

WHAT CLIMATE CHANGE MEANS FOR FARMERS A FARM, SCIENCE AND POLICY UPDATE

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“Adaptation to climate change is one of the biggest challenges facing Australian agriculture in the next 20 to 30 years. Like all changes, a changing climate brings both risks and opportunities. Those who better understand the nature and implications of the change can adapt more effectively to avoid the risks and seize the opportunities.” Gary Sansom, President QFF, 2 March 2009.

Queensland Farmers' Federation (QFF) is the peak body representing and uniting sixteen rural industry organisations who work on behalf of primary producers across the state. QFF's mission is to secure a sustainable future for Queensland primary producers within a favourable social, economic and political environment by representing the common interests of its member organisations.

Broadly the QFF members represent the intensive agriculture sector and farm activities within this group tend to be highly water dependent and as such associated with irrigation activities. In normal years the intensive agriculture industries account for about half of Queensland's \$13.7 billion of farm output and first round processing, and offer employment for about 40,000 people.

Climate and weather are obviously important ingredients in the mix of things that determine the success or otherwise of any farming enterprise. But in recent years we have seen how “climate influences” can change dramatically once they become socialised and politicised into mainstream thinking. No longer is it just a matter of whether it's hot or dry! Now a farmer needs to calculate into his planning such things as possible “cap and trade” Emission Trading Schemes (ETS), carbon footprints and carbon miles, product life cycles, etc. Now it is both consumers and politicians who can create new “climate influences” that need to be dealt with.

In this paper we take as a given the emergence of climate change into mainstream thinking and the uneven policy responses. Likewise, the past twenty years of the IPCC's (The United Nations Intergovernmental Panel on Climate Change) research and discussions on global warming is well documented. Nor do we directly address the well known policy challenges facing Australia and the world as a consequence of the failure of the Copenhagen Climate Conference in December 2009 to create a replacement for the Kyoto Protocols for greenhouse gas reductions. Rather we share with you the farmers' perspective on what they have to do, and offer an approach that farmers hope our policy makers might heed as a sensible way of dealing with climate change.

Climate Risk Management

In March 2009 the QFF family of intensive agricultural industries released an important report “A Farmers Guide to Climate Change in Queensland”. It detailed what farmers and scientists saw as important for improving the capacity of Queensland's intensive agricultural industries to manage climate change. This report summarised the state of play at the end of 2008 between

climate scientists and practicing farmers across a range of Queensland industries, including the chicken meat industry.

It was the culmination of the QFF Climate Change Project, a major initiative funded in part by the Australian Government's National Climate Change Adaptation and Agriculture Action Plan which has been superseded by NCCARF (Primary Industries is one of eight networks within the National Climate Change Adaptation Research Facility at Griffith University) and DAFF's Australia's Farming Future programs. While it is an unfortunate reality of the prerogative of governments to reshuffle portfolios and programs, QFF's climate change work has fallen victim to funding shifts and this previously well coordinated work is now diffused among member groups fortunate enough to secure some research funding. Nonetheless, we will continue to promote the need for overarching climate research programs that link farmers and scientists in an ongoing process for adaptive risk management. We see this as the best path for sustainable solutions to the challenges that climate change brings.

The most important outcome of the QFF Climate Change Project is the comprehensive list of activities that are works-in-progress within Farm Management Systems (FMS) used by farmers to achieve sustainable production processes. Farmers want to be able to factor in relevant climate research into their decisions. They want high level research broken down into practical information and tools.

Professor Tim Reeves, the QFF project facilitator noted *“each of the intensive industries involved in the project has used the project data to inform not only its risks and opportunities assessment, but also as a basis for the industry to identify and implement adaptation strategies focused on future productivity, profitability and sustainability. Given the relatively short duration of this project, more work will be required on these adaptation strategies, and also on the capacity building, education and communication necessary to ensure that the strategies identified can be effectively and efficiently adopted in a timely manner, by all industry stakeholders”*.

The QFF project concluded that there needs to be an ongoing effort to ensure that Climate R&D is an “industry-driven, coordinated approach to move Australian primary industries a step ahead in their understanding of and response to climate change,” including coverage of these broad areas of investigation and response;

- a) Adaptation to climate change.
- b) Greenhouse gas mitigation.
- c) Emissions accounting and trading.
- d) Details of policy change impacts on primary industries and rural communities.
- e) Professional information and tools to cope with the big climate change issues.
- f) Capacity building to respond to the impacts and opportunities.

