Disaster Resilience Planning for

AGRICULTURE IN QUEENSLAND

Project Report

QUEENSLAND FARMERS' FEDERATION

MAIN CONTENTS

This paper has the following structure:

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The objective of this project is to improve the preparedness of the agricultural sector in Queensland in facing natural disasters. The project work aimed to achieve this by improving:

- **Business continuity in the aftermath of disaster.**
- **Operational sustainability of farms and agricultural businesses which are an integral part of regional economies.**
- **Improved resilience to rebound from disasters and adapt to the post-disaster environment.**

QFF worked with its member groups and other grower organisations, agribusiness industry organisations, community groups and disaster resilience practitioners to deliver an all-of-sector outcome.

The proposed outcomes of this project aimed to reduce the impact of natural disasters on the agricultural sector through improved preparedness. The work conducted in this area was also predicted to have flow-on effects for supply chain partners and consumers. Specifically:

- A reduction in the nature and extent of impact of natural disasters on farming production systems and minimisation of production losses.
- A more rapid business recovery back to 'full' production which is central to broader community recovery.
- Greater sustainability of agricultural businesses from improved management of a range of business risks.
- Reduced direct financial impacts on farmers, in turn regional communities.
- Continuity of supply of agricultural products direct to market and to downstream processors.

Scope of work

The scope of work was set to include:

A. Development of a framework for disaster resilience planning
B. Development of a model plan
C. Implementation of pilot studies
D. Development of an Implementation Strategy

A. Framework for development of disaster resilience planning

A framework was successfully developed for disaster resilience planning at the regional industry level. It sets out the concepts that underpin the preparation and presentation of a disaster resilience plan.

The framework presents a strategic and systematic approach to defining and elucidating resilience specifically for agriculture. The framework represents the first step in moving from analysis of the theoretical concepts to the action of improving resilience for agriculture.

The framework has the following structure:

1 Provides the background the project work.

2 Discusses disaster and resilience definitions, highlights the concepts that underpin this work.

3 Discusses the risk for agricultural businesses associated with the weather, climate and natural disaster and the differences between the three concepts; and the interaction between them.

4 Describes the policy context including the evolution for the emergency management planning and the current institution arrangements in Australia and Queensland.

5 Presents a conceptual framework identifying the elements of resilience and how they translate to practical application of the agricultural sector of Queensland.

For each of these core areas a risk based process has been used to map, identify, assess and evaluate risk and plan a response.

The framework comprises of a series of questions and suggested responses, encouraging the planner to consider the full range of issues relevant to the industry.

B. Implementation of pilot studies

Pilot Studies were undertaken on two industry groups, (Dairy and Mango) and a geographical area (Barker & Barambah Creek).

The pilot studies have been used to apply the framework at a commodity level (e.g. dairy) and also to the small geographical area. Banana was initially scoped for a pilot study, but complexities due to a serious outbreak of Panama disease removed them as a pilot study.

The output from the pilot studies is a farm/business scale plan which can be adapted for use for future planning. It will be an important test of the effort required to develop a plan, the availability of information inputs and the practicality of the resultant plan. Preparedness and effective risk management requires structured action plans but if these prove too tedious to develop then a different approach may be required.

C. Development of a model plan

Based on the findings of the pilot studies, a model plan has been developed. The model plan provides a structured guidance on natural disaster management, preparation, recovery and response. The model plan provides outcomes based on resilience and preplanning to minimise natural disaster impact, rather than a reactive recovery.

D. Disaster resilience implementation strategy

Resilience planning for agriculture is not yet at a point where it can detail actions to reach an objective. Outlining specific activities, costing and schedules is the long term goal and we need continued work in disaster resilience planning to achieve that.

An implementation strategy has been developed by QFF, the strategy sets out further work to prioritise resilience planning and a no-regrets approach to actioning existing information.

The strategy outlines;

1 **The current policy context**

2 **Resilience work to date**

   i. The challenge for future work

3 **Future resilience planning**

   i. The next stage of planning

   Stage 1. Understanding resilience in agriculture.

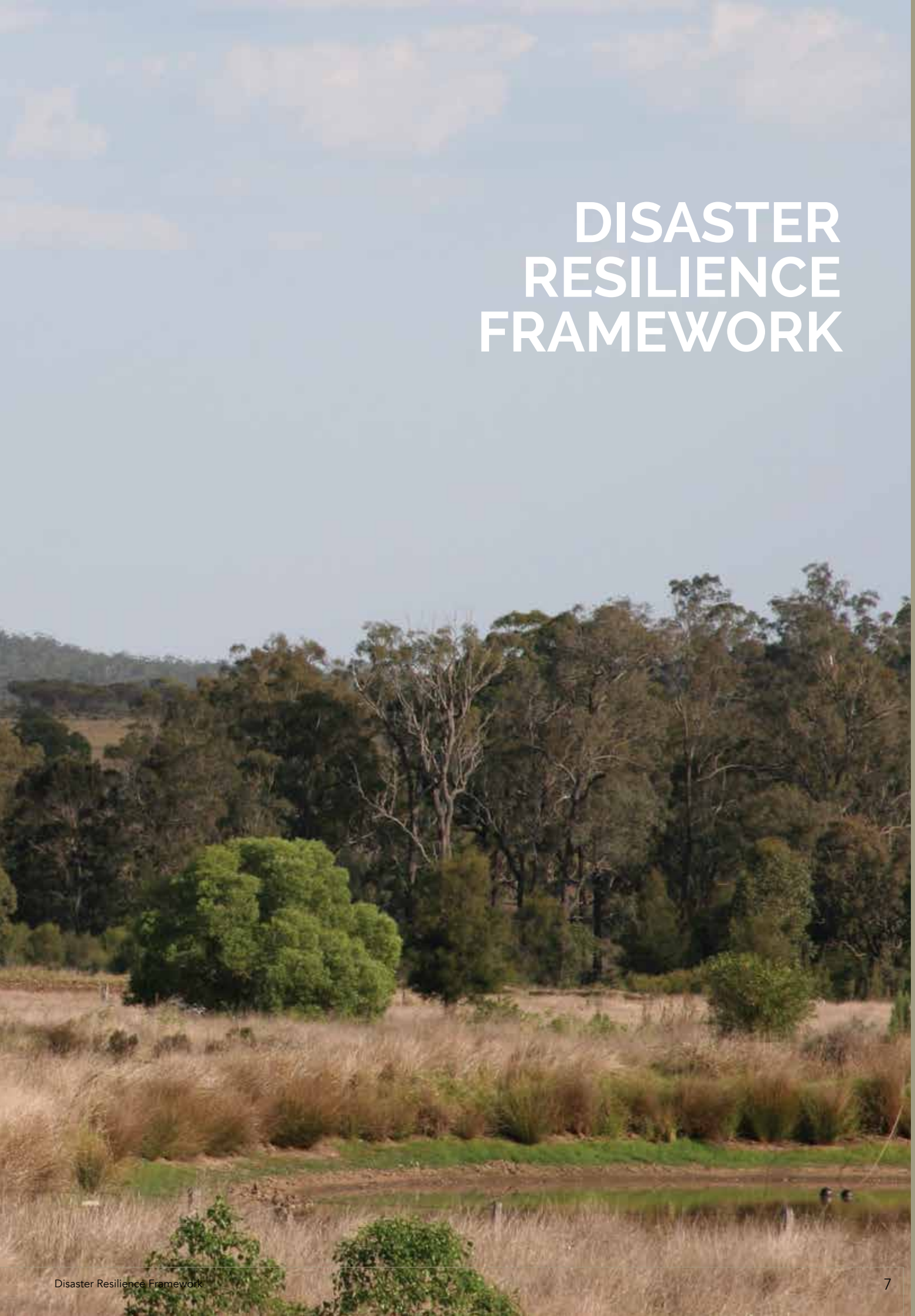
   Stage 2. Mainstream agriculture in disaster response

   Stage 3. Instil resilience planning as business as usual.

The Implementation Strategy asserts that the future direction of resilience planning is to move agriculture to a 'safeguard mindset' using a range of provisions that afford protection against natural disaster risk. Future agriculture will need to change its collective mindsets to resilience planning as a strategic enabler of business.

Note: For a full version of this report visit the Queensland Farmers Federation website. www.qff.org.au

DISASTER RESILIENCE FRAMEWORK



1 Framework for natural disaster resilience in agriculture

This section of the report presents a conceptual framework for natural disaster resilience for the agriculture sector. The framework provides a structured approach to understanding the factors and processes which influence resilience.

1.1 Resilience framework

To reiterate, resilience refers to the ability of a system to absorb shocks, and to learn and adapt to changing or adverse conditions. Figure 3 presents a framework for natural disaster resilience. This framework has been distilled from information presented in the literature and other unpublished sources. It has been devised to meet the specific needs of project work i.e. increasing resilience for the agricultural sector in Queensland.

The framework is intended to portray the concept that existing settings and the consequence of disaster impact influence the resilience to current and future disturbance. The relative simplicity of the framework does not convey the complexity of the underlying concepts nor the divergent opinion on how these concepts interact (see Colburn and Seara 2011).

Each of the 'headline' concepts – context, disaster consequence and reaction are described below.

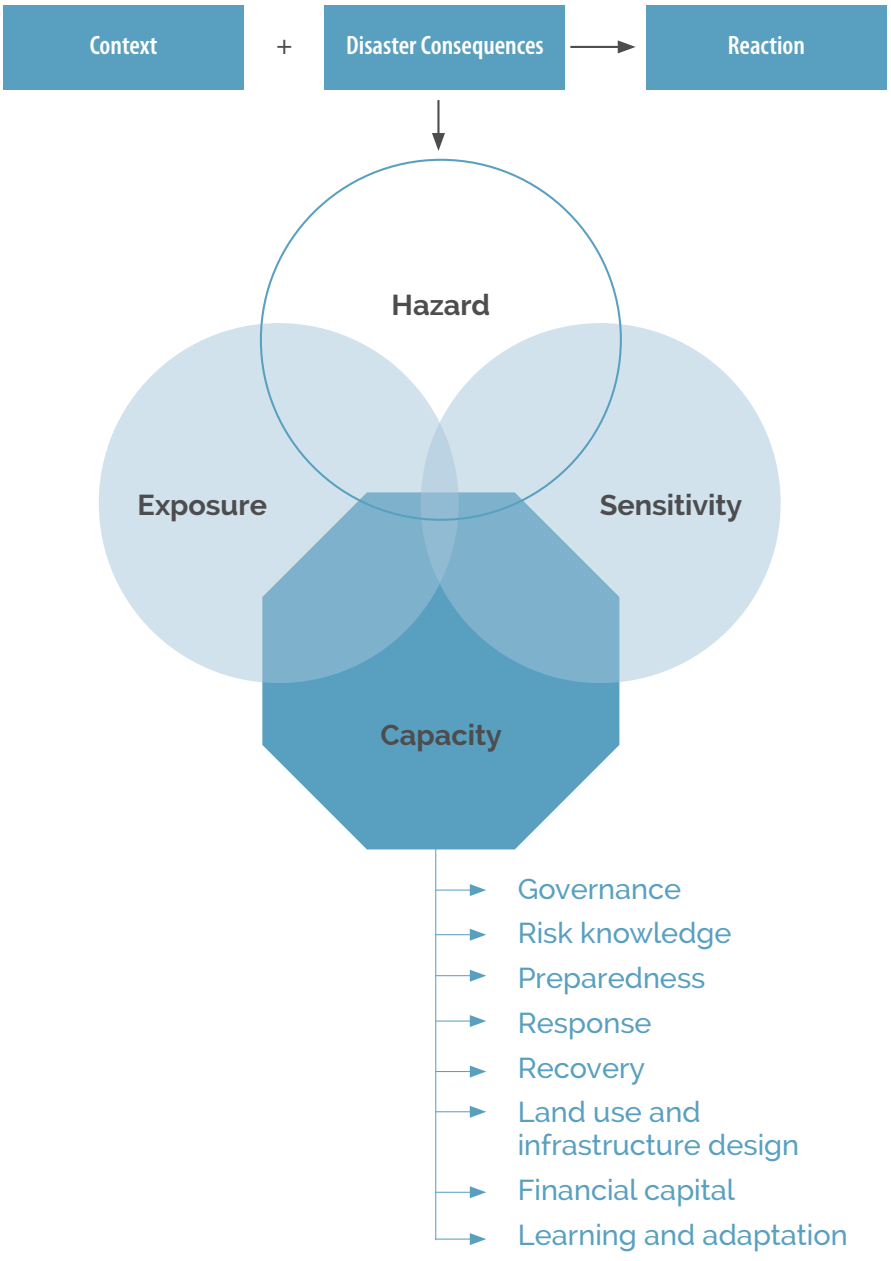


Figure 3: A natural disaster resilience framework for agriculture in Queensland.

1.2 Context

In this framework Context refers to the group which is being considered in terms of resilience. This may be a social group, a socio-economic or political system, a region or an institution. Contextualisation allows for a coherent answer to the question 'resilience of what?' (DFID 2011).

Much of the literature refers to community resilience where community is used to set boundaries of the social system encompassed within a geographic space such as neighbourhood or city. This concept is not as applicable to agriculture since the 'community' or more aptly the 'community of interest' may be geographically disparate.

Defining the community of interest presents challenges of scale and collective organisation. Scalar issues result from the sheer size; diversity of geography, industries and production systems and; remoteness/isolation of Queensland agribusinesses. The challenges of scale have influenced the way in which agricultural businesses have organised into representative groups such as produce-based groups at the district or regional level, and resource management groups at the sub-catchment level. Other groups have evolved from common production issues such as land use and planning issues e.g. organic production or supply chains e.g. producers contracted to the same processor.

Defining the context also requires consideration of the overlying administrative boundaries relating to district disaster management groups, local governments and regional planning boundaries.

Figure 4 defines the scales at which disaster consequence is managed in agriculture, noting that in reality these are unlikely to be discrete units but a continuum along the same scale.

Having defined the system or group, it is then necessary to consider the broad range of issues of relevance including environmental, political, social, economic, historical, demographic and policy conditions.

This project focuses on agriculture at the industry (meso) level, each of which has common and individual contextual issues.

