Lessons Learned from Cyclones in Northern Australia
Lessons Learned from Cyclones in Northern Australia

By Rhonda Sorensen

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Foreword

This report brings together available information about the effect of cyclones in Australia’s northern cyclone prone region. For the first time, agricultural industries supplied post-disaster data has been collated to give a picture of the common agricultural focused issues, challenges and practical rural solutions. It also brings together some useful industry, disaster and community links.

Agricultural industries face a number of challenges, and in the event of a direct hit by a category 4 or 5 severe tropical cyclone, this causes devastation beyond the normal coping mechanisms of most enterprises. Many of these issues can be understood and made more resilient by research, development and extension, which can be hampered by a lack of basic information.

RIRDC has funded this report to pull together all of the agricultural industry learning from previous cyclone experiences in North Queensland. The project team has located hundreds of post-cyclone response reports and industry recovery plans. The analysis of this data has identified shared impacts and responses across industry sectors to produce an independent report that highlights the gaps in research, legislation and policy that need to be addressed, in order to build a more resilient northern agricultural industry.

This report is an addition to RIRDC’s diverse range of over 2000 research publications and it forms part of our New and Developing Plant Industries R&D Program, which aims to produce an overview report and deliver a message of hope, in a timely manner, that will increase the confidence of existing and potential farmers in tropical northern Australia by providing information, and directing the reader to additional studies and sources of information, on ways to help farm businesses survive a cyclone, both physically and economically.

Most of RIRDC’s publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Craig Burns
Managing Director
Rural Industries Research and Development Corporation
About the Author

Rhonda Sorensen is the Principal Researcher and Managing Director of SassyBio Pty Ltd., which specialises in rural innovation, rural economic and community development, tropical expertise and entrepreneurship, and has particular interests in sustainable agriculture, and conservation tourism.

She has an extensive background in science, agriculture, manufacturing, community, government and politics. Having been a farmer herself, worked in agricultural industry, community and government, most recently as an elected Councillor, her networks are extensive, robust and strong, and her most favoured role is to link groups of stakeholders to work collaboratively together for a shared future vision.

As the recently appointed Chair of the Wet Tropics Management Authority Community Consultative Committee, she represents the views of the broader community, including World Heritage landholders and neighbours, farmers, councillors, four wheel drivers, wildlife conservationists, tourist industry representatives, teachers, scientists and deals with community issues like weeds, feral animals, road and tourism access, tourism and technology, and sustainable agriculture.

Acknowledgments

First and foremost, we would like to thank the Steering Committee, Tony Hamilton (Chair RIRDC New Plants Advisory Committee), Sue Fairley (RIRDC New Plants Advisory Committee), Alan Davey (RIRDC) for their commitment to ensuring the integrity of this study as a “Voice of the Farmer” that will deliver a message of hope and resilience for farmers across northern Australia. Alan Davey retired during the period of the study and was replaced by Dr John de Majnik (Senior Research Manager RIRDC).

Thanks are also extended to fellow RIRDC Cyclone Project researchers from the Queensland Department of Agriculture Fisheries and Forestry, Yan Diczbilis, James Drinnan, Peter Holden, Matthew Weinert for their kind assistance and collegial support.

SassyBio research assistant Melissa Robertson was a constant source of enthusiasm, technology trouble shooting and pure hard work as this extensive body of work took shape. QDAFF communications officer JoAnn Resing provided vital assistance with sourcing documents and recommendations on web-based research tools with filters and reporting capabilities.

Particular mention goes to the Industry leaders. We appreciate the time the key informants gave so generously. Your knowledge and expertise to confirm the veracity of the post-disaster data by completing the rather onerous 73 questions taking over an hour to complete and adding many informed responses to complete this questionnaire was invaluable. We thank you for contributing to this final report.

We also thank the many other contacts in the industry for their generous exchange of information.
## Abbreviations

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<th>Description</th>
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<tr>
<td>ABGC</td>
<td>Australian Banana Growers Council</td>
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<tr>
<td>ACIAR</td>
<td>Australian Centre for International Agricultural Research</td>
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<td>AMGA</td>
<td>Australian Melon Growers Association</td>
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<td>APFA</td>
<td>Australian Prawn Farmers Association</td>
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<tr>
<td>BOM</td>
<td>Bureau of Meteorology</td>
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<td>BSES</td>
<td>Bureau of Sugar Experiment Stations Ltd.</td>
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<tr>
<td>CA</td>
<td>Cotton Australia Ltd.</td>
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<tr>
<td>CAWCR</td>
<td>Centre for Australian Weather and Climate Research</td>
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<tr>
<td>CCBGA</td>
<td>Cassowary Coast Banana Growers Association</td>
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<tr>
<td>CCC</td>
<td>Centre for Climate Change</td>
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<tr>
<td>CCRC</td>
<td>Cassowary Coast Regional Council</td>
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<td>CG</td>
<td>Cane Growers</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific Industrial Research Organisation</td>
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<tr>
<td>DEEDI</td>
<td>Department of Employment, Economic Development and Innovation (Prior to 2012)</td>
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<tr>
<td>DNRM</td>
<td>Department of Natural Resources and Mines</td>
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<tr>
<td>EMQ</td>
<td>Emergency Management Queensland</td>
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<tr>
<td>FAQ</td>
<td>Flower Association of Queensland</td>
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<tr>
<td>FMD</td>
<td>Farm Management Deposit</td>
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<td>FNQ</td>
<td>Far North Queensland</td>
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<tr>
<td>FNQROC</td>
<td>Far North Queensland Regional Organisation of Council</td>
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<tr>
<td>GA</td>
<td>Geoscience Australia</td>
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<tr>
<td>IRO</td>
<td>Industry Recovery Officer</td>
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<tr>
<td>JCU</td>
<td>James Cook University</td>
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<tr>
<td>NDRRA</td>
<td>Natural Disaster Relief and Recovery Arrangements</td>
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<td>NFF</td>
<td>National Farmers Federation</td>
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<td>NGIQ</td>
<td>Nursery &amp; Garden Industry Queensland</td>
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<td>NGRMG</td>
<td>Northern Gulf Resource Management Group</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>NRM</td>
<td>Natural Resources Management</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<td>PA</td>
<td>Papaya Australia</td>
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<tr>
<td>QCWA</td>
<td>Queensland Country Women's Association</td>
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<td>QDAFF</td>
<td>Queensland Department of Agriculture Fisheries &amp; Forestry (formally DPI, DEEDI)</td>
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<td>QDO</td>
<td>Queensland Dairyfarmer's Organisation</td>
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<td>QFF</td>
<td>Queensland Farmers Federation</td>
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<td>QRAA</td>
<td>Queensland Rural Adjustment Authority</td>
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<td>RAWN</td>
<td>Regional Agriculture Women's Network</td>
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<td>RDA</td>
<td>Regional Development Australia (FNQ&amp;TS)</td>
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<td>RIRDC</td>
<td>Rural Industry Research &amp; Development Corporation</td>
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<td>RRRC</td>
<td>Reef and Rainforest Research Centre Limited</td>
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<tr>
<td>SDIP</td>
<td>Department of State Development, Infrastructure &amp; Planning</td>
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<tr>
<td>SES</td>
<td>State Emergency Services</td>
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<tr>
<td>STC</td>
<td>Severe Tropical Cyclone</td>
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<td>TA</td>
<td>Timber Australia</td>
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<td>TC</td>
<td>Tropical Cyclone</td>
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<td>TEFA</td>
<td>Tropical Exotic Fruit Association</td>
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<tr>
<td>TERRAIN</td>
<td>Wet Tropics Natural Resource Management Group</td>
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<tr>
<td>TFC</td>
<td>Tablelands Futures Corporation</td>
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<tr>
<td>TQ</td>
<td>Timber Queensland</td>
</tr>
<tr>
<td>UQ</td>
<td>University of Queensland</td>
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<tr>
<td>WTMA</td>
<td>Wet Tropics Management Authority</td>
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Executive Summary

What the report is about

Tropical cyclones are a fact of life for many communities along the Northern Australian coast during summer, and the impacts, particularly as a result of flooding, can often be felt by communities well inland and well south of where they cross the coast. Australia is known as a land of contrasts and natural disasters including droughts, floods, bushfires, storm surges and cyclones are features of the landscape and climate that will continue to have personal, social, economic and environmental impacts that take many years to recover from.

This report is the voice of the farmer – the data has come directly from farmers and their industry bodies. When discussing the effect of cyclones on Northern Australia particularly Severe Tropical Cyclones (TC) Larry and Yasi, it is essential for the farmer to be heard, as agriculture is the predominant industry and the agricultural participants have been the most heavily impacted.

This collation of information for farmers and others on the lessons learned from cyclones in Northern Australia will be a valuable resource for farmers, agricultural industries, and has the ability to influence all three levels of government. The role of this report is to identify major common issues and learnings shared across the agricultural sector. Agricultural industries, government, research, educational and community organisations will be able to use the information, analysis and recommendations from this report to better manage future wet season disasters.

Results/key findings

This study reveals that under or non-insurance of farms is the major issue facing farmers after cyclones Larry and Yasi. Escalating premiums, redlining of areas north of Rockhampton, and non-insurance of whole industry sectors underlines a deteriorating insurance agenda where farmers are opting to insure only parts of their enterprises and in some cases have stopped insuring their business at all.

The foremost problem for beef and dairy producers during cyclones and other wind and rain events is the damage caused to rural fences, roads and other infrastructure by falling trees and limbs. Landholders believe the Vegetation Management Act (VMA) diminishes their ability to manage the clearing of vegetation, which has the potential to interfere with the operation of important farm infrastructure, thus exposing them to unnecessary risk of damage, liability and long-term productivity losses. Rural landholders anxiously await the practical outcomes of the new Vegetation Management Framework Amendment Bill 2013 which potentially will support agriculture by reducing red tape and regulatory burden while maintaining protection and management of native vegetation resources.

A vision for a Tropical Australia Food & Agriculture CRC emerged through the work done on the study. The purpose of the CRC would be to build on the strength and resilience of Australian tropical agricultural regions, communities and industries, based on genuine regional, industry and research partnerships to facilitate best practice in tropical food production including research to sustainably increase diversity, yield, quality and profitability and improve social, economic and environmental circumstances in tropical rural communities.

“Even the tough and hardy people of the Far North could be excused for a sense of despair”

General Cosgrove Cyclone Larry Recovery Coordinator; April 2006

(Cosgrove, 2007)
Introduction

Tropical cyclones are a fact of life for many communities along the Northern Australian coast during summer, and the impacts, particularly as a result of flooding, can often be felt by communities well inland and well south of where they cross the coast. Australia is known as a land of contrasts and natural disasters including droughts, floods, bushfires, storm surges and cyclones are features of the landscape and climate that will continue to have personal, social, economic and environmental impacts that take many years to recover from.

This report is the voice of the farmer – the data has come directly from farmers and their industry bodies. When discussing the effect of cyclones on Northern Australia, it is essential for the farmer to be heard, as agriculture is the predominant industry, and yet there is a strong reported “recovery fatigue” amongst the agricultural participants recently impacted by cyclones, particularly Severe Tropical Cyclones (TC) Larry and Yasi. People simply want to stop talking about the cyclones, and get on with their lives in the changed environment.

“We just get on with it. We have had seven cyclones hit this farm in 35 years, and we’ve still got two sons who want to take it over. I wouldn’t trade it for quids.” Kerry Alcock, Innisfail Cane Farmer (front cover photo)

Rather than ask the same questions that have been asked in previous studies, this report actually set about to analyse all of the Ag-industry reports prepared in the quick-response stage post-disaster that were useful in the immediate aftermath of Severe Tropical Cyclones Larry and Yasi to receive the humanitarian, infrastructure and disaster relief required. These reports are a record of history on the impacts to agriculture caused by these cyclones, the response and recovery actions, and provide us with an opportunity to learn from that history. However, these reports are primarily fieldwork that is event, location and industry sector specific. This study marks the first time the Australian agricultural sector post-cyclone concerns have been gathered, collated and analysed to discern common concerns and recurring issues across agricultural industry sectors distilled into common themes and issues, and released in a single report.

Key informants from the agricultural sector in Northern Australia using a standardised electronic questionnaire and some core interviews, were asked to verify the recurring themes and issues and the common requests from the post-disaster data set. The key informants added a deeper level of understanding of the impact and recovery, and were encouraged to feedback their own knowledge of the current situation and potential solutions that could be further investigated to enhance preparedness, response, recovery and build resilience. The questionnaire compiled from the post-disaster reports helped the respondents to revisit the traumatic events and/or the subsequent relief and recovery efforts to extract their experiential learnings to help provide insights and contribute to our understanding of the effects of cyclones on agricultural and the individual in agriculture.

It was apparent during the course of this study that emergency and disaster management in Australia is undergoing reform and the disaster operational and strategic models have been rapidly adapting. Much of the responsibility for recovery operations lies with the agencies of Government and each of them conduct their own processes to learn from the disasters and to implement changes, refinements and innovations that improve each time Queenslanders face another natural disaster.

This report is an analysis of collective impacts, learnings and practical rural solutions recorded in these two data sets. It is hoped that this report will inform and direct policy development and innovation for the agricultural sector, not only in disaster management, but also in ensuring innovation in farming practices to make the agri-business and rural communities more resilient in the face of cyclones.
Objectives

This collation of information of the lessons learned from cyclones in Northern Australia will be a valuable resource for farmers, agricultural industries, and governments. The role of this report is to identify major common issues and learnings shared across the agricultural sector. It articulates broad strategies to deal with the issues, suggests pathways for implementation and encourages greater coherence and coordination of the agriculture sector’s efforts into the future.

It includes a literature review and bibliography of reports and papers on the topic with a focus on TC Larry and TC Yasi, but including the whole of Northern Australia and relevant reports from around the globe. A trusted, reliable and sustainable digital repository needs to be found for these documents, which are a record of history and should be preserved to provide us with an opportunity to learn from that history in the future.

The research team also analysed research undertaken in relation to the landscape in which agriculture in Northern Australia operates, including the economic, social, cultural and environmental. This extensive body of knowledge helped to inform the construction of the extensive Key Informant Questionnaire.

Gathering this knowledge of the agricultural and agronomic lessons from scientists and industry participants post these natural disasters, will help current and future farmers in their preparation for, or recovery from cyclones.

Targeted interviews were conducted with industry, government, academia and other specialists to identify current strategies, initiatives and projects that are addressing the lessons learned from these two cyclones, and identify what has been achieved to date and what is being done at this time to reduce cyclone risk in the future.

This report also;

- presents the gaps, and identifies what still needs to be done to increase the hope and resilience for participants in agriculture.
- discusses research and development needs to mitigate risk and what initiatives should be supported to extend the practical rural solutions already conceived and underway.
- identifies current strategies, policies and guidelines, even government policies or rules that may currently hamper protection from or recovery after cyclones.
- identifies issues not directly under Government control including insurance and a brief consideration of economic angles to cyclone damage.
Methodology

This report provides an analysis of the effect of Cyclones on the Agriculture Sector in Northern Australia, focusing mainly on Severe Tropical Cyclones Larry (2006) and Yasi (2011). A Steering Committee was formed to oversee and guide this research study. The Steering Committee met four times over the course of the project from July 2012 to March 2013.

Key Informants

The list of key informants started with those identified from the extensive networks of the Steering Committee and the existing networks of the researcher. These people were known to have had some experience with Cyclone Yasi or Cyclone Larry either as farmers and graziers with personal cyclone experiences, Ag-industry leaders or industry, or community sector and government workers involved in relief and recovery operations. These people were contacted and a snowballing technique whereby the interviewee refers the researcher on to other informants was effective in rounding out the key informant list as the links took off in diverse directions. In total 175 key agricultural industry, government and rural community members were identified and documented.

Literature Collection and Selection

The key informants provided or identified reports they were aware of, and the research team independently searched, located, described and assessed documents, reports, webpages, articles and books as data assets relevant to the effect of cyclones, and agricultural resilience in Northern Australia.

The literature review included cyclones relevant to Northern Australia, it also included some of the “Queensland 2011 Summer of Disaster” ag-industry flood reports as they were considered to be inter-related, as some of the flooding was caused by Cyclone Anthony and Cyclone Tash. Included also was a great deal of contextual articles, and disaster management reports and information on cyclone preparedness and cyclone risk minimisation. Web searches were used to gain a national and global context, using the following key words and phrases: agriculture, risk mitigation, climate and weather forecasting, year and cyclone, media, type of document, political, advice, industry specific, location, social, wellbeing, information, technology, economical, bio-security, supply chain, infrastructure, case studies, climate, commodities, industry studies and academic analysis, digital, disaster preparedness, management, recovery and resilience, emergency management, environmental, farming practices, food security, geoscience, context, indigenous, innovations, natural resources, productivity, Research, Development and Extension, resources, sustainability and vegetation management.

In total, over 600 documents were located and documented as a reference list. This audit of the literature established a clear understanding of the key shared impacts, issues and problems and shed light on the important common definitions, the jargon and terminology that was not necessarily shared across Ag-industry sectors. After establishing the data assets that existed, they were classified according to their anticipated value to achieve the objectives of this overview study.

Exclusions from this study were urban specific reports, as we found the issues for towns and cities were well covered in many documents and information was abundant. Since the objective of this study was to focus on the participants in agriculture, only publications that particularly referenced agriculture were included in the broad sweep.

Post-disaster Data Set

A decision on which reports to include in the in-depth review and analysis to discern common concerns and recurring themes across agricultural industry sectors was taken by the Steering Committee. It was determined that the most valuable research data necessary to define the core issues related to Ag-industry disaster management and on-farm resilience would be derived from the Ag-industry reports and recovery plans that were constructed in the immediate aftermath or during the
response and recovery phase within twelve months of either Cyclone Larry (2006), Cyclone Yasi (2011) and the 2011 Queensland floods.

Documents listed in the bibliography, were selected for detailed examination and the significant points made were data entered into an online database to analyse the post-disaster data set for commonalities and trends. Of these there were two compilations of situation reports from QDAFF which were unable to be released in their entirety due to the sensitive nature of some of the detail, and the need to retain a trusted relationship with the agencies that supplied the information confidentially during the post-disaster trauma.

These identified reports were analysed in detail using Zoho the digital web-based research application with filters and reporting capabilities. Each document was searched for information pertaining to the effects of cyclones and floods and the data entered into an online application. The data was categorised by a number of indexes that determine which weather event the issue pertains to, what position of management would be involved, what industry and part of the agricultural business the event had impact on. The issue was further defined by whether it had impact on Social, Economic or Environment/Biosecurity.

From over 900 entries containing 9000 pieces of data, it was possible to search for shared impacts and responses from across industry sectors and identify significant commonalities. The post-disaster data was synthesised and distilled into 12 common themes and numerous issues, collective impacts, learnings and practical rural solutions were constructed into a feedback survey.

**Key Informants Feedback**

Utilising a key informant type questionnaire and face-to-face interviews, the team was able to test the validity and reliability of the analysis of the post-disaster data and ascertain whether progress had been made in the intervening years between Cyclone Larry to Cyclone Yasi and up to the end of 2012. The 73 questions related to the twelve common themes identified from the post-disaster data set. The questionnaire also allowed respondents to identify gaps and brought to the fore burning issues that were not captured by the reports from the immediate aftermath of the cyclones.

This post-disaster data and feedback from the key informants makes up the body of this report, and the rest of the literature was used to provide context to, and to clarify, explain and develop the discussions and recommendations contained in this report.

Key informants were selected to participate in the questionnaire because of their position in the agriculture industries, the leadership they have demonstrated and/or the knowledge they have regarding the impacts of cyclones on Agriculture in Northern Australia. Three types of contact were made with 175 key informants either by; phone call, email or face-to-face interviews.

These surveys and interviews identified initiatives and projects that still need to be addressed; current strategies/policies/guidelines that need review and seek out the practical rural solutions that have appeared since Larry. The questionnaire intention was to test the veracity of the identified shared impacts and responses across industry sectors that had arisen from the document audit. The questions also assisted the team to prioritise issues and identify any knowledge gaps.

Collated information included current research, communication with industry, lobbying and policy development are currently being undertaken. This report identifies the gaps, and covers all aspects that will instil more confidence in the longer-term future of agriculture within the cyclone zone.

Permission was sought from each Key Informant to utilise the information collected and quote them where necessary.
Data Tools

The research team used many web-based tools to help them with this study. Cloud based programs were utilised for the ability to store documents and access computer programs hosted on a remote service (i.e. Can access information from any computer). This assisted immensely and has meant that if the project of a digital repository is adopted, then this data collection could become useful. This included digital, web-based research tools

**Zoho** is a comprehensive suite of online collaboration applications used to house the data set from the industry Action Reports. Zoho was utilised as the database of contacts for the Key Informants to track all interactions and appointments.

**Survey Monkey** is a web-based survey tool utilised to collect data from the Key Informants Questionnaire, track their response rates, analyse the data and provide reports that have created all of the charts in the documents.

**Zotero** is a web-based, bibliographic tool that is a digital repository for all of the documents read, analysed, scanned or stored. It was also possible to extract the Report’s bibliography and reference list.

**On-line team collaboration tools** were also utilised to support the real time editing of the report, sharing information with Key Informants and colleagues based in other regions, and to have regular meetings with the team and some participants. These included; Skype, Google Docs, Team Viewer and Drop Box.

Approach

The Tablelands based company, SassyBio Pty Ltd, headed by principle researcher Rhonda Sorensen, conducted this project. As a non-government agency, the aim was to collate all of the post-disaster agricultural industry data to produce an independent report that highlights the gaps in research, legislation and policy that need to be addressed in order to build a more resilient northern Australian agricultural industry.

The team at Sassy Bio have a commitment to the farming community and in particular the farmers that have demonstrated resilience, disaster after disaster. By providing information, and directing the reader to additional studies and sources of information, it is hoped to help farm businesses survive a cyclone both physically and economically.

This study was conducted independently with extensive local experience, rural understanding and empathy with the farmers and broader ag-industry as a key instrument to ensure the integrity of the final report as a collective voice of the farmers affected by Cyclones.
Results

The results in this section are a synthesis of the agricultural lessons learned from cyclones taken from the two data sets. This report is an analysis of collective impacts, learnings and practical rural solutions recorded in these two data sets, and thus is the collective voice of the farmers.