Climate Research

At the initiation of the project, participants recognised that Queenslanders already live in a highly variable climate and so agreed it would be instructive to examine climate change scenarios in relation to already existing climate variability measures. The aim here was to provide farmers with key measures of temperature and rainfall and identify trends that might already exist. This could also provide a perspective for the climate scientists to show how farmers are already dealing with climate challenges.

While the global climate issues are important, it is the local impacts that matter to decision makers. As a group, the intensive agriculture industries developed a wish list of climate parameters that need to be disaggregated to a regional Queensland level and updated periodically as the climate science capability is further refined. This list included the following parameters;

- a) Rainfall – annual and seasonal in percentage change and mm amounts.
- b) Rainfall incidences and intensities, e.g. number of consecutive dry days (<2 mm), number of rain days (>10mm), annual number of electrical storms, cyclonic lows.
- c) Temperature – annual and seasonal average change percentage and degrees.
- d) Temperature – monthly minimums and maximums % change and degrees.
- e) Frosts – average number frost free days, average timing first & last frost (<2 deg).
- f) Evaporation – annual and seasonal percentage change and mm amounts.
- g) Heat stress days – average number days + 30 and + 35 degrees.
- h) Stream flow, runoff yields, and modeled impact to water allocations.

The industry participants acknowledged that there may be an accuracy trade-off with some of these climate scenarios but felt an effort should be made to bring the data into a mode where it could be used by on-ground practitioners. This came about as a direct result of the project scientists disaggregating IPCC data and selecting a subsection of the twenty three global models (GCM's) that matched Australia's and more specifically Queensland's weather systems best. This was a very revealing aspect of the project.

For this project the University of Southern Queensland generated detailed regional climate change modelling for selected regional centres. Results from the modelling process have been presented by comparing the per cent change of the projected climate in 2030 to the average climate across the period from 1961 to 1990. This approach has produced the most accurate and regionally specific rainfall, temperature and solar radiation projections for Queensland to date. The summary seasonal temperature and rainfall projections for 2030 are included at the end of this paper.

Using the five best climate models (as tested against Queensland conditions, particularly modelling the impact of ENSO), a key finding was that monthly weather patterns are shifting sufficiently to define a new summer wet season as January to March rather than the traditional December to February. Results from climate modelling of annual rainfall change in Queensland by 2030 show a general decrease in mean rainfall relative to the 1961 to 1990 baseline throughout the majority of the state of around -10 to -50 millimetres, although this decrease is less (or even a slight increase) in far northern regions and central inland regions. Summer rainfall increases from 0 to 50 millimetres across the majority of Queensland, but the rest of the year is drier. The greatest reductions (minus 20 to minus 50 per cent) predicted to occur in coastal regions in winter months. Rainfall is also projected to occur in less frequent but more intensive rainfall events. Increases in maximum and minimum temperatures and solar radiation will most likely result in increased evaporation rates further decreasing water availability.

In general the climate projections in the QFF report extend the findings of the officially published projections such as Queensland Government (2008) *Climate Change in Queensland: What the science is telling us*. Participants in the project needed climate change data to be disaggregated and presented in a way that helps farm level decision making. Considerable progress was made in this direction during the course of this project as evidenced by the

material published in the QFF Guide, a few examples of which we can discuss later in the session.

Industry participants also suggested that a major “education effort” is required to improve peoples understanding of the major climate drivers for their region and the associated dynamics of climate change (i.e. how is the climate change already manifesting itself in weather patterns).

One cannot over state the importance of climate scientists staying in regular discussion with farmers about climate issues. At a recent seminar organised by NCCARF we heard from the Macquarie University Professor John McAneney of findings in ongoing emergency management and natural hazards risk research. He outlined research aimed at seeking knowledge of the probabilities of climate catastrophes in a changing climate world. Somewhat surprisingly this research has found no trend in either the number or severity of weather extremes.

Professor McAneney stressed that “beyond temperature and sea levels, climate change models have little useful to say, especially about regional implications”. He noted that so far, rainfall extremes are poorly captured by the climate models, and storms and other extreme weather events are unresolved. This is more a statement about the current limitations of the models than knowledge of how climate may change with rising temperatures and sea levels, but the latter are either theories or scenarios and should not be interpreted as anything other than that. Watch this space, as they say.