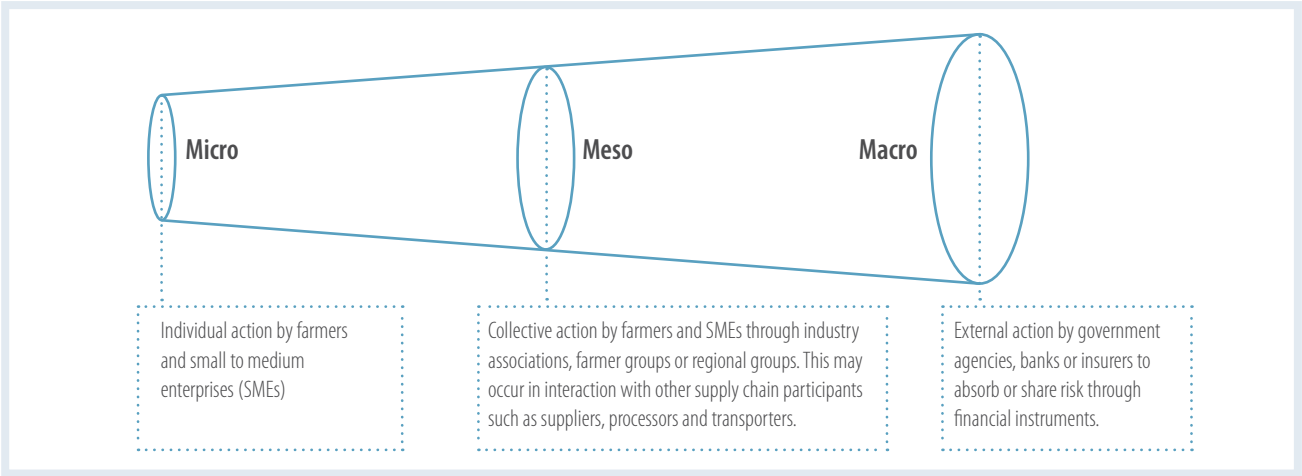


Figure 4: Scales of resilience planning in agriculture.

1.3 Disaster consequence

The term disaster consequence is used here to refer to the potential (not actual and realised) disaster loss; in lives, health status, livelihoods, assets and services, which could occur in a particular community (van Niekerk 2011). In this framework disaster consequence is a function of the interplay between hazard, exposure, sensitivity and vulnerability. Refer to Figure 5

In this conceptualisation hazard is unchangeable. While the probability and number of hazards varies temporally and spatially there is no anthropogenic change that can remove natural phenomena altogether. (Note that this statement makes no inference to human activities linked to the alteration of atmospheric composition and hence climate change.)

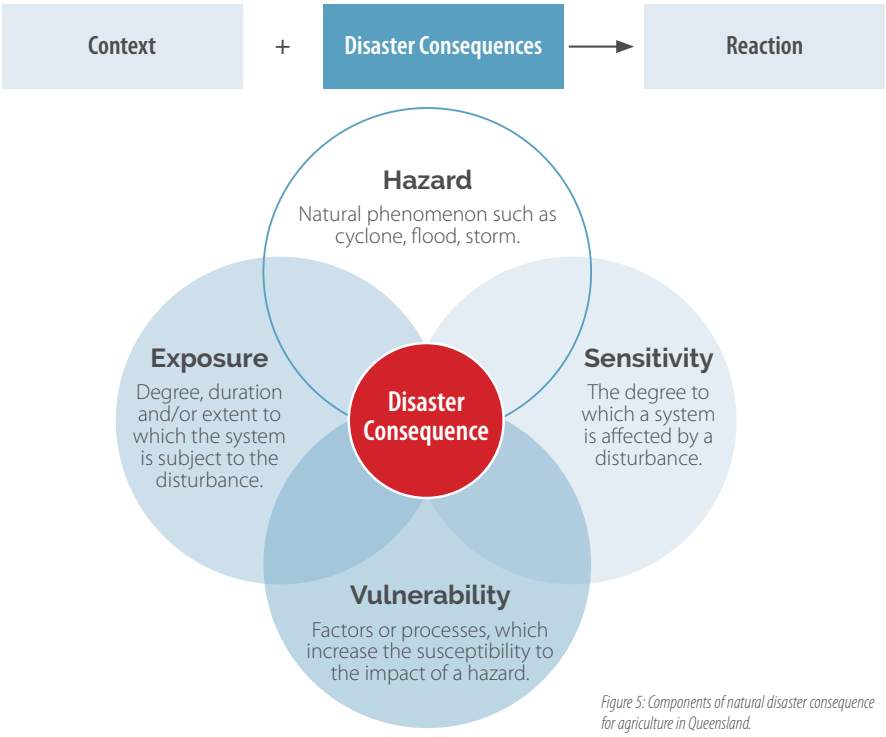


Figure 5: Components of natural disaster consequence for agriculture in Queensland.

1.3.1 Hazard

Based on the definition of disaster used in this paper and those natural hazards posing the most risk in Queensland, this work focuses on flood, cyclone, storm and fire.

Since hazard is unchangeable, reducing disaster risk therefore relies on reducing sensitivity, exposure and vulnerability. These 'manageable' or partially controllable components of disaster risk are presented in Figure 6.

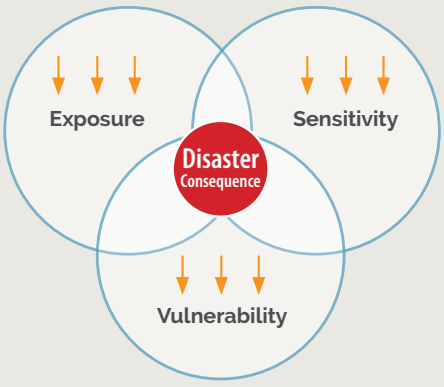


Figure 6: Manageable components of disaster consequence for agriculture in Queensland.
Source: Adapted from ADRC Asia (2005)

1.3.2 Exposure

In this framework exposure is used to refer to the degree, duration and/or extent in which the system is in contact with, or subject to, a disturbance. A disturbance is the negative effect of shock or stress. A shock is a sudden event such as flood or price volatility, whereas stress is long-term trend such as climate change or resource degradation. Some disturbances are covariate meaning they affect an entire population or geographic areas such as flood, market prices, trade/policy shocks. Other disturbances are idiosyncratic meaning they affect only certain individuals or households for example, crop failure or damage to or loss of assets.

Exposure can be measured using indicators of frequency, duration and intensity of previous shocks and stressors.

It is important to note that resilience to one type of shock does not ensure resilience to others. This work is limited to a narrow set of rapid onset natural hazards but previous disturbances irrespective of source will influence disaster consequence. All the same, preparation for rapid onset shock is likely to be beneficial in responding to a slow onset shock such as drought.

1.3.3 Sensitivity

In this framework sensitivity refers to the degree to which a system is affected by a disturbance. This is determined by the characteristics of a system that make it susceptive to the impacts and consequences of hazard exposure.

Sensitivity is relatively fixed. For example, continuous production industries such as dairy are particularly sensitive to disruption of electricity services and transport routes; tree crops are susceptible to wind damage (more so than field crops) and; gender-specific social preferences can exacerbate sensitivity to mental ill health.

There are however management interventions which can reduce some sensitivities. For example, trellising for exotic tropical fruits or removing the canopies from banana trees to reduce potential wind damage. However, for many production systems there is limited scope for change of practices.

1.3.4 Vulnerability / Capacity

Vulnerability is the flipside of capacity. Reducing vulnerability will result in improved capacity. Refer to Figure 7

Bene et al (2012) describe three types of capacity:

- **Absorptive capacity** – the ability to minimise exposure to shocks and stresses through preventative measures and appropriate coping strategies to avoid permanent, negative impacts.
- **Adaptive capacity** – making proactive and informed choices about alternative livelihood strategies based on an understanding of changing conditions; and
- **Transformative capacity** – the governance mechanisms, policies/regulations, infrastructure, community networks, and formal and informal social protection mechanisms that constitute the enabling environment for systemic change.

The elements of capacity represent desired conditions that must exist to support resilient communities. Eight elements are defined here as influencing capacity:

1. **Governance:** Industry and government leadership, policy and institutions provide the enabling conditions for resilience.
2. **Risk knowledge:** Government and industry assess hazards and risk information is utilised when making decisions.
3. **Preparedness:** Industry has the capacity to absorb and recover after an event through planning.
4. **Disaster Response:** Industry and government implement a collective and coordinated response which addresses interdependencies and prioritises community values.
5. **Recovery:** Plans are in place prior to hazard events that accelerate disaster recovery, engage agribusinesses in the recovery process, and minimise negative environmental, social and economic impacts.
6. **Land use and Infrastructure design:** Effective land use planning and infrastructure development is in place to protect environmental, economic and community values and reduce risks from hazards.
7. **Financial capital:** Development of industry financial capital at the collective and individually level.
8. **Learning and Adaptation:** Industry has the ability and willingness to learn from collective and individual experience.

These elements are presented graphically in Figure 8.

Each element is supported by four core capacities:

- **Policy and planning** – enabling conditions for community resilience.
- **Physical and natural resources** – infrastructure or resource capacity to support resilience.
- **Social and cultural** – relating to self-resilience of the community achieved through networks, cultural norms, and education and outreach.
- **Technical and financial** – support needed to sustain resilience efforts.

It is important to reiterate that resilience is a process rather than a static state. Its determinants constantly change within evolving social, economic and environmental contexts.

The elements and the associated core capacities are considered in detail in their application their pilot studies.

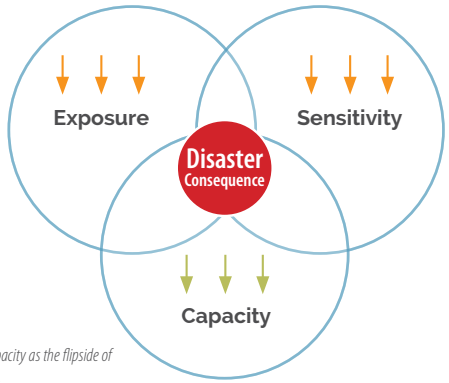


Figure 7: Capacity as the flipside of vulnerability.
Source: Adapted from ADRC Asia (2005)

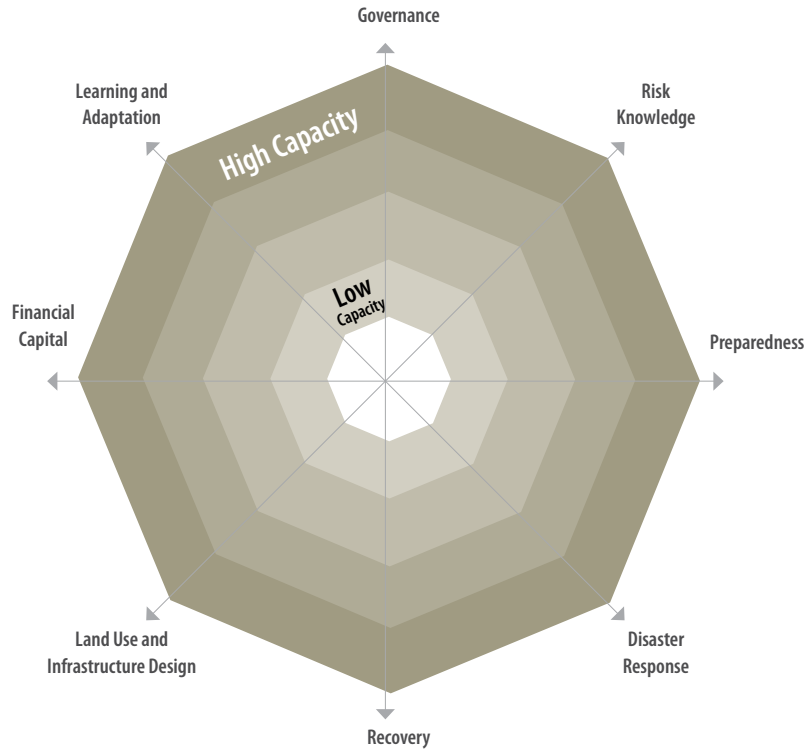


Figure 8: Elements of capacity for agriculture in Queensland. Source: Adapted from US Indian Ocean Tsunami Warning System Program (2007)

1.4 Reaction

In this framework reaction refers to the response to a disturbance and is a function of the preceding elements of the framework. Reaction can be considered in terms of survival, coping, recovery, learning and transforming. Frankenberger et al (2013) have measured reaction using indices of health, assets, social capital, ecosystem health and economic status. Figure 9 presents four categories of reaction.

In reality reaction can be slow and uneven and complicated by other factors such as lack of information and secondary disturbances. Like resilience itself, reaction is more accurately considered as a process rather than a static state.

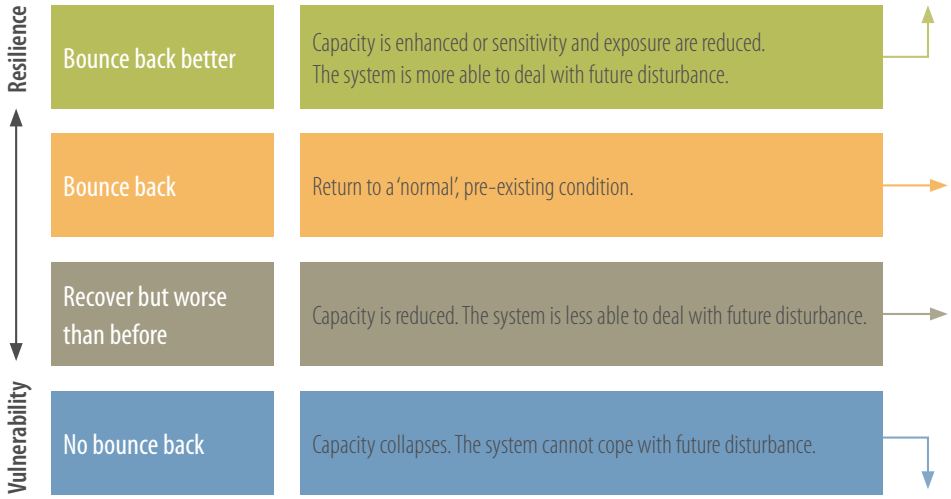
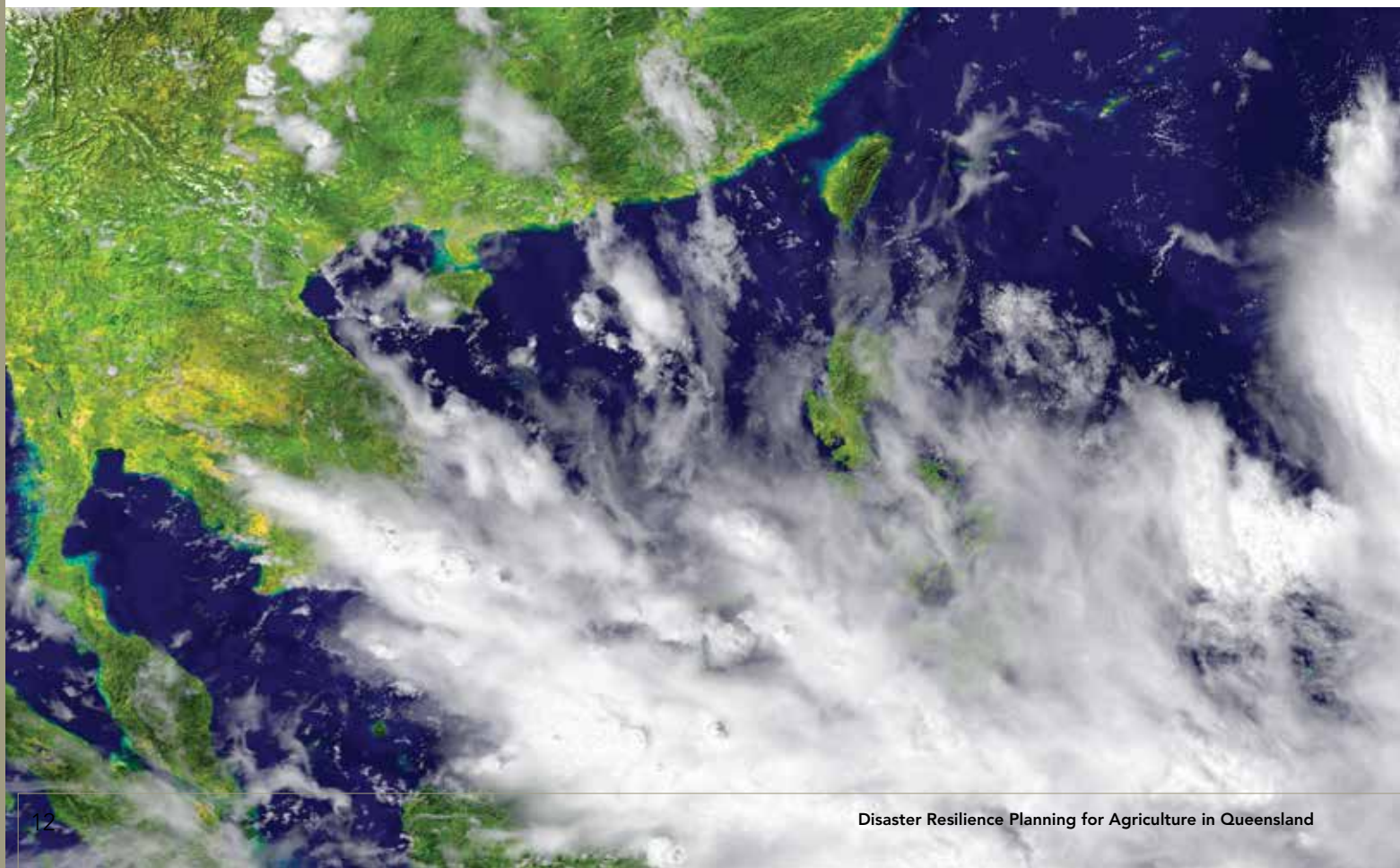