- Post Event Data – information reported within 12 months of a disaster or event including Agriculture Cyclone Response Situation Reports and Recovery Plans. The post-disaster data was synthesised and distilled into twelve common themes and numerous issues, collective impacts, learnings and practical rural solutions were constructed into a feedback questionnaire.

- Key Informant Feedback questionnaire related to the eleven (Financial Management and Farm Financial Counsellors combined into Financial Risk Management) common themes identified from the post-disaster data set. The questionnaire also allowed respondents to identify gaps and brought to the fore burning issues that were not captured by the reports from the immediate aftermath of the cyclones.

Table 1: Agricultural Lessons Learnt – key learnings since Cyclone Larry (2006), through to Cyclone Yasi (2011)

Key Informants commented on improvement or deterioration in regards to the eleven agricultural cyclone issues since Cyclone Larry (2006), through to Cyclone Yasi (2011), to now (2013). Insurance
was ranked the major issue that experienced strong deterioration on the left, and disaster preparedness and response showed the strongest improvement on the right.

1. Insurance

Each results section discusses the subject in detail, including the issues arising from the post-disaster data, key respondents feedback, current issues, and potential solutions.

Insurance has emerged from this study as the major problem still facing farmers after cyclones Larry and Yasi with a massive 63% of respondents reporting that the agricultural insurance situation had actually deteriorated since 2006 when tropical cyclone Larry hit. Under or non-insurance of farms is now exacerbated by escalating premiums, redlining\(^1\) of areas above Rockhampton, and non-insurance of whole industry sectors. Insurance premium costs have risen so much that farmers are opting to insure only parts of their enterprises and in some cases have stopped insuring their business at all. Houses and other farm infrastructure are more often still insured, however, equipment, business, crop and stock losses are reportedly not covered.

The Northern Australian agricultural insurance situation has actually deteriorated from 2006 Cyclone Larry to 2011 Cyclone Yasi to now. Producers found they had inadequate insurance for several reasons including policy terms and conditions, under-insurance due to valuations incorporated into the policy and underinsurance due to affordability, availability and relevance to business continuity.

In an effort to reduce their exposure to massive payouts in areas they perceive as high risk, some insurance companies have been redlining the whole tropical zone placing everyone living at postcodes above the Tropic of Capricorn just north of Rockhampton (4730) at serious risk. They are also redlining some agriculture sectors and refusing to offer insurance to many businesses eg; some companies have reportedly redlined the whole nursery industry.

“If you can manage to get someone to even give you a quote to insure your farm business, then the premium costs are so outrageous that farmers are opting to reduce and in some cases stop insuring their business altogether.” (Key Informant comment, 2013)

The number of farm business insurance policies has fallen by a massive 48% according to the Financial Ombudsman Service 2010-2011 Overview of General Insurance Code of Practice, designed to raise standards of practice and service in the general insurance industry. Nearly half of all Australian farm businesses failing to renew their policy, is a disturbing reinforcement of the comments and criticisms received about dealings with insurance companies and escalating premium costs.

Insurance companies withdrawing from the market in perceived high-risk regions and sectors indicates market failure, and government needs to consider intervention in the underwriting of agricultural insurance to maintain a level of risk that enables people to farm in the tropical zones of northern Australia.

Queensland has a history of 56 declared disaster events since 1967 according to the Insurance Council of Australia. (“Historical Disaster Statistics - Insurance Council Australia,” 2012.). New South Wales recorded 79 declared disaster events in the same period, with quite a few shared with other states including southern Queensland. Only two of the 21 Queensland events in the decade to February 2012 were attributed to Cyclones, Cyclone Larry in March 2006, and Cyclone Yasi in February 2011. Only four of these 21 events are reported to have hit the area north of the Tropic of Capricorn that cuts the

\(^1\) Example of Geographical redlining; “we are not going to insure north of Rockhampton”. Example of Sectoral redlining; “we are not insuring the whole nursery industry”.

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state roughly in half. In the context of these insurance council statistics, where less than 20% of the insurable disasters in Queensland are recorded in the northern half of the state, the insurance industry would have difficulty justifying a high-risk designation.

Insurance underwriters’ refusal to insure many agricultural properties was viewed by many of the key respondents as a clear indication of market failure that necessitates government intervention. All insurance offerings have progressively worsened towards being unaffordable and the farmer wearing the risk. There are serious repercussions from the farming sector opting for non-insurance or under-insurance. There is now a real risk that farmers are not taking full insurance cover and when another cyclone hits, farmers will not be able to afford to replant, repair and rebuild.

In the Northern Australian context, there is very little customisation of insurance packages that is particularly tailored for tropical agriculture, and the risks associated with destruction, loss or damage to farm infrastructure, equipment, livestock and crops caused by a tropical cyclone. Following Larry and Yasi, damaged infrastructure was rebuilt to be more resilient to the effects of tropical cyclones. Revised new building regulations introduced in North Queensland in the early 1980’s have meant that all new houses and sheds have been built to withstand cyclonic winds. Pre-1986 houses and sheds fared quite badly in the recent cyclones, and have since been rebuilt to the new code. For structures built to the new code, the damage losses was only about 5% compared to 10-15% overall according to Geosciences Australia Modelling the Impact of Tropical Cyclone Larry Infrastructure Damage report.

“In Farmers across the northern regions are choosing to harden-up infrastructure which greatly reduces the risk of damage in future cyclones. Insurers are not taking this risk reduction into account.” (Key Informant comment, 2013)

Insurance needs a total review in the context of tropical agriculture business continuity. Insurance companies specialising in rural/farm policies cover a wide range of risks. Glossy brochures and websites offer farmers the flexibility to arrange their insurance to meet their particular needs. Every farm enterprise is different, and circumstances change constantly, so the insurance policy needs to be easy to understand, flexible enough to match demands, and affordable enough to make it worthwhile to invest. No insurance can protect against every risk, and with the complexities of the farming enterprise it becomes a personal decision as to what packages, inclusions, exclusions and excesses amounts to appropriate protection for that particular business’s circumstances.

Little, if any of this apparent customisation relates to farming in the tropics, and therefore agricultural enterprises in the tropics simply do not have suitable insurance options available to minimise their production risks.

“There is now a real risk that farmers are not taking full insurance cover and if another event arises farmers will not be able to afford to rebuild. Farmers will have little option but to ‘walk-away’ from their farms.” (Key Informant comment, 2013)

### Issues from the Post-Disaster Data Set

<table>
<thead>
<tr>
<th>Issue</th>
<th>Details</th>
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</table>
| Under-insurance was a major problem | • Insurance suitable for Agri-businesses was generally not available or affordable  
• Eligibility criteria often excluded businesses  
• Availability of Ag-industry customised insurance eg: crop insurance; freight/produce in transit_SUPPLY chain |
<p>| Insurance knowledge was    | • Low understanding of Inclusions/exclusions and excesses               |</p>
<table>
<thead>
<tr>
<th>Issue</th>
<th>Details</th>
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<tbody>
<tr>
<td>lacking in Agri-businesses</td>
<td>Confusing packages making it difficult to compare</td>
</tr>
<tr>
<td>Lack of insurance responsiveness delayed</td>
<td>Slow processing of claims</td>
</tr>
<tr>
<td>infrastructure replacement</td>
<td>Assessors and process overly bureaucratic and inflexible</td>
</tr>
<tr>
<td>Produce Freight Insurance</td>
<td>Alternative routes to market left freighted product un-insured</td>
</tr>
<tr>
<td>Crop Insurance</td>
<td>Generally not available</td>
</tr>
<tr>
<td>Less reliance on Commercial Insurance</td>
<td>Risk Management Plans</td>
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<td>Financial Risk Management – Farm Management Deposits</td>
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<tr>
<td></td>
<td>Business continuity is the core issue</td>
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<td></td>
<td>Alternative schemes – eg: government/industry schemes</td>
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Table 2: Agricultural insurance issues

Key Informants Feedback

The Northern Australian agricultural insurance situation has actually deteriorated from 2006 Cyclone Larry to 2011 Cyclone Yasi to now. Only 11% of key informant respondents thought that there had been any improvement at all in insurance for agriculture since Cyclone Larry in 2006. A massive 63% believed that the agricultural insurance situation had deteriorated – this means nearly 90% of respondents believe the availability, affordability and relevance of rural insurance has shown no improvement or actually deteriorated in the last 7 years. Table 2 shows that this negative result is by far the most pressing issue related to agricultural participants in the post-disaster environment.

Under-insurance was highlighted as a major problem for farmers after cyclones Larry and Yasi, and has continued to be exacerbated by escalating premiums, redlining of areas above Rockhampton, and whole industry sectors have found it difficult to get insurance. Insurance premium costs have risen so much that farmers are opting to insure only parts of their enterprises and in some cases stop insuring their business at all.

“All insurance has progressively worsened towards being unaffordable and the farmer wearing the risk. There are serious repercussions from the farming sector opting for non-insurance or under-insurance.” (Post-disaster data comment, 2013)

- 74% of key informants agreed and more than half of those strongly agreed that farm business insurance needs a total review in the context of agricultural business continuity. After a natural disaster emergency, farmers focus on crisis management with a passion to keep the farm business functioning, and insurance is out of step with this.

- 84% of key informants agreed that Agricultural businesses need to understand what constitutes best practice Ag-industry customised insurance options.

  - There was a feeling that insurance companies generally do not understand agricultural practices and therefore it would be difficult for them to develop a best practice plan.

  - Ag-industry needs access to clear information that is easy to understand in order to make informed purchasing decisions. What insurance is essential, what is desirable, what is discretionary. There needs to be clearly identified minimum specifications presented in plain English. Exclusions need to be clearly identified. Repercussions from non-insurance and under-insurance need to be clearly defined.

  “Online insurance selection tools need to be available for farm and business insurance similar to iSelect.com” (Key Informant comment, 2013)
• The rural and insurance industry may benefit from online social forums and webinars that help them with this issue.

• Key respondents strongly agreed (82%) that risk mitigation strategies could be useful when negotiating with insurance companies for reduced premiums. For example,
  
  − Trellised exotic fruit trees are braced to withstand the cyclonic wind damage – trellising is expensive and not considered by the insurance company as a strategy that mitigates the risk (similar to deadlocks on urban windows).
  
  “Given the high cost of crop insurance, the diversification of on-farm activities was usually a good risk strategy. From anecdotal evidence, the impact of the cyclone on growers’ cash-flow was strongly related to the diversification of crops and on-farm activities.” (Mary Milne, 2006)

• There is a direct relationship between affordable insurance cover, premiums and the level of the insured risk(s). Mitigating known risks on farms with industry validation should provide just-cause for the insurance industry to review the systemic correlated nature of risks associated with crop and other agricultural insurance.

• 54% of respondents think an investigation is called for to uncover whether insurance companies were profiteering from natural disasters.

• There was a mixed reception to the question of whether Ag industry should lobby for government underwriting of insurance premiums. 54% of respondents agreed but 18% disagreed with government underwriting. This was due to the debate of whether insurance is an area of policy and legislation only, or whether government should actually enter into the market. Insurance underwriters have refused to insure many agricultural properties and this was viewed as a market failure that required government intervention.
  
  “Insurance companies have put a red line across the map at Rockhampton. The whole tropical zone of Queensland postcodes above that line is struggling to get insurance, and the prices are ridiculous” (Key Informant comment, 2013)

Current issues surrounding rural insurance in Northern Queensland

• Insurance availability for primary producers for damage from cyclones;
  
  − Very few companies will insure farming enterprises.
  
  − Inability to insure against stock and crop loss.
  
  − Some infrastructure insurance not available for some farm infrastructure. Crop insurance particularly aimed at tropical agriculture eg: sugar cane, prawn aquaculture and bananas is not available or cost prohibitive.
  
  − There are no packages to cover the risks associated with destruction, loss or damage to livestock and crops caused by a tropical cyclone.

• Insurance affordability for primary producers;
  
  − There have been massive increases in insurance premiums
− Prohibitively expensive to insure beyond the house and shed.

There has been an enormous 48% fall in the number of farm business insurance policies written in 2011 compared to 2010 (Financial Ombudsman Service, 2011)

**Eligibility** Issues: Insurance companies are simply not insuring or charging excessively high fees in some areas or industry sectors that have been redlined;
− Geographical redlining eg. “We are not going to insure north of Rockhampton.”
− Sectoral redlining eg: “We are not offering insurance to the whole nursery industry.”
− Some traditional agricultural insurance companies no longer insure livestock.

**Premiums do not recognise or reward risk mitigation** and preparedness practices;
− Trellised exotic fruit trees can be braced to withstand cyclonic wind damage. Trellising is expensive and is not considered by the insurance company as a strategy that mitigates the risk (similar to deadlocks on urban windows).
− More RD&E is needed to identify innovative farming practices to reduce the risk and improve the confidence and resilience of farming in the tropics. (Some work is currently being done by QDAFF to reduce the risks associated with tropical tree crop production in north Queensland).

**Freight**/produce in transit/supply chain is expensive and then limited by problematic exclusions;
− Freight insurance for agricultural product on the way to market is nullified by having to take alternative routes around flood zones.

**Are insurance companies profiteering** from natural disasters?

**Agricultural enterprises are not able to make well-informed purchasing decisions on insurance,** because of complexity, lack of knowledge, and mistrust of information supplied by the insurers.

**Agricultural properties with little or no insurance leave the property owners at risk** eg:
− Banks and other lenders require adequate asset insurance cover at all times as part of the mortgage contract.
− Without full insurance cover, farmers will not be able to afford to rebuild.

**Off farm investments** in local accommodation units or property have been hit with massive body corporate fees mostly because of increased insurance.

“Government intervention in the underwriting of insurance should be considered where there is complete or uncompetitive market failure by insurance companies withdrawing from the market in given risk areas.” (Key Informant comment, 2013)

**Potential solutions that could be investigated**

**Tripartite Solutions:** Engage the insurance industry, government and Ag-industry organisations to focus on appropriate agricultural insurance in the cyclone prone areas. Promote better, more informed relations, between insurers and their agricultural customers to improve consumer confidence in the general insurance industry.

**Affordability** could be enhanced by;
− Government intervention in the underwriting of insurance for declared natural disasters as an insurance price offsetting mechanism.

− Government /Ag-industry insurance option with a new dedicated primary industry levy to contribute into a tailored Rural Disaster Insurance Fund.

− Government regulation/monitoring of insurance company profits in the rural sector.

• **Crop Insurance for tropical agriculture** options are being thoroughly investigated by Peter Holden from Queensland Department of Agriculture, Forestry and Fisheries as an RIRDC project.

  − Government underwriting of high insurance excesses could be funded from the NDRRA derived grants in the event of a natural disaster such as a cyclone causing widespread crop losses.

  − There is a direct relationship between affordable insurance cover, premiums and the level of the insured risk(s). Mitigating known risks on farms with industry validation should provide just-cause for the insurance industry to review the systemic correlated nature of risks associated with crop and other agricultural insurance.

• **Help** agricultural enterprises make well-informed decisions.

  − Promote education, awareness and understanding of individual farming enterprise insurance needs and options.

  − Teach farmers how to conduct a rigorous annual risk & insurance review.

  − Opportunity for on-line insurance advisors where businesses get an opportunity to compare a range of insurance policies including premiums, excesses, inclusions, exclusions, and customised extras like crop insurance.

• Insurance companies should give strong **recognition of industry Risk Management practices** and programs in premium setting.

  − Cyclone rated infrastructure.

  − Insurance could be made available at a reduced rate if the farmer undertook to implement Farm Risk Management/Mitigation strategies, infrastructure improvements and practices to minimise the liability risks.

• Insurance companies and government should support RD&E projects that underpin disaster management for agricultural enterprises to mitigate their own risks e.g. resilient infrastructures, risk mitigation practices, financial resilience, farm diversification, weather forecasting, prevention and preparedness to minimise the damage and losses incurred.

• More should be done to identify and test options for agricultural adaptation and resilience to protect the viability of farms in a cyclone area.

  − Diversification options identified included geographical, varieties, farm management practices and alternative markets.

  − Farm Financial Resilience needs to be built into the system so farmers can make tough decisions like providing more resilient new infrastructure, defoliating to reduce canopy wind resistance in the face of an imminent event, or sell some stock before their peak because of the seasonal climate forecasting.

• Identify and support the vital next stages of work by the JCU Cyclone Testing Unit specifically in relation to agriculture and rural infrastructure.
2. Vegetation Management

The foremost problem for beef and dairy producers during cyclones and other wind and rain events is the damage caused to rural fences, roads and other infrastructure by falling trees and limbs. 78% of key informants said there had either been no improvement or deterioration in the ability to manage vegetation to reduce risk during a cyclone, placing this in second ranked order of major issues facing agricultural businesses in the cyclone belt.

From the post disaster data set, vegetation management came up as one of the major solutions for farmers and graziers to be able to mitigate this risk in the future. Frustrations at the regulatory burden that the Vegetation Management Act and other legislation, regulations, policies and plans placed on their ability to make good strong practical decisions particularly regarding clearing fence lines, made this issue second only to insurance, in level of importance to agricultural recovery and improvement in future resilience for agricultural participants.

The post disaster data set revealed that Landholders believe the Vegetation Management Act (VMA) diminishes their ability to manage the clearing of vegetation, which has the potential to interfere with the operation of important farm infrastructure, thus exposing them to unnecessary risk of damage, liability and long-term productivity losses. The effect of damage to road infrastructure is covered in the Transport & Roads section, so this section will deal mainly with the damage to fences, and broader vegetation management issues.

All three categories of farm and property fences internal, boundary and fencing that adjoins government-managed land all sustained the same huge debris removal costs and repair problems. Hundreds of kilometres of fencing was damaged by fallen trees and limbs in both cyclone Larry and cyclone Yasi eg: Each of the 120 dairy farmers on the Atherton Tablelands experienced an average 7 kilometres of fencing destroyed by tree debris during cyclone Larry.

Cyclone Yasi was still a category three cyclone over 200km inland and so it cut a swath through some rich grazing land of the southern Atherton Tablelands and the Etheridge Shire where normal cattle management was crippled for months by inaccessible roads and fallen fences.

Operation Farm Clear (OFC) has become one of the success stories of the cyclone recovery efforts. More than 1000 farms were cleared by the end of the cyclone Larry clean-up. OFC started in the dairy recovery team, and eventually was run through the department of Primary Industries as a partnership between all levels of government and industry that assisted primary producers to clear vegetation and other debris from properties and re-establish fences. After Yasi, the model changed to Operation Clean-Up and extended to include farms and tourism businesses. Funding was supplied through Cairns-based Choice Management Australia, and Terrain NRM to employ 230 participants for 26 weeks of paid work clearing vegetation and debris.

Issues from the Post-Disaster Data Set

Risks and damage incurred by vegetation damage to fences and roads during the cyclones.

- Fences and roads damaged by fallen vegetation incurred huge removal and repair costs
- Graziers and farmers were unable to muster to carry out normal animal husbandry operations
- Numerous stick injuries from debris in pastures, not able to monitor and treat stock properly
- Serious disruption to pasture management practices which led to long term loss of income
• Mustering and access problems meant stock was able to be sent to market at peak production

• Inability to conduct normal work and day to day operations, increased financial pressures, inability to travel to and attend community meeting and events

• Animal welfare and animal health problems increased and wandering stock caused a safety risk on roads, sick, injured, malnourished and dying stock

• Weed, pest and disease inundation and spread from huge volumes of debris and stock wandering into forested areas

• Landholders and contractors were unable to salvage trees.

• Forestry plots and tree crops deteriorated further whilst waiting for clean-up and maintenance

• Wandering stock posed a risk to human safety and animal welfare and the amount of debris on farms meant that many primary producers would take years to clean-up and get back to full production without assistance.

Immediate and on-going frustrations were apparent with the Vegetation Management Act (VMA) not allowing landholders to make good practical decisions towards clearing patterns for risk minimisation.

• Extensive damage to roads could have been minimised of roads with a clearing buffer commensurate with the height of the adjoining trees

• Debris could not be removed in one operation. If approval for increased clearing width is delayed, landholders have to make a second clearing operation at increased expense

• Internal fence damage and boundaries between agricultural properties caused major distress as landholders and their Ag-industry lobby groups raised many concerns about their inability to clear sufficient buffers around fences under the Vegetation Management Act

• Properties adjoining crown land, national parks and military land had increased difficulty in retrieving stock due to no internal fencing on these lands. National Park/State Forest neighbours come under tougher clearance buffers (only 1metre clearance was reportedly allowed in 2006) for boundary fence regulations

• Current policy definitions related to clearing widths around fence lines under the Vegetation Management Act needs to incorporate a practical width that accommodates the height of the surrounding vegetation

• Producers clearly felt that current regulations are a disincentive to planting trees and that better conservation outcomes would result from incentives for vegetation protection and improvement than through regulation

• Landholders with successful ballot applications under the Vegetation Management Act needed an extension on their clearing deadline, to accommodate for the delays and additional impediments and costs caused by the cyclone

• The solutions put forward across the board, call for a review of the VMA to include a flexible system for practical solutions for clearance zone dimensions to enable a reasonable vegetation free space around farm infrastructure
There were calls for an industry strategy to encourage government to review legislation on fence line clearing for buffer zones, due to vulnerability to damage, and hindrance to clean-up operations by the large vegetation burden.

The Ergon Energy Standard for Vegetation Management was often suggested as the basis for a review of clearance zones. The Ergon model is seen as an example of best practice for trimming and removal of trees that threaten infrastructure and access, and farmers want that same level of practical risk mitigation available to them.

“There are practical solutions and most farmers are happy to include vegetation offsets where they can put infrastructure in the right place and trees in their right place too.” (Key Informant comment, 2013)

Vegetation clean-up and salvage.

Beef producers and other landholders requested permission to burn fallen trees stacked in piles as clean-up operations were hampered by the large vegetation burden.

The timber industry tried to salvage a lot of the fallen timber, but this proved to be largely unsuccessful. Particularly distressing to the public was the obvious destruction of rare and valuable rainforest timber trees and there was some attempts to salvage on a widespread or even individual basis with limited success.

Timber plantation crops proved difficult to salvage due to the sheer vegetation burden, and farm forestry plots often did not have a suitable road for the heavy machinery access to the fallen timber in the prolonged wet conditions.

Timber and tree crop disease threat to remaining trees post cyclone emerged as an on-going concern with very little prior knowledge to understand how to mitigate.

Post-cyclone community attitude to ecosystem repair particularly trees.