Farmers tell us they need new decision-support tools where the farming community engages in discussions with advisers and scientists to guide their actions. Such tools need to be developed as much to assist the scientific community in assessing the relevant decision-systems and processes needed for these industry sectors, as for understanding within the industries themselves. Likewise industry FMSs also need to be constantly updated to take into account ongoing research. This will require close and ongoing relationships between industry bodies and rural R & D corporations, as well as continuing investment into updating FMS programs.

Some commodity and regional groups have received funding to progress these Climate Change initiatives, and the Queensland Office of Climate Change is progressing a new Climate Risk Management Matrix tool to help build capacity for managing impacts of climate change, but work is rather fragmented and underfunded in light of the scope and scale of the challenges ahead.

Energy Efficiency

Energy efficiency was the second part of the QFF Climate Change project. On-farm energy efficiency is becoming increasingly important in the context of rising energy costs and concern over greenhouse gas emissions. Energy intensive machinery is used to move water, distribute nutrients, modify the farming environment, harvest, store and transport farm outputs. As a significant input cost, rising energy prices are a major challenge for intensive agriculture industries in Queensland. For these reasons, energy audits of different commodities were undertaken in order to develop a greater understanding of energy consumption and create a conceptual framework for future work into energy efficiency.

Energy audits are a crucial part of the energy and environmental management process. An energy audit refers to the systematic examination of an entity, such as a farm, to determine how efficiently energy is being used. Energy audits can also be used to identify energy and cost saving opportunities and highlight potential improvements in productivity and quality. Energy audits covered a range of farming practices in South East Queensland including sugar cane, horticulture, nursery and some broad acre crops. This information was used to further inform industry groups of energy usage in their industry's farming systems and associated opportunities to increase energy use efficiency.

Not surprisingly results showed that the energy intensity of different industries varies greatly. Despite large variations in and between different industries some useful findings emerged. Energy for irrigation/pumping was found to be significant for all industries. It was also found that harvesters used a significant proportion of energy on a farm. However, when minimum tillage and controlled traffic techniques are used, results showed that energy use could be reduced by approximately 20%.

The energy intensity of different commodities were calculated and standardised for easy comparisons. Similarly, the total amount of greenhouse gas emitted as a result of the energy consumed was calculated using emission factors from the Australian Greenhouse Office (2006). Although helpful in comparing energy use these calculations do not address the variation caused by different farming methods and different machinery. To include such detail, future research is needed to supplement the results from this study with other "technical" indicators of energy efficiency such as pump and tractor efficiency.

Farm Management Systems in Queensland

A Farm Management System (FMS) approach to property management recognises the importance of equipping growers to make informed decisions and manage on-farm risks. The FMS approach champions a structured risk based approach to assist in decision making and has long term benefits for producers' capacity to respond to change and benchmark improvements. Undertaking an FMS analysis of farm activities allows producers to identify and target specific areas of weakness and pinpoint specific actions to better manage priority risks. In recent years, the FMS approach has gained increasing acceptance across the intensive agricultural industries and Regional NRM bodies as a useful planning tool to help guide investment and incentive delivery.

Adapting to climate change is fundamentally an issue of risk management. For this reason, an FMS approach is well suited to achieving climate change adaptation and assessing climate risk within the context of other on farm risks. Significant potential exists to manage the risk posed by climate change using existing management tools such as the FMS approach.

The concept of FMS is translated differently in different intensive agricultural industries. For this reason, the incorporation of climate change into industries' FMS will vary in response to differing FMS methodologies and the different risks and risk management approach. For example, the FMS tool in the Dairy Industry is known as *Dairying Better N Better for Tomorrow*, a program now delivering structured improvements in many aspects of land, crop and animal management. For the cotton industry, the FMS tool is the Cotton BMP program, originally developed as a tool for chemical management, but expanded to include land, water and soil issues. Thus the pre-existing FMS approach provides the ideal framework for the delivery of the climate change extension and adaptation support material.

Industry Action Plans

Each participating industry in the QFF climate change project developed a preliminary industry action plan to deal with the risks and opportunities associated with climate change in Queensland. This was undertaken in response to existing literature, results from expert panel and industry workshops and the findings of new modelling projections for Queensland undertaken by the USQ. Since this time, additional research such as that completed by CSIRO (2008) has become available that reinforces the position outlined in each industry action plan.

The following example shows how a particular industry identifies the risks, opportunities and responses to climate change within the context of a specific intensive agricultural activity. This action plan makes a direct connection between the capacity of industry FMS to assist producers manage and respond to climate change.