Figure 9: Categories of reaction to disturbance.

In reality reaction can be slow and uneven and complicated by other factors such as lack of information and secondary disturbances.



Appendix 1 Natural hazards

A1.1 Floods

A flood occurs when water covers land which is normally dry. Flooding most commonly results from intense or prolonged rainfall when natural waterways do not have the capacity to convey excess water. Flooding can also occur when water overflows the natural or artificial confines of a water body, or accumulates by draining over low-lying areas. Inundation can also result from dam failure (triggered for example by an earthquake), groundwater seepage and in coastal areas from storm surge, tsunami and waves.

In 2011, the Australian Government introduced a standard definition of flood for insurance policies providing flood cover for a home building, home contents, small business or strata title insurance policy. For this purpose a flood is defined as: "The covering of normally dry land by water that has escaped or been released from the normal confines of: any lake, or any river, creek or other natural watercourse, whether or not altered or modified; or any reservoir, canal, or dam."

There are three common types of floods that can occur:

- Slow-onset floods which occur in inland catchments. These floods may take days to build up and can last for days, weeks or even months. This type of flooding leads to loss of livestock and damage to crops, as well as disruption of road and rail networks isolating towns and properties.
- Rapid-onset floods occur more quickly. These floods can pose a greater risk to loss of life and property since there is less time to take preventative action from a faster, more dangerous flow of water.
- A flash flood results from relatively short, intense bursts of rainfall, often during thunderstorms when soil absorption, runoff or drainage cannot adequately disperse intense rainfall. These floods pose the greatest threat to life since people are often swept away after entering floodwaters on foot or in vehicles. They can also result in significant property damage and major social disruption, particularly in urban areas where drainage systems are often unable to cope.

Floods may make land unsuitable for agricultural production until waters recede or may more permanently affect productivity through erosion or changes to soil health such as increased soil salinity.

A1.2 Tropical cyclones

Tropical cyclones, hurricanes and typhoons are regional names for what is essentially the same phenomenon. A tropical cyclone is a low-pressure system which develops over the ocean in the tropics (between the Tropic of Cancer and the Tropic of Capricorn) and produces an average sustained wind speed of at least 63 km/h. If this wind speed exceeds 118 km per hour the system is defined as severe.

Cyclones will often bring destructive winds and heavy rainfall that can cause flooding. Storm surge, coastal inundation by seawater and less commonly tornadoes are all associated with cyclones in Australia.

Agricultural damage from cyclones can be due to direction destruction of crops, orchards, livestock and vegetation and damage to infrastructure such as buildings, irrigation, and storage. Long term loss of soil fertility can result from erosion and saline deposits over land flooded by sea water.

A1.3 Severe storm

A severe storm, or thunderstorm, consists of strong winds, heavy rain, lightning, thunder and possibly hail. The Bureau of Meteorology classifies a storm as severe if it produces any of the following:

- Hailstones that are larger than 2 cm in diameter.
- Wind gusts of more than 90 km/hr.
- Flash flooding.
- Tornadoes which is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes are typically in the form of a visible funnel with the narrow end touching the ground. Compared with cyclones, tornadoes are relatively short lived and the associated damage is intense and targeted.

Severe thunderstorms are likely to cause damage to property, crops and natural vegetation and may even result in death or injury.

A1.4 Fire

Wildfires or bushfires are fires that burn uncontrollably, occurring as either grass fire or forest fire. Bushfire is usually caused by lightning, arson or started accidentally. Fire can threaten the lives of people and stock and destroy infrastructure, buildings and crops.

PILOT STUDY REPORTS

Farmers are inherently resilient. Agriculture in Queensland has evolved over time to the current standard of highly technical commercial enterprises. This would not have occurred without resilient individuals and groups that have bounced back from many setbacks.

Resilience in agriculture means the ability to recover and attain full business functionality after a disruption. Building resilience is about changing industry and governments attitudes toward risk and developing capacity to adapt to change.

The agriculture sector in Queensland is exposed to, and indeed dependent on a highly variable climate. It needs to improve industry self-reliance in the face of climate extremes.

The Disaster Resilience Planning for Agriculture in Queensland Project was initiated to improve the preparedness of Queensland's agricultural sector to manage the impacts of natural disasters – cyclone, flood, storm and fire.

A Framework has been developed to identify factors which influence resilience for agriculture in Queensland. The Framework has been applied to two industries and a geographical area as pilot studies to:

- Test the validity of the Framework for agriculture in Queensland.
- Assess the current state of resilience within the pilot industries.

This document reports on the results of those pilot studies.

QFF gratefully acknowledges the funding provided for the project by the Queensland Government through the Department of Agriculture, Fisheries and Forestry; as well as the time generously contributed by the many participants.

2

1 Introduction

The natural disaster resilience framework for agriculture in Queensland provides a structured approach to understanding the factors and processes which influence resilience.

Refer to Figure 1.

The framework conveys that the existing settings and the consequence of disaster impact influence resilience to disturbance. In this conceptualisation hazard is unchangeable; while exposure, sensitivity and vulnerability are 'manageable'.

The emphasis of the framework is on capacity (as the flipside to vulnerability) since this is considered to have the greatest potential for increasing resilience.

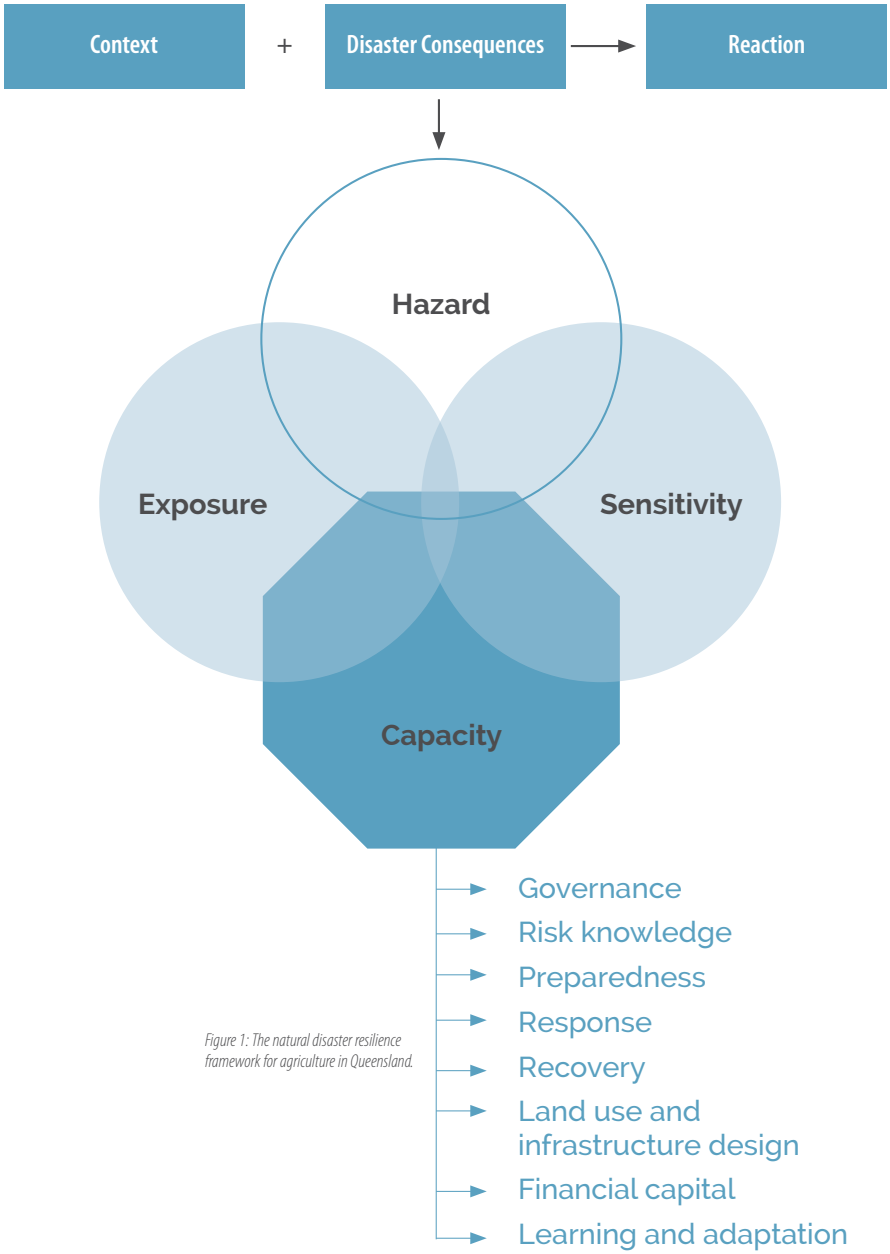


Figure 1: The natural disaster resilience framework for agriculture in Queensland.

In this conceptualisation hazard is unchangeable; while exposure, sensitivity and vulnerability are 'manageable'.

2 Method

Pilot studies were used as small scale test of the Framework. Investigations focused on assessing the current capacity of the industry as a way to identify strengths and gaps in capacity. In this way the results of the pilot provide information to define and prioritise actions to reduce risk, accelerate recovery and adapt to change.

The method used here was adapted from the Coastal Community Resilience Guide (US Indian Ocean Tsunami Warning System 2007). This guide was developed building on experienced gained from the Indian Ocean tsunami of December 2004 to address coastal hazards and reduce risk to vulnerable communities.

This guide was developed building on experienced gained from the Indian Ocean tsunami of December 2004 to address coastal hazards and reduce risk to vulnerable communities.

2.1 Applying the framework

The eight elements of capacity (refer to Figure 2) represent conditions that must exist to support resilient industries. These are described below:

1. **Governance:** Industry and government leadership and policy providing the enabling conditions for resilience.
2. **Risk knowledge:** Industry and government assessment of hazards and risk information used when making decisions.
3. **Preparedness:** Industry's capacity to absorb and recover after an event through planning.
4. **Disaster response:** Implementation of a collective and coordinated industry and government response.
5. **Recovery:** Pre-prepared plans that accelerate disaster recovery, engage agribusinesses in the recovery process, and minimise negative impacts.
6. **Land use infrastructure and design:** Land use planning and infrastructure development which reduces risks from hazards.
7. **Financial capital:** Self-generated financial capital to support industry resilience.
8. **Learning and adaptation:** Industry's ability and willingness to learn from collective and individual experience.

Each element is supported by four core capacities:

- Policy and planning which provides the enabling conditions for community resilience.
- Physical and natural resources referring to the infrastructure or resource capacity to support resilience.
- Social and cultural relating to self-resilience of the community achieved through networks, cultural norms, and education and extension.
- Technical and financial support needed to sustain resilience efforts.

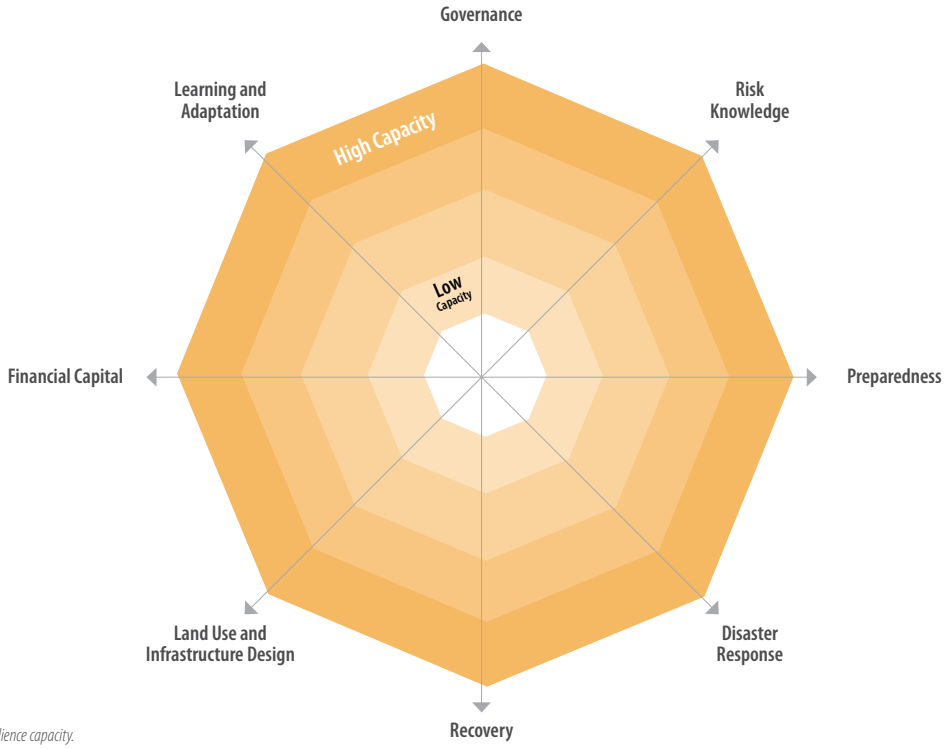


Figure 2: Elements of resilience capacity.