Cyclones trash many areas of revegetation and contribute to bank erosion where improvement works have not yet occurred.

New environmental impacts like weed and disease spread arise from post cyclone clean-up activities and contribute to the extent of post-cyclone environmental impacts.

The limited knowledge of cyclone resilient tree species to plant and management practices for revegetation plots, urban street trees, windbreaks and shade or paddock trees is another aspect to the issue of vegetation management that emerged from the data set.

A regional communication strategy/campaign focused on community education about post-cyclone plantings eg: plants to protect infrastructure, planting more appropriate wind resistant natives in urban areas, outlining the benefits of effective vegetation buffers in managing coastal and crop damage.

Natural Resource Management (NRM) groups were concerned that there was intentional removal of additional vegetation to improve views, or offer future protection of infrastructure. The impact of this may be to increase weediness in native vegetation or to make weak corridors even more fragile.

Additional State and Commonwealth investment was required to restore riparian zones that were undergoing stabilisation works at the time of the cyclones. Local River Improvement Trusts, Councillors, Landcare and Catchment groups have extensive experience that proves the need to
stabilise rivers and major tributaries in intensive land use (agriculture) areas through a combination of appropriate hard rock stabilization and vegetation plantings to develop effective riparian corridors resistant to erosion.

Landcare for Larry was a very successful relief appeal created out of the wreckage by Terrain NRM, within days of Cyclone Larry. The appeal raised over half a million dollars in cyclone relief and has since sparked significant new investments in natural resource management in the Wet Tropics as well as building local resilience with real relationships formed and proven between people affected on the ground by the devastation of the natural environment.

Key Informants Feedback

Many of the post disaster reports revealed that landholders believe the Vegetation Management Act (VMA) diminishes their ability to manage the clearing of vegetation, thus exposing them to unnecessary risk of damage, liability and long-term productivity losses. The table below shows that the key informants agree that the VMA restrictions on vegetation clearing exposes landholders to unnecessary risk during cyclones and other wind and rain events where falling trees and limbs cause damage to rural fences, roads and other infrastructure.

Table 3: Key informant feedback regarding VMA

76% of respondents verified that there ought to be a call to review the VMA to include a flexible system for practical solutions for clearance zone dimensions to enable a reasonable vegetation free space around farm infrastructure, particularly fences.

Using the Ergon Energy Standards for Vegetation Management as the basis for this review of vegetation clearance zones was the most often suggested solution in the whole post-cyclone data set. However when this was put to the Key Informant test to confirm the veracity of this comment, it was clear from the overwhelming “don’t know” or “neutral” responses and comments that although it became a useful catchcry after the alarming devastation, however not enough is known about these standards to warrant agreement. If the current Vegetation Management Framework Amendment Bill 2013 does not satisfy this need for practical clearance zones based on surrounding vegetation, rather than a regulated standard distance, then further investigation may be warranted. (Queensland Government, 2013)
Table 4: Ergon vegetation management system as benchmark


- reduce red tape and regulatory burden on landholders, business and government
- support the four pillar economy - construction, resources, agriculture and tourism
- maintain protection and management of Queensland's native vegetation resources

Windbreaks, shade/paddock trees, riparian and farm forestry plantings are another aspect of vegetation management on farm

- QDAFF are currently funded to complete a RIRDC project to determine windbreak species, location, suitability for purpose, maintenance requirements, and dual-purpose plantings eg: timber value.

  “There should be an investigation of farm trees that survived the cyclones. We just had two big wind tests and the evidence is there now, the stumps are still there, the ones that survived are there. DAFF should research and document it right now, work out why they survived and get this information out to farmers.” (Key Informant comment, 2013)

- Shade trees/paddock trees research is needed including species, planting patterns, multi-purpose plantings eg: wildlife safety, shade for livestock, and planting pattern/clumping for strength and stability of the trees.

- Conservation Volunteers Australia has started community plantings of paddock trees in Tully
Current issues surrounding impact of cyclones on vegetation in Northern Queensland

- The foremost problem beef and dairy producers during cyclones and other wind and rain events is the damage caused to rural fences, roads and other infrastructure by falling trees and limbs.

- Farmers are frustrated at the regulatory burden imposed by the Vegetation Management Act and other legislation, regulations, policies and plans on their ability to make good strong practical decisions particularly regarding clearing fence lines on their properties.

  “If community concerns for the ecosystem creates increased risk on private land, then surely this is an ecosystem service for which the farmer should receive an ecosystem services payment” (Key Informant comment, 2013)

- Landholders believe the Vegetation Management Act (VMA) diminishes their ability to manage the clearing of vegetation, which has the potential to interfere with the operation of important farm infrastructure, thus exposing them to unacceptable risk of damage, liability and long-term productivity losses.

- During cyclones and other wind and rain events the damage to rural fences, roads and other infrastructure is caused mainly by falling trees and limbs across fences, roads and Many landholders believe the Vegetation Management Act (VMA) diminishes their ability to manage the clearing of vegetation, thus exposing them to unnecessary risk of damage, liability and long-term productivity losses.

- Biodiversity in FNQ 2031 Regional Plan are inaccurate and unworkable. New local government planning schemes are required to incorporate this inaccurate vegetation mapping into biodiversity overlay codes. Landholders freehold right to manage their properties, and farm the land are being infringed, and they are calling for revision of the planning schemes and reassessment of state government requirements.

- There is limited knowledge about tree species selection, management and maintenance for cyclone resilience.

Potential solutions that could be investigated

- Review the Vegetation Management Act to include a flexible system for practical solutions for vegetation management which;
  - Reduces the regulatory burden
  - Supports clearance zones of vegetation around farm infrastructure, particularly fences and roads that mitigate the risk from cyclonic winds and other natural disasters

Note: Rural landholders anxiously await the practical outcomes of the new Vegetation Management Framework Amendment Bill 2013 which potentially will support agriculture by reducing red tape and regulatory burden while maintaining protection and management of native vegetation resources.

- Investigate and develop a framework of payments for ecosystem services (PES) to encourage climate change mitigation, watercourse improvement and biodiversity conservation as a transparent system of offering incentives to farmers and landholders in exchange for managing their land to provide a voluntary ecological benefit.

- Conduct an investigation of farm trees that survived the cyclones to document resilience features.

- Support research, development and practical implementation of resilient vegetation projects including windbreaks, shade/paddock trees, riparian and farm forestry plantings

Generally, the higher priority of mitigating life and property losses takes precedence over biosecurity issues during and immediately after a natural disaster. However early awareness of weed, disease and pest issues is desirable so considerations can be adapted to the emergency situation to respond appropriately to mitigate biosecurity risk if possible.

This study has verified that post disaster biosecurity awareness, procedures, protocols and practices vastly improved from Cyclone Larry to Cyclone Yasi to the present. However, none of the key informants thought there had been a corresponding strong improvement in the weeds, pests and diseases situation.

Key informants comments on this disturbing contradiction revealed that they were very concerned that all the documentation and practices did not translate into actual improvement in on-ground mitigation of weeds, pests or disease. In fact, 15.5% of key informants believed there had been significant deterioration in the agricultural industry biosecurity situation since cyclone Larry, and the issue was third on the list of agricultural cyclone problems after insurance and vegetation management. It is clear that cyclones are a magnifying event that escalates the increasing spread of pests, weeds and disease, as well as creating new threats.

Prolonged wet and flooding following a cyclone causes many extended impacts and interruptions to farm operations including

- water logging of crops
- loss of standing crops
- loss of soil nutrients
- loss of pasture
- soil compaction or erosion
- increased susceptibility to diseases and insects
- permanent damage to perennial crops and trees
- compromising of livestock nutrition, body condition and welfare
- disruption to normal animal husbandry and fertility/production cycles

Pests, weeds and disease eruptions and incursion into areas previously uncontaminated is a major issue and threat in every agricultural enterprise, and particularly relevant in the internationally significant, high biodiversity Wet Tropics region of northern Queensland. It is in the national interest to address this, and the Ag-industry groups, local government, catchment management, Landcare, NRM, community groups and individuals continually work to prevent the spread of invasive pests, weeds and disease. There has been wide adoption of a 'whole of landscape’ management approach and an increase in capacity in pest management across the region.

“Ag-industry struggles with weeds all the time - Natural Disasters accelerate these problems. Everyone is reactive, but then the on-going long-term problems are not dealt with.” (Key Informant comment, 2013)
Animal health and welfare consequences associated with tropical cyclones include storm-related mortalities and injury, infections from injuries, damage to housing, ponds and other animal specific infrastructure. Disruption to normal animal husbandry services is almost a certainty, pasture damage and other nutritional requirements and quality can become compromised, especially supplementary feed storage and feed-out systems in the warm humid conditions.

Some producers, notably pork, poultry and banana growers operate with 'closed boundaries' systems all the time and enforce wash-down procedures on all vehicles and contractors entering the farm.

“It is also about meeting our OH&S obligation regarding hazard ID and keeping stock safe and production clean at all times.” (Key Informant comment, 2013)

Green mulch was a critical issue with many respondents, as it can become an actual vector of biosecurity outbreaks. Myrtle Rust, electric ants and many weeds were all mentioned in the post-disaster data, as being spread by green mulch produced from the cyclone debris. Debris in pastures is also a risk for grazing animals, as fallen material is suddenly available on ground, and some stock have consumed leaf material that has proven to be toxic. There was a recording of 29 cattle in a paddock south of Tully that suddenly got sick and died days after cyclone Larry went through.

**Issues and Suggested Solutions from the Post-Disaster Data Set**

**Plant diseases**

Plant diseases in the post disaster reports were much more of an issue than pests and weeds. This is probably because the disease problems were more immediately apparent than the more constantly escalating weed and pest problems. The impact of disease was felt across nearly every agricultural industry in the cyclones’ path.

Cyclonic wind damage to plants including the roots and fruit together with the prolonged wet and reduced sun exposure following the cyclones exacerbated the bacterial and fungal diseases that resulted in crop and tree losses.

Tropical fruit tree losses are very high, with the bulk of the species affected being rambutan, mangosteen and durian. The severe damage experienced by tropical exotic fruit trees after Cyclone Yasi, particularly tree roll out, was possibly related to tree root damage, which developed unobserved in the period since Cyclone Larry. Papaya growers reported unusual fungal growth that impacted on new plantings and requested to expedite an application for emergency permits for fungicide use to support new plantings.

“The main tropical fruit species produced in the wet tropics are rambutan, mangosteen, soursop, rollinia and pomelo with another sixteen species grown by individual specialist producers in varying amounts” (Post-disaster data comment, 2013)

Following cyclonic wind damage to avocados and macadamias, and the prolonged wet weather, Phytophthora root rot became a serious concern. An outbreak of bacterial soft rot in bruised avocado fruit caused product loss and downgraded quality. Industry groups called for emergency permits to be allowed eg: Emergency permits were issued to allow chlorine use in packing shed to protect against soft rots.

“Macadamia trees have a long lead time from planting to production – about 10 years to full production. It would be at least another 5 years before the trees blown over by STC Yasi reached full production (since they were replanted after STC Larry). Many more macadamia trees have had to be stood up and staked post-cyclone.” (Post-disaster data comment, 2013)
Adverse weather conditions affected the sugar cane fields as they remained saturated and coupled with low solar radiation from continuously cloudy skies resulted in poor growing conditions, low crop vigour, reduced sugar conversion and promoted leaf fungal diseases in cane.

The Nursery and Cut Flower post cyclone Larry industry report called for more research into plant diseases and the promotion of effective treatment. Myrtle Rust became a critical issue in nurseries after Yasi, with another call for education and detection activities. They also highlighted a need for the State Government to place additional human resources in the region to assist the industry with the recovery process and to undertake a range of longer-term industry development activities

**Animal Diseases and Animal Welfare Issues.**

There were immediate livestock deaths and injuries from the cyclones. Injuries sometimes resulted in ongoing problems but the major long-term impact was the disruption to regular animal husbandry and routine services in the damaged environment and the inability to properly house or muster livestock. A huge amount of fencing was destroyed during both cyclones caused by falling trees, and stock isolated by fallen trees, or wandering stock quickly escalated to a safety and animal welfare problem for producers.

“Not sure where you include things like mastitis in dairy cows due to no electricity to power milking machines. In Larry it was critical to bring in mobile milking machines and heavy duty generators to many remote dairies.” (Key Informant comment, 2013)

Intensive livestock farms had to deal with critical animal welfare situations, as housed animals are highly dependent on humans for every need. The welfare of intensive livestock animals and the risk of disease outbreak need better hazard awareness by producers who may then have to escalate the problem to be dealt with by the disaster management arrangements.

“The SES is not allowed to supply tarps for livestock structures. Humans can be housed elsewhere, but the animals usually have no other options. Sunburn and heat exhaustion cause pigs to abort.” (Key Informant comment, 2013)

Aquaculture ponds experienced immediate problems oxygenating ponds to prevent animal deaths. As time went on, these businesses experienced other water quality issues that led to disease related stock losses.

Complex farm practices and scheduling fell by the wayside, as damaged fences, sheds, bails, and yards and the unrelenting rain made it difficult and in some cases impossible to effectively treat animals for lameness, stick injuries and general illnesses. Routine animal husbandry operations such as herd recording, artificial insemination and pregnancy-testing schedules were seriously disrupted. Standing water on crops and pastures, reduced sunlight for growth, machinery unable to access fields, fertiliser schedules interrupted, stranded animals all contributed to animal nutrition compromises.

There were also long term animal nutritional problems such as the inability to provide supplementary feeds and nutrients and minerals. Eg. Lack of phosphorus licks leading to peg leg in cattle. Intensive livestock farms grain stock rapidly grew moulds and fungi in the hot humid conditions that produced toxic aflatoxins that particularly effect monogastric animals and can reduce reproductive rates in piggeries by up to 50%. Aflatoxins are toxic and among the most carcinogenic substances known, and all animal species including humans are affected, so stored grain becoming mouldy suddenly becomes a serious occupational health and safety (OH&S) risk. Replacement grain stock became scarce in the local area and expensive to truck in long distances from areas unaffected by the disaster. Even the local road conditions contributed as imposed load limits prevented more than small truckloads of feed being delivered.
Poultry producers experienced much mortality, which meant replacement starter pullets were in short supply locally. Older replacement stock sourced from southern areas constituted a greater bio-security risk, and created issues with meeting their property quality certification requirements. Poultry producers called for better awareness and emergency disaster management arrangements to help them prevent disease outbreaks.

Pests

The major pest problems extracted from the post disaster data were feral pig raids on horticulture, weevil borers and climbing rats in sugar cane, flying fox predation in fruit crops and cattle that had to be moved through the “tick line” during periods of road restrictions.

There were calls for realistic red tape reduction around emergency procedures to mitigate these impacts in real time. An example was the Damage Mitigation Permits required before baiting of the climbing rats within cane paddocks using baiting stations. The usual process is designed for individual properties to apply to the Cane Productivity Services, who conduct an on-farm inspection to identify fresh damage, refers the damaged property onto the QPWS, who conducts another on-farm inspection before granting the permit. Permits should be able to be issued automatically in designated damage zones.

Cyclone damage causes increased time and costs of controlling weeds, and rats and other vermin, pigs, cockatoos, wild dogs and dingoes.

Weeds

Agricultural industry battles weeds all the time. Natural Disasters accelerate these problems, and often lead to weed explosions due to the lack of vegetation cover, rain and dispersal of seed. Everyone is reactive, but then the on-going long-term problems are not dealt with properly across agencies.

Weed growth, the spread of weeds and incursion into areas that were previously unaffected by weeds are major concerns for landholders following cyclones. This was particularly increased by wind and flood water dispersal of seed, the prolonged wet conditions following the cyclones and the removal of canopy trees in forest opening the under storey up to weed growth.

Weed proliferation was often exacerbated by the rapid response and clean-up, not having time, resources and knowledge to minimise the spread. Green mulch was reported many times as being a critical source of pest weed species spread. Emergency services, electricity and road workers and volunteers need to be aware of the real danger of weed spread and wash-down facilities need to be provided in damaged areas for rapid removal of weed seeds before moving machinery and workers between properties.

Securing whole of landscape resilience in the cyclone-affected areas of far north Queensland, necessitates an acknowledgement of the interdependence of the remaining rainforest and primary production areas. According to Stephen Turton, tropical rainforest ecosystems in the Wet Tropics of Australia show remarkable ability to recover from cyclonic disturbance. However, cyclonic winds uproot, damage and defoliate trees providing favourable forest conditions for post-disturbance weed explosions and incursion into previously unaffected areas, and similar incursion into pasture and cropping land from the fringes of the forest.

“It is therefore important that we begin to build more cyclone resilient landscapes to reduce the vulnerability of our remaining rainforest habitats and primary production systems. Securing
landscape resilience requires greater NRM investment in key areas, including landscape connectivity, river repair, protecting coastal assets and cyclone resilient farms.” (Turton, 2011)

**Key Informant Feedback**

Key informants endorsed the concept that damage zones susceptible to pest, weed and disease infestations should be assessed, mapped and declared a designated Pest, Weed or Disease Watch Zone. 74% of respondents believed this flexible response could facilitate and coordinate special preventative strategies, permits and conditions being quickly and efficiently authorised. The majority reinforced that this would be an effective outcome and agreed that in some cases automatic authorization could be allowed within the designated Watch Zone. There was a significant 9% who suggested caution would be necessary when reducing red tape to ensure that the long-term costs did not outweigh the short-term gains.

“Ongoing surveillance after an event of pest threats based on cyclone track and likely pests should be constructed and mapped. Research strategies for combating emerging disease and pests post-disaster should be developed before and/or immediately after the event” (Key Informant comment, 2013)

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**Table 5: Emergency strategies for disaster preparation**

All four of the post-disaster biosecurity procedures identified in the post disaster data set, were verified as important by the key respondents as each one received a rating of over 1 (one). The ranking reveals that the most important was training post-disaster workers, followed by having emergency wash down stations and emergency biosecurity protocols. Emergency restricted use permits were seen as still very important but comments revealed these could take some time to be identified and were therefore less immediately useful. Early training and awareness was seen as necessary every day for some workers, and should be incorporated as standard management procedures on properties. For those only involved in post-disaster work, training must be completed before any event.

“Biosecurity protocols and weed seed declarations already part of the government contracts for Cyclone Yasi clean-up” (Key Informant comment, 2013)

There was resounding endorsement (68%) of the calls for realistic red tape reduction and fast tracking around regulatory procedures/protocols to mitigate the influx and development of biosecurity issues
emerging after the disaster (eg: new chemical registrations issued with an emergency restricted use permit). Again, there was a cautionary note to ensure long-term outcomes were not sacrificed.

**Current issues surrounding agricultural biosecurity in Northern Australia**

- Although post disaster biosecurity awareness, procedures, protocols and practices have vastly improved, there has not been a corresponding strong improvement in the weeds, pests and diseases situation on the ground. Rapid flexible and effective responses to biosecurity issues post disaster are needed to improve outcomes on the ground.
- Many animal welfare and nutrition issues need further investigation, research, response and dissemination of practical solutions.
- Little is known about tree crop susceptibility and resistance to cyclonic wind damage and the diseases that attack the cyclone damaged orchard trees
- Little is known about how to protect/mitigate cyclonic wind damage in crops, tree crops and timber trees.
- Innovative, practical local knowledge has not been collated and other producers encouraged to adopt these new farming practices, infrastructure improvements and risk mitigation techniques.
- Weed and pest dispersal and incursion into new areas is magnified by extreme weather events and especially cyclones.
- “Whole of Landscape” strategies that involve rainforest conservation and primary production need to be supported

**Potential solutions that could be investigated**

- Damage zones susceptible to pest, weed and disease infestations could be assessed, mapped and declared a designated Pest, Weed or Disease Watch Zone to facilitate and coordinate special preventative strategies, permits and conditions being quickly and efficiently authorised. Automatic authorization could be allowed within the designated Watch Zone.
- Emergency restricted use chemical permits should be investigated as one of the tools available within a Pest, Weed or Disease Watch Zone. (eg: new chemical registrations issued with an emergency restricted use permit restricted to a certain mapped area, or specific crop or timeframe)
- Realistic red tape reduction and fast tracking around regulatory procedures/protocols to mitigate the influx and development of biosecurity issues emerging after the disaster
- Early training and awareness training for post-disaster workers in emergency biosecurity protocols should be undertaken in preparation stages
- Disaster management arrangements need to give animal welfare issues a higher profile. More information should to be provided to emergency services personnel about plant and animal health, biosecurity concerns and farm clean up issues.
- More emergency wash down stations would help minimise weed dispersal
- More agronomic R&D and extension of advice on managing extreme cyclone conditions. (more detail in RD&E section)
- Development of “Whole of Landscape” strategies that involve rainforest conservation and primary production
4. Research Development & Extension - Tropical Agriculture

Rural research, development and extension (RD&E) contributes significantly to Australia’s reputation as world-leading, productive, innovative and efficient farmers. A consistent and enduring focus on the need for profitable, competitive and sustainable farmers and significant co-investment by farmers and government in rural research and development puts Australia in an enviable position to meet the future demands for food security, adaptation to climate challenges and the rising costs of farming.

“Australia’s rural industries have a strong tradition of being innovative and adapting to new challenges. They have proven highly productive and competitive in international markets.” (Department of Agriculture, Fisheries and Forestry, 2012)

RD&E was ranked as the overall number four issue in this study, however it ranked number two on the deteriorating situation scale. The key informants clearly described this was due to the failure to effectively perform extension, dissemination, education, training and adoption of the research, and the translation into improved farm practices has simple deteriorated.

For decades, established agricultural industries have collected farmer levies to provide funding into rural research, development and extension (RD&E) programs. Of the $1.66 billion now spent annually on rural related R&D, the industry funded Research and Development Corporations (RDCs) fund around $500 million. This has grown from around $200m annually over the past twenty years and is now the largest single source of rural related research funds. (Core, 2009)

Dissemination and adoption of the co-invested scientific research findings, is one of the lowest priorities on the research agenda, and farmers have constantly called for this to be rectified. The post cyclone data contained many references to the shortage of experienced extension staff with technical expertise in Far North Queensland dedicated to industry skills development to help farmers incorporate scientific knowledge into their farm practices. All industry sectors expressed needs for “extension officers” to assess and document on-ground impacts of the cyclones and floods for response and recovery planning and to provide on-farm best practice support and technical knowledge to respond, adapt and build resilience to on-farm consequences of cyclones and floods.