Queensland Chicken Meat Industry – Industry Overview

Most commercial meat chicken farms are intensive, highly mechanised operations that occupy relatively small areas compared with other forms of farming. The Queensland Chicken Meat Industry is predominately centred in the South East corner of the state and has experienced strong growth over past decades. Today chicken makes up around 34 per cent of Australians' meat diets. In 2006, the Queensland industry contributed over 20 per cent to the Australian chicken meat output or approximately \$600 million. The South East Queensland chicken industry operates in close proximity to major urban and tourist centres and is therefore an industry used to close scrutiny of its production processes. To ensure both high quality production and environmental outcomes the chicken meat industry is one of the early adapters when it comes to delivering and implementing FMS to improve farm operations. For this reason the Queensland Chicken Meat Industry is an active player in the Australian Chicken Meat Federation (ACMF) project identifying risks, opportunities and responses to climate change for chicken meat production in Queensland.

Risks associated with climate change

The warmer, drier conditions associated with climate change will increase heat stress management issues for chicken meat producers in Queensland. Animal heat stress is linked to air temperature, relative humidity, wind and solar radiation. When conditions are outside the "critical temperature range" for a species the animal's response quickly affects production efficiency.

The overarching impact of climate change on feed ingredients is an ever present issue that is likely to become much more significant as bio-fuels and direct foods continue to compete for the limited productive land. Also, as an intensive energy user chicken meat producers are likely to face significant increased energy costs, with or without a formal emissions trading scheme.

Finally, intensive livestock farmers need to be cautious of partial solutions to the challenges posed by the complex issue of climate change, especially with regard to water and energy use. Mal-adaptive and reactionist strategies from government and or industry would be detrimental for both farm production and consumers.

Opportunities associated with climate change

The Queensland Chicken Meat Industry is well positioned to be promoted to consumers as a sustainable, low emissions source of affordable protein. This is because chicken meat

production has high a conversion rate of feed stock to animal weight gain and “low food miles” compared to other forms of meat production due to the proximity of production regions to urban areas. Furthermore opportunities exist for the increased reuse of chicken manure in fertilisers as the price of synthetic fertilisers increases, with or without mandated emissions reduction schemes.

The Chicken Meat Industry in Queensland in conjunction with the ACMF recognises the existing efficiency of chicken meat production but also sees the need to more fully understand the “carbon footprint” of chicken meat production to ensure that consumers’ understanding of the benefit of chicken meat is based on hard science. In this way, ACMF has undertaken an initial Carbon Footprint Project to document and benchmark emissions and energy use in chicken meat production. This information is necessary to understand how food production and processing sectors contribute to national emissions and document how shifting public opinion might ultimately impact consumer spending patterns.

At a farm scale, a FMS framework provides the systematic approach to evaluate the impacts of climate change on business decisions. An FMS approach allows farm level adaptations to be tested against existing policy, technology and research. In this way, existing FMS structures are being adapted to include the findings of research such as chicken meat production carbon footprinting.

Conclusions and Proposal for the next steps

In the past, intensive agricultural industries in Queensland have proven their capacity to cope with change and remain viable in a highly variable climate. However, the climatic changes projected to occur in future years may be of a greater scale and occur at a more rapid rate and therefore it is prudent to examine a new level of risk management and adaption options.

QFF is continuing to suggest that all supply chain participants need to be fully engaged in these projects, as do broader community interests when a regional industry group is assessing options. Our proposals include;

Project A. Increasing Climate Change Management Capacity in the intensive agriculture sector of Queensland (ICCMC).

A project aimed to accelerate the uptake of Climate Risk Management strategies through integration of climate information into industry Farm Management Systems (FMS), by engaging a scientific and producer based consultative group to workshop information and set parameters that industries can use. Public funds are required to facilitate the next steps in developing and extending practical information that will influence decision making and actions at regional and/or commodity levels in Queensland. A primary activity of this overarching project is to manage and facilitate three Consultative Group workshops annually, and ensure practical outcomes for QFF’s industry members and their extensive network of producer members in the many regions of Queensland. The ICCMC project is designed to serve three key roles:

1. QFF Climate Change Coordination

A project leader is required to strengthen the linkages between industry members and individual farmers by providing overarching guidance for the further development of the various commodity based climate change action plans that continue to evolve as more information (both climate science and farm response) comes to hand. This would also

ensure that the strategies identified can be implemented more widely, and with confidence that they are being continuously improved with ongoing expert advice.