2.1.1 Best practice for resilience

Best practice statements were developed for each element (and the supporting core capacities) to describe the situation where resilience would be enhanced. Refer to Table 1.

Table 1 : Best Practice Statements used for benchmarking.

Resilience Element Supporting Core Element	**BEST PRACTICE STATEMENT**
1 Governance	**Enabling conditions for resilience are provided through industry and government leadership, policy and institutions.**
1.1 Policy and planning capacity.	Deliberate action is being undertaken to enhance capacity, supported by resilience policies, plans and programs.
1.2 Physical and natural capacity.	Basic services to support capacity (water, electricity, transportation, communications) are available to all participants.
1.3 Social and cultural capacity.	Collaborative mechanisms (networks) are in place to share data and information, lessons learnt and good practices across government, industry communities and individuals.
1.4 Technical and financial capacity.	Technical and financial support mechanisms are in place to support capacity enhancement.
2 Risk Knowledge	**Government and industry assess hazards and risk information is used in decision-making.**
2.1 Policy and planning capacity.	Natural hazard risk assessment been completed at an appropriate scale for the industry.
2.2 Physical and natural capacity.	Natural hazard risk assessments are comprehensive.
2.2 Social and cultural capacity.	Risk assessment processes are inclusive and the knowledge is shared.
2.2 Technical and financial capacity.	Information from risk assessment is accessible and useable for risk reduction.
3 Preparedness	**Industry has the capacity to absorb and recover after an event through planning.**
3.1 Policy and planning capacity.	Preparedness plans are in place at the industry scale.
3.2 Physical and natural capacity.	Plans are in place to protect physical and natural assets from natural hazards.
3.3 Social and cultural capacity.	Preparedness information is shared within the industry.
3.4 Technical and financial capacity.	Information and assistance is available to facilitate preparedness.
4 Disaster Response	**Industry and government implement a collective and coordinated response.**
4.1 Policy and planning capacity.	Predefined roles and responsibilities are established for immediate action at all levels.
4.2 Physical and natural capacity.	Industry participants are self-reliant in basic emergency and relief services.
4.3 Social and cultural capacity.	Business level response planning is in place.
4.4 Technical and financial capacity.	Disaster management arrangements are in place with technical and financial resources to support industry response.
5 Recovery	**Recovery plans are in place that accelerate disaster recovery, minimise negative impacts and engage agribusinesses in the recovery process.**
5.1 Policy and planning capacity.	Pre-established disaster recovery plans addressing people, livestock and finances are in place.
5.2 Physical and natural capacity.	Pre-established disaster recovery plans addressing infrastructure and natural resources are in place.
5.3 Social and cultural capacity.	Pre-established coordination mechanisms are in place to coordinate assistance from organisations and volunteer programs.
5.4 Technical and financial capacity.	Technical and financial resources are available to support the recovery process.
6 Land Use and Infrastructure Design	**Effective land use planning and infrastructure development is in place to protect community, environmental and economic values and reduce risks from hazards.**
6.1 Policy and planning capacity.	Pre-established disaster recovery plans addressing people, livestock and finances are in place.
6.2 Physical and natural capacity.	Pre-established disaster recovery plans addressing infrastructure and natural resources are in place.
6.3 Social and cultural capacity.	Pre-established coordination mechanisms are in place to coordinate assistance from organisations and volunteer programs.
6.4 Technical and financial capacity.	Technical and financial resources are available to support the recovery process.
7 Financial Capital	**Industry manages risk through financial planning, insurance and access to credit.**
7.1 Policy and planning capacity.	Policies and programs are in place to facilitate improved business planning and financial self-reliance.
7.2 Physical and natural capacity.	Sound financial management practices support physical and natural assets.
7.3 Social and cultural capacity.	Collaborative networks promote improved business planning and refer the economically marginalised.
7.4 Technical and financial capacity.	Technical information is available to support financial and business planning.
8 Learning and Adaptation	**Industry has the ability and willingness to learn from collective and individual experience.**
8.1 Policy and planning capacity.	Reflective practice is built into resilience policies, plans and programs, including adaptation of these where necessary.
8.2 Physical and natural capacity.	Monitoring and reporting processes have been established to track recovery effort and outcome.
8.3 Social and cultural capacity.	Collaborative networks are used to identify measures to reduce risk and learn from experience.
8.4 Technical and financial capacity.	Technical and financial programs are in place to support the implementation of best practice.

2.2 Interview process

A semi-structured interview process was used to discuss capacity elements for each pilot study. Interviews were guided by the use of model questions. Refer to Appendix 1. An assessment was then made of the current situation of the pilot industry in relation to the best practice statement using a scale of zero (low capacity) to five (high capacity).

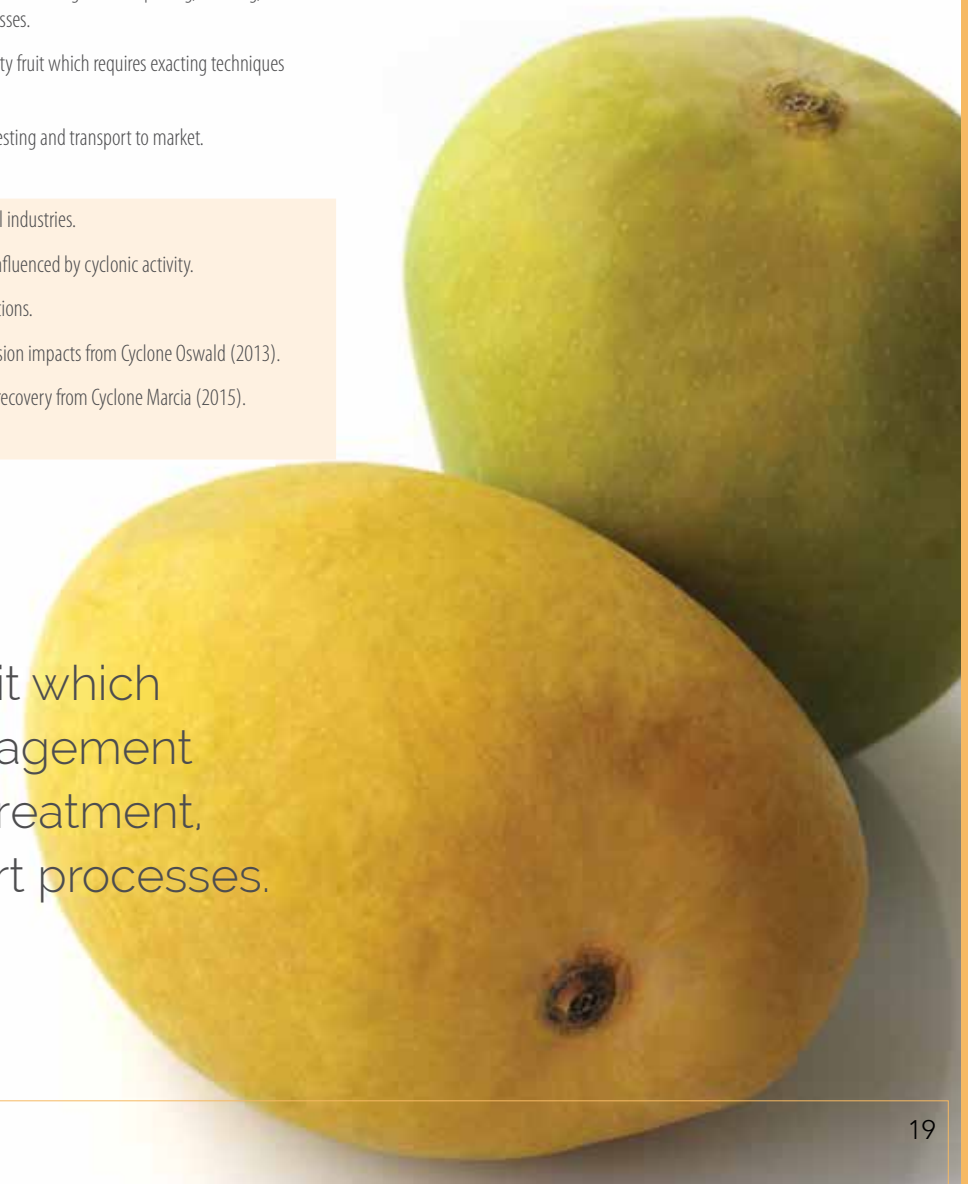
It should be emphasised that the numeric value for each capacity element is only indicative and its value lies more in the identification of gaps and strengths than in the assessment itself.

3 Pilot studies

Three industries were selected to pilot the application of the framework. Their selection was based on consultation with the Project Advisory Committee and was designed to highlight a number of disaster issues of relevance to the agriculture industry summarised in Table 2.

Table 2 : Key disaster issues for 3 pilot studies.

Industry	Characteristics of interest to resilience planning
Dairy	Fresh milk is considered by many as a dietary staple. Dairying requires a continuous production system reliant on uninterrupted power supply. Animal welfare issues associated with provision of appropriate feed and water, ability to milk (at least twice daily), provision of dry stand and ready access to animal health support services and supplies. Milk is highly perishable product and must be refrigerated. It requires transport, processing and packaging before sale for human consumption. Geographic spread of dairy farms and processors from south-east Queensland to Far North Queensland. Some challenges evident in responding to and recovering from recent disaster events.
Mango	Perennial tree crop taking a relatively long time period for commercial fruit production. Large annual variability in fruit production associated with genetics, seasonal conditions prior to and during fruit setting, and biosecurity risks. Highly perishable fruit which requires careful management of picking, washing, treatment , ripening and transport processes. Financial incentive to produce high quality fruit which requires exacting techniques during annual production cycle. Narrow window of opportunity for harvesting and transport to market.
Barker-Barambah Creek Sub-basin	Range of intensive successful agricultural industries. Tropical rainfall and river flow patterns influenced by cyclonic activity. Serviced by a range of regional organisations. Experience with severe flooding and erosion impacts from Cyclone Oswald (2013). Recent experience with natural disaster recovery from Cyclone Marcia (2015).



Highly perishable fruit which requires careful management of picking, washing, treatment, ripening and transport processes.

2

4 Dairy industry pilot study

This section of the report presents the findings of the dairy industry pilot study.

4.1 Dairy foods

Milk is a rich source of essential nutrients including protein, carbohydrate, vitamins (A, B12, iodine and riboflavin), and minerals (calcium phosphorus, potassium, and zinc). The calcium in dairy products is a unique contributor to the Australian diet – few other foods contain as much calcium and it is well absorbed compared to other plant sources (DHA and NHMRC 2005). Consumption of dairy foods may help reduce risk of help reduce risk of high blood pressure, heart disease, stroke, type 2 diabetes and some cancers (NHMRC and DHA 2013).

The main dairy products consumed in Australia are drinking milk, cheese, butter and butter blends, and yogurt. Consumption trends have varied over time between products. This reflects among other variables changes in consumer trends, multi-cultural influences on food, heath perceptions, product development and competition from other products (Dairy Australia).

The per capita consumption of drinking milk is currently estimated at around 106 litres, growing strongly over recent years linked to the rise of the 'coffee culture' (2013/14 data, Dairy Australia). Average consumption of other dairy products includes approximately 13 kg cheese, 4 kg butter and 7 kg yoghurt (2013/14 data, Dairy Australia).

To produce milk a dairy cow needs to be pregnant or lactating. Milk production peaks between 40 to 60 days after calving and continues for 10-16 months. At this point cows are 'dried off' and milking ceases in preparation for the next calving. About 60 days later, 12-15 months after the birth of her previous calf, a cow will calve again. A cow produces around 25 litres of milk per day, with this amount decreasing as the season progresses.

Milk quality is measured by white blood cell counts in the milk. The main threat to milk quality in Australia is mastitis –inflammation of the cow's mammary gland usually caused by bacteria entering the teat canal and moving to the udder. The number of cells in milk increases in response to infection with mastitis. Bulk milk cell counts will also indicate bacteria which may occur in milking equipment and storage tanks.

Cows predominately graze on pasture and/or forage crops (the edible parts of a plant, other than separated grain), supplemented with grain. The nutritional needs (energy, nutrients, water) of a cow will vary with size, activity, stage of pregnancy and level of milk production. Nutrition needs to be carefully managed to maximise milk production and avoid animal welfare issues. Nutrition will also influence milk composition i.e. the proportion of protein and fat.

Silage is fermented forage which can be used as a long term feed reserve. Producing silage is an important strategy to cost-effectively fill seasonal and disaster-related feed gaps. However, silage production needs to be carefully managed to attain acceptable levels of quality with minimal losses avoid waste and avoid animal health issues.

4.2 The dairy industry in Queensland

In Queensland there are 510 dairy farms producing 457 mil litres of milk (2012-13 data, Murphy and Simpson 2013). This represents 5 per cent of the national milk production and is valued at $225 mil. Dairy farms are located in the north, central, south-east and Darling Downs regions of Queensland. Refer to Figure 3.

There are six main milk processing plants and a number of smaller processors in Queensland. The two major processing companies are Lion Dairy and Drinks and Parmalat. Norco is based in northern New South Wales (NSW) with a milk processing plant in Queensland. Queensland also has a number of small processors supplying fresh dairy products to local markets. Virtually all of the milk produced in Queensland is consumed within Queensland as fresh milk (QDO 2014).

After processing, the value of drinking milk and other value-added dairy products is estimated to be $700 million. In 2008, ABARE reported that dairy provides an estimated regional economic multiplier effect of 2.5 (ABARE 2008). In 2011-12, an estimated 2,250 people were employed in the dairy industry (DEEWR 2012).

Following deregulation in 2001, the number of dairy farms in Queensland has declined from 1,545 in 2000 to 610 in 2010 (DAFF 2014a). This decrease continues with a 7 per cent decrease in farm numbers from 548 in 2011-12 to 510 in 2012-13 with a corresponding decrease of 28 mil litres of milk.

The Queensland Dairy Accounting Scheme (QDAS) provides analysis of business performance from 65 farms. The dairy operating profit is calculated from the amount of profit retained after paying all expenses except finance costs and taxes. The average dairy operating profit across QDAS farms in 2012-13 was reported to be 7.7 per cent, or $247 per cow (Murphy and Simpson 2013).

According to the Rural Debt Survey (QRAA 2012) in 2011 there were 452 borrowers in the dairy industry with an average of $0.525 mil debt, totalling $237.4 mil. This represented a decrease from 2009 from the total industry debt of $266.1 mil.