To continue to grow tropical agriculture in the cyclone belt of Northern Australia, rural industries expressed a particular need for ongoing tropical agriculture scientific research, agronomic advice and extension officer support to bring the latest research technologies and best management practice, knowledge, skills and training to commercial farming enterprises. Disaster Preparedness, Improved Farm Practices for risk mitigation, and Farm Financial Risk Management were the priority RD&E areas identified by this study, to help the agricultural sector manage extreme conditions and reduce future reliance on disaster assistance.

Rapid response plans and mechanisms, weather forecasting and how to use it, business continuity strategies, infrastructure construction techniques and real-time information to producers and decision makers ranked high on the priority list. Interestingly, pest, weed and disease control was considered a key priority rather than a high priority, because it is seen as an issue that requires attention all of the time, not just after natural disasters.

The Rural Infrastructure and Agro-Industries Division of the Food and Agricultural Organisation of the United Nations (FAO) advocates and supports the development of entrepreneurship in agricultural support services. Australia has to ensure they have appropriate policies, strategies and methodologies to assist farms and agribusinesses in developing managerial and technical skills for supporting production, post-harvest, infrastructural, marketing and financial operations related to developing and improving efficiency, effectiveness, competitiveness, and profitability of agricultural and food enterprises.
Established industry sectors that have well-organised and funded research and development through the systems described above, were less likely to make a request for further research through the post-disaster reports. However, every industry called for more on-the-ground extension/recovery officers with technical knowledge of their industry. Most industries also needed assistance with the viability and practicality and even red-tape reduction to enable salvage operations in the response and recovery stages.

There was also a big call for assistance with future preparedness, diversification and resilience options. Farmers wanted to utilise the innovative farm practices developed from the lessons learnt from the cyclones eg: banana industry canopy removal pre-cyclone; trellis use in tropical fruits showing some benefits. It would be beneficial for future studies to include the research, documentation and dissemination of this practical rural solutions information.

“There should be an investigation of farm trees that survived the cyclones. We just had two big wind tests and the evidence is there now, the stumps are still there, the ones that survived are there. DPI should research and document it right now, work out why they survive. These are part of the lessons learnt, and we should get this information out to farmers as soon as possible”. (Key Informant comment, 2013)

Private foresters expressed a need for government industry partnership to lead and support urgent and technically sound work to assess the viability and practicality of salvage options. The region has lots of poorly designed private forestry plots, inappropriate trees, and many tree farmers that feel there is no industry infrastructure to help them manage in times of crisis.

The private forestry industry also requested access to appropriately qualified and additional industry development and extension resources to promote recovery, particularly with the treatment of plant disease issue, future preparedness and resilience. They could also assist with plant selection and management, bio-security and provide opportunities to develop sustainable industries based around native forest products such as food, native cut flowers and foliage, essential oils, and bioactive compounds.

Tropical exotic fruit industry requested Research and Development for some specific needs. Ideas that they wanted looked at included; re-engineering and canopy management of orchard trees in cyclone prone areas, re-appraising how we establish trees, consideration of support infrastructure such as trellising and the economics of trellising, use of emergency defoliants to drop leaves prior to the cyclone.

“There is a loss of foliage and branches can be nearly 100% during severe category cyclones, the failure of the trunk and roots is of greatest significance. Susceptibility to trunk snapping varies between species due to differences in wind resistance, trunk flexibility, wood density, crown symmetry and the presence of hollows, often caused by termites” (“An assessment of tree susceptibility and resistance to cyclones,” n.d.)

In the aftermath of any natural disaster, there is always going to be new emerging problems and banana producers reported the death of the apical bud in banana plants where the leaf canopy was removed after the cyclone. These plants were cut off below where they were bent by the cyclonic winds, within a couple of days of the cyclone, generally from young plants, with a reasonable chance

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2 Red-tape is used to describe all the bureaucratic processes that are put in place to carry out legislation and regulations eg: permits, restrictions, closures, licences, log books
of reshooting. There was no knowledge of why some buds were dying while others were reshooting successfully, and more research and extension work still needs to be completed.

On a “whole of landscape” perspective, government assistance in the form of research and technical advice was required to determine cyclone resistant shade trees and best possible tree replanting configurations. Once varieties are determined, coordination is required with local nurseries to produce seedlings and tree planting field days to get the message out to the community for rapid effective adoption.

**Key Informant Feedback**

A lot of useful research and development going on in the area of Agriculture including climate adaptation, disaster preparedness and recovery, rural resilience, rural farm practices and ecosystem recovery.

Rural industries in the post-disaster data expressed needs for RD&E in the following areas and key informants were asked to rank them as priorities.

![RD&E Priorities Chart]

Table 7: Research, Development and Extension priorities

From the feedback, Preparedness is the indisputable priority need for agricultural research to assist with disaster mitigation to reduce the consequences of cyclone events. The best way for Ag-industries and individual agricultural enterprises to survive a cyclone is to have plans in place and be prepared as well as they can before it strikes. Although there is a lot of development work being done in preparedness for natural disasters, there is little specific research done on cyclone preparedness and virtually none for agriculture in cyclones.
Farm Financial Risk Management, Farm Practices to mitigate risk, and Farm Risk Management all rated as the next highest research priority. Future developments in farm financial risk management should include tools to help manage extreme conditions and reduce future need for disaster assistance. Farm Managed Deposits are a tax office initiative to enable primary producers to even out the tax burden of high and low income years, and constitute an important element of farm financial resilience in the face of natural disasters..

ABARES in its paper *Farm risk management in a changing climate* (ABARES, 2012) suggested that the two risk management options that would play an increasingly important role for Australian farmers were decision making support systems, and financial products such as insurance. Risk management does not necessarily eliminate risk but achieves a balance between risk and return that suits the needs and desired outcomes of an individual farmer or agricultural business. All risk management options have a cost, either directly through the purchase of risk protection such as insurance, or indirectly through relinquishing some potential gains.

Case Study: Banana farmers in far north Queensland grow 90% of the very popular fruit. Dennis Howe of Howe Farming Walkamin, decided to chop a percentage of his banana crop in the face of an imminent hit by Cyclone Yasi. He had carefully watched and listened to all the relevant weather forecasts, and decided there was a high risk that the farm would indeed get hit, but that by chopping the canopy so the plant did not break, they would be back in production sooner than other farmers, thus beating the market glut. Farmers and businesses must follow the weather forecasting to assess the risk and weigh up the relative gains and losses when considering the most appropriate risk management option in any situation. This is an example of ABGC together with QDAFF officers and producers developed plans for a staggered return to cropping. Synchronisation of cropping in the coastal production area resulting from regrowth after the cyclone would result in a flood of bananas to markets.

Northern Australian farmers and graziers are pioneers in many ways with a real ground level practical, inventive turn of mind, and an understanding of the land, the climate, and what it takes to successfully grow and market food in this environment that has had limited research and is poorly documented. They have learnt to adapt to an uncertain and variable climate, and they actively seek mitigation strategies and new and innovative farm practices that reduce risk and vulnerability to enhance their financial resilience.

Many of the options available to understand and manage risk constituted the next level of priorities. Rapid response plans and mechanisms, improved weather forecasting and farmer training in how to use it, business continuity strategies, access to real-time accurate information and infrastructure construction techniques.

It is interesting to note some comments about the relative needs for long range and seasonal climate forecasting versus the immediate weather forecasting for the next few days. Most respondents definitely saw a need for farmers to know and understand what sort of wet season is predicted, but that wet seasons and the possibility of cyclones should be accounted for every day. However the crucial decision making time for actual preparedness was in the two weeks or so of build-up and the final few days before a cyclone struck, and this is when it is essential to closely follow the weather forecasting, understand your risks and make decisions based on the mitigation options you have at your disposal.

The need for unbreakable communication systems and knowledge of where and how to access real-time information was seen as essential. Internet sites and mobile phone apps supplying the specific material for example, climate and weather forecasting information and disaster preparedness checklists are proliferating at a staggering rate providing a seemingly endless choice. However, rural communities are only slowly adopting these sorts of decision support systems. Many impediments were proposed for this slow adoption including little or no extension, lack of relevance to local conditions and failure to involve farmers in the development leading to a lack of trust and confidence in the products.

“Projects have been funded, but research takes time.” (Key Informant comment, 2013)

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Diversification strategies to reduce risk need further investigation including, diversification on-farm, with different income streams to spread the risk. More research needs to be done, and certainly agronomic and technical advice supplied to farmers to assist diversification into new geographic locations to mitigate the risk of total income loss with one event. New varieties selection, alternative crops, and innovation and technology all got the tick as well.

There were a few key respondents who believed that the development of markets is not a disaster related RD&E topic, however, there were more comments along the lines that new markets and market development are one of the key aspects of business viability and resilience building in the post-disaster landscape. The regional food network which received post-cyclone Yasi Rural Resilience funding, was formed to promote and distribute the supply of regionally grown, processed and manufactured produce in Tropical North Queensland to locals and visitors through local retailers, and food outlets. The establishment of local food supply chains and markets builds resilience for farmers and the broader community benefits by supplying a buffer against future disruption to food supplies.

The two sectors that were further down the scale than would have been predicted from the post-disaster data are pests, weeds and disease control, and livestock and cropping scheduling. Pests, weeds and diseases received the largest vote as a “Key Priority”, which reinforced the stated view that this is an area of research and extension that needs constant sustained effort, not simply in relation to disasters. The biosecurity sectors most significantly related to post-disaster and preparedness are plant diseases and animal welfare, which both need further research and much better extension to disseminate learnings.

Livestock and cropping schedules rated lowest because this is the newest and least known cyclone risk mitigation strategy on the list. This is a particularly significant issue for banana and papaya cropping, but also has ramifications for other continuous supply industries like pigs, poultry and eggs. There may well be learnings in crop and livestock scheduling for longer-term industries such as beef and tropical fruits to avoid the post-cyclone synchronisation that causes gluts on the market that have significant impacts on transport, supply chains, processors and market price.

The post-disaster data revealed a deep-rooted angst that the winding down of the Queensland state government based extension services has created a gap that industry laments has tried to fill with limited funds and limited success.

“Bring back extension officers to bridge the gap between the science and on farm practices.”
(Key Informant comment, 2013)

Most of the cyclone-impacted Ag-industries have been involved in recovery, repositioning and best practice resilience building projects since the cyclones for example; QFF Taking Stock: Horticulture 2020; Cane Industry – Best Practice; 2020 Beef initiative working group.
Table 8: Need for extension programs, training and commercialisation support

Key informants reinforced the significant need for enhanced access to technical, financial and agronomic on-farm extension and advice to raise the uptake of preparedness and risk mitigation mechanisms, confirming the veracity of the call from the post-disaster data set. The new knowledge and technology generated through R&D must be extended to and adopted by farmers and other end users before the value is realised.

Key respondents endorsed the critical need for transfer of knowledge to industry. Extension of new farming knowledge, and farmer adoption of new practices is central to rural industries remaining internationally competitive, environmentally sustainable and socially responsible. There is little published research on how farmers prefer to learn, but those that are available generally concur that preferred learning methods include hands-on demonstration, farm visits, one-one-one, field days, discussion and on-farm tests. (“Farmer, Agent, and Specialist Perspectives on Preferences for Learning Among Today’s Farmers - JOE_v48_3rb1.pdf,”)

To improve the overall effectiveness of research and development, an extension and adoption component needs to be built into all Rural R&D project plans with processes and requirements to facilitate timely adoption of research results by end users. Extension of information, knowledge, new learnings and ideas flow through a complex maze of different providers, private consultants, agribusiness and input suppliers, local grower groups, and public information obtained through the internet, conferences, demonstrations, training, workshops and publications.

“All levels (of knowledge transfer) are needed, extension plus technical training, together with identification and support for commercialising innovations if a farmer sees a particular improvement as a result of disaster.” (Key Informant comment, 2013)

Innovation is different to research, and there are many innovations devised because of the hard lessons from Larry and other cyclones in the rural sector. Some of the best innovations are borne out of adversity, and there is a need to reward the innovators and help commercialise and/or disseminate the knowledge these innovations bring. These innovators produce new knowledge and ideas that can be
applied into the broader farming community, where it is most likely adopted, adapted and innovated again.

Primary producer or processor levies (for RD&E) are based on crop and livestock revenues and matched with public sector funds, which means that at the crucial time when specific research and extension on natural disaster preparedness and resilience is needed, there is less money available to do it. Government should be encouraged to continue the same amount of investment or more to accommodate these difficult times.

Key informants considered quite a few other issues not raised in the post-disaster data set worthy of RD&E. Supply chain and freight movement, including the hub and spoke model, transportation bottlenecks; enabling storage technologies for sea freight; alternative food products research, development and extension.

The Western Australian key informants perspective was that there had been a significant reduction in focus on Rural Industry RD&E in that state.

**Current issues surrounding Rural Research Development and Extension in Northern Australia**

- Rural industries involvement in disaster management frameworks is fragmented, and they are not an identifiable and integrated component in local and district disaster management and preparedness plans.
- JCU’s cyclone centre has done some excellent work on farm infrastructure and this sort of practical work needs to be funded and results need to be communicated widely.
- Investment and commercialisation opportunities need to be supported.
- RD&E needs to be carried out in the Tropics to be applicable to the Tropics.
- Every rural industry in the tropical north needs to develop cyclone mitigation and preparedness strategies and farm practices.
- Most important to develop one-on-one extension services, as well as comprehensive mechanisms to ensure early effective training and adoption for farms and other rural businesses.
- Training to ensure an early and sustained uptake of new knowledge coming out of research, or being shared with other farmers.
- There is a lot of rural innovation available from Australian farmers that have commercial opportunity. There needs to be a process where this knowledge transfer, and commercialisation of rural research and innovation is supported by the research organisations and government.
- More should be done to identify and test options for diversification to protect the viability of farms in a cyclone area including diversification options such as; geographical, varieties, farm management practices and alternative markets.

**Potential solutions that could be investigated**

This is such an enormous area of significant needs, that it is suggested that a dedicated Tropical Agriculture Cooperative Research Centre (CRC) should be considered. The details to scope this investment in assisting tropical rural industries to be productive, profitable and sustainable, is included in the Appendix. Following are the key research development and extension ambitions that have been distilled from this research – they are by no means a complete list of the research objectives of a
dedicated Tropical Agriculture Research Facility, and it is understood that the context for agricultural research is currently undergoing review and repositioning in Australia.

- Extension, training, extension, education, extension, commercialisation, extension, build capacity, and resilience are the most important needs to ensure adoption of research. Report on the role extension plays in identifying and adapting to change, and how private extension providers work with industry funding partners and research agencies to improve the delivery of rural extension.

- Tropical Agriculture Disaster Preparedness - Rural industries should be an identifiable and integrated component within local and regional disaster management and preparedness plans.

- Disaster Management Research Development and Extension needs to address cyclones and other natural disasters in Agriculture arena.

- Farm risk management.

- Financial risk management.

- Agricultural business continuity.

- Resilient farm practices for cyclone risk mitigation.

- Rapid response plans and mechanisms.

- Climate and weather forecasting and intensive training for farmers in how to use it to assist decision making with real-time information.

- Communications are critical and new platforms and frameworks for use and dissemination of real-time information Preparedness and rapid response plans.

- Monitor loss trends, improve catastrophe modelling, address climate challenges, and extend this research to help farmers prepare for and adapt to the impacts.

- Infrastructure construction for more cyclone resistant or resilient farm infrastructure.

- Agricultural diversification as a risk strategy.

- New varieties development, selection and adoption.

- Innovation and rural technology solutions.

- Pest, weed, disease control.

- Market development, and alternative markets.

- Alternative crops, alternative food products.

- Cropping and livestock schedules.

- Tree research in several areas is essential. There should be assessment of tree susceptibility and resistance to cyclones of farm trees that survived the cyclones.
  
  - Wind and disease damage assessment
  
  - Tropical Exotic Fruit and Native Fruit Orchard trees
  
  - Windbreaks
- Urban trees
- Revegetation trees
- Timber trees, forest maintenance, harvesting and processing.

- Shade or paddock trees research is needed including species, planting patterns, multi-purpose plantings eg: wildlife safety, shade for livestock, and planting pattern/clumping for strength and stability of the trees

- Extensive new knowledge is required and extension of this knowledge, and dissemination and commercialisation is then crucial.

- Research, development and extension with consideration of more resilient farm infrastructure including horticulture protective cropping structures, farm management and farming practices, alternative variety selection and better marketing initiatives.

- Prioritise RD&E of alternative energy solutions for back-up power supply in post disaster situations including implementation and commercialisation options.

- Supply chain and freight movement, including the hub and spoke model, transportation bottlenecks; enabling storage technologies for sea freight.

- Agricultural Insurance needs intensive research and development work including the possibilities of government underwriting and possible funding methods to achieve this.

- Support Ag-industry focus on risk management, financial risk management, best practice farming and grazing systems, and long-term risk mitigation and resilience education, preparedness and disaster management. This should also include industry response mechanisms and plans.

- Support the development of emerging Industry Groups eg: Private Forestry Industry; Tropical Exotic Fruit Growers; Small Farmers supplying local food to promote preparedness, resilience and productivity.
5. Social Wellness & Resilience Issues

Natural disasters like a category 4 or 5 tropical cyclone, take a significant emotional toll on people, and are devastating for some. At the point where the disaster has devastated your home and business, there is little you can do to allay the pressures and costs of the massive task in front of you, except to get in and make a start. There was some reluctance on the part of farming families to accept the help initially offered after cyclone Larry. The word most often used (and overused) to describe them in those early days was “stoic”, which means enduring, tolerant, patient, resigned. A common catch-cry was “Oh no, we’re OK – there must be someone else who needs your help more than we do.”

People can be traumatised by the many hours of fear for their lives, and the destruction of buildings, resulting in people suddenly finding themselves homeless. After cyclone Larry and cyclone Yasi, many people had to leave the area suffering the loss of everything they have ever known - home, possessions, sometimes their pets, and separation from family, friends and familiar communities. For those who have lived through a catastrophic natural disaster, life may never return to the way it was, but addressing these emotional costs will be an important step along the path to recovery.

“Increased depression, worry, and anger can have significant long-term effects for individuals, their families, and their communities, including increased healthcare costs, morbidity rates, and risk of substance abuse. To minimise these deleterious consequences when facing future predicted disasters, like a hurricane or a snowstorm, leaders should not overlook resources for enhanced psychological and emotional assistance both before and after the event. In addition, getting ahead of the disaster with the proper preparedness messaging will also be likely to ease these emotional effects.” (www.gallup.com, 2013)

Farming families have many more responsibilities to consider than the average home owner does, and the natural disaster devastation means that some livelihoods are lost and many are left with reduced incomes, increased expenses and a feeling of despair as to how they will find the strength, the energy and the resources with which to rebuild. The initial quick response required is to look after family and animal welfare, reduce hazards and commence any salvage operations that can be assisted by the relief operations. Farming has a unique set of characteristics that can promote great satisfaction with quality of life, however, people living and working on farms are subject to a number of environmental, climatic, economic and social stressors which may impact on their sense of wellbeing and also on their mental health.(RIRDC, 2008)

Much of the post-disaster data regarding the social aspect of recovery from a catastrophic event by agricultural participants is focused on access to government assistance packages to relieve some of the financial hardship that makes it impossible to see how they will actually tackle the sheer enormity of the clean-up, repair and rebuild to replant or restock. Each farming enterprise is different, so money, reduction of red tape and other practical government assistance to get on with the job, is the most effective help.

The effectiveness of the Industry Recovery Officers and other field services that supply information and support is repeatedly documented in the post-disaster reports. Field service officers in general are viewed as the essential element in navigating the disaster relief and recovery processes, and those industries with specific knowledgeable help available rapidly on-the-ground recovered more strongly.

However, it is now understood that disaster management is not just about Preparedness, Relief and Recovery but that hope, confidence and determination spring from wellbeing and resilience. Wellbeing is described as doing work that is worthwhile, having friends and family who love you, a secure home, enough money and health to do what makes you happy, and a strong community connection with access to schools, medical attention and other services. Connections to rural communities through
industry associations, groups and volunteering, ensures people are connected, sharing knowledge and have strong linkages and referral networks which contribute to their ability to recover.

Ag-industry groups working in partnership with processors and government as in the Dairy Recovery Team provide a vital interface with a large number of disaster sufferers with complex and urgent needs. These centres apply powerful, quick and effective assistance solutions with minimal red tape. Responsive access to significant financial assistance was facilitated to people in need and quick focused compassionate assessments could be made of their immediate needs – for example in terms of health, food, clean water, shelter and money.

These Ag-industry recovery centres are a very useful two-way conduit of both practical help, information and advice as well as being a very useful means of maintaining a ‘health check’ on the affected population and its progress in rehabilitation. Emerging agricultural, biosecurity, environmental or social issues can be quickly identified and attention sought for relief and assistance through the Disaster Management Arrangements.

**Issues from the Post-Disaster Data Set**

The early emphasis on the delivery of relief services on a large scale across the community shifts towards individual case management later in the recovery process. Existing vulnerabilities in people are often intensified after the cyclone and result in the need for particular mental health support.

“The psychological impact of severe cyclones is always understated. People who experience even minor impacts, can struggle to manage the consequences.” (Key Informant comment, 2013)

In locations with extensive cyclone damage, it is vital that as the response phase moves into the recovery phase, more attention and resources gets devoted to the outreach of human services to widely dispersed landholders suffering fatigue and the pressures of conflicting responsibilities and financial uncertainties. Stress and coping problems continue, and as the very long hours and the scale of animal welfare, crop damage and the clean-up still in front of them takes its toll, farmers and their families can suffer from depression, lack of motivation and disinterest in working, be it cleaning debris away, replanting or salvaging crops.

“Five primary producers, predominantly banana farmers from the Wet Tropics region, believed it would take over 1000 person days to complete the clean-up.” (Post-disaster data comment, 2013)

Ag-industry advisers, productivity staff, industry recovery officers and even processor employees who are in constant contact with producers need support and debriefing arrangements in place to help them cope with the enormity of workload and human empathy they are continually expending beyond their normal skills and capabilities. Farmers in the impacted areas have such a huge burden of responsibilities and needs, they are often at a loss to see how they will make it through to recovery. The demands on disaster victims are immense and human needs and comforts can often take a back seat to the requirements of dependent animals and crop salvaging.