The QFF has proposed to coordinate and streamline industry involvement in climate change science discussions by holding workshops and forums that focus on commodity/regional issues. The QFF Climate Change Consultative Group would function as the primary forum for:

- a) Communication and information sharing between scientists, farmers, advisors and farm industry leaders.
- b) Strengthen the links between industry programs, on-farm risk management tools such as industry-lead FMS programs and the banking/insurance sector.
- c) Increased industry awareness of climate issues (climate forecasting, carbon, nitrogen, water and energy management, and government policies and programs), including further exploration of the risks and opportunities as identified in the Consultative Group workshops and regional/commodity programs.

2. *QFF Climate Change Consultative Group*

A Consultative Group of scientists and top farmers is required to keep abreast of relevant policy and research activities and facilitate proactive interchange between them. This Consultative Group would be made up of a cross-disciplinary group of specialists and industry participants with extensive knowledge of Queensland's intensive agriculture industries and the key climate systems that impact on their viability. This group would meet three times annually (face to face) to review the latest climate science and update action plans and set priorities for future activities. It would also serve to guide any specific commodity or regional initiatives that QFF members may be pursuing.

The scientists involved in the panel would be initially sourced from Queensland University of Technology (QUT), University of Southern Queensland (USQ) and the Queensland Climate Change Centre of Excellence (QCCCE). As issues emerge, membership may come from outside these organisations based on the skills and knowledge required. The farmers involved would be accredited FMS practitioners, and acknowledged as industry champions within their spheres. Given this mix of experience it is recognised that there needs to be a common base of knowledge wherever possible to ensure good communication and feedback between scientists and farmers.

The Consultative Group would;

- a) Contribute to analyses and ongoing updates of climate change impacts and responses within the intensive agriculture industry in Queensland;
- b) Assist industry to refine questions and responses on climate change and variability;
- c) Where appropriate be available to assist in any industry/producer workshopping sessions;
- d) Peer review proposed fact sheets and periodic reports; and
- e) Recommend a process to continue climate science and practical farm production expertise input into Farm Management Systems modules that are relevant to climate risk management.

3. *Communication Materials and Information Flow Strategy*

Utilising the outputs from the Consultative Group deliberations and other research outputs where appropriate, the project would assist QFF to produce and distribute relevant Fact Sheets covering the following broad themes:

- a) Promotion of the highlights of the three annual Consultative Group workshops as updates of what climate change means to intensive agriculture farmers in Queensland, and what they are doing about it.
- b) Suitable FMS case studies from within the QFF network of Climate Change Action Plans that are yielding good results.
- c) The latest projections for climate risks as they relate to general regional planning and commodity based decision making tools.
- d) Liaise with industry and regional bodies to develop constructive linkages for all climate change activities in Queensland relevant to primary industries.

Project B. Climate Preparedness and Risk Management Skills for Queensland's intensive agriculture sector (CPRMS).

In the Productivity Commission recommendations for National Drought Policy (Exceptional Circumstances) reform there is a strong emphasis on the need to promote the principles of self-reliance, climate preparedness, co-responsibility and mutual obligation. QFF is seeking support to begin implementing a proactive program to build climate management skills relevant to this objective. As a first step, the CPRMS project would engage with commodity and community groups that are experiencing some form of climate stress and work through a process to identify appropriate solutions. The CPRMS project would serve two key roles:

1. *QFF Climate Risk Management*

The initial stage of the CPRMS project would focus on identified climate stresses that need priority attention. The mobile climate officer would use this pilot/case study approach to develop a number of specific action plans that are based on proactive climate responses within the 25 Skills Matrix identified as needed for dealing with Queensland's variable and changing climate. The QFF mobile climate officer would become the "go to" expert for climate preparedness solutions.

2. *QFF Climate Skills Development*

The second phase of the CPRMS project would be to assist groups that are willing and ready to develop and implement Climate Risk Management programs that can build skills and capacity to manage their identified climate risks. The focus would be the 25 Skills Matrix that can build preparedness and self-reliance skills across important activities including water, natural resources, energy, carbon & nitrogen management. This would be a deliberate capacity building activity that uses planning frameworks to ensure priorities are actioned and feedback is evaluated to maintain confidence that climate risks are being well managed.