There has been a 15 per cent fall in consumer fresh milk prices since 2008-09, which is likely to be related to supermarket pricing practices (DAFF 2014). Farm gate prices fell in 2013/14 (see http://www.dairyaustralia.com.au/Markets-and-statistics/Prices/Farmgate-Prices.aspx). Queensland milk production has been less than Queensland market demand since the natural disasters experienced at the start of 2011. However this did not trigger an increase in farm gate prices, again considered to be associated with supermarket pricing practices.

Table 3 summarises the future opportunities and challenges for the dairy industry in Queensland.

The Queensland Dairyfarmers' Organisation is the peak industry body for the Queensland dairy industry, with approximately 65 per cent of Queensland dairy farmers being members (QDO 2014).

Dairy Australia is a national body servicing dairy farmers and the industry. It provides base resources for a Regional Development Program which aims to drive innovation in research and extension by using regional knowledge and skills, and works collaboratively to identify and implement local industry projects. The subtropical dairy region extends from the Atherton Tablelands south to Kempsey in NSW.

Figure 3: Location of dairy farms in Queensland.
Source: Murphy and Simpson (2013)

Opportunities	Challenges
• A growing domestic population will result in greater demand for dairy products. • Consumer interest in niche milk products, such as organic, local provenance and A2 milk, is expected to grow. • Demand for fresh milk and dairy products in developing Asian countries, particularly China, is likely to increase. ` • Once delivered, the China-Australia Free Trade Agreement will see tariffs on Australian dairy products phased out over the next 11 years with tariffs on infant formula phased out over the next four years. • There is potential for large dairy development projects in Queensland to service the growing Asian market e.g. in the Mary River region.	• Increasing climate volatility leading to increased risk exposure by farm businesses. • Input costs and transport costs will continue to increase. • Competition and costs for land and water will continue to increase. • Ongoing improvements in dairy practices from interstate competitors. • There is increasing community scrutiny of livestock production systems and practices, and increasing expectation for animal welfare standards and environmental stewardship. • There will continue to be competition for labour and skills. • Competition from countries with lower costs of production.

Table 3: Future opportunities and challenges for the dairy industry in Queensland.
Source: Adapted from DAFF (2014)

4.3 Dairy industry pilot participants

Interviews were conducted between October and November 2014 and a total of 20 industry participants across various part of the supply chain where fully or partially interviewed to gain their insights across the Model Questions.

4.4 Dairy industry pilot findings

Figure 4 presents the findings of the dairy pilot. The industry's strengths, gaps and opportunities are summarised in Table 5.

Figure 4: Current status of resilience capacity in the Queensland dairy industry.

Capacity Element	Strengths	Gaps	Opportunities
Governance	Dairy is a relatively homogenous industry with similar production systems across regions. The state industry organisation retains a high proportion of farmer membership and is perceived to be delivering a good service. QDO delivers support services to all Queensland dairy farmers in times of disasters (regardless of whether they are members). Farmers are well serviced by programs through national (Dairy Australia) and regional (Subtropical Dairy) industry providers. The industry was previously well serviced by government RDE, although this service is diminishing. There is a co-dependent and co-operative relationship between farmers and processors. There are solid communication networks in place with minimal competitive tension between farmers.	There are some isolated producers particularly in Central Queensland which don't have nearby dairying neighbours. Some farmers choose not to use industry services or connect with district networks. Industry organisations have very limited resources aligned to responding to disaster events. There is a reliance on government funding for in- and post-event assistance to farmers by the state industry organisation. Government not equipped to provide rapid response/ service when disaster occur and lead emergency recovery.	Continued use of the strong communicative relationships in place. Transition to reduced reliance on government funding following an event.
Risk knowledge	Farmers usually have a sound understanding of the physical impact of disasters e.g. which land areas will be inundated in different scales of flood. Most farmers do assess the risk of their production investments in an informal way. Industry organisations send out preparation reminders and checklists prior to the west season and deliver tailored weather risk information through multiple media (SMS, email, print).	The skills and knowledge of farmers limits understanding of some information (e.g. seasonal forecast) particularly given the inherent complexity of the data and therefore the level of certainty around predictions. Information is not fine scale enough to support decision making for individual farmers.	Tailoring of information for specific decision points – when and how much. For example, granular weather data or fodder tracking services. Improving uptake of 'smart' communication platforms by farmers.
Preparedness	Most farmers have direct experience in managing through a natural disaster. Farmers maximise storage of feed material where possible. Alternative power supply available on most farms (generators). Industry organisations provide prompts to check back up systems and reserves.	Conditions in the last decade, particularly the last 2-3 years has meant it has not been possibly to store enough feed, or feed supply has been rapidly diminished.	One of the main opportunities to improve resilience in the dairy industry is in this area of pre-planning, particularly in feed planning and milk loss during an event. Priorities for investigation include: – Better analysis of future feed requirements to assist decision making in storing and forward buying of feed. – Provision of incentives to encourage feed 'future proofing'. – Cooperative farmer feed storage systems. – Continued emphasis on the need for alternative electricity supply and communications in-event. – Continued availability of incentive schemes to assist preparedness e.g. water and feed storage infrastructure loans.

Capacity Element	Strengths	Gaps	Opportunities
Disaster response	The industry organisation has a centralised database to aid the management and coordination of disaster response. Contact details for farmers are readily available and current. There is high level of good will amongst neighbours in terms of sharing resources e.g. access to functioning milking equipment. The industry organisation has experience in responding to multiple natural disasters.	The current industry response system is driven by individuals meaning it is susceptible to change. There is not consistent connection to the Local Disaster Management Arrangements (LDMA) where response needs are communicated and prioritised. Current coordination arrangements between local and state governments yields inefficiencies in the collective disaster response.	Formalisation of existing arrangements is needed. This includes pre-event agreement on: – Responsibility for roles in conjunction with local government (in their role as leading LDMA). – Which organisation will contact farmers and for what purpose. – Triaging of issues and response options with pre-planned responses.
Recovery	There is a smooth transition from emergency response issues to recovery issues. There is a high level of awareness of mental health issues amongst the industry, which surface after a disaster.	Disaster response correctly focusses on the health and safety of humans and animals. There are longer term impacts which reduce productivity which need to be addressed during the recovery phase e.g. changes in hydro-chemical soil status.	Formalisation of recovery arrangements is needed. This includes a formal move from emergency response to addressing longer term issues of productivity and profitability, as well as preparedness for the next event. Formalised connection to existing resources and services is needed e.g. health, welfare and volunteer services.
Land use infrastructure and design	Farms infrastructure assets are usually inherited and progressively re-developed or reconfigured as required.	There is limited opportunity to replace or re-sight facilities due to the large initial outlay.	The principle of betterment needs to be grounded in recovery work.
Financial capital	Progress has been made in negotiating insurance products for limited milk loss associated with disasters. Some evidence of increasing use of income protection insurance which assists farming families (but not businesses).	A series of recent events has meant that farmers have not been financially able to position themselves to prepare for the next event/s. There is a lack of capital in the industry dedicated to disaster preparedness and response. Insurance costs are prohibitive, and current insurance arrangements are unlikely to be adequate to address full recovery for all farms.	Opportunity to pursue more insurance options and provide guidance to farmers to ensure insurance coverage is appropriate and cost-effective.
Learning and adaptation	The importance of evaluation and collective learning is well understood. Farmers have adapted to changed market conditions. Event experiences are shared at the farm and industry level through existing networks.	The industry is currently focussed on needs, vulnerabilities and changed market conditions which results in a repetitive response. The truism "no two events will ever be the same" is limiting more detailed reflection and an improvement of the response.	Forensic business analysis is needed to review past responses and evaluate effectiveness. This will assist in development of a more strategic approach which can be established to operate independently of individuals.

Table 4: Summary of dairy industry pilot findings from the interviews.

5 Mango pilot study

This section of the report presents the findings of the dairy industry pilot study.

5.1 The mango

After bananas, mangoes are the second most consumed tropical fruit in the world. Ripe mangoes are usually eaten raw as dessert or in fruit salads. They can also be used as an ingredient in cooked food (such as curries), salad and drinks. Ripe fruit can also be frozen, dehydrated, canned or made into jellies, jams, juices; incorporated into yoghurts and iced confectionery; or used to make liqueur. Immature fruit can also be eaten fresh but are usually used in pickles, chutneys or salads.

The mango is a good source of complex sugars, vitamins A and C, the antioxidant beta-carotene, essential macrominerals calcium and potassium, and fibre.

The mango is a perennial, evergreen tree with dense foliage. It grows broad and relatively tall (up to 20 m), although a maximum of less than 4.5 m is recommended for efficient harvesting and effective spraying. Grafted trees commence fruiting within two to three years. Commercial harvest is achievable after three years but peak production is at six to eight years. Seedlings take longer to come into production. Dependent on the variety and climate, mangoes flower in winter, set fruit in spring and are harvested in summer.

Fruit are difficult to pick. Traditionally ladders and hydraulic platforms have been used. More recently semi-mechanised harvest aids have been developed for use in large-scale commercial orchards which are either self-propelled or tractor-pulled. Care needs to be taken to prevent flow of the caustic sap from the stem end onto the fruit at and soon after harvest. This is achieved by de-sapping the fruit on racks or by washing the fruit in a detergent solution. Fruit is graded and packed before being transported.

Fruit are susceptible to a number of insect pests – thrips, scales, leaf and flower- eating caterpillars, plant and leafhoppers and fruit flies; and diseases – anthracnose, stem end rot and scab (Owens 2006).

Flowers can be damaged by rain and wind, and wind can reduce fruit setting and result in the loss of fruit. Cyclones can cause serious damage a trees, flowers and fruit. Defoliation from strong wind often results in a poor crop in the following season, especially from young trees (Johnson and Parr 2006).

Mature trees can tolerate flooding. Although, they may only tolerate one large flood of extended duration.

Pruning is usually carried out to shape trees and open up the centres to allow for increase air flow and penetration of sprays to efficiently control pest and disease (Poffley and Owens 2006). Penetration of sunlight can enhance the colour of the fruit and improve quality.

After bananas, mangoes are the second most consumed tropical fruit in the world.

5.2 The mango industry in Queensland

In Queensland there are around 7,000 ha of commercially grown mangoes (DAFF 2014b). The main production areas are in the far north, north, central, Wide Bay-Burnett and south-east regions. Refer to Figure 5. The total volume of fruit varies from year to year due to seasonal conditions and the irregular bearing nature of the crop. The ten year average production volume is 29,643 tonne (DAFF 2014a).

The gross value of production (at farm gate) was estimated to be approximately $77 mil for Queensland (2013-14 data, DAFF 2014a). This represents around half of the Australia-wide value of production which also includes production from Darwin and Katherine in the Northern Territory, Kununurra and Carnarvon in Western Australia, and northern New South Wales. Trial plantings are also in place in north-western Victoria and the Riverland region of South Australia.

The main commercial mango varieties grown in Queensland are Kensington Pride and B74 (marketed as CALYPSO®), R2E2 and Honey Gold®. Limited production of other varieties including Keitt, Kent, Palmer, Brooks, Keow Savoey and Nam Doc Mai, is used to extend the seasonal availability of mangoes or supply niche domestic and export markets (DAFF 2014b).

Table 6 summarises the harvest windows for the Queensland mango production.

Location	Harvest window
Burdekin, Bowen	November to December
Mareeba, Dimbulah	November to February
Rockhampton	December
Bundaberg	January to March
Sunshine Coast	January to April

Table 5: Queensland mango production areas and harvest
Source: AMIA and HAL (2014), DAFF and AMIA. windows

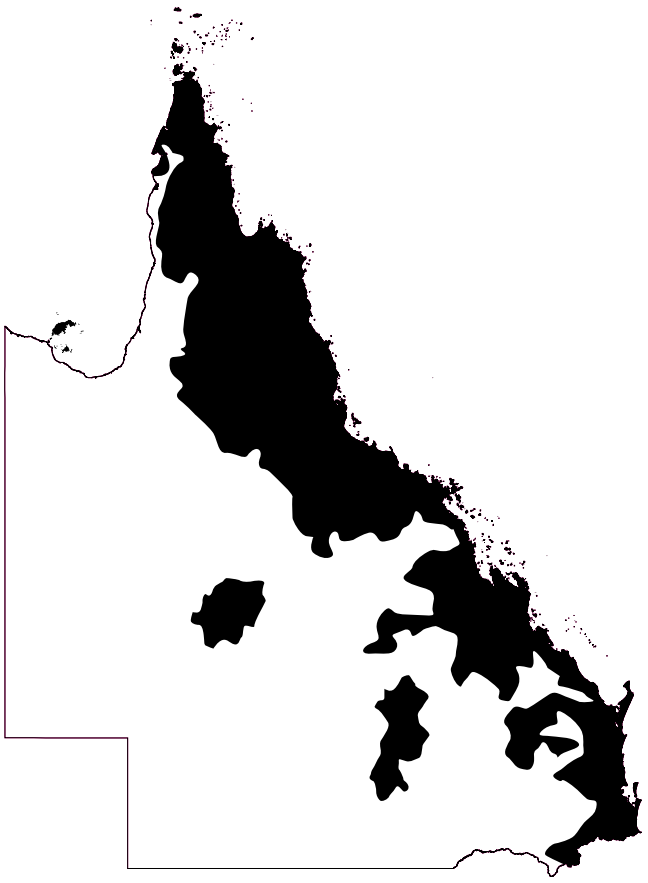


Figure 5: Location of mango production in Queensland.
Source: Adapted from ABS (2008)

Most (92 per cent) of the Australian mango crop is consumed domestically (Australian Mangoes). In Queensland the majority of the fruit is sold in the main domestic markets (Brisbane, Sydney, Melbourne and Adelaide) and the remainder is used in the processing for canned mango, mango juice and mango-flavoured products. Between 5 and 10 percent of the crop is exported.

A benchmarking project was recently undertaken to assess enterprise performance over the years 2010/2011 to 2012/13. Due to the sensitivity and confidentiality of information provided by growers, the findings of this report have not been available to QFF. However, the rising cost of production and decreasing return are major concerns for mango growers. The profitability of a mango orchard can be improved through (Ngo and Owens 2002):

- Achieving high yields.
- High wholesale prices can be achieved for high quality or meeting a niche in seasonal availability.
- Orchards are large enough to obtain better returns through economies of scale resulting in lower production costs.
- Production costs can be reduced especially those costs related to the picking, packing, transport and marketing.
- Fruit could be sold through alternative markets (especially international export) to lessen the pressure on domestic prices through surplus supply.

The AMIA is the national peak body for the mango industry. It was established in 2000 and is funded through membership fees and fee for service provision.

The AMIA commissioned a Strategic Investment Plan (SIP) was developed in 2014 ". . . to provide a clear direction for the advancement of the Australian mango industry and to define the key outcomes required from the investment of industry and government monies over the next five years". The plan climate variability adaptation strategies and increased resilience as critical to the advancement of the industry.