“Humanitarian Aid - People Comfort. The making available of hot showers, laundry facilities and hot meals in small towns where there has been no water, electricity or phones for days, maybe even weeks must be part of future disaster response plans.” (Key Informant comment, 2013)

Free and confidential farm financial counselling services help individual agriculture, fishery and forestry businesses facing financial hardship to explore the issues and problems they are facing,
understand their current financial positions and assess their options. Government financial support packages are an essential part of keeping farmers and graziers from exiting the industry.

“The demography of the industry, including a large proportion of older producers, and the long lag time between replanting and the start of production (5 – 10 years) may result in significant adjustment. … may choose to leave industry instead.” (Post-disaster data comment, 2013)

Displaced workers who live locally and want to remain, had to be diverted into different roles, and there is a need to match workers for example: from crops that no longer needed harvesting, to clean-up and replanting. As the social structure is disrupted in these cyclone affected small rural communities, and financial hardship forces outmigration of agricultural workers and families, this can result in further disturbance to the social fabric like school viability issues.

“Labour force in Innisfail district has reduced by approximately 60%. That is $1.69m/ week that is not being cycled through the local economy.” (Post-disaster data comment, 2013)

Effective and co-ordinated communication is necessary during the all stages of the disaster management process, especially during the immediate preparedness, response and recovery development. Newsletters, fact sheets and social media sites containing latest news of assistance available, emerging issues and possible solutions, stories of lessons learnt and successes are essential for effective and co-ordinated communication on matters affecting the Ag-industry. Good news stories and understanding how to access the available assistance, helps generate positive attitudes and encourages agricultural participants to consider their long-term resilience.

Key Informant Feedback

There was a mixed reception to whether social aspects had improved or not. 53% of key informants assessed that there had been no improvement or the situation in regards to social aspects had actually deteriorated since cyclone Larry to the present moment. Two people thought there had been strong improvement and quite a few people (45%) thought the situation had improved somewhat. There were no comments that could be used to define this difference of opinion.

Strengthening local networks to help with social connectedness, wellbeing and resilience received an unparalleled level of support from over 92% of the key informant group. This confirms how farmers and their families have traditionally viewed their commitment to ensuring strong local communities and the networks that bind them together as one of their core values.

“Vibrant rural communities are crucial to economic opportunities, social vitality and the environmental sustainability of rural areas. Prosperous, sustainable agricultural systems and functional rural communities often rely on each other” (http://www.uq.edu.au/agriculture/rural-communities, 2013)

The results of the survey type question regarding support groups has provided some interesting and possibly valuable insight, and perhaps warrants further study into the role of effective community organisations in the context of rural community wellbeing. Some of the long established and most supported groups have the lowest membership, and this alongside the local action groups could suggest the objectives of the older style organisations are less relevant in the contemporary context.

“Found shed meetings work - where different farmers (got complicated when women came) get together at different sheds and see what each other are doing. Light a fire and chat about what each person is doing.” (Key Informant comment, 2013)
Table 9: Social connectivity and resilience from participating in voluntary community groups

This questionnaire was designed for a select group of key informants to endorse the body of evidence distilled from the post-disaster data, and was definitely not a general survey. Therefore, the proportion of Ag-industry participants was obviously skewed, as can be seen by the 45% membership status. Unfortunately, the design of this survey type question made it vague, ambiguous and the aim was unclear. Even so, the result is a strong conclusion that either respondents or family are members of all of these groups except the Farm Watch, which is a concept put forward during an early steering committee meeting for this project, and Farm Watch groups do not actually exist yet. Where the respondent or family were not members, they generally ticked the “support” button or the “would be good to have” button, meaning that every social support group received at total positive response over 70%. Several written responses referred to other groups who were especially helpful in the immediate aftermath, like Red Cross, the Salvation Army (Salvos), Saint Vincent’s De Paul Society (Vinnies), Local Councils and members of Parliament.
Question 67 about what support made a difference to rural people making a post-disaster recovery was more specific and gave a much clearer answer to what support mechanisms provided the most benefit to rural people in the post-disaster recovery. Access to information services had a resounding 86% of respondents believe it was important. Recovery support centres were the biggest provider of access to relevant, timely and accurate information and assistance, so the fact that it came in as number two reinforces that information was the number one priority for agricultural participants.

Social occasions (i.e. shows, field days, festivals, gatherings, and meetings) are always important gathering places, where country folk catch up with each other, share stories and find out how everyone is faring. They are also significant venues for introduction to the latest infrastructure and equipment, animal husbandry and cropping practices and things like weed, pest and disease identification and eradication techniques.

In Australia’s Farming Future Final Market Research Report (Department of Agriculture, Fisheries and Forestry, 2009)- Understanding behaviours, attitudes and preferences relating to climate change. Prepared For: Australian Government Department of Agriculture, Fisheries and Forestry Submitted by Donnelly et al; it is reported that primary producers use a particular process of thinking, talking, testing and checking when considering changes to their business and farming practices. Primary producers use a range of trusted sources to gather ideas and information to triangulate and validate what they have heard or read, then run their decision past an influential secondary decision maker (usually their wife or partner) before implementing their decision. This presents a good case for men’s groups where they can talk freely about the things that matter to them. Effective women in agriculture organisations are also considered important to ensure they are well informed, and have strong robust networks to rely on.

Counselling for suicide prevention was supported by the key respondents, as self-reported levels of distress in farming and rural communities are particularly prevalent when dealing with the effects of a natural disaster. There is a recognised need to work with farming families to reduce the high levels of suicide in this sector of the population.
“People in rural areas are at great risk of poor physical and emotional wellbeing due to limited access to specialist services. Mental health and counselling support services are often non-existent or provided on an irregular, outreach basis in rural and remote communities” (QCOSS, 2009)

Post-disaster, it is essential that people have access to their doctors and other medical services. Although some level of observing and support is offered through the recovery centres and industry groups, this is no replacement for the value of the family doctor and other helping professionals when monitoring the emotional impact on farmers and their families. Social Support Personnel are essential for many months as the recovery progresses, as is the availability of counsellors to visit on-farm to assist with mental and emotional coping strategies and encourage friends and family to “pack support” around any potential suicide victim.

Schools operating and committee and group meetings received more than 50% vote, however, programmed activities like CWA, sports, arts and cultural activities took a back seat to the enormous volume of work involved in recovery. These regular contact events are often the loser in the battle to find enough time, energy and money to meet the day-to-day responsibilities in a damaged farm environment.

There is a lack of recognition of the connection between the damage to the environment and the wellbeing of the people. People on the land, treasure their natural surroundings and understand that it supports their whole existence, their livelihoods, their relaxed rural lifestyle and the strong sense of community they normally enjoy.

“Particularly in an area like the Wet Tropics, the fact that their environment was trashed so badly was almost worse for them than the physical damage to property, as this is usually covered by insurance and can be fixed in the foreseeable future. Looking out every day to a totally trashed landscape, where once there was a lush green rainforest, was extremely difficult for some people to cope with.” (Key Informant comment, 2013)

Landcare for Larry was established as a public donation relief fund for the natural environment, but it also recognised the socio-ecological impacts and helped build local resilience with real relationships formed and proven between people affected on the ground by the devastation of the natural environment. Community tree plantings or clean up and rehabilitation of an environmental area, even during the long painstaking recovery, can encourage a spark of optimism in the community that they can rebuild a brighter future together.
Table 11: How people perceive farmers

The above chart shows that rural image, hence, farmers are viewed more, and more negatively, the more urbanised and further removed people are from the source of their food.

“Immediately after a disaster I believe there is a lot of empathy shown nationally (the Aussie spirit) for the plight of farmers. However, I don't think it lasts very long. I feel that outside the local area there is not a lot of understanding of the plight of farmers. There only seems to be some concern when certain products are not on the shelves or prices have risen remarkably.”
(Key Informant comment, 2013)

Central to this discussion is the increasing urbanization of the world, the growing population, and the declining ratio of food producers to food consumers. Australia is one of the most urban countries in the world, and each Australian farmer produces enough food to feed 600 people, 150 here and 450 overseas. There are approximately 134,000 farm businesses in Australia, 99% of which are family owned and operated. Despite common misconceptions, Government support for Australian farms represents just four percent of farming income. By comparison, according to the Organisation for Economic Cooperation and Development (OECD), in Norway it is 61%, Korea 52%, European Union 22%, Canada 17%, and United States 9%. (NFF Farm Facts 2012)

“Farm incomes have remained static or gone backwards for decades, and yet the urban feedlots we supply food to every day continue to get richer. They have a very negative view of farmers as environmental vandals who are always looking for government bail-outs, and then they want to buy the food we produce at prices lower than our cost of production.” (Key Informant comment, 2013)

In fact, Australian farmers are among the most self-sufficient in the world.- (“OECD Factbook 2010 - Statistics,” 2010)
particularly in their attitude to climate adaptation and mitigation challenges. Primary producers feel as though they are constantly under attack and therefore have some well developed defence mechanisms when they feel urban people are pushing their agenda onto the sparsely populated rural and regional areas. (Department of Agriculture, Fisheries and Forestry, 2009)

There is also concern about the aging community of farmers around Australia, and young people cannot see the benefit in becoming farmers with huge debt levels and relatively small and insecure income. Particularly the effect of multiple natural disasters has made farmers and graziers less certain about their ability to continue farming, but there seems little option.

“The young ones aren't coming into farming. They can't afford to buy the land at market price and once they got there they can't pay it off.” (Key Informant comment, 2013)

One of the Red Cross workers in the agricultural and NRM sector post Larry and Yasi, Jenny Quealy, working on Landholder Recovery after disasters, coined a new term ‘Generational Anxiety’. She is still refining it, but it describes what she witnessed as a deep emotional attachment to the land, combined with deep-seated concerns about whether farmers (particularly men but also rural women) can carry on, whether the next generation will be there to do so, whether they indeed did the right thing taking it on as their lifetime investment. The concept includes actually living with and passing on of anxiety, through generations, as almost a 'condition' of being a family involved in agriculture, particularly during the last 2-3 generations. Jenny is developing a ‘Generational Anxiety’ concept paper and it may be beneficial to conduct future research to understand rural, regional and remote landholder and family attitudes, behaviours and well-being issues and challenges, that could be understood in the context of ‘generational anxiety’. This research could indicate and provide evidence for how agencies and suppliers could better connect and engage with farmer and landholder clients (e.g. support by family and community networks, agencies, health and well-being and agribusiness and financial support services to landholders).

For three decades, we have been seeing an attitude of government that is detrimental to our culture to our ability to make a profit, to actually run a profitable business and thus we have a new rural joke “What’s the ultimate in child abuse? Leave them the family farm!” (Key Informant comment, 2013)

It has to do with the regulatory burden within a policy framework which is very supportive of free market aspirations, high employee wages and conditions, extremely high quality food, animal welfare, safety, superannuation and high level environmental values, which together amount to being very unsupportive of agriculture. (Productivity Commission, 2007)

Combine this with mounting concern about the dominance and practices of the duopoly of two big supermarkets in the Australian domestic market. The Australian Competition and Consumer Commission chairman Rod Sims disclosed that he has escalated an investigation into Coles and Woolworths over possible anti-competition behaviour towards suppliers including primary producers. (Short, 2013). These two supermarket giants now have an estimated 75% of the Australian market, and are accused of unconscionable behaviour and misuse of that market power. Farmers are the price-takers not price-makers in any sale of their products. Add to that the ever-increasing cost of almost all farm inputs and freight, and you have a story that endorses a concept of ‘Generational Anxiety’. This anxiety is only intensified when, in the space of five years, you and your business are hit by two catastrophic events that are outside your ability to plan, manage or mitigate.
Current issues surrounding social aspects of cyclones in Northern Australia

- Two or more years down the track from Cyclone Yasi and Larry, farmers and graziers are still facing the very real challenges of economic recovery from the devastating effects of the cyclones. This is combined with financial pressure from the other significant challenges including low prices, increasing costs and regulatory burden, labour shortages, increased debt, live export trade damage, and declining profitability.

- Ag-industry has trouble retaining skilled employees, as the sector finds it hard to compete with the mining sector, particularly when agriculture has had such a battering.

- The most effective change agents are other primary producers and they share information whenever they get together both informally and formally. Local Ag-industry group meetings, farming men’s and women’s groups, Landcare and local action groups, field days and local community events; trials; looking at and comparing other producers in the area and casual gatherings where producers invite, visit and call on each other are all important socially and as a means of information gathering and validation of ideas.

- Disaster Management arrangements and government assistance are absolutely critical components of disaster recovery, however farmers in the cyclone prone areas want to be able to build in their own resilience into their farming enterprise.

- There is a lack of recognition of the connection between the damage to the environment and the wellbeing of the people.

- Ageing population of farmers and rural communities and out migration of all age cohorts below 45 years is a serious loss to rural communities. Resilience and social capital are strong but they are underscored by long-term decline in population, young people and local and regional economies.

- The rural-urban divide continues to be a problem, with farmers viewed more and more negatively, the further removed people are from the source of their food. More needs to be done to understand why this is happening, what the implications are, and how to avoid it deepening. Programs aimed at bridging this divide should be developed and implemented.

- There is almost a ‘generational anxiety’ being observed where actually living with and passing on of anxiety, through generations, is being considered as a ‘condition’ of being a family involved in agriculture, particularly during the last 2-3 generations.

Potential Solutions that may be explored

- Disaster management plans that strongly focus on empowering the preparedness, response and recovery functioning of local community organisations would significantly strengthen the system.

- There needs to be a quadruple bottom line approach across environmental, social, economic and cultural aspects with cultural being seen to be a key aspect of the ‘resilient spirit of individuals, groups and communities’ in rural and other communities, at localised and regional levels in particular.

- Programs aimed at improving the rural image, and bridging the rural-urban divide should be developed and implemented at state and national levels.

- There should be a greater recognition of the socio-ecological aspects of disaster response and recovery, and programs developed to increase awareness and implementation of strategies to alleviate this in the post-disaster process.
• As the profitability of agriculture declines and government services are cut, the role of local support networks is even more vital, especially between good neighbours. “Farm Watch” is a program that has been suggested that could be instigated along similar lines to “Neighbourhood Watch”.

• Continuing support for local shows, festivals and field days, shed meetings, women’s networks, local action groups and industry bodies as people use these events and networks to get together to catch up and share information.

• Need to investigate and implement strategies to increase attractiveness of rural sector employment.

• In devastated communities where there no access to water, electricity or phones for days or weeks, humanitarian aid consisting of hot showers, laundry facilities and hot meals should be part of future disaster response plans.

• It may be beneficial to conduct future research to understand rural, regional and remote landholder and family attitudes, behaviours and well-being issues and challenges, that could be understood in the context of ‘generational anxiety’. This research could indicate and provide evidence for how agencies and suppliers could better connect and engage with farmer and landholder clients (e.g. support by family and community networks, agencies, health and well-being and agribusiness and financial support services to landholders).


Besides the usual struggles with commodity prices, input costs, the Australian dollar and rural debt, a natural disaster compounds the financial pressures faced by rural operators. Rural enterprises in the Cassowary Coast, southern Atherton Tablelands and northern Gulf region of Queensland are particularly vulnerable to escalating farm debt and financial hardship following two catastrophic natural disasters since 2006.

All primary producers impacted by cyclones, share the combined financial pressures of reduced income due to crop and stock losses or damage and inability to get product to market at peak, and increased costs of clean-up, rebuilding structures, and either restock, replant or rehabilitation of the income producing elements of their business. A number of factors influence the input costs and flow of revenues to primary producers after a cyclone including the extent of damage to current crops, trees and livestock, ability to salvage any of the current crops, ability to send animals to market at peak production, additional expenses to clean-up and re-establish, income diversification strategies, and the level of assistance from the government.

The section on Regional Economic Recovery focuses quite heavily on the Financial Relief and Loan Packages which agri-businesses and rural communities were extremely grateful for the government distributing so quickly after both Cyclone Larry and Yasi. These packages were recognised in both the post-disaster and key informant data as playing a significant part in the recovery of agricultural enterprises from the extreme trauma and huge financial impost of repairs and replacement.

Ag-industry bodies respond quickly to disaster events by providing support to growers and producers and working with the Disaster Management Groups and government departments to ensure rapid relief and aid in the recovery efforts. After a natural disaster is declared the Ag-industry bodies put together up to date fact sheets that describe the various financial assistance measures available to primary producers and small businesses in the declared disaster zones under the Natural Disaster Relief and Recovery Arrangements (NDRRA) available at their websites listed in Appendix 4.
These NDRRA government interventions are only activated when the extent of the natural event is considered to be so extreme that it is beyond the scope of normal risk management and self-reliance strategies of individuals and businesses to cope.

Farmers face multiple, often simultaneous, sources of risk such as weather, market prices and disease, and so a farmer's business strategy must include some form of risk management. Climate influences the mean and variability of weather conditions and the frequency of extreme events, which to a great extent determines the variability of production and yields on-farm. The Office for Economic Co-operation and Development (OECD) identifies three layers of risk faced by farmers:

- **Normal risk** is frequent but not too damaging and can usually be managed at farm or household level - for example, minor variations in price or yield. Tax offsets like Farm Management Deposits, social networks, industry productivity and best practice systems help to manage such risks.
- **Marketable risks** which have intermediate levels of frequency, with some predictability and magnitude of losses that insurance companies might see as a market opportunity, and therefore design and offer an insurance package to cover the risk eg: hail damage to cotton crops in the first three months after sowing.
- **Catastrophic risks** are infrequent, but cause enormous damage for many farmers that are beyond their normal processes to cope. Cyclones, floods, drought or disease outbreaks fall into this category because the level of uncertainties associated with these events and the possibility of devastating losses makes it difficult to find market (insurance) solutions, and there is a good chance of market failure. In these circumstances government interventions are needed to reduce risks, prepare for, respond to, and recover from disasters.

In the last two decades, Queensland’s rural debt has increased by 361% to nearly $17billion with an average debt per borrower of $1.073million (QRAA, Queensland Government, 2011). The major driving forces behind this include an extended property asset price boom associated with easy access to credit; low farm income combined with significant input cost increases; and extreme environmental conditions, including droughts, cyclones and floods.

This section will focus on Farm Financial Risk Management including decision support systems, farm financial counsellors and policy support to build farm financial resilience. Farm Financial Risk Management is an area that needs much more research and development of models and tools for farm financial counsellors, accountants, financial institutions, industry and industry advisors to use.

**Issues from the Post-disaster Data**

On-farm income was seriously disrupted for all cyclone affected properties. The post-disaster data was packed with references to stock losses such as fishkills, uninsured milk losses, avocados, cane, bananas, cattle and all manner of other agricultural products. Salvage operations and mitigating the losses were a primary focus in the early days and continued for many weeks and months for some producers, particularly fruit growers and intensive animal farmers who had to source alternative feed, and attend to animal welfare issues.

After the first two weeks, when most people were beginning the recovery process, attention turned to rebuilding restocking, replanting, and re-establishing production schedules and cycles. Regaining productivity targets was a medium to long-term target for most primary producer, depending on the industry, and the degree of damage. This is when the effects of lower farm income was compounded by a need to spend more on re-establishment, and even repositioning the farm business.

Farm Financial Counsellors (FFC’s) – the post-disaster data contains many references to the invaluable assistance provided by Farm Financial Counsellors, and a consistent reference to the need for additional resources in this area. In the immediate aftermath of cyclones, the Queensland government has deployed farm financial counsellors into the cyclone area to assist existing counsellors in the region, because of the high demand for services. The Queensland government cut the funding...
for all of the 13 state permanently employed Farm Financial Counsellors in December 2012. There has been no indication of a replacement program, and so this valuable free service is no longer available to most Queenslanders except for designated periods after disaster events. There are two Federal Government Rural Financial Counsellor Services still operating in the south west and central west regions of Queensland.

Farm Management Deposit (FMD) Scheme through the ATO, Farm management deposits are a financial risk management tool to help farmers deal with uneven income, by allowing a tax deduction for farm management deposits made in high income years, and withdrawn in low income years (included in tax assessable income). One of the government initiatives after cyclone Yasi was to remove the penalty for early withdrawal of the FMDs to facilitate their use with post-disaster expenses and cash flow restrictions.

The Farm Management Deposits scheme complements other risk management strategies available to primary producers, such as developing more cyclone resistant or resilient farm infrastructure, increasing fodder and water reserves, financial planning, diversifying production systems and employing farm disaster mitigation practices.

Farmers generally want to build their own resilience - they do not want to depend on the government or anyone else to bail them out. The incidence of catastrophic events are predicted to be on the rise, and yet the major NDRRA funds and QRAA loans are restricted to being used for replacement only. Farmers and their Ag-industry lobby groups strongly requested that this be changed to include on-farm spending to improve and adapt to the climate challenges that were so dramatically in front of them.

Farmers want to be able to build their own financial, operational and structural resilience so they have the freedom to make the choices they know they need to make, when they need to make them.

**Key Informant Feedback**

Key informants (66%) were strongly in favour of expanding QRAA Natural Disaster Assistance concessional loans to cover capital costs to upgrade operations and improve productivity, not only to repair or replace exactly what was damaged or destroyed.

“We need to get rid of this replacement only mentality. QRAA must devise ways to reward change for the better, not subsidise people to keep doing the same thing that didn’t work anyway. QRAA money said you had to do it the same as you had before. This is the most stupid thing!!! Suggest a new QRAA question should be: ‘what are you doing to improve your farm’ - and the reward should be there for those that are making themselves more resilient”(Key Informant comment, 2013)

QRAA and NDRRA were both heavily criticised for adhering to a “no betterment” policy. It does not make sense to use public monies to restore infrastructure, equipment and other capital items with the same systems that failed to withstand the cyclone. Key informants reported that it is very important that people rebuilding after cyclone and disasters are able to make improvements - this is the logical continuous improvement towards resilience approach.

A massive 85% of key respondents would like to see more farmers completing and implementing a farm risk management plan, including financial risk, infrastructure and farm operational practices risk mitigation strategies. Most saw that disaster related financial risk management plans are simply good business practice and can be promoted to large and small scale producers alike. However there was a definite strong reluctance to add to the red-tape and regulatory burden already experienced by farmers.