This project would develop and foster farm and community enthusiasm for a proactive approach to climate risk management. It would use QFF's 25 Preparedness Skills Matrix as a planning tool for prioritising what skills are needed in particular localities to build the necessary capacity for general risk management and specific climate preparedness, self-reliance and mutual obligation activities. Where appropriate it would provide the linkages to other climate programs that can assist expand the use of Farm Management Systems (FMS) for developing better risk management strategies and action plans.

Principle References

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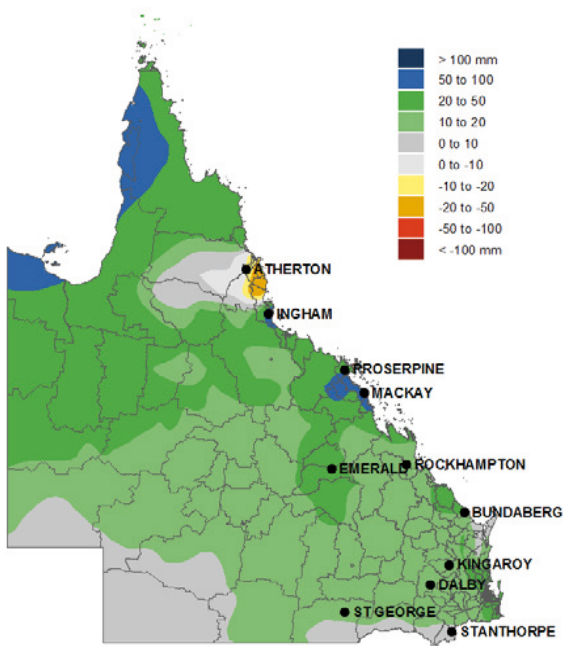
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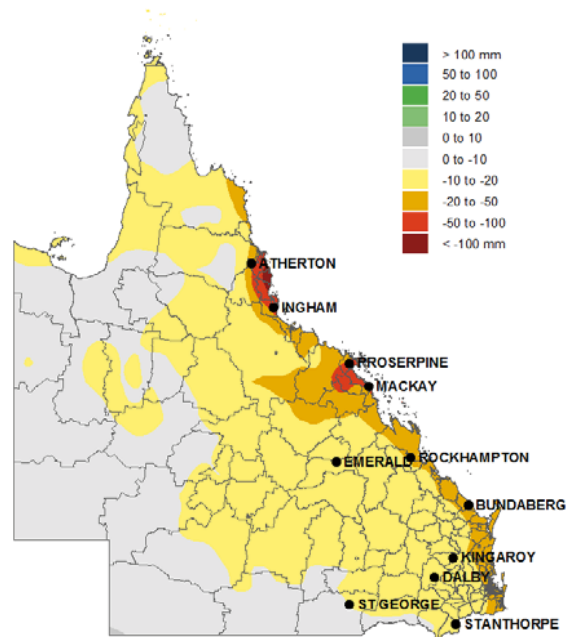
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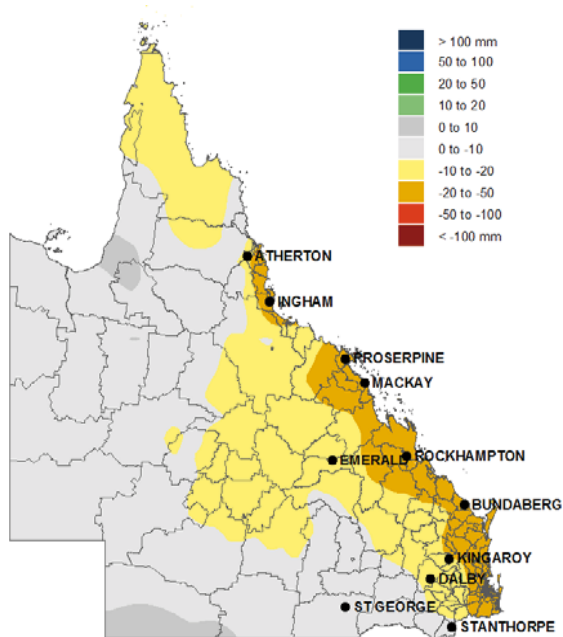
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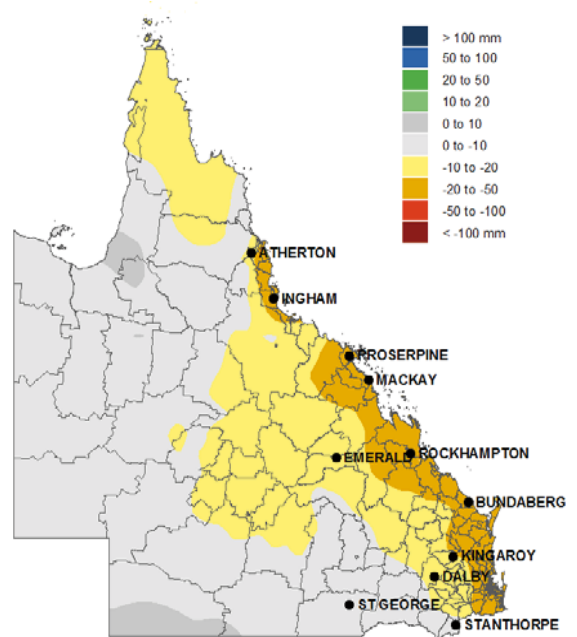
Rainfall change by 2030 for the period January, February, March