Biosecurity planning for the mango industry was updated through the preparation of the Mango Industry Biosecurity Plan released in 2012. The plan identifies exotic pests and outlines key threats, risk mitigation plans and contingency plans for the industry. This type of pre-emptive planning process can improve the industry's capacity to deal with the threat of new pests and inform stakeholder organisations about their role in biosecurity protection.

An analysis of Strengths, Weaknesses, Opportunities and Threats was undertaken in the development of the Australian Mango Industry SIP. Table 3 summarises the future opportunities and challenges for the mango industry in Queensland relevant to resilience planning.

Opportunities	Challenges
• Mangoes are an appealing fruit with nutritional benefits. • Data is available on consumer requirements and preferences. • There is a growing demand for healthy, fresh food domestically, and a niche international markets for premium Australian product. • Market access arrangements are in place or in train in a growing number of countries. • Large, corporate agribusinesses are able to provide continued investment in infrastructure and value chains. • The large geographic spread of production distributes natural disaster risk to the industry. • Research and development into new varieties, tree architecture and orchard design; new technology for field and packing application and; availability of new biosecurity compounds. • Levy provides stable investment in industry development and promotion work.	• Fruit is highly perishable and requires careful treatment and handling. • There is susceptibility to a number of biosecurity risks. • Some SMEs have a reduced profitability due to the inability to produce large volumes of consistently high quality fruit. • Some enterprises reliant on a single variety which can magnify the effect of some production risks. • Maintenance of current and securing of new export market access with workable protocols. • Limited/patchy uptake of research across the industry. • Withdrawal of research, development and extension services from Queensland government.

Table 6: Future opportunities and challenges for the mango industry in Queensland.
Source: Adapted from AMIA (2012)

5.3 Mango industry pilot participants

Interviews were conducted between February and March 2015 and a total of 14 industry participants across various part of the supply chain where fully or partially interviewed to gain their insights across the Model Questions.

5.4 Mango industry pilot findings

Figure 4 presents the findings of the mango pilot. The industry's strengths, gaps and opportunities are summarised in Table 5.

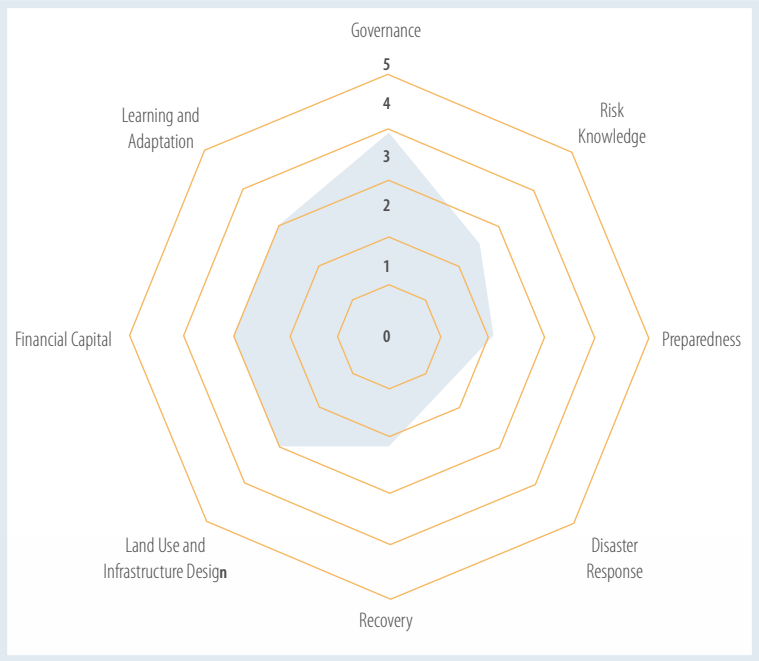


Figure 6: Current status of resilience capacity in the Queensland mango industry.

Capacity Element	Strengths	Gaps	Opportunities
Governance	The AMIA is a high profile organisation and has a high level of brand recognition within the industry. Within Queensland, the opportunity for regional connection is maintained by a regular newsletter, as well as grower workshops and field days.	The initial focus of AMIA's risk management planning has been biosecurity and food safety issues. Whilst AMIA does provide a unifying entity for the industry, the reality is that one region's misfortune may be another's boon.	Resilience planning appears to be a logical progression from the work that AMIA has developed to date. Since AMIA is an Australia-wide body the defining type of natural disasters events and the geographic priorities for planning would need careful consideration.
Risk knowledge	There is a high level of understanding of the physical impact of natural disaster events within the industry. This has been garnered from multi-generation experience in farming in natural disaster prone areas. There is evidence of the use of weather-related tools to assist with seasonal forecasting.	There is limited information about the financial cost of natural disasters within the industry. There are two major reasons for this (i) difficulty in obtaining financial information from growers and (ii) the potential delay between event impact and determination of impact on fruit quality (which may continue for some years).	Analysis of the potential cost of natural disasters focussed on a reduction in fruit quantity and/or fruit quality would be beneficial in building a benefit-cost case for investment in resilience planning.
Preparedness	The industry benefits from the broader community effort in preparedness planning for people safety and public infrastructure.	There is a surprising level of complacency in preparing agri- business for natural disasters particularly among small enterprises. This is the case even where there is recall of a relatively recent disaster event. The source of this complacency appears to be related to a fatalistic outlook that an event will occur and/or a sense of helplessness that there is limited action that is possible to reduce the impact. Moreover, the operational burden of addressing the challenges of increasing costs of production and gaining market access appears to limit the capacity for strategic thinking about resilience.	One of the major opportunities for the mango industry is to improve preparedness for indirect impacts. For example planning of alternative transport routes, or use of alternative packing premises.
Disaster response	There is no industry 'tradition' of reliance on government assistance programs.	There appears to be little collective response within the industry in disaster response. The reasons for this is unclear. Disaster assistance programs are not particularly suited to the industry since loss of fruit quantity or quality may not be apparent until future harvest/s. In the case that mango trees are destroyed the enterprise has lost 5-30 years of work which is extremely expensive, if not impossible to replace.	There is opportunity for a more structured regional industry response, supported by AMIA. This could include consumer marketing to maintain customer loyalty during difficult times.
Recovery	Mango trees are available to survive some periods of flooding, dependent on the eco- physiological response of the tree.	There is information available and in use regarding best management practice post event e.g. pruning techniques. However there is limited research and as such these are not generally considered 'proven' and may vary between varieties. There is research emerging through the Small Tree-High Productivity initiative which aims to boost crop yield per hectare by manipulating trees through dwarfing rootstock and tree architecture.	There is an opportunity for obtaining technical consensus and industry promotion of the current best management practices post event.
Land use infrastructure and design	There is likely to be continued investment in infrastructure for medium to large enterprises. This includes replacement or renovation to accommodate innovation in sorting and packing, and more specialised facilities such as commercial ripeners. Additional treatment facilities may also be established in response to treatment requirements from new markets e.g. vapour heat treatment. Enterprises are likely to proactively seek independent engineering advice for infrastructure specifications to withstand local weather conditions.	Given the very mature state of trees in most mango production areas, reconfiguration of farms to plan for flood and wind protection is unlikely. Smaller enterprises are likely to be reliant on advice from regional councils regarding engineering standards for new infrastructure which is sound.	There is opportunity for a more structured regional industry response, supported by AMIA. This could include consumer marketing to maintain customer loyalty during difficult times.
Financial capital	Medium to large enterprises are well connected to their supply chains. They are continuing to improve their risk management through geographical, varietal and product diversification, insurance and product buffer planning.	Increasing production costs are impacting on the ability of small enterprises to financially plan or change harvest systems to prepare for an event. Underinsurance is likely to be commonplace which will only surface after an event.	There is opportunity for the industry to provide information on insurance products, including multi-peril crop and business continuity products.
Learning and adaptation	The AMIA represents a natural choice as an organisation to collectively learn from previous events. This has reportedly occurred for previous experiences with pest incursions.	While no planned response is in place for natural disasters, there is no impetus for collective learning and adaptation.	There may opportunity to improve regional connections through encouraging a broader attendance. The perennial challenge is how to engage these members of the industry.

Table 7: Summary of mango industry pilot findings from the interviews.

6 Barker-Barambah Creek sub-basin pilot study

This section of the report presents the findings of the third pilot study, differing from pilot studies one and two in that it focused on the Barker-Barambah Creek catchment in the South Burnett and the industries within this region.

6.1 The Catchment

Barambah Creek is a sub-catchment of the Burnett River. It starts in the hills between Kingaroy and the Sunshine Coast at an elevation of 377 m and flows in a northerly direction before joining the Burnett River north-east of Gayndah. The Creek is dammed south of the town of Murgon forming Lake Barambah (or Bjelke-Petersen Dam) with a capacity of 125,000 Ml. The Creek is approximately 240 km in length with seven tributaries including Barker Creek, Sandy Creek, Boonara Creek, Back Creek and Oaky Creek. The Barker and Barambah Creek sub-basin has a total catchment area of 5,930 km^2.

The catchment area of the Burnett River is 33,038 km^2 and it flows into the ocean at Burnett Heads, approximately 20 km downstream of Bundaberg.

Barambah Creek sub-catchment contains the major towns of Goomeri, Murgon, Nanango and Wondai.

The region experiences a typically tropical climate with distinct wet and dry seasons. Most of the rain in the region falls between December and March when tropical cyclones cross the Queensland coast from the Coral Sea. Average annual rainfall in the Barambah Creek sub-catchment rainfall is 500 to 1,000 mm.

Strong seasonal rainfall results in a seasonal river flow. The 'wet season' occurring December to June results in peak river flows typically occurring during the same period. Low flows are recorded during the dry season (July to November), with flow ceasing altogether at some points in the creek.

Fentie et al (2014) provide a summary of soils in the Burnett region grouped as:

- Rolling hills and plateaus west of the coastal plain consisting of:
  - Clayey soils formed from basic volcanic rocks on hills.
  - Sandy soils formed from granite rocks on hills.
  - Deep red soils formed from deeply weathered volcanic rocks on plateaus.
  - Brown or grey sandy or loamy texture contrast soils formed from deeply weathered granitic or sedimentary rocks on plateaus.
- The western catchment boundary is formed by a ring of mountain ranges or high plains consisting of:
  - Loamy texture-contrast soils formed on sedimentary, volcanic, acid intrusive and metamorphic rocks on ranges.
  - Dark cracking clays formed on elevated relict alluvial plains.

Land use in the sub-catchment follows spatial variation in soil and rainfall and available water. Aside from agriculture, the area contains nature conservation, forestry, urban areas, power generation, mining and extractive industries, tourism and recreation and water resource development land uses.

The catchment has been hit with two major natural disaster events in the last three years.

Tropical Cyclone Oswald in January 2013 passed through the region causing widespread impact including severe storms, flooding, and damaging winds. The upper Burnett catchment was severely flooded and the regions of this pilot study severely affected.

Severe Tropical Cyclone Marcia made landfall in central Queensland and tracked south affecting the region of the pilot study. Although it had weakened when it came through the region it still caused widespread damage, mainly from flooding in the northern area of the pilot study.

Figure 7. Path of TC Oswald through the pilot area (Sourced from QLD Reconstruction Authority)

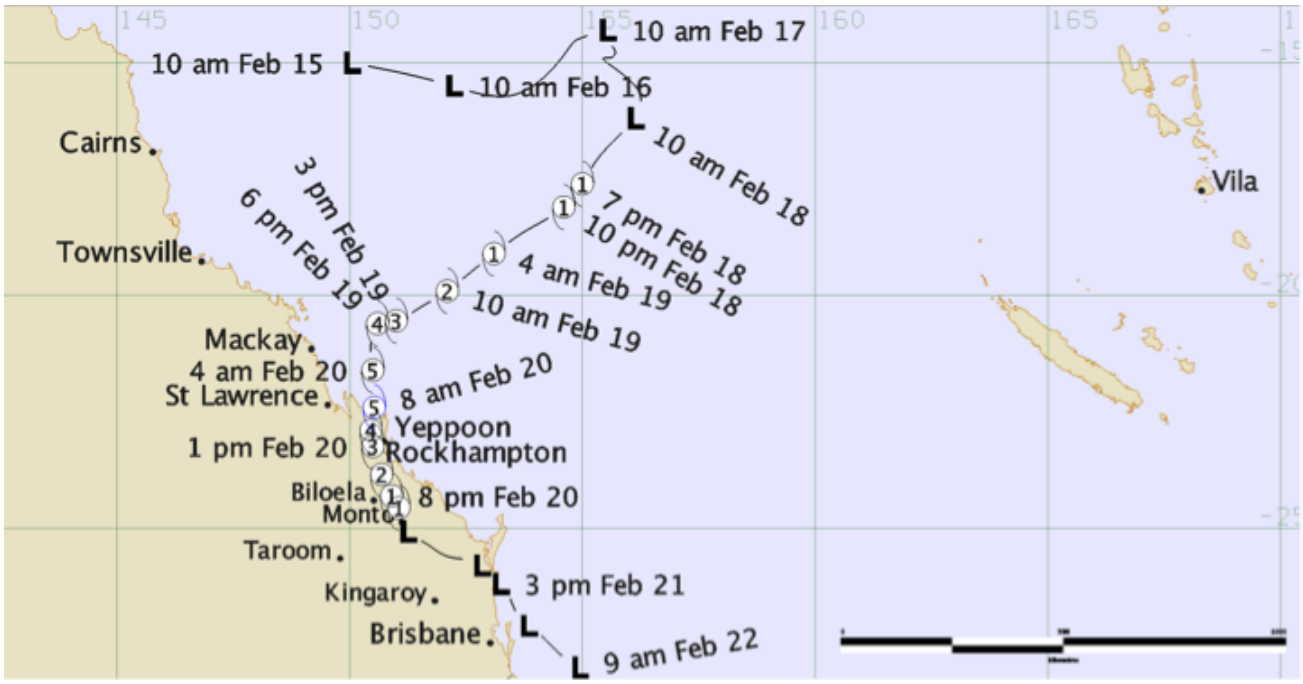
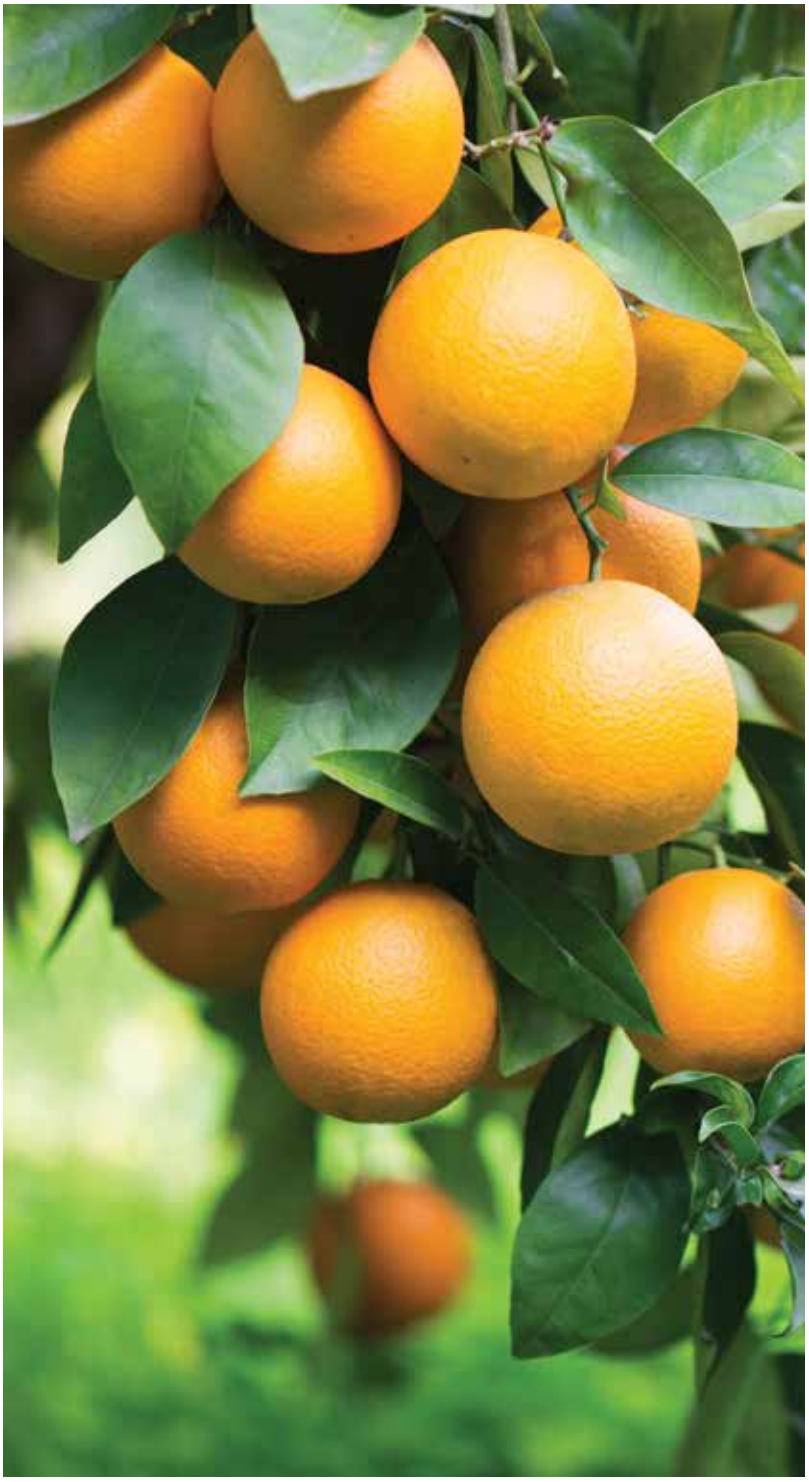