“Financial risk to a prawn farmer is structuring the farm so as not to let ponds of stock die - to do so can mean an instant loss of quarter to half a million dollars. Farms are faced with the
intricacies of growing prawns combined with an already over burden of too much red tape and paperwork.” (Key Informant comment, 2013)

When asked the question about linking financial risk management plans to insurance premium reductions, 70% of key informants agreed that this could be a solution that would demonstrate best practice business management and risk mitigation plans are being implemented to lower the risk to the insurance companies. There was a strong cautionary note from 13% of respondents again that suggested that there was a lot more research that needed to be done to determine the advantages and ensure the advantages of such a proposal outweighed the disadvantages.

“The financial and other advantages of risk management strategies need to be determined. Not just relationship to insurance premiums. There are other advantages - less loss of production, improved resilience, less personal hardship and psychological issues.” (Key Informant comment, 2013)

There was much discussion that risk management was simply sensible business practice. Best-management practice programs like the pastoralists business EDGE courses, QFF’s Taking Stock, and the cane and dairy programs are all well established and could include a section on risk management.

Farm Financial Counsellors (FFC’s) provided a free, confidential, one-on-one financial counselling from someone with Ag-industry knowledge to farmers, graziers and associated small businesses. An extraordinary 98% of key informants verified how helpful, necessary and even essential FFC’s were to recovery from cyclones, making this the most strongly supported single issue in the whole survey.

“My understanding is that these positions of farm financial counsellors have been severely cut - shame! I assume they would have been the group to lead the thrust of the above suggestions.” (Key Informant comment, 2013)

**Current issues surrounding farm financial risk management in Northern Australia**

- QRAA Natural Disaster Assistance concessional loans do not cover capital costs to upgrade operations and improve productivity and resilience to future events. They are not to be used for “betterment, only to repair or replace exactly what was damaged or destroyed.

- Few farmers are currently developing and implementing a farm risk management plan, including financial risk, infrastructure and farm operational practices risk mitigation strategies.

- Financial risk management plans could be used to negotiate insurance premium reductions. This could be a solution that would demonstrate best practice business management and risk mitigation plans are being implemented to lower the risk to the insurance companies.

- The Queensland government cut the funding for all of the 13 state permanently employed Farm Financial Counsellors in December 2012. There has been no indication of a replacement program, and so this valuable free service is no longer available to most Queenslanders except for designated periods after disaster events. The need for free, confidential, one-on-one financial counselling from someone with Ag-industry knowledge was the single issue most strongly supported by the Key Informants.
Potential solutions that may be explored

- QRAA concessional loans should be reviewed to include “betterment” as a requirement.

- Farmers should be encouraged to currently developing and implementing a farm risk management plan, including financial risk, infrastructure and farm operational practices risk mitigation strategies. A strategy for delivery could be to include this into the “Best Practice Management” programs being implemented into many agricultural sectors.

- Future studies should investigate the options for farm risk management plans to be used to negotiate insurance premium reductions

- Develop a new one-on-one government operated farm financial program with a Farm Risk Management and Resilience focus. A repositioned program to supply a free, confidential, one-on-one financial counselling from someone with Ag-industry knowledge to farmers, graziers and associated small businesses to replace the Farm Financial Counsellors Program.
7. Transport & Roads – market access

Roads and transport are a major cross-industry issue. Roads have an enormous scope and complex impacts as described in the following matrix. Continued reliance on road transport, by all industries, obviously has real risks to agricultural industry and the wider regional economy. There is a real need to strengthen contingency plans to maintain robust supply chains post natural disasters. Red tape including load restrictions, sometimes applied across large areas, is a major issue affecting current supply routes to markets. Growers fortunate enough to have stored product ready for market, or livestock at peak condition, can experience extensive delays because of complicated red tape to access permits and this leads to higher costs, reduced quality, market gluts when supply routes are reopened, all resulting in lower returns to the producer.

<table>
<thead>
<tr>
<th>Type of Road</th>
<th>Financial Impacts</th>
<th>Social Impacts</th>
<th>Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Farm Access</td>
<td>Repair costs, unable to carry out normal animal husbandry operations, disruption of pasture management practices lead to long-term loss of income, mustering problems. Unable to salvage crops, forestry and tree crops deteriorate further whilst waiting for clean up and operational maintenance.</td>
<td>• Extra workloads, deadlines missed, plans undelivered, financial strain from rising costs and uncertain ability to recoup with sales of product. • Additional safety and OH&amp;S risks of working in a damaged environment.</td>
<td>Animal welfare and animal health problems, wandering stock, weed and disease spread</td>
</tr>
<tr>
<td>Access to the farm</td>
<td>Inputs not able to be delivered, product and livestock not able to be sent to the processor / market at peak production. Leads to increased input costs combined with loss of income resulting in diminished returns to the farmer.</td>
<td>• Inability to reach normal social emotional and medical support. • Lack of involvement in industry and social groups leads to isolation. • Production losses result in financial hardship and emotional strain. • Increased safety risks, and employees not able to get to work. • Off-farm work not possible.</td>
<td>Wash-outs and trees across the roads, lead to alternative routes / longer journeys / detours and higher sediment loads in the run-off water.</td>
</tr>
<tr>
<td>Supply Routes closed</td>
<td>Inputs, markets, supply chains disrupted, freight costs increase, back-loading not available, not covered by produce insurance on detours Insurance nullified by taking alternate route. Perishable goods unable to get to market (eg: milk, eggs, and fruit).</td>
<td>• Delayed freight of food and goods - food shortages - Communities run out of food and medical supplies. • Transport company workers, including truck drivers experience fatigue, pressure and decision-making stress as well as additional safety and OH&amp;S risks of travel, and work loading and unloading freight in a damaged environment.</td>
<td>Animal welfare, product deterioration &amp; environmental disposal issues. Low load limits on in-land routes means more truck movements and less environmental efficiency.</td>
</tr>
</tbody>
</table>

Table 12: Transport system Issues
Issues and Suggested Solutions from the Post-Disaster Data Set

- Repair and rebuild regional road networks, flood-proof those with no alternative routes.
- Real time access to information on road closures, load limits and temporary permits to enable trucks currently on the road with produce/livestock to make well-informed decisions.
- Flexibility and bureaucratic approval speed to allow practical rural solutions to keep freight moving post-disasters eg: bridge load limits, road access permits, and fatigue management authorizations. A proposed solution was the establishment of Disaster Control Centres (run by relevant DTMR officers) which has authority to reduce red tape and issue special permits to waive load limits and driver relief requirements in disaster situations, when such vehicle movements are necessary to ensure animal welfare, or food security.
- Coordinated approach to freight movement. After Natural Disasters, the Rural Lobby Groups go in to lobby for their own sector, resulting in senseless inclusions and exclusions eg: beef but not prawns.
- Contingency plans to be developed and agreed to by industry bodies to facilitate the above during and immediately following disaster events.
- Integrated Transport Infrastructure Planning needed – road, rail and port.

Key Informants Feedback

- Key informants recognise that post-disaster transport in North Queensland has made a good deal of improvement in the area of post-disaster transport from 2006 (Larry) to 2011 (Yasi) according to 62%. A small but significant 5% believe the post-disaster transport situation has actually deteriorated for Ag-industry.
- Road infrastructure improvements were called for by many of the key informants. Calls for the Bruce Highway to be further upgraded to provide more consistent access along the normal coastal route and the need for improved inland options were highlighted.

  “Upgrade the Bruce Hwy to above normal flood peaks and replace Nettle Creek Bridge so the inland route remains open more often.” (Key Informant comment, 2013)

- Access to accurate and timely information on road closures/detours and changed conditions are necessary for Ag-industry products to continue moving post-disaster. Accurate, relevant information needs to be able to be accessed in real time on the move, to enable trucks currently in transit with produce or livestock to make well-informed decisions. This need was overwhelmingly endorsed by 73% of key informants, who agreed strongly, plus another further 21% who agreed and no one disagreed.
  - Communications is a priority for any system
  - Transport companies communication systems are the best
  - Qld police Facebook site is good for road closure information
  - NSW rural fire services have an app with real time information on bushfires.
- Post Disaster transport co-ordination - There was enormous support for a coordinated approach to post-disaster freight movement.
• **Integrated (road, rail and port) Transport Infrastructure Contingency Plans** - Over 90% agreed or strongly agreed that these need to be prepared and agreed to by Ag-industry

• **Red-tape reduction**
  
  – Drivers working longer shifts to travel alternate transport routes due to road closures. Driver fatigue and relief driver requirements become problematic as there was increased difficulty picking up relief drivers in remote areas.

  – Load limits on roads and bridges caused problems because there were no available vehicles of smaller capacity or configuration. Industry transport systems for commercial feed and livestock are geared towards high volumes and large numbers for sound economic and environmental reasons.

  – During a period of road and transport dysfunction, it is proposed that greater consideration be given to temporary permits or curfew windows to allow for vehicle movements without undergoing the full Performance Based Standards process that is typically required.

  – The Queensland Government is offering transport-related assistance to affected businesses. This includes options to extend dormant seasonal vehicle registration periods up to two years.

    “A single point of contact for growers in an affected area to coordinate transport, into and out of an area, is a critical aspect needed for a faster and efficient recovery after an event.” (Key Informant comment, 2013)

• **Costs increase** due to the absence of back loading opportunities usually provided by the huge volume of horticulture freight travelling to southern markets and respondents were concerned that there may have been some possible profiteering by transport and other companies.

• **Freight insurance** is nullified if loads have to take alternative routes to avoid floods.

Current issues surrounding agricultural transport and roads in Northern Australia

• **Many of the key informants called for Road infrastructure improvements.** Repeated requests called for further upgrades to the Bruce Highway to “flood-proof” this major freight route to provide consistent supply chain access along the normal coastal route. The need for improved alternative inland options was also highlighted.

• **Post disaster transport co-ordination** is a critical need, particularly in the area of agricultural stock and perishable goods freight movement. Growers and transport companies need a single point of contact in a disaster affected area to ensure freight keeps moving for a fast and efficient recovery.

• **Access to accurate and timely information** on road closures/detours and changed conditions is essential for Ag-industry products to continue moving post-disaster. Accurate, relevant information needs to be able to be accessed in real time on the move, to enable trucks currently on the road with produce/livestock to make well-informed decisions.

• **Post Disaster transport co-ordination** is currently managed through the Disaster Management Groups and the State disaster management arrangements. There is a need to make sure the right people are linked into this system to ensure that businesses reliant on freight understand how to get their issues dealt with quickly and effectively.
• **Integrated Transport Infrastructure Contingency Plans** that utilise and account for all of the available road, rail and port infrastructure in a region, need to be prepared, negotiated and agreed to prior to the disaster to enable quick responses to freight movement issues. An agreement on this contingency plan and a clear checklist for a hierarchy of needs would enable quick implementation of operational decisions following a disaster event. A cross sectoral group should be formed and given the authority to look across normal silos to develop an Ag-industry Disaster Transport Plan that can be rapidly implemented post disaster. Practical people to be involved in the construction of this contingency plan would include

  – Transport companies involved in transporting livestock, produce and perishable finished goods
  – Ag-industry groups
  – Insurance experts
  – Disaster Management
  – Government departments involved in permits and other red-tape

• Freight insurance should be investigated to ensure that stock continues to be insured when taking authorised alternative routes to market.

• Investigation and monitoring of freight costs to prevent profiteering

**Potential solutions that could be investigated**

• Integrated Transport Infrastructure Contingency Plans prepared and agreed upon perhaps through a regional Roads Alliance, focused to keep supply chain freight moving post-disaster

• Post-Disaster Transport Control Centres

• Post –Disaster Ag-industry Management Group – Regional and State levels

• Government intervention in freight insurance in the post disaster phase.

• Vegetation Management Act to incorporate a practical clearance width that accommodates the height of the surrounding vegetation to protect road infrastructure and ensure access is not unnecessarily disrupted.

• Government intervention in post-disaster profiteering through freight.

• Improvements in accurate and timely information on road closures/detours and changed conditions, and transfer of this knowledge to the people on the ground.
8. Regional Economic Recovery

The initial focus after a cyclone is obviously on damage and destruction of infrastructure and the impact on people’s lives, their homes and their personal possessions. Industry, especially primary industry, had been devastated, and post cyclone Larry estimates give the agricultural economic damage (foregone income) as upwards of half a billion dollars (Cosgrove, 2007). This devastating effect resulted because agriculture, and tourism are the predominate cornerstones of the far north Queensland regional economy and both these sectors were severely impacted by Cyclone Yasi and Larry.

Agribusiness and tourism are economically linked in many ways particularly food supply, food tourism, farm-stays, as well as the appealing rich country culture and visual amenity of rolling green grazing hills and fields of bananas and sugar cane provided by agriculture in a tropical climate.

“The primary industry sector has been and is providing stability to the regional economy. This sector is vulnerable to change. Food security is vulnerable. More extreme events with flooding will make communities more vulnerable based on current transportation.” (Dale et al., 2011)

Recurrent localised disasters in the same geographic area leads to reduced investment due to the perceived risk of asset loss and out-migration from the stricken area. Two catastrophic events in five years means that Agricultural Industry groups were now well versed in response and recovery programs and immediately swing into action with back-up support from processors, supply chain stakeholders and government field staff.

The Operation Recovery Industry Action Group (ORIAG) preliminary assessment of the economic and related impacts, less than a month after Cyclone Larry hit Far North Queensland estimated the total loss of agricultural production in the far north to be around 8%, or approximately $500 million. In response to the massive damage sustained in cyclone Larry, and the need to, the $80 million State and Federal government disaster assistance package was calculated to reduce the losses down to 5% or $330 million. (Cosgrove, 2007) Job losses in the region that had been estimated to be around 2,500 full time equivalents (FTE) were predicted to be reduced to 1,800 FTE with the government assistance.

Farm infrastructure damage is an additional loss and the proportion of affected producers with insurance coverage and the capital damage to agricultural industries and associated insurance payments has developed into a major ongoing issue. The ORIAG report suggested there had been significant damage to 40-60 per cent of farms from Cairns to Cardwell. $230,000 was reported as the initial average farm infrastructure and milk losses (after insurance) on more than 120 dairy farms on the Atherton Tablelands.

Industry sectors affected by the cyclone need early targeted support measures to speed up the recovery. The degree to which emergency assistance is accessible under NDRRA is categorised by the degree of disruption to a community or region. Primary producers must be located in one of the disaster declared local government areas for assistance under NDRRA.

Ag-industry learnt a lot about response to emergencies from the Cyclone Larry disaster. These learnings were then tested and refined in 2011, the year of Natural Disasters when three-quarters of Queensland was declared a disaster zone because of the flooding caused by ex-cyclones in December 2010 and January 2011. Then in February, Cyclone Yasi hit the same area of North Queensland that was devastated just 5 years prior by Cyclone Larry, and continued its path of destruction well inland.
“Post Larry, the Innisfail district lost its entire banana crop and around 50% of sugar production. The nine-month loss of bananas featured in the nation’s economic statistics in 2006 and provided material for many stand-up comics” (Key Informant comment, 2013)

The far north Queensland region faces specific economic challenges in the weeks and months after a cyclone because of its reliance on a few key agricultural industries, mainly sugar, beef and bananas that take several months and even years to recover from the massive damage inflicted. Grazing, sugar cane and bananas are the backbone of agriculture in far north Queensland. They are well suited to the wet and dry seasonality of the climate and they are to some extent resilient to cyclone damage as they return to production relatively quickly. However, repeated catastrophic events such as intense cyclones in short succession could devastate even these industries.

The personal and business financial assistance packages help ensure that businesses continue to operate, that workers keep their jobs, and that devastated regions recover quickly, and are in a good position to continue economic growth once the recovery is underway.

The total loss in the gross value of agricultural production was between $365m and $545m over a 12 month period post cyclone Larry. (Cosgrove, 2007) This represented 50 per cent of the forecast agricultural output of the region. Some 85% of the banana crop was lost (with a gross value of lost production of around $283m). Sugar cane production was also severely affected, with reductions due to damaged crops and reduced sugar content (around $111m). Other tropical fruit, nut and citrus growers and the forestry and dairy industries all reported significant losses that became more apparent as time progressed. The relatively small tropical dairy industry reported an estimated $40million reduced dairy related spending into the regional economy due to Cyclone Larry alone.

In his role as coordinator of the Cyclone Larry recovery, General Cosgrove took a triple bottom line view and managed basic human welfare, social, economic and environmental aspects as equally important parts of the response and recovery. Under his leadership, outside agencies worked with the existing local systems to build the local response, and thereby contributed to leaving a lasting legacy of increased local community capacity, ownership and resilience.

**Issues and Suggested Solutions from the Post-Disaster Data Set**

Government financial assistance programs targeted at primary producers and businesses expedite recovery not only of these businesses, they effectively support the entire regional economic recovery after cyclones and other natural disasters. General populous financial assistance relieves immediate cash flow problems, stabilises employment and provides a stimulus to local economies affected by the natural disaster.

Government financial assistance packages are designed to ensure that farmers and graziers have the hope and resilience to pick themselves up and continue the farm business so they support a solid economic recovery. Wage subsidies give farmers the provision to retain skilled employees who might otherwise have been displaced from the region. The suite of government interventions are welcome additions to maintenance of the regional economy.

The post cyclone Yasi government assistance package included QRAA concessional loans of up to $650,000 for eligible businesses, primary producers and not-for-profit organisations suffering extreme damage, with a grant component of up to $50,000. Wage assistance for employers, including primary producers for up to 13 weeks and a $20 million Rural Resilience Fund to help fund business and community support activities, such as farm clean-ups, counselling and social support measures. This assistance built on a range of measures that had already rolled out, including granting more than 200,000 claims for Australian Government Disaster Recovery Payments that injected more than $230 million into cyclone-affected communities.
Support services like farm financial counsellors, industry recovery officers, one-stop shops assist farmers and other small businesses to access disaster income recovery assistance grants and concessional loans, and the Premier’s disaster relief fund are all much appreciated after a catastrophic event such as a category 4 or 5 cyclone. Farm debt ratios and farm financial risks are intensified by natural disasters such as cyclones when reduced income is combined with additional expenses for repair, replacement and resilience building. (QRAA, Queensland Government, 2011)

Operation Farm Clear (OFC) started as an initiative within the dairy recovery team, and quickly became one of the success stories of cyclone Larry. More than 1000 farms received help to clear vegetation from the fencelines, paddocks and infrastructure. The OFC and Community Jobs Plan project, managed by Queensland Department of Primary Industries provided employment and training for farm workers displaced by the cyclone and the local unemployed. Many displaced workers returned to work in primary industries with new skills and experience and others who had been long term unemployed gained new skills to find work. These learnings were carried through to the cyclone Yasi Operation Clean-up that also proved to be a successful recovery tool.

The Cyclone Yasi funded rural resilience projects that allowed industry to make their own decisions about what “betterment” projects would help their industries the most, were great examples of what can be achieved when there is collaboration between industry and government to develop field officers and farmer led initiatives.

More broadly, several sectors called for research, development and extension with consideration of new resilient farm infrastructure including horticulture protective cropping structures, risk mitigating farm management and farming practices, diversification and alternative variety selection and better marketing initiatives to build farmers own levels of resilience.

In the wake of a catastrophic event regions rapidly rebuild without taking the opportunity to review the region's long-term economic goals and allowing the destruction of the old to provide the necessary impetus for economic rejuvenation and renewal.

Key Informants Feedback

Government disaster funding is a critical success factor to relief and response after a natural disaster. Much of the government disaster funding is directed at retaining businesses to maintain a strong regional economy. Agricultural businesses were very appreciative of all of the government assistance and recovery packages that were provided to ensure a strong and sustained recovery. Respondents believe the government assistance packages are an essential part of the disaster relief process but there needs to be a thorough exploration of agricultural business needs for effective long-term industry resilience and stability.
Table 13: Effects of government funding on recovery

Key informants validated that all of the components of the financial assistance made available to primary producers after the cyclone, were important for the recovery of the regional economy, and prioritised the positive effect that they have in the following order:

- **Natural Disaster Relief and Recovery Arrangement (NDRRA)** provides funding to States and Territories to help pay for natural disaster relief and costs when recovery expenditures for a disaster exceed a given threshold.

- NDRRA funding to repair roads and other infrastructure was validated by over 90% of respondents as having a positive or very positive effect on regional economic recovery. The Queensland Reconstruction Authority QRA set up after Cyclone Yasi and the “Queensland Summer of Disasters 2010-2011”, received some criticism for adopting an extremely limited view of repair and replace, and by adding another level of bureaucracy it was criticised for contributing to delays in reconstruction. Note: A Queensland Reconstruction Authority Amendment Bill 2013 expanded the jurisdiction of the QRA legislation to include the Ex Cyclone Oswald flooding in South East Queensland, and provided for a stronger focus on disaster resilience.

- 85% of respondents confirmed that wage subsidies were necessary to retain key skilled employees within the business and community. After a disaster, out migration is a real problem for the local community and economy and wage subsidies attempt to mitigate that.

- **Industry Recovery Officers (IRO’s)** working directly with agricultural enterprises played a crucial role in recovery and were considered essential. There were a few negative comments related to the skills and experience of the appointed officer, and there was a cautionary note about ensuring there was no duplication of services with the QRAA Client Liaison Officers.

  "**IRO’s are essential to keeping producers and businesses sane through the marathon rollercoaster maze of recovery**" (Key Informant comment, 2013)

Business grants are an absolute bonus to businesses besieged with all of the post-disaster costs, and a key motivator and injection of confidence into the economy.
QRAA concessional loans were seen as necessary to the recovery efforts, however key informants raised a couple of issues

- Loans are still loans, and many farmers were reluctant to apply again after cyclone Yasi, as they were still committed to repaying the cyclone Larry loan, and the debt to equity ratio of increasing that loan would have been crippling.

- QRAA loans need to encourage a more resilient future, not merely support repair and replacement of the same non-resilient structures, equipment and practices that were destroyed.

  “We just wanted to buy a bigger chainsaw! Farmers have always got to be able to upgrade and improve – not just repair and replace” (Key Informant comment, 2013)

- QRAA concessional loans were made available to small businesses, but there were requests to make them available to a wider group of businesses, especially those whose income is directly related to on-farm spending. On-farm contractors are often quite severely impacted, however these impacts are not structural, and loss of income is not recognised in the eligibility criteria.

  “On-farm contractors face the same economic impact as farmers but were not recognised for QRAA funding assistance.” (Key Informant comment, 2013)

NDRRA Freight subsidies worked to ensure that farm inputs of products that were not available locally after the cyclone, eg: grain, were able to be freighted up to the region. The other impact to freight was that because there was such a massive reduction in bananas going south, there was no backloading to off-set the cost of freighting anything to the far north.