Rainfall change by 2030 for the period April, May, June.

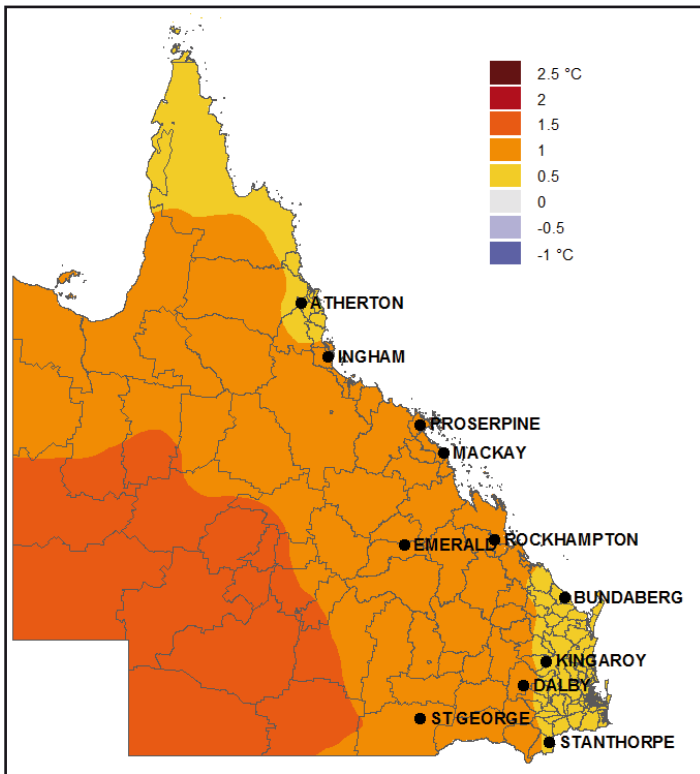


Rainfall change by 2030 for the period July, August, September.

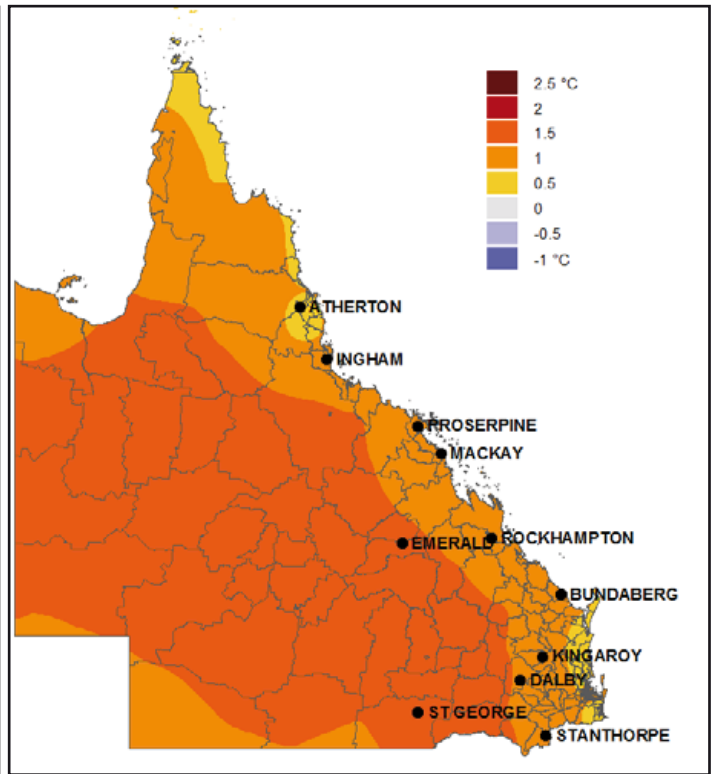


Rainfall change by 2030 for the period October, November, December.