Figure 8. Path of TC Marcia (Sourced from BOM)



6.2 Agricultural enterprises in the region

Agricultural activities in the study area include grazing, cropping (cereals, peanuts, cotton and broad acre crops), vineyards, orchards, dairy, horticulture and timber (BMRG 2005). Irrigation is sourced from shallow aquifers and the Baker Barambah water supply scheme for the more intensive industries. Primary industries are major contributors to the local economies both in the North Burnett and South Burnett region.

Historically, the region had a strong base in beef and dairy production with both industry groups (QDO and AgForce) having a strong presence. Recently smaller farms have closed, this is particularly evented in the dairy industry. While some beef properties have expanded as they still enjoy a strong following with a meat works in Biggenden and selling complexes operating in Biggenden, Eidsvold and Monto. Feedlots have increased in the region over recent years, access to meatworks, good road infrastructure and local grain and fodder easily sourced is helping these enterprises to grow.

The study area is home to a large citrus producing region as well as other horticulture produce such as table grapes, stone fruit, mangoes, avocadoes and vineyards. Local packing and processing co-operatives supply national and international markets. Growcom as an industry body are active within the study area.

With agriculture contributing over a one billion dollars in gross production, it is the major economic driver for the area.

Industry	Gross Value ($m)
Crops	56.4
Livestock slaughtering.	49.4
Livestock produce	2.5
TOTAL	108.3

Table 8: Gross value of agriculture production – North and South Burnett regions
Source: Adapted from ABS Agriculture census (2006)

The study area is home to a large citrus producing region as well as other horticulture produce such as table grapes, stone fruit, mangoes, avocadoes and vineyards.

6.4 Barker – Barambah catchment pilot findings

Figure 7 presents the findings of the Barker – Barambah creek pilot. The catchments strengths, gaps and opportunities are summarised in Table 11.

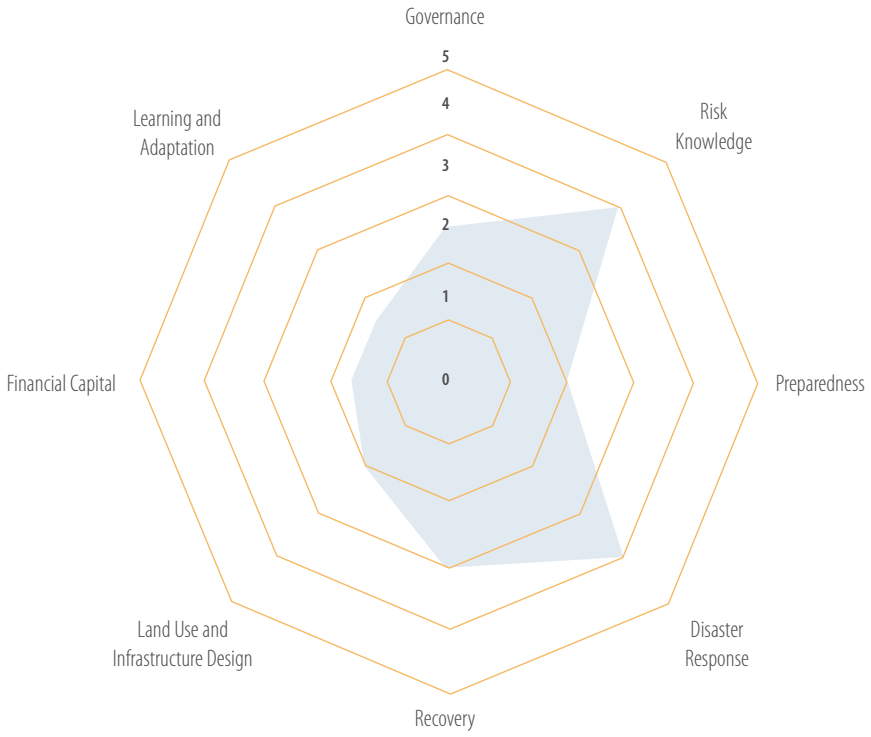


Figure 9: Current status of resilience capacity in the Queensland mango industry.

Capacity Element	Strengths	Gaps	Opportunities
Governance	The region has a good capability to respond to natural Disasters. Wide Bay Burnett Regional Organisation of Councils (WBBROC) is very active in Natural Disaster Response and infrastructure maintenance and strategic planning. Farmers are well catered for through a number of different organisation groups, industry organisations (Queensland Dairyfarmes Organisation, Growcom and AgForce) and government extension and field officers.	There is no dominant organisation throughout the region to coordinate and lead work on natural disasters. Resilience planning and policy is understood but with no structure and funding there is little active work in this space. Information gathering and information sharing is limited through this regions. There is no coordinated approach to work being done in the region.	The region is very experienced with natural disasters. The information collected within the different organisations, industry groups and local governments would be extremely useful if it could be analysed and used to its full effect. Due to the frequency of natural disaster events resilience planning would likely have far reaching and significant outcomes in the region.
Risk knowledge	The region, due to the frequency of natural disasters, has a high understanding of the risks associated with natural disasters. Farmers have a good level of risk knowledge as many have been effected a number of times over the past 5 years. Individual farms are taking steps to use this in their farm management and decision making.	The understanding of the risk and the affects they have on the local area at a local government level and at farmer level are not being documented. There is the risk that once people with firsthand knowledge move on the knowledge they have will be lost with them. Farmers are not aware of the level of financial risks associated with natural disasters. Limited amount of ground staff to inform people of that risk and gather in information to quantify the financial impacts. There is no leadership at a strategic level in increase the awareness of natural disasters and increase farmers understanding of the risks; physically, financially and mentally.	Frequency of events in this region has led to an increase understanding of the risks. If a coordinated approach to document this information can be found there is a large amount of very useful information that could be gathered across all levels within the region.

Capacity Element	Strengths	Gaps	Opportunities
Preparedness	The region has strong understanding of local organisations and industry bodies. These all understand the importance of preparedness. Individual farmers have a good levels of preparedness due to the frequency of natural disaster events.	Throughout this region preparedness is not thought of after recovery has finished, the region and it capabilities is only focused on recovery. Meeting that are successfully organised across organisations, departments and industries groups for recovery don't discuss preparedness. There is no lead organisation to push the conversation on to planning and resilience. The region has limited information available for farmers on preparedness. Farmers are left to assume and plan themselves with very limited support.	Industry groups have started to work on preparedness. There is an appetite for this information and services providing this but there is no information or people on the ground to provide this information.
Disaster response	Local government and industry led disaster response is very good. They are well practiced in recovery work and are able to meet quickly to address the situation. The industries are well represented in the area, the QFF led IRO projects has been a valuable project, enabling people to access assistance quickly and efficiently.	Communication across local government groups is poor, each has their own local priorities with no cross regional/council plans or strategies. There is currently limited response to the financial and business impacts of a natural disaster.	The scope for financial assistance and business planning needs to be prioritised as a response to a natural disaster. Industry led financial planning and business services to assist farmers with financial and business recovery although difficult will be extremely beneficial to the area.
Recovery	The region has a good ability to recover from natural disasters, farmers are able to repair physical damage relatively quickly post natural disaster. Local infrastructure that support the supply chain is prioritised by local government and this helps industry through the region. Industry organisations have been quick in the past to get assistance to producers. These projects (IRO project managed by QFF) are great at getting assistance to the farmer quickly. Technical assistance, in particular irrigation experts and agronomists are available and used by farmers in the region to get the farm back to pre-natural disaster state as quick as possible. Individual farmers have recovery plans to response to the common fast acting natural disasters ie floods.	The recovery from natural disasters for most of the region does not include financial recovery or business planning. Communication between all organisations, government and industry is hard to coordinate This can lead to areas being over serviced or underserviced and not the most effective use of services and resources.	With no dominant industry in this region BMRG are well positioned act as a coordinator for natural disaster recovery. They have received funding previously to work on flood recovery and are experienced in this area.
Land use infrastructure and design	Mapping though the region is good, with BMRG and industry groups able to provide detailed maps for most of the region. Local government have started some high level planning exercises aimed at protecting the local economy and communities. The Barambah Creek Floodplain (Byee) Land Management Plan, developed by BMRG is a very good and detailed plan. It demonstrates the skills that are accessible in the region. The plan highlights land use, infrastructure and incorporates an Action Program.	No formal strategic advice or policy available from the local government level. Communication between organisations, government and industry poor.	Regional Development Australia are becoming active in this space with high level strategic goals.
Financial capital	Large farms in the region are well linked in their supply chains. Farms are diversifying as a way to improve their risk management.	The area is dealing with tough economic conditions and the outlook currently is not good enough to stimulate continued agricultural investment. Farms and landholders are managing the farm 'day to day' rather than forward planning with long term financial planning. This limits the ability for the landholder to prepare financially to natural disaster events. Due to financial hardship many landholders are moving off farm for work, many moving in to the mining sector.	The area has the potential for large investment, the infrastructure is there to support large Agricultural enterprises. Hope dairies is one such large investment. If confidence continues to grow this will benefit all levels of agriculture in the area, increasing investment and opportunities in the area. Industry groups increasing their activities in the area, assisting with locally needed services and skills (financial planning, business development).
Learning and adaptation	Due to the frequency of events in this area there a large amount of information and knowledge around natural disaster recovery. At a farmer level there is an adaptation to natural disasters; this is due to the recent events being fresh in everyone's memory and the experiences they have gained from living through them over the past 5 years.	There is an inadequate level of documentation on what has been learned and how the area has adapted to the natural disasters. This is not happening at a regional level or a farmer/industry level. There has been no push for a coordinated evaluation of the recovery from the natural disasters. Industry groups are pushing Best Management Practice (BMPs) through the region, but none of these have any information on natural disasters.	Industry led BMPs are key for many industry groups in Queensland. If these could include a section on natural disasters it will change the thought process of natural disasters at a farmer level. It is an easy way to start all levels of an industry thinking about natural disaster resilience and preparedness.

Table 9: Summary of mango industry pilot findings.

7 Summary

The pilot studies have successfully;

- Tested the validity of the Framework for agriculture in Queensland.
- Assess the current state of resilience within two pilot industries and a geographical area.

The information collected about governance, risk knowledge, preparedness, disaster response, recovery, land use and infrastructure design, financial capital and leaning and adaption have assisted in the creation of a model plan for resilience.

Each industry and geographical area has shown to have had different strengths, gaps and opportunities; each of which has been processed to capture and quantify these results. It is important to note that there is no one answer for natural disaster recovery or natural disaster resilience for all industries or locations.

There are some common themes throughout the pilot studies; financial capital is a strong limiting factor in improving preparedness and initiating change in resilience planning across all pilot study industries and areas. Lack of financial capital has impacted upon the ability for appropriate learning and adaptation. The dairy & mango industries financial resources were not available to fully explore natural disaster preparedness and resilience.

Governance is strong through industry groups, with both dairy and mango demonstrating good governance practices. The governance throughout the Barker – Barambah creek pilot study was very weak in compassion. With no strong industry body and poor communication through the local councils, the region failed to successfully manage strategic recovery for the long term along with documenting 'lessons learned' to improve preparedness for the next event.

Resilience in agriculture means the ability to recover and attain full business functionality after a disruption. The agriculture sector in Queensland will continue to be exposed to Natural Disasters in the future. Disaster Resilience is key to improving the preparedness of the Queensland agricultural sector to manage the impacts of natural disasters – cyclone, flood, storm and fire. Industry, local & state governments need to understand and be involved in resilience planning to ensure implementation throughout all levels of industry, from farm to peak industry bodies.

These pilot studies assessed and quantified the current capacity, identifying strengths and gaps in capacity. From this a Model plan has been developed as part of the QFF Disaster Resilience Planning for agriculture in Queensland Project.

QFF is grateful of the support and funding provided for the project by the Queensland Government through the Department of Agriculture, Fisheries and Forestry.

The pilot studies relied on the generosity of many industry, government and non-for-profit Organisation. Without their efforts this would not have been doable.

