four commercial properties that are used as both demonstration and teaching resources. The campus caters to several specialties including: broad acre crop and grain production; irrigated and dry-land cotton production; intensive livestock production; rural business management; and agricultural engineering.</p>	<p>None</p> <p>Current activities restricted to AACC training purposes</p>
Dalby AACC – railway property	AACC	220	<p><i>AACC property (training)</i></p> <p><i>Railway</i> - a 220-hectare cropping block on the Jandowae road</p>	<p>None</p> <p>Current activities restricted to AACC training purposes</p>
Dalby/Moola – Crystal Brook [14km east of Dalby]	AACC	116	<p><i>AACC property (training)</i></p> <p>A 116-hectare mixed cropping/grazing farm</p>	<p>None</p> <p>Current activities restricted to AACC training purposes</p>
Emerald Research Station	QPIF	40	<p><i>Research Station</i></p> <p>The station has 40ha of land with approximately 25 ha irrigation (flood & spray) suitable for experiments (supply of water is unreliable in the winter months). The station is utilised by QPIF staff from the Emerald town office in combination with numerous</p>	<ul style="list-style-type: none"> • CQ Farming Systems (Wheat and Barley phenology) <p>Other Plant science projects on-site</p> <ul style="list-style-type: none"> • GRDC DAQ00105. Applied solutions to weed issues in CQ

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			<p>producer co-operative sites for experimental work. The major soil type is Bug (heavy open cracking clay) with an average rainfall is 634 mm per annum (rainfall pattern is extremely erratic) and there are an average of 7 frosts per year.</p>	<ul style="list-style-type: none"> GRDC National mungbean improvement
Emerald AACC (main campus)	AACC	1200	<p><i>AACC property</i></p> <p>Mixed purpose site with horticulture (table grapes, and mangoes), cropping (cotton, grain and forage for hay) and 43ha of irrigated pasture. The water resources include 3266ML allocation from the river and a 200ML Ringtank; 500t of grain storage and an extensive range of row cropping machinery.</p>	<ul style="list-style-type: none"> GRDC/CRDC Enhanced performance of integrated cotton/grain production systems in CQ <p>Plus activities associated with AACC training role</p>
Gatton Research Station	QPIF	49	<p><i>Research Station</i></p> <p>Gatton Research Station is at the centre of the major horticultural production areas of Qld, close to major population and supply areas. The climate is suited to wide range of crops and pastures, with a range of quality well drained soil types. The site is across the road from the University of Queensland campus and benefits from increasing collaborative opportunities.</p>	<ul style="list-style-type: none"> GRDC Sorghum Breeding Breeding livestock wheats Core wheat pre-breeding GRDC DAQ00106 Herbicide tolerance of barley & wheat Disease progress nursery (rust) MLA Breeding oat varieties GRDC DAQ00096 Emerging foliar disease issues GRDC DAQ00110 Barley Breeding Australia

FUTURE QPIF CROPPING FACILITIES

<p>Hermitage Research Station</p>	<p>QPIF</p>	<p>228</p>	<p><i>Research Station</i></p> <p>Hermitage Research Station is a major centre for plant breeding and agronomic studies on agricultural crops grown in Queensland and northern New South Wales. The station is located 6 km east of Warwick, and 160 km west of Brisbane. Total area of 228 ha comprising some 80 ha of rich black alluvial clay, 90 ha of sloping arable soils derived from Walloon coal measures, and 60 ha of non-arable timbered slopes of basalt derivation. Facilities include office block, conference rooms, biotechnology laboratory, three controlled environment plant growth rooms, five glasshouses, three cold storage rooms, six insulated cool seed stores, automatic rainout shelters, drying ovens, gas fired drying barn, and seed store with range of threshing, grading, and grinding equipment. Programs conducted by Hermitage staff include barley breeding; pathology and biotechnology; sorghum breeding, physiology and biotechnology; pulse breeding and agronomy (chickpeas and mungbeans); soybean varietal/strain evaluation, and rural water use efficiency studies. Other research conducted at Hermitage includes a long-term fallow management study, wheat frost tolerance studies, oat variety testing, herbicide studies and information systems evaluation and development</p>	<ul style="list-style-type: none"> • GRDC -Sorghum Breeding • Reinvestment fund, Sorghum reverse genetics • GRDC DAQ00085 Sorghum staygreen physiology • GRDC DAQ00110 Barley Breeding Australia • GRDC DAQ00094 Barley grain defects • GRDC DAN00106 Barley agronomy • GRDC Maize germplasm enhancement • GRDC Australian chickpea breeding • GRDC National mungbean improvement • GRDC DAQ00077 Pedigree based genome mapping (barley) • GRDC DAQ00106 Herbicide tolerance of barley & wheat. <p>Plus contracted wheat & barley trials</p> <p>Other Plant science projects on-site</p> <ul style="list-style-type: none"> • DAQ00122 Nationally coordinated frost trials • GRDC DAQ00096 Emerging foliar disease issues
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FUTURE QPIF CROPPING FACILITIES