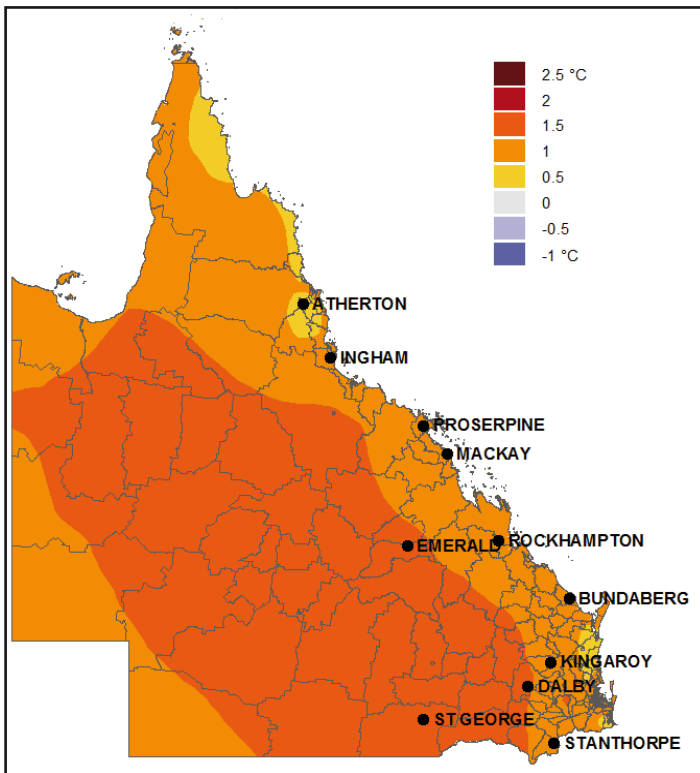
Figure 3: Seasonal rainfall change in Queensland relative to the 1961-1990 baseline



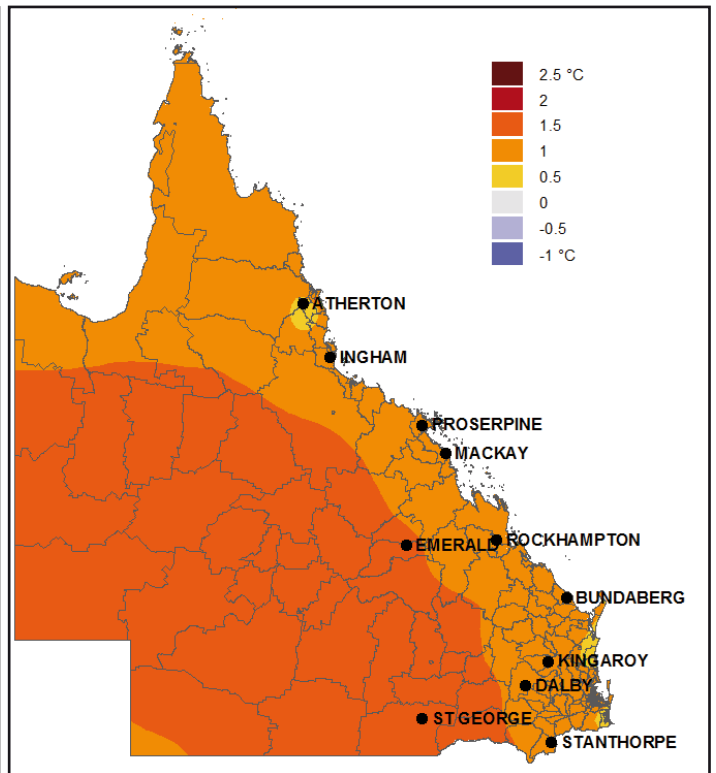
Projected rainfall change by 2030 for the total period January, February, March



Projected rainfall change by 2030 for the total period April, May, June.



Projected rainfall change by 2030 for the total period: July, August, September.



Projected rainfall change by 2030 for the total period October, November, December.

Figure 5: Projected seasonal temperature change in Queensland relative to the 1961-1990 baseline