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Appendix 1 Model questions

Good Practice Statement		Model Questions
1 Governance	**Enabling conditions for resilience are provided through industry and government leadership, policy and institutions. leadership, policy and institutions.**	
1.1 Policy and planning capacity.	Deliberate action is being undertaken to enhance capacity, supported by resilience policies, plans and programs.	Is there a shared vision for resilience of the industry? Are there any specific actions to enhance resilience incorporated in plans, programs or projects?
1.2 Physical and natural capacity.	Basic services to support capacity (water, electricity, transportation, communications) are available to all participants.	Is service provision a limiting factor for any actor in the supply chain?
1.3 Social and cultural capacity.	Collaborative mechanisms (networks) are in place to share data and information, lessons learnt and good practices across government, industry communities and individuals.	Is there a mechanism in place to collectively strategize and plan for resilience?
1.4 Technical and financial capacity.	Technical and financial support mechanisms are in place to support capacity enhancement.	Are there resources, tools or technical assistance available to build industry resilience? Is there a budget allocation for resilience planning?
2 Risk Knowledge	**Government and industry assess hazards and risk information is used in decision-making.**	
2.1 Policy and planning capacity.	Natural hazard risk assessment been completed at an appropriate scale for the industry.	Is there sufficient information for the industry regarding natural disaster risk?

Good Practice Statement		Model Questions
2.2 Physical and natural capacity.	Natural hazard risk assessments are comprehensive.	Do business owners understand the impact of natural disasters? Are there particularly vulnerable participants within the industry? Do risk assessments address risk to, utilities infrastructure, suppliers, processors. Do risk assessments address risk to the natural resource base?
2.2 Social and cultural capacity.	The risk assessment processes was inclusive and the knowledge is shared.	Is natural disaster risk information accessible to industry? Is it being accessed?
2.2 Technical and financial capacity.	Information from risk assessment is accessible and useable for risk reduction.	Is risk assessment information considered in decision making?
3 Preparedness	**Industry has the capacity to absorb and recover after an event through planning.**	
3.1 Policy and planning capacity.	Preparedness plans are in place at the industry scale.	Is the industry ready for the next natural disaster?
3.2 Physical and natural capacity.	Plans are in place to protect physical and natural assets from natural hazards.	Is any action underway to prepare for natural hazards? Is there a process to regularly update?
3.3 Social and cultural capacity.	Preparedness information is shared within the industry.	Is there an information or extension program in place to share preparedness information?
3.4 Technical and financial capacity.	Information and assistance is available to facilitate preparedness.	Is there any support available for preparedness work?
4 Disaster Response	**Industry and government implement a collective and coordinated response.**	
4.1 Policy and planning capacity.	Predefined roles and responsibilities are established for immediate action at all levels.	Have industry-level response plans been developed? Have coordination protocols with disaster management organisations been established?
4.2 Physical and natural capacity.	Industry participants are self-reliant in basic emergency and relief services.	Have materials and supplies for short term response been planned for?
4.3 Social and cultural capacity.	Business level response planning is in place.	Are awareness programs in place to inform of industry-level disaster management plan?
4.4 Technical and financial capacity.	Disaster management arrangements are in place with technical and financial resources to support industry response.	Do disaster management arrangements meet industry-specific needs? Are volunteers appropriately trained and resourced to assist in disaster response?
5 Recovery	**Recovery plans are in place that accelerate disaster recovery, minimise negative impacts and engage agribusinesses in the recovery process.**	
5.1 Policy and planning capacity.	Pre-established disaster recovery plans addressing people, livestock and finances are in place.	Are there disaster recovery plans? Do plans address longer term strategies for improving profitability and reducing future risk?
5.2 Physical and natural capacity.	Pre-established disaster recovery plans addressing infrastructure and natural resources are in place.	Do plans provide guidance on reconstruction and redevelopment away from hazard areas?
5.3 Social and cultural capacity.	Pre-established coordination mechanisms are in place to coordinate assistance from organisations and volunteer programs.	Have coordination mechanisms with support and volunteer organisations been established?
5.4 Technical and financial capacity.	Technical and financial resources are available to support the recovery process.	Is appropriate technical assistance available to support recovery? Is there a mechanism to manage recovery resources to a useful end? Is the level of support and its implementation appropriate for the industry?
6 Land Use and Infrastructure Design	**Effective land use planning and infrastructure development is in place to protect community, environmental and economic values and reduce risks from hazards.**	
6.1 Policy and planning capacity.	Land use policies and building standards that incorporate measures to reduce risk from hazards and protect agri-business are implemented.	Are building safety and hazard risk reduction standards and codes available? Are hazard maps available and used? Is natural hazard risk considered in infrastructure siting, design and construction? Is there institutional capacity to implement land use plans and enforce policies and plans?
6.2 Physical and natural capacity.	Critical infrastructure is located outside of high risk areas and constructed to address risk from priority natural hazards.	Are there incentives or penalties in place to encourage compliance with land use policies and building standards and codes?
6.3 Social and cultural capacity.	Actors incorporate risk reduction into the location and design of structures.	Have building standards to site, design and build infrastructure in hazard areas been adopted?
6.4 Technical and financial capacity.	Education and extension programs are established to improve compliance with land use policies and building standards.	Is there sufficient communication to educate the industry in hazard-resilient building practices and design.
7 Financial Capital	**Industry manages risk through financial planning, insurance and access to credit.**	
7.1 Policy and planning capacity.	Policies and programs are in place to facilitate improved business planning and financial self-reliance.	Does the industry have financial management planning programs? Does government policy support financial self-reliance?
7.2 Physical and natural capacity.	Sound financial management practices support physical and natural assets.	Are insurance products used for physical assets? Are insurance products available for crop loss from natural hazards?
7.3 Social and cultural capacity.	Collaborative networks promote improved business planning and refer the economically marginalised.	Are (free) government referral services used?
7.4 Technical and financial capacity.	Technical information is available to support financial and business planning.	Is financial advice and planning tools available to the industry?
8 Learning and Adaptation	**Industry has the ability and willingness to learn from collective and individual experience.**	
8.1 Policy and planning capacity.	Reflective practice is built into resilience policies, plans and programs, including adaptation of these where necessary.	Did the industry collectively evaluate its response to the last event?
8.2 Physical and natural capacity.	Monitoring and reporting processes have been established to track recovery effort and outcome.	Are there any evaluation processes in place?
8.3 Social and cultural capacity.	Collaborative networks are used to identify measures to reduce risk and learn from experience.	Is there an industry network that is/could be used for reflection and learning from natural disaster?
8.4 Technical and financial capacity.	Technical and financial programs are in place to support the implementation of best practice.	Is there technical information on best practice available? Are NDRRA assistance measures (subsidies, grants, loans) effective?

Resilience in agriculture is the ability to recover and attain full business functionality after a disruption. Building resilience is about changing industry and governments attitudes toward risk and developing capacity to adapt to change.

The agriculture sector in Queensland is exposed to, and indeed dependent on a highly variable climate. It needs to improve industry self-reliance in the face of climate extremes.

The Disaster Resilience Planning for Agriculture in Queensland Project was initiated to improve the preparedness of Queensland's agricultural sector to manage the impacts of natural disasters – cyclone, flood, storm and fire. QFF gratefully acknowledges the funding provided for the project by the Queensland Government through the Department of Agriculture, Fisheries and Forestry; as well as the time generously contributed by the many industry participants.

The Model Plan

This Model Plan provides guidance as to how to manage a natural disaster through the lifecycle of preparation, recovery and response at a regional level. The model is grounded in the need for systematic and proactive planning to minimise impact, rather than a reactive response. It supports a quick, successful and more successful return to business after an event.

Risk

Resilience starts with understanding exactly what you're industry needs in order to recover from disaster events and plan ahead for the challenges. Better preparation will assist with short term response and longer term recovery.

Assessment of the vulnerability to risk is a key motivator for preparation.

The variability of resilience

Resilience is not a constant state. Vulnerability can change depending on factors such as location, financial status, stage in crop production and preceding seasons (including disaster events). However, an informed understanding of the risks faced and the likely impacts of those risks will increase resilience.

We cannot be or even plan to be resilient to everything, but by planning we can design for flexibility and adaptable when faced with stress.

Scalability

This plan is aimed at disaster management at the regional level. This may comprise a range of industries which can 'naturally' unify or a single industry in a regional area. Application of the plan will vary and the policies and protocols that are adopted will need to be relevant to the specific requirements of that industry or industries in that region.

A MODEL PLAN FOR RESILIENCE IN AGRICULTURE

Disaster management is a shared responsibility. This plan encourages active engagement with the state and local governments, emergency service agencies and other stakeholders.

While this model plan provides guidance at the regional level, much of the content is applicable to disaster management to support a small to medium agri-business through a disaster.

The human factor

Perhaps the most neglected challenge with resilience planning is the human factor. During times of 'crisis', all available resources are focused on resolving issues of immediacy. Working long hours adds to an already stressful situation. This is the least preferable time to be making difficult decisions and errors can be costly.

Building success

Past experience has demonstrated that surviving and bouncing back after an event requires (adapted from DRET and Tourism Australia):

- Commitment – time, money and resources.
- Awareness – using skills, knowledge and experience to understand the risks that may impact vulnerability to these risks.
- Planning – identifying what the region needs to recover from an event and documenting it.
- Integration – to complement industry and enterprise business planning, and work in partnership with the planned response of government and non-government agencies.
- Testing – to ensure clarity of roles and responsibilities and to continual improve the response.

These principles have been built into the model plan.

The financial cost of planning

Low profit margins have forced producers to seek efficiencies in all aspects of production. There is very limited information to support a risk versus cost assessment – how vulnerable is the industry and how much will it cost to increase 'protection'?

The first challenge for agriculture is moving a higher proportion of industries into an insurance mentality. If this is achieved, future work will challenge industry to view resilience as a strategic enabler (by avoiding productivity losses, and maintaining market share and customer loyalty).

Structure of the model plan

This model plan is deliberately simple.

Disclaimer

This Model Plan template is provided as basic guidance to assist organisation help their industry become more resilient.

Organisations who specialise in business continuity planning exist throughout Australia and there may be other formats or methods of business continuity planning which are more suitable for individual businesses or organisations.

1 Cover page

[Organisation Name]
[Contact details]
[Business Address]
ABN: [ABN]
ACN: [ACN]

[Industry/Region Name]

RESILIENCE PLAN

Prepared: [Date prepared]

Revision history

Version Number	Changes made	Person responsible	Date updated
[e.g. Version 1.0]	*[Description of changes made and what prompted the changes]*	*[e.g. C. Jones]*	*[Day/Month/Year]*

Communication strategy

Manager/ staff	Type of communication	Person responsible	Frequency
[e.g. CEO]	*[E.g. Presentation, email]*	*[e.g. C. Jones]*	*[e.g. Monthly and after each change]*

2 Business continuity

2.1 Risk assessment

[List and assess the potential natural disaster related hazards to your industry.]

Business hazard	Consequence [see table below]	Likelihood [see table below]	Assessed Risk [see table below]
[Description of the hazard and the potential impact to your business.]	*[Extreme, High, Medium, Low]*	*[Almost certain, Likely, Possible, Unlikely Rare]*	*[Extreme, high, moderate, low]*
For example . . . *Flooding resulting in loss of access to highway.*			

CONSEQUENCE

LIKELIHOOD OF OCCURRENCE	TYPICAL EVENT
Extreme	Threatens the viability of the industry. Financial and productivity loss is extreme.
High	Threatens the viability of businesses. Financial loss is very high. Intervention may be required.
Medium	Threatens business functionality and changes in operation may be required. Financial loss is medium.
Low/Negligible	The consequences can be dealt with by routine operations. Financial loss is low or negligible.

LIKELIHOOD

LIKELIHOOD OF OCCURRENCE	TYPICAL EVENT	POTENTIAL EVENT RISKS
Extreme	Expected frequency twice per year.	Storm event causing localised erosion.
High	May happen once per year.	Storm event resulting in wind and hail damage.
Medium	Once every few years.	Large scale bushfire.
Low/Negligible	Once every few decades.	Severe tropical cyclone resulting in multi-region damage.

RISK ASSESSMENT TOOL

E Extreme Risk
H High Risk
M Moderate Risk
L Low Risk

LIKELIHOOD	CONSEQUENCE				
	NEGLIGIBLE	LOW	MEDIUM	HIGH	EXTREME
Almost Certain	H	H	E	E	E
Likely	M	H	H	E	E
Possible	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H

3

2.2 Risk management

[List the assessed risks (in descending order) to your industry and the mitigation strategies.]

Business risk	Assessed Risk	Mitigation strategy	When	Responsibility	Proof of action
[Description of the risk.]	*[Extreme, High, Medium, Low]*	*[What actions will you take to minimise/mitigate the potential risk to your business?]*			
For example . . . *Flooding resulting in loss of access to highway.*		*e.g. Training employees in multiple areas of the business will reduce key person risk.]*			

2.3 Scenario planning

[Once you have completed your critical business areas table and ranked them, complete a more detailed scenario based on each of your top three critical business areas.]

Scenario 1: [Name of scenario]

Question	Details
Critical failure	*[Provide a short description of a critical area that could be interrupted.]*
Background	*[Provide any relevant background information that is essential to restoring the critical area.]*
Impact to business	*[Provide an estimate of the impact to your business. This can be in terms of percentage of sales or a dollar figure.]*
Immediate actions	*[List what needs to be completed immediately to ensure loss is kept to a minimum.]*
Secondary actions	*[Once immediate actions have been completed, what secondary actions can be completed until your business has recovered completely?]*
Responsibilities	*[List the people who are responsible and for what during this critical business scenario.]*
Resources needed	*[What resources will you need to ensure you recover well in this sort of scenario? For example: cash flow, staff, service providers]*

Scenario 2: [Name of scenario]

Question	Details
Critical failure	*[Provide a short description of a critical area that could be interrupted.]*
Background	*[Provide any relevant background information that is essential to restoring the critical area.]*
Impact to business	*[Provide an estimate of the impact to your business. This can be in terms of percentage of sales or a dollar figure.]*
Immediate actions	*[List what needs to be completed immediately to ensure loss is kept to a minimum.]*
Secondary actions	*[Once immediate actions have been completed, what secondary actions can be completed until your business has recovered completely?]*
Responsibilities	*[List the people who are responsible and for what during this critical business scenario.]*
Resources needed	*[What resources will you need to ensure you recover well in this sort of scenario? For example: cash flow, staff, service providers]*

3

Scenario 3: [Name of scenario]

Question	Details
Critical failure	*[Provide a short description of a critical area that could be interrupted.]*
Background	*[Provide any relevant background information that is essential to restoring the critical area.]*
Impact to business	*[Provide an estimate of the impact to your business. This can be in terms of percentage of sales or a dollar figure.]*
Immediate actions	*[List what needs to be completed immediately to ensure loss is kept to a minimum.]*
Secondary actions	*[Once immediate actions have been completed, what secondary actions can be completed until your business has recovered completely?]*
Responsibilities	*[List the people who are responsible and for what during this critical business scenario.