The Rural Resilience Projects were a new initiative introduced after cyclone Yasi. They provided up to $99,000 for industry projects that built rural resilience. There was no negative feedback about this program, and a good deal of positive comments about the effectiveness of industry led initiatives being more successful.

Table 14: Long-term effects of cyclones on workforce

Government plays a vital role in the recovery stage of disasters by providing jobs and training opportunities in the clean-up operations to retain the workforce in the local community. One of the
lessons learned from cyclone Larry was that there was a demand to match employers with employment opportunities with prospective employees deposed from their jobs because of the devastation.

The key informants feedback suggests that one effect of cyclones was an out-migration of skilled local workers who were later replaced on-farm by skilled contractors. This was perhaps because skilled workers were able to find other employment, most likely in the strong Queensland mining sector.

“Other factors e.g. mining industry workforce demand has probably had most impact on skilled labour and tradesperson supply to rural industries.” (Key Informant comment, 2013)

Casual local labourers were replaced with more backpackers when production restarted. According to the key respondents, the permanent local unskilled labour force situation appears to be basically unaffected, possibly because of the government employment subsidies and alternative work and training schemes that were made available in the post-disaster clean up.

Temporary accommodation businesses that were able to continue to operate received a boost from the government, insurance, clean up and reconstruction workers who inundated the hardest hit areas over the weeks, months and even years following the cyclones. Temporary tourism accommodation was severely negatively impacted initially and is still feeling the effect that two concurrent events have had on consumer confidence.

Some on-farm contractors received a positive boost from the works funded by government and insurance that flowed into the area for reconstruction. However, other on-farm contractors suffered because their normal scheduled work was depleted as landholders diverted their attention and money into the clean-up efforts. Cash-flow problems due to crop and livestock damage also affected the farmer’s ability to employ outside contractors to help with the clean up and repair tasks.

Table 15: Economic flow-on effects of cyclones

With the sort of resilience, you would expect of primary producers, the agricultural economy has regained a viable and self-sustaining footing. The flow-on effects were most severe for the local transport companies, local suppliers and processors. Some sectors of the regional economy such as retail and rental accommodation enjoyed a short-term boost to their business; however, the longer-term effects of a downturn in the regional economy definitely affected these businesses. Construction and repair services also injected activity into the economy. However, full recovery still lies in the future for
many businesses and some long-term casualties remain such as producers of tree crops, where trees have been destroyed and new trees will take a number of years to produce cash crops.

“Regardless of the government bailouts, two major cyclones plus minor flooding, bushfires, a global financial crises and a regulatory framework that fails to support primary industries has weakened the farmers and graziers ability to pick themselves up and go again” (Key Informant comment, 2013)

It is now well understood that the immediate response assistance packages are not the only support needed. There is a need to build up farm financial resilience and cash reserves including Farm Management Deposits (FMD) so that in times of disaster, agriculturalists can better manage seasonal variables and build their own natural resilience into the farm business.(http://www.ato.gov.au/taxprofessionals/content.aspx?doc=/content/00281622.htm, 2013)

Current issues surrounding economic recovery and agricultural contribution to the regional economy in Northern Queensland

- Insurance premiums have skyrocketed (discussed in detail in Insurance section) which is a huge impost on farm businesses. Some farms are increasing their risk by reducing their cover, or simply opting out of insurance. This puts the whole regional economy at risk, as government disaster assistance cannot replace adequate and appropriate insurance cover.

- NDRRA arrangements have become too centralised, overly bureaucratic and unwieldy.

- The FNQ regional economy has experienced many traumatic events in recent years. There is very little knowledge or economic benchmarking and adaptation strategies has got to be long-term and based on sub-regional data because of the huge geographic, climatic and economic differences. This could be fundamentally linked through the Regional Development Australia RDA framework.

- The current regulatory framework does not support primary industries. It places a huge regulatory burden on rural landholders and has eroded their private property rights.

- Queensland State Government has removed the funding for on-going farm financial counselling that was so important to agricultural enterprise making recovery, resilience and repositioning decisions.

- It is now well understood that the immediate response assistance packages are not the only support needed. There is a need to build up farm financial resilience and Farm Management Deposits (FMD) so that in times of disaster, agriculturalists can better manage seasonal variables and build their own natural resilience into the farm business.

- Tropical exotic fruit growers are still reeling from the effects and require special consideration for added recovery support and resilience building.

- After two catastrophic natural disasters in the space of the last seven years, the rural communities surrounding Innisfail, Tully, Cardwell, and inland through the Southern Atherton Tablelands need continued support to build resilience and reposition themselves within the drastically changed landscape. The cyclones have triggered a period that some innovators have seen as creative destruction of the old thinking, and more needs to be done to build and promote adaptability and resilience.

- More broadly, several sectors called for research, development and extension with consideration of new resilient farm infrastructure including horticulture protective cropping structures, risk mitigating farm management and farming practices, diversification and alternative variety
selection and better marketing initiatives to build farmers own levels of resilience and ability to adapt to changes.

- The government assistance packages are an essential part of the disaster relief process but there needs to be a thorough exploration of agricultural business needs for effective long-term industry resilience and stability.

Potential solutions that could be investigated

- NDRAA reform to attain stronger focus on disaster resilience and adaptation strategies including devolution of power and upfront risk management assessment and adaptation plans.

- Assess the agricultural component of disaster mitigation strategies for long-term triple bottom line sustainability and resilience.

- Rebuild a regulatory framework that is supportive of primary production and farmers based on a resilience approach that incorporates incentives to change, innovate and adapt.

  “Rather than focusing on the need to control natural variability and to maintain the system in some sort of perceived optimal state, a resilience approach to management and governance would instead focus on alternative system regimes and thresholds and the capacity to avoid or manage them.” (Brian Walker, 2006)

- Research, development and extension with consideration of new resilient farm infrastructure including horticulture protective cropping structures, risk mitigating farm management and farming practices, diversification and alternative variety selection and better marketing initiatives to build farmers own levels of resilience and ability to adapt to changes.

- Develop a new one-on-one government operated farm financial program with a resilience focus.

- Explore agricultural business needs for effective long-term industry resilience and stability

- Review insurance options, premiums, availability, affordability and suitability.

- Exploration of agricultural business needs for effective long-term industry resilience, stability, and the relationship to post-disaster government assistance schemes.
9. Power

Restoration of power after cyclones is one of the most urgent tasks, not only for households, hospitals, and other vital public services, but also for the intensive livestock primary producers. Prolonged loss of electricity affects every agricultural enterprise.

“The broad scale loss of power and projected long term disruptions, particularly in some of the more remote rural communities across the southern Tablelands and some nearby coastal towns and resorts, posed a number of serious dilemmas for disaster managers and in particular the local dairy and aquaculture industries.

The Department of Public Works was tasked with sourcing and connecting generators to enable primary industry producers to recommence operations and subsequently avoid animal and industry losses. Generators were also sought and installed to maintain power at a range of Telstra Mobilenet communication facilities.” (Post-disaster data comment, 2013)

Post Cyclone Larry and Cyclone Yasi, each type of farming enterprise was impacted in a different way. Depending on the reliance on electrical power within their business, whether they had alternatives immediately available, whether these alternatives were able to run every part of their operations, and system failures due to the length of time off-grid (20 days) and systems that were impacted by the cyclone. A small number of properties that are permanently off-grid with stand-alone power systems were relatively unaffected.

Severe disruption to domestic power supply causes many household inconveniences and safety concerns that have to be quickly assessed and minimised. However, on the intensive livestock farm, there are many extra concerns because loss of power also means loss of water and possibly feed for stock, housing, plant and equipment hygiene practices disrupted, and can mean that normal animal nutrition and husbandry regimes are interrupted and animal welfare needs can escalate rapidly.

Loss of power also means loss of refrigeration, and therefore stock that has already been harvested, often has had value added and is ready for market, starts rapidly deteriorating. Fruit and other stock that may be able to be salvaged will need refrigeration to prevent spoilage.

Loss of power also means loss of telecommunications, which means the business can grind to a halt, along with the ability to communicate with others on and off the farm, access information and reach emergency services. Mobile phone systems tended to be less reliable in Yasi than 5 years previously in Larry. This was because mobile towers failed, as they lost power after 24 hours as Telstra had no back-up power supplies.

Intensive livestock producers such as dairy, pig, poultry and aquaculture, as well as small farms and graziers spend many long and often emotional hours ensuring livestock animals needs are restored as quickly as possible after cyclones. Many farms were without power for ten days to three weeks after Cyclones Larry and Yasi.

Intensive animal industries, in particular the dairy and aquaculture industries, have a high level of reliance on power for running milking machines, vats, cold stores, automatic feeding and watering systems and aeration pumps and it is evident that it is necessary to provide adequate generators to run this essential equipment. Life and death of the animals is determined by the ability to power the living conditions of intensive livestock. The majority of intensive animal farming enterprises have invested heavily in back-up power supply systems and ensured that the installation has built in resilience.

Housed pigs were not able to be moved while repairs were being undertaken as there was no alternative structures available to hold stock temporarily. Pigs that are used to being shaded are particularly vulnerable to UV exposure, and the SES is not allowed to issue tarps for animal shelters.
All the aquaculture farms between Mossman and Cairns experienced a loss of mains power and relied heavily on generators in the wake of Cyclone Yasi. The majority of farm issues related to electrical damage meant that they were unable to pump water, oxygenate the ponds and refrigerate the product. This resulted in stock mortalities, loss of processed stock ready for markets and a long, difficult and expensive road to recovery.

Due to the severe disruption to domestic power supply, there was an urgent demand for generators that made them difficult to source at the critical response stage.

Some of the reported power problems resulted from the extended period of time without power. Diesel and petrol storage facilities proved to be inadequate. Generators and PTO’s on tractors were not matched to the task of such a heavy load for extended periods and in many instances failed to stand up to the job after several days.

Cyclone recovery of power is carried out by the service providers (Ergon, Powerlink) themselves mostly using their own resources. They are constantly upgrading and maintaining their networks to minimise the number and duration of power interruptions. Government assists in instances like airlifting electricity pylons and priority road access.

The concerted effort to provide consumers with accurate and timely information on where power outages are occurring and when it is likely to be restored appears to flow quite successfully as the flow of power outage and restoration information was not raised as an issue in any of the Post Disaster Data. Local links between intensive industries in the far north and Ergon Energy are now well established and rehearsed. These strong links allow strategic deployment and re-deployment of private generator assets as the power infrastructure is restored.

The lessons learned after Larry triggered a review of Powerlink’s emergency management procedures which now include a specific preparedness plan for cyclones that was tested in a joint exercise with Ergon Energy in November 2006 (Final Cosgrove report)

Issues and Suggested Solutions from the Post-Disaster Data Set

- Government supplied generators, borrowed or purchased generators and the timely allocation and supply
- Water solutions: Water trucks, small 'fire-pump' style pumps
- Processors require huge generators – beef, aquaculture, sugar, dairy, poultry, pigs
- Provisions made to allow emergency supplies of diesel through declared disaster areas
- Telecommunication companies should provide generators for their mobile phone towers, and work with Local Community Disaster Groups to keep them operating
- Intensive livestock and aquaculture enterprises to have backup power supplies to ensure animal welfare
- Government pool of generators available for short-term hire in extreme circumstances
- Provision of back-up power on farms can be cost-prohibitive – Industry/Government incentive scheme to purchase generators for intensive livestock industries
- More resilient alternative energy solutions developed for backup power supply
- Prioritise planning to have power lines underground in cyclone prone areas
Key Informants Feedback

- There was a strong 63% positive reaction to the question of whether Key Informants believed that the situation in regards to power on farm had improved from 2006 (Larry) to 2011 (Yasi) to now. A further 35% thought there had been no improvement and only 2% believed the Ag-industry situation had actually deteriorated in that time.

- 54% of key informants agreed that it should be mandatory for intensive livestock and aquaculture enterprises to have back-up power supplies to ensure the welfare of the animals, however nearly 13% disagreed. Those who did not agree believed it should not be a mandatory requirement as each business manager is responsible for managing their own risk. There was a cautionary note about trying to legislate out all risk, as often there is structural damage to the intensive livestock facilities during a disaster that could prevent the facility from being safely powered for some time, through either the mains system or alternatives.

- Every key informant agreed that ensuring telecommunications are powered is critical and that telecommunication companies should provide generators for their mobile phone towers, and work with Local Community Disaster Groups to empower them to keep these fuelled up and running in a prolonged emergency. Absolutely nobody disagreed with this statement.

  “All telephone exchanges & towers need to have 24/7 back-up power supply capable of supporting the network for a minimum of 7 days straight.” (Key Informant comment, 2013)

- Generators supplied under the disaster management arrangements are prioritised according to human welfare first, animal welfare requirements next and then numbers of FTE (Full time equivalents) employees. Review in regards to the animal welfare provisions is called for.

- The ongoing provision of fuel to power the generators must be an area wide coordinated effort e.g. Identified and planned fuel depots for delivery and collection after an event.

- Dairy Farmers provided a generator subsidy scheme after cyclone Larry. Large (30-50 KVA) standby/stand-alone generators that can also power the house and dairy will be a major consideration for most dairy farmers impacted by natural disasters including the recent flooding from ex cyclone Oswald in central and southern Queensland.

- Prioritise future power infrastructure improvements necessary to build resilience. Far North Queensland still has to contend with three types of power system, the normal two phase, three phase which is needed for most industrial and agricultural properties, and the old single wire earth return (SWER) lines that still provide power to many outlying farms and properties.

  - 3 phase power should be supplied to all farms
  - Underground power in cyclone and flood zones

- The development of alternative energy solutions for back-up power supply received strong support from the majority of key informants where 40% of key informants agreed and 27% strongly agreed that there should be more.

  “There is a need to encourage more farms to move to "green energy" options like wind and hydro as well as sun - all need battery backup, and government incentives. Why is there only an incentive for solar?” (Key Informant comment, 2013)

- Alternative power supplies need to be properly sized, designed to fit the purpose, installed and maintained to ensure the system works when there is no grid supplied power. Some systems failed to meet the needs of the property owner, and in some cases poor installation has led to safety risks.
Large commercial wind turbines require a generator as a basis to generating power from natural energy sources.

“Wind Farms need to have base back-up power supply so they still ‘think’ to operate to generate local power when high voltage lines are isolated. (Eg following regional disaster). Wind turbines need 240v to the computer systems before they can generate power” (Key Informant comment, 2013)

- An innovative solution was suggested to have mobile biomass plants that would generate power from the enormous amount of vegetation that usually becomes a problem after cyclones. Using this green waste to produce energy would remove the risk of it spreading weeds and pests like crazy ants when it is turned into mulch.

“There should be support for mobile biomass plants that can hook up to the grid after a cyclone, using the waste produced from the cyclone we can generate power, instead of it going to waste!” (Key Informant comment, 2013)

Current issues surrounding power for agricultural in Northern Australia

- Ensuring communications are powered is critical and that telecommunication companies should provide generators for their mobile phone towers, and work with Local Community Disaster Groups to empower them to keep these fuelled up and running in a prolonged emergency.

- Energy security needs more flexible baseload generation locally combined with resilient new power infrastructure to mitigate risks such as 3 phase power supplied to all farms and underground power in cyclone and flood zones

- Alternative energy could provide solutions for baseload power supply, but little is known about these options, including the design, maintenance and installation to ensure robust and resilient systems for whole communities

- Research and Development of alternative energy solutions for back-up power supply post disaster events aimed at decreasing the reliance on mains power is needed. These solutions then need to be widely disseminated and implemented.

- Intensive Livestock and aquaculture venture need back-up power supply to decrease animal welfare issues after disaster events.

- Review of the priority allocation of generators procured under the disaster management arrangements in regards to the animal welfare provisions is called for.

- Generators become unavailable for purchase or hire by primary producers in post-disaster situations.

- The ongoing provision of fuel to power the generators must be an area wide coordinated effort.

Potential solutions that could be investigated

- Telecommunication companies should provide generators for their mobile phone towers, and work with Local Community Disaster Groups to empower them to keep these fuelled up and running in a prolonged emergency.

- Expand the Tablelands Regional Council Model of Local Community Disaster Groups to assist with mobile tower response.
- Industry/Government incentive scheme for intensive livestock industries to purchase generators or invest in alternative power generation programs to ensure future resilience should be investigated.

- Prioritise planning to have three-phase power available to farms, and power supply infrastructure located underground in cyclone prone areas.

- Review the priority allocation of generators supplied under the disaster management arrangements in regards to the animal welfare provisions.

- Investigate a government pool of generators available for hire in post-disaster situations.

- Identified and planned fuel depots for delivery and collection after an event.

- Prioritise RD&E of alternative energy solutions to provide flexible baseload power supply locally in post disaster situations including implementation and commercialisation options.

- Alternative energy solutions for baseload or back-up power supply should be researched, developed and the knowledge disseminated widely, including commercialisation options, and government incentives to adopt solar, wind and hydro alternatives on farm.

- Mobile biomass plants could hook up to the grid after a cyclone, using the waste produced from the cyclone to generate power.

- Wind farms could supply power to whole communities via local feeders. This could then provide back-up power for that community when high voltage lines are out, providing the wind farm has a small back-up power supply itself.
10. Agricultural Disaster Response and Recovery

Australia is known as a land of contracts and natural disasters including droughts, floods, bushfires, storm surges and cyclones are features of the landscape and climate that will continue to have personal, economic environmental and emotional impacts that take many years to recover.

“Human life is number one, no matter what. Everything else is able to be phased and staged and is much easier to manage if your alive and not grief stricken.” (Key Informant comment, 2013)

It was very apparent during the course of this research study that emergency and disaster management in Australia is undergoing rapid reform. The Council of Australian Governments’ National Strategy for Disaster Resilience aims to enhance Australia’s community and organisational capacity to better withstand and recover from emergencies. Disaster resilience will strengthen when government, industry, communities and individuals collectively adopt risk-based planning and mitigation strategies.

“The introduction of building construction standards for wind loads beginning in 1975 has proved to be a most effective form of mitigation. Very few buildings constructed since 1975 have suffered more than minor damage by winds in the 10 cyclones that have had an effect on Cairns since that time, though substantial damage has been done to vegetation and power lines. There is little, however, that can be done to reduce the risk of wind damage to sugar cane or tree crops such as banana and pawpaw” (Australian Geological Survey Organisation, 1999)

One of the great outcomes of not only one, but two catastrophic events hitting the same rural areas in such a short space of time, is the creative destruction of old levels of thinking, such as that there is little that can be done to reduce the risk of wind damage to sugar cane or tree crops such as banana and pawpaw. There have been remarkable advances in this area of agriculture, with a lot of the creative research completed by farmers themselves and shared with other farmers.

As advances in digital technologies and productivity continue to be made, real-time situation information will direct more and more disaster management decisions. Knowing how to access real-time situation information, interpret it, make informed decisions and respond appropriately to the abundance of rich information is key. Furthermore, communicating information to raise community awareness about the risk of a disaster, an unfolding disaster or what to do after a disaster is also important. Rapid access and sharing of accurate, integrated information is critical for governments, rescue agencies and communities to make life-saving decisions and effectively co-ordinate disaster responses.

Issues from the Post-disaster Data

Department of Primary Industries (now DAFF) assisted with the provision of twenty nine generators to seven aquaculture farms(aeration purposes) and forty six dairy farms (mostly to run milking machines) at a cost of $233,401.57, with $224,951.13 claimed back through NDRA. Generators were moved around as power was progressively restored. Also, the supply of two portable milking machines via Hercules aircraft was organised and a vehicle and trailer transported these milking machines on a continual basis for five weeks around dairy farms on the Tablelands. Electricians were contracted to assist with the installation of generators. Coordination through the SDMG and the Dialogue for Action process enabled this program to be rapidly integrated into the NDRA to ensure it was properly funded.

Animal industries also required emergency assistance to repair damaged vital infrastructure such as feed and hay sheds, fences and yards.

Animal Welfare: Provision of more information and education on what laws are being violated if animal’s needs are not met quickly. Intensively housed livestock are solely reliant on their owners for their every need. Recovery agencies need to have a better understanding of animal welfare legislation and its implications on the stockowners Animal welfare issues should be given increased importance.
when intensive livestock producers are seeking assistance in regard to power, tarps and effluent problems

Animal welfare needs of intensive animal industries were compromised as a result of Cyclone Larry. Welfare issues included mortalities, an increased incidence of disease, animal stress and suffering, fertility and production losses.

Government assistance yes, but please see all previous comments about the basis being government assistance delivered through empowered local community services as much as possible. Perhaps the next-to-immediate Government assistance (after emergency services), should be about acting as a referral agency to the expert local services and including recognition of animal welfare grounds of recovery for intensive livestock within the disaster plans in all States & Territories (Key Informant comment, 2013)

Government financial assistance programs targeted at primary producers and businesses expedite recovery not only of these businesses, they effectively support the entire regional economic recovery after cyclones and other natural disasters. General populous financial assistance relieves immediate cash flow problems, stabilises employment and provides a stimulus to local economies affected by the natural disaster.

Key Informant Feedback

After the cyclones, what further monitoring, evaluation and impact assessment of on-farm damage, and medium to long-term damage to agricultural businesses should/could be done to build future confidence and resilience? This was an open ended question which received a lot of comment that is covered in other sections. The one thing key respondents called for here that was different was the sharing of lessons learnt.

• Cyclone mitigation workshops should be offered to discuss & develop plans for individual properties for learnings and future events

• Facilitation of on farm meetings of farmers to share ideas

• Farm practices impact assessment reporting and collection of data from industry so farmers know the info that is required to feed up to State government

• Local communities including the farmers, and industry groups, should be able to get together to debrief, support, and learn (including from experts) and improve from managing disasters, broader evaluation and then communication of what other farmers have done to be better prepared, as a learning experience
Table 16: Post-disaster priority ranking.

Sorting out the post-disaster priorities in any farming situation, is a tough call, but trying to establish a common priority was an ambitious objective. Regardless of the less than perfect question, predictably key respondents ranked human welfare as the highest priority for farm and rural relief operations in the post-disaster period. Securing an alternative power supply was closely followed by animal welfare priorities. Including recognition on animal welfare grounds of recovery for intensive livestock within the disaster plans in all States & Territories was seen as critical by many.