Kairi Research Station	QPIF	245	<p><i>Research Station</i></p> <p>Kairi was initially established to supply to supplying vegetables and eggs to allied troops in North Queensland, New Guinea and the Pacific theatre, and was converted to a research Station at the end of the war. Today, it occupies 244 ha undertaking research programs for the peanut, maize, potato and sundry agricultural and horticultural industries. Plant science activities include peanuts, maize, sweet corn and cropping systems. <i>(Note: See new arrangements announced for the Atherton Tableland)</i></p>	<ul style="list-style-type: none"> • GRDC Maize germplasm enhancement • GRDC Peanut breeding & pathology support to PCA • Wheat pre-breeding project to determine adaptation in non-traditional areas
Kingaroy Research Station	QPIF	53 plus 56 ha @ Redvale site NE of Kingaroy	<p><i>Experimental property</i></p> <p>A 12 ha block for trial purposes containing fairly level cultivation, deep brown clay soils ideally suited for intensive agriculture. No accommodation facilities or staff located on-site.</p>	<ul style="list-style-type: none"> • GRDC Red soils farming systems initiative • GRDC DAQ00086 Integrated pest management for Pulses • CRDC DAQ131 Myriads and stinkbugs • In-crop spatial variability assessment (remote sensing) • ACIAR 2441 Enhancing peanut agronomy • GRDC Agronomic packages for peanuts
Kingsthorpe property	QPIF	12	<p><i>Experimental property</i></p> <p>A 12 ha block for trial purposes containing fairly level cultivation, deep brown clay soils ideally suited for intensive agriculture. No accommodation facilities or staff located on-site.</p>	<ul style="list-style-type: none"> • Reinvestment fund, Irrigation Strategies for wheat and Cotton • DAQ00122 Frost project • GRDC DAQ00119 Genetic approaches to Fusarium and Bipolaris

FUTURE QPIF CROPPING FACILITIES

Roma Research Station	QPIF	67	<p><i>Research Station</i></p> <p>Research activities at Roma Research Station have declined in recent years due to drought conditions. The site provides office and very basic lab facilities.</p>	<p>NO current work at Roma.</p> <ul style="list-style-type: none"> • 'Grain & Graze' project activity during last 6 months (CSIRO/DPIF) • MLA Breeding oat varieties • GRDC Wheat pre-breeding
Wellcamp	QPIF	24	<p><i>Experimental property</i></p> <p>A 24 ha plant science experimental block. No accommodation facilities or staff located on-site. Research has been limited by drought in recent years.</p>	<ul style="list-style-type: none"> • GRDC DAV00076 Synthetic wheats CR • GRDC DAQ00119 Genetic approaches to Fusarium and Bipolaris • GRDC DAQ00106 Herbicide tolerance of barley & wheat cultivars in NR
<p>Footnote: Other locations where facilities such as drying ovens and lab space is utilised for R/D for farming-systems related experiments include: Ayr, Roma, Emerald DPIF complex, Biloela, Bundaberg and Kingaroy</p>				
<p>LABORATORIES OR OFFICE COMPLEX SITES WHERE R & D UNDERTAKEN</p>				
Toowoomba Leslie Research Centre	QPIF	7	<p><i>Laboratory</i></p> <p>The Toowoomba Leslie specialises in winter cereal plant breeding. Structural facility to cater for these breeding programs include: PC2 biotechnology laboratory, barley quality laboratory, wheat quality laboratory with baking and noodle making facility. Glass houses, growth rooms and growth cabinet facility for early generation disease testing, seed processing and storage capacity of up to 100 tonne, dehumidified long term seed storage and various cereal testings labs. LRC acts as service provider with comprehensive farming capabilities to the cereal breeding programs throughout NSW, Southern and central Queensland. It also provides limited research farm facility</p>	<ul style="list-style-type: none"> • Wheat pre-breeding • Breeding livestock wheats • GRDC DAQ00104 Sponge & dough bread quality • MLA Breeding oat varieties • GRDC DAQ00110 Barley Breeding Australia • GRDC DAQ00094 Barley grain defects • DAQ00122 Frost project • GRDC DAQ00096 Emerging Diseases • GRDC DAQ00107 Cropping Options for nematodes • GRDC DAQ00106 Herbicide Tolerance of barley and wheat varieties • GRDC Herbicide resistance strategies • GRDC/CRDC Modelling for sustainable

FUTURE QPIF CROPPING FACILITIES

			with full irrigation capacity.	<p>glyphosate use</p> <ul style="list-style-type: none"> • GRDC DAV00076 Synthetic evaluations • GRDC DAQ00119 Genetic approaches to resistance to Fusarium and Bipolaris • GRDC Defect elimination in wheat • GRDC Biotech disease resistance phenotyping • GRDC New pre-breeding projects x 4 • AGT – Wheat disease evaluations • Wheat & forage oats molecular biology
Toowoomba – Tor Street	QPIF		<p>Office and Laboratory complex</p> <p>Established in the early 1970's. Multi functional office, glasshouse and laboratory research facility containing plant science R & D staff, South Regional office, and other Government agencies such as DNRW who have constructed office blocks for 200 staff. Also on the site is the Animal Disease Surveillance Laboratory, entomology and plant pathology laboratories and a conference facility.</p>	<ul style="list-style-type: none"> • GRDC DAQ00108 Reducing impact of pulse diseases • GRDC / CRDC DAQ00074 Facilitating adoption of IPM • CRDC DAQ0006 Silverleaf whitefly insecticide resistance monitoring • CRDC_DAQ134 Managing cotton aphids with parasitoids • CRDC_DAQ003_Cotton Fusarium wilt management • Bioinformatics support for plant improvement • GRDC National Statistics project • Reinvestment fund, Irrigation projects use of ovens & labs for plant and soil data • Cotton Farming Systems – use of precleaner and delinting machine