Movement of freight, animal security and disease outbreaks were next on the common list of rural priorities to be dealt with. Government assistance and repairing damaged infrastructure were ranked closely and this is significant because there were comments that clarified that people believe that having all public infrastructure, roads, water, power and communications was one of the most important factors on the road to recovery.

It was interesting that insurance claims could wait a while, but then people expect them to be processed expediently. It was also interesting that many people saw the salvage of fruit and nut trees and crops and pastures as less urgent.

Recovery plan. Key modules will include Animal Health, Nutrition and Feed Management, Financial Planning and Taking Stock. Industry and Government need joint natural disaster preparation, response and recovery plan, which sets out protocols for preparation prior to known natural disaster risks, emergency response and recovery actions and resource contribution.

Current issues surrounding farm disaster risk management in Northern Australia

- Local communities including the farmers, and industry groups, should be able to get together to debrief, support, and learn (including from experts) and improve from managing disasters, broader evaluation and then communication of what other farmers have done to be better prepared, as a learning experience.

- Ag-Industry needs to be integrated closely into Disaster Management Arrangements, preferably as a dedicated Agriculture Disaster Control Centre

- Farmers want to be able to learn more from other farmers innovations gained because of the hard lessons learned from cyclones.
Potential solutions that may be explored

- Cyclone mitigation workshops should be offered to discuss & develop plans for individual properties for learnings and future events
- Facilitation of on farm meetings of farmers to share ideas
- Farm practices impact assessment reporting and collection of data from industry so farmers know the info that is required to feed up to State government
- Local communities including the farmers, and industry groups, should be able to get together to debrief, support, and learn (including from experts) and improve from managing disasters, broader evaluation and then communication of what other farmers have done to be better prepared, as a learning experience
- Ag-Industry needs to be integrated closely into Disaster Management Arrangements, preferably as a dedicated Agriculture Disaster Control Centre
11. Agricultural Disaster Preparedness

Disaster preparedness was the agricultural issue that gained the best score in terms of improvement since 2006, Cyclone Larry. Nearly 80% of respondents reported that there had been improvement in the area of disaster preparation, and this is a massive endorsement of all the hard work contributed by the all levels of government, Ag-industry groups, rural community groups and individual farmers and farm workers. Disaster knowledge building is a slow incremental process where each disaster raises preparedness and time elapsed since the last one reduces it. Research shows that preparedness for a possible disaster is not a daily high priority because there are so many competing claims on peoples' time.

This report focuses on one particular type of natural disaster, cyclones. Tropical cyclones pose a considerable threat to the north Queensland coastline. In the 123 years since the settlement of Cairns was established there have been 53 cyclones that have had some effect on the town. That is, an average of one cyclone nearly every two years, bringing with them the multiple threats of destructive winds, heavy rain and storm tide inundation. However it was pointed out by many respondents that farmers and graziers, even in the cyclone prone areas have to be prepared for other disasters such as bushfire, drought and floods. (Australian Geological Survey Organisation, 1999)

“The recent devastation of 4 million acres of western savannah grazing property and fires in the Ravenshoe district has had a worse effect on property owners than a cyclone.” (Key Informant comment, 2013)

It is clearly not possible, economic or rational to attempt to eliminate all risk. It is, however, feasible and economic to reduce the outstanding risk associated with even the most extreme event, by implementing long-term planning strategies, such as the relocation of critical facilities and maintaining a vigorous campaign of community awareness.

“Preparedness is more than a check sheet, it is incorporating natural disaster planning and risk preparedness into all aspects of your business, operational and financial planning.” (Key Informant comment, 2013)

There were numerous comments about making sure Ag-Industry and Government develop joint natural disaster preparation, response and recovery plans, which set out protocols for preparation prior to known natural disaster risks, emergency response and recovery actions and resource contribution. Ag-industries need to be included in the process of formulating preparedness and rapid response plans and mechanisms to ensure they are responsive to the real needs of farmers. To be effective, these plans will have to involve the delivery of a number of extension modules adapted to meet specific needs of producers during the recovery.

A lot of work that is being done in this area because of the recent 2012/2013 cyclones, floods and bushfires. Much of this extensive body of work is just being published and made available for the public to access as this report goes to print. Particularly from an Agricultural perspective in Northern Australia, preparedness has always meant making long term decisions for farm financial resilience, business continuity to give businesses the confidence to make decisions they know need to be made, if and when faced with an imminent natural disaster on the doorstep. Resources and access to funds determines what alternatives and options you have. This includes access to real time and real information such as forecasting. Having a risk management plan and linking it to risk mitigation and insurance premiums will provide farmers with added confidence.

The Queensland Department of Science, Information Technology, Innovation and the Arts has developed the climate change risk management matrix which is a tool for extension providers, industry and regional representatives and consultants to help address climate projections and uncertainty by identifying and analysing the risks, vulnerabilities and opportunities so farmers and graziers can

Quite a lot of farm innovation emerged as farmers took note of what happened in Larry and then adapted their farming practices accordingly. A lot of this learning has been recorded in two video series QFF ‘Taking Stock: Preparing rural businesses for natural disaster and climate risk’, and Terrain ‘Living in Cyclone Country’. There is no indication of how widespread this learning is, but many farmers have adapted their farming systems after Larry, to be more appropriate to a cyclone-prone environment. For example, in horticulture, some producers have used frames to trellis and strengthen their crops, and have kept the crops lower than was the normal practice. Some lime producers have adjusted the timing of their pruning to before the cyclone season, and post Yasi, were back in production very quickly. In bananas, there was some interesting innovation relating to de-leafing, as well as laying down the stems, and a whole lot was learned about scheduling and staggering the return to market, so more farmers could take advantage of the price fluctuations and not be caught out by market gluts. A vanilla farmer modified the vine growing frames so that they could be quickly laid down in the event of a cyclone, after observing that anything left standing after Larry was less than about half a metre high as there seemed to be an area close to the ground that was not badly affected by the winds.

Issues from the Post-disaster Data

Preparedness was not mentioned very often in the post-disaster reports as they were mostly focused on what needed to happen to relieve the situation on the immediate aftermath, or recovery in the short to medium-term.

It was noted that the larger, more structured Ag-industries were better prepared than others, and some farms are better prepared due to the nature of geography, industry, enterprise and management. There was some call for specific measures of preparedness to be outlined and the benefit/cost of each defined. Industry needs to identify additional incentives to assist and encourage producers to improve preparedness and self-reliance. Industry and Government need joint natural disaster preparation, response and recovery plan, which sets out protocols for preparation prior to known natural disaster risks, emergency response and recovery actions and resource contribution

Unpredictable and powerful storms are a part of life, particularly in Tropical Australia during the wet summer season. Accustomed as people are to their arrival every storm season, it's vital to be prepared by developing and implementing strategies for risk mitigation, industry and business preparedness, partnership response and long term economic recovery.

Key Informant Feedback

A huge 97% of key informants believed that farmers need real-time access to reliable weather forecasting and training in how to use the information was fundamental to being able to adequately prepare for the onslaught of natural disasters.

It is interesting to note some comments about the relative needs for long range and seasonal climate forecasting versus the more immediate weather forecasting for the next few days. Most respondents definitely saw a need for farmers to know and understand what sort of wet season was predicted, but that wet seasons and the possibility of cyclones should be accounted for every day. However the crucial decision making time for actual preparedness was in the two weeks or so of build-up and the final few days before a cyclone struck, and this is when it is essential to closely follow the weather forecasting, understand your risks and make decisions based on the mitigation options you have at your disposal.
I think more than just checklists are required, I would rather see mentoring, coaching and a social forum developed that carried people along a preparedness track. (Key Informant comment, 2013)

Ag-industry groups are moving rapidly towards develop preparedness and risk management modules that would fit neatly into the current ‘best management practice’ programs that cane, beef, dairy and horticulture already have instigated. Preparedness modules for on-farm risk mitigation would include:

- Household Plans
- Farm Design, including resistant/resilient farm infrastructure, power backup, and communications
- Farm Practices including diversification, scheduling, pests, weeds and disease mitigation
- Business resilience and continuity planning
- Imminent event preparedness checklists
- Weather and bushfire forecasting training, tools and decision-making
Recommendations

After two catastrophic natural disasters in the space of the last seven years, the rural communities surrounding Innisfail, Tully, Cardwell, and inland through the Southern Atherton Tablelands need continued support to build resilience and reposition themselves within the drastically changed landscape. The cyclones have triggered a period that some innovators viewed as creative destruction of the old thinking, and more needs to be done to build and promote adaptability and resilience.

Many potential solutions that could be investigated further are recommended in each of the previous sections. This is a list of critical recommendations that have been distilled from both data sets, and all of eleven agricultural issue discussions.

- A secure trusted accessible digital repository must be found to house this collection and maintain it for the lifetime of the data
- Recommendation for Tropical Food/Agriculture CRC or similar focus on tropical agriculture RD&E to achieve long-term economic, social and environmental outcomes
- Thorough review of rural insurance for affordability, availability, eligibility, applicability and government intervention options in the case of market failure to provide these options.
- Knowledge transfer and adoption of research, sharing of farm practice innovation must be improved through additional networking, training, extension, education and commercialisation.
- Review of the Vegetation Management Act to ensure that landholders can protect their crucial infrastructure, particularly fences and roads from tree damage in high winds.
- Invest in research that assesses tree susceptibility and resistance to cyclones and ensure the knowledge transfers to nurseries, farmers, foresters, NRM workers and the general community.
- JCU’s cyclone centre has done some excellent work on farm infrastructure and this sort of practical work needs to be funded and results communicated widely.
- Develop a new one-on-one government operated farm financial program with a Farm Risk Management and Resilience focus
- Prioritise RD&E of alternative energy solutions for back-up power supply in post disaster situations including implementation and commercialisation options.
- Assist Ag-Industry groups and processors to develop “Best Practice” implementation programs that include Risk Management and Disaster Preparedness modules.

This report articulates broad strategies to deal with the eleven identified issues, suggests pathways for implementation and encourages greater coherence and coordination of the agriculture sector’s efforts into the future. Implementation of the findings and recommendations contained in this study needs to be taken up as projects by the relevant Ag-industry groups, NRM groups, and all levels of government.
Appendices

Appendix 1: Tropical Australia Food & Agriculture CRC

What is a CRC

The Cooperative Research Centres (CRC) Program is an Australian Government Initiative. The CRC program supports collaboration between researchers, industries, communities and governments to solve major challenges facing Australia, many of which are global challenges. CRCs commonly have dozens of participating organisations including universities and research institutions, businesses ranging from multinational corporations to small and medium enterprises, governments at national, state and local levels, international partners, not-for-profit organisations and industry and community associations. The CRC program encourages participation from all sectors and disciplines, including the humanities and social sciences. It can be adaptive and aim to grow its business free from the corporate obligations of the research parties.

Vision for a Tropical Australia Food & Agriculture CRC

The purpose of the CRC would be to build the strength and resilience of Australian tropical agricultural regions, communities and industries, based on genuine regional, industry and research partnership.

To facilitate best practice in tropical food production including research to sustainably increase diversity, yield, quality and profitability

To improve social, economic and environmental circumstances in tropical rural communities

Major challenges a Tropical Australia Food & Agriculture CRC would address

Cross-sectoral focus, that has defined adoption pathways built into its design, with active involvement of the beneficiaries before, during and after the research phase.

A tropical food CRC would need to recognise, utilise, document and remunerate the farmers and graziers who have already developed a great deal of Tropical Expertise because of their frontier/pioneer personality. They have a real ground level understanding of the land, the climate, and what it takes to successfully grow, market and deliver food in that environment and are powerfully creative with practical rural solutions.

Suggested Research Participants

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<tr>
<th>RIRDC</th>
<th>James Cook University</th>
<th>University of Queensland</th>
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<tr>
<td>Charles Darwin University</td>
<td>Queensland Department of Agriculture Fisheries and Forestry</td>
<td>Australian Department of Agriculture Fisheries and Forestry</td>
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<tr>
<td>RDA</td>
<td>Councils in region</td>
<td>CSIRO</td>
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Potential Collaborators

<table>
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<tr>
<th>CRC for Beef Genetic Technologies</th>
<th>CRC for National Plant Bio-security</th>
<th>CRC for high integrity Australian Pork</th>
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<tr>
<td>CRC for Forestry</td>
<td>Dairy Futures CRC</td>
<td>Future Farm Industries CRC</td>
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<td>Poultry CRC</td>
<td>Bushfire CRC</td>
<td>CRC for Aboriginal and Torres Strait Islander Health</td>
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<tr>
<td>Ag-Industry Groups</td>
<td>Economic Development Groups</td>
<td>NRM Groups</td>
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Appendix 2: Digital Repository for Cyclone Reports

**DEFINITION:**
A digital library is a library in which collections are stored in digital formats (as opposed to print, microform, or other media) and accessible via computers. (en.wikipedia.org/wiki/Digital repository)

**What is a Digital Repository?**

The Digital Repository is a centrally administered library service for managing … digital resources from individual items required for course delivery to large collections that are of cultural or scholarly significance. The Repository contains digital objects including: research papers, theses, journal articles, books and book chapters, maps, video and audio recordings, photos etc. http://repository.unimelb.edu.au/help/faq.html#what

There are a number of attributes that are important to be aware of when establishing a digital repository for this library. A trusted digital repository is one whose mission is to provide reliable, long-term web-based sharing access to managed digital resources to its designated community, now and in the future. Trusted Digital Repositories: Attributes and Responsibilities; An RLG-OCLC Report, Mountain View, CA, May 2002 http://www.oclc.org/resources/research/activities/trustedrep/repositories.pdf

**Desirable Attributes of a Digital Repository**

**Single searchable interface:**
There are a number of programs available to manage a repository. For example, Zotero collates research in a single, searchable interface, and SassyBio researchers chose it to catalogue word documents, Excel spreadsheets, PowerPoint presentations, PDFs, images, audio and video files and web pages. Zotero automatically indexes the full-text content of the library.

**Trusted Repository where the library can be safely housed**
The key issue is where is most appropriate to house the collection for the lifetime of the data, and who is best to maintain and populate it. Servers housing these programs can be decommissioned from time to time and if allocated staff moves from the position, then the maintenance relies on continuity of management.

There are a number of issues such as copyright, contractual restrictions and digital rights to be considered. Information can be sensitive and approvals must be sourced to make material available. If access to the entire document is restricted, permission can be sought to include an abstract and contact details to source it.

Organisations that may be appropriate to house a digital repository on the effects of cyclones on agricultural industry in Northern Australia include;

- ACIAR – Australian Centre for International Agricultural Research
- Townsville City Library has a “corporate” service to house a collection
- JCU Tropical Data Hub is a central research data repository and discovery service in Townsville - houses special collections of resources pertaining to North Queensland.
- Terrain NRM
- Regional Development Australia – Townsville or Cairns
- RIRDC may already have existing digital repositories that could be utilised. The Australian government has an agricultural database.
- Creative Commons is a worldwide project that encourages copyright owners to allow others to share, reuse and remix their material, legally.
- There is the Australian National Data Service initiative to collect data sets from research.
Appendix 3: Cyclone forecasting and weather monitoring tools

The following are a set of online and digital tools that support producers in making informed business decisions concerning weather and climate.

### Cyclone weather

#### Pre-cyclone forecasts and monitoring

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<td>Facebook</td>
<td>Oz Cyclone Chasers</td>
<td>These passionate weather enthusiasts use Facebook to explain the weather and track tropical cyclone progress in Nth Australia.</td>
<td><a href="http://www.facebook.com/ozcyclonechasers/info">www.facebook.com/ozcyclonechasers/info</a></td>
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<td>Map</td>
<td>US Satellite service</td>
<td>Click on the maps for MTSAT East to see a variety of satellite maps and loops from NOAA.</td>
<td><a href="http://www.goes.noaa.gov/sohem/is">http://www.goes.noaa.gov/sohem/is</a></td>
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<tr>
<td>Map</td>
<td>Historical maps of cyclones</td>
<td>This site produces 'spaghetti' maps, showing a 100 year record of historical cyclones as tracks.</td>
<td><a href="http://www.csc.noaa.gov/hurricanes/#">http://www.csc.noaa.gov/hurricanes/#</a></td>
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#### Post-cyclone – condition monitoring

| Map | Road closures | This Qld Govt Transport site 131940, will show you road closures due to flooding. | [http://131940.qld.gov.au/Home.aspx](http://131940.qld.gov.au/Home.aspx) |
| Website | Heavy Vehicle & Freight Restrictions | This Qld Transport site is to inform transport carriers and provides reports on road conditions and restrictions specifically for heavy vehicles. | [http://highload.131940.qld.gov.au/](http://highload.131940.qld.gov.au/) |
| Website | Qld Disaster Warnings and Alerts | This page provides you with news and resources on current warnings, alerts and disasters in Qld. | [http://www.disaster.qld.gov.au/Warning_s_and_Alerts/default.html](http://www.disaster.qld.gov.au/Warning_s_and_Alerts/default.html) |
| Facebook | Local Council area disaster news | Many local councils operate a Facebook service to inform and coordinate response and recovery operations during emergency events. | [www.facebook.com](http://www.facebook.com) Cairns Disaster Coordination Centre; Townsville Disaster Information; Tablelands Regional Council - Disaster Management [https://www.facebook.com/ErgonEnergy/](https://www.facebook.com/ErgonEnergy/) |
| Facebook | Ergon Energy | This page is operated during major disaster events and keeps you up to date with Ergon repair and restoration work in regional Qld. | [https://www.facebook.com/ErgonEnergy/](https://www.facebook.com/ErgonEnergy/) |

### Climate forecasting

### Appendix 4: Ag-Industry and Disaster Related Websites

<table>
<thead>
<tr>
<th>Ag-Industry Groups</th>
<th>Website</th>
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<tbody>
<tr>
<td>AgForce Queensland</td>
<td><a href="http://www.agforceqld.org.au">www.agforceqld.org.au</a></td>
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<tr>
<td>Australian Banana Growers’ Council</td>
<td><a href="http://www.abgc.org.au">www.abgc.org.au</a></td>
</tr>
<tr>
<td>Australian Barramundi Farmers Association</td>
<td><a href="http://www.abfa.org.au">www.abfa.org.au</a></td>
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<tr>
<td>Australian Chicken Growers’ Council</td>
<td><a href="http://www.acgc.org.au">www.acgc.org.au</a></td>
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<tr>
<td>Flower Association of Queensland</td>
<td><a href="http://www.flowersqueensland.asn.au">www.flowersqueensland.asn.au</a></td>
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<tr>
<td>Nursery &amp; Garden Industry Queensland</td>
<td><a href="http://www.ngiq.asn.au">www.ngiq.asn.au</a></td>
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<tr>
<td>Queensland Farmers Federation</td>
<td><a href="http://www.qff.org.au">www.qff.org.au</a></td>
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<tr>
<th>Business and Government</th>
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<tr>
<th>Disaster Management</th>
<th>Websites</th>
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<tbody>
<tr>
<td>Disaster Management : Department of Community Safety</td>
<td><a href="http://www.disaster.qld.gov.au">www.disaster.qld.gov.au</a></td>
</tr>
<tr>
<td><strong>Emergency Management Australia</strong></td>
<td><a href="http://www.ema.gov.au">www.ema.gov.au</a></td>
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<tr>
<td><strong>Emergency Services</strong></td>
<td><a href="http://www.emergency.qld.gov.au/SES">www.emergency.qld.gov.au/SES</a></td>
</tr>
<tr>
<td><strong>Queensland Police Service</strong></td>
<td><a href="http://www.police.qld.gov.au">www.police.qld.gov.au</a></td>
</tr>
<tr>
<td><strong>Queensland Ambulance Service</strong></td>
<td><a href="http://www.ambulance.qld.gov.au">www.ambulance.qld.gov.au</a></td>
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<tr>
<td><strong>Disaster Assistance</strong></td>
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<tr>
<td><strong>Department Agriculture, Fisheries &amp; Forestry - DAFF</strong></td>
<td><a href="http://www.daff.qld.gov.au/home.htm">www.daff.qld.gov.au/home.htm</a></td>
</tr>
<tr>
<td><strong>Department Energy and Water Supply</strong></td>
<td><a href="http://www.energy.qld.gov.au/?utm_source=DEEDI&amp;utm_medium=301&amp;utm_campaign=redirection">www.energy.qld.gov.au/?utm_source=DEEDI&amp;utm_medium=301&amp;utm_campaign=redirection</a></td>
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<td><strong>Disaster Management: Department of Community Safety</strong></td>
<td><a href="http://www.disaster.qld.gov.au">www.disaster.qld.gov.au</a></td>
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<tr>
<td><strong>Qld Reconstruction Authority</strong></td>
<td><a href="http://www.qldreconstruction.org.au">www.qldreconstruction.org.au</a></td>
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<tr>
<td><strong>Other</strong></td>
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<tr>
<td><strong>Harden Up – Protecting Queensland</strong></td>
<td><a href="http://hardenup.org">http://hardenup.org</a></td>
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<tr>
<td><strong>Insurance Council Australia</strong></td>
<td><a href="http://www.insurancecouncil.com.au">www.insurancecouncil.com.au</a></td>
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<td><strong>Managing climate</strong></td>
<td><a href="http://www.managingclimate.gov.au">www.managingclimate.gov.au</a></td>
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<tr>
<td><strong>Caring for our Country</strong></td>
<td><a href="http://www.nrm.gov.au/funding/agriculture/index.html">www.nrm.gov.au/funding/agriculture/index.html</a></td>
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http://www.uq.edu.au/agriculture/rural-communities, 2013. Rural Communities - School of Agriculture and Food Sciences - The University of Queensland, Australia.
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Lessons Learned from Cyclones in Northern Australia

By Rhonda Sorensen  
Pub. No. 13/071

Tropical cyclones are a fact of life for many communities along the Northern Australian coast during summer, and the impacts, particularly as a result of flooding, can often be felt by communities well inland and well south of where they cross the coast.

This report is the voice of the farmer - the data has come directly from farmers and their industry bodies. This collation of information for farmers and others on the lessons learned from cyclones in Northern Australia will be a valuable resource for farmers, agricultural industries, and all levels of government.

RIRDC is a partnership between government and industry to invest in R&D for more productive and sustainable rural industries. We invest in new and emerging rural industries, a suite of established rural industries and national rural issues.

Most of the information we produce can be downloaded for free or purchased from our website <www.rirdc.gov.au>.

RIRDC books can also be purchased by phoning 1300 634 313 for a local call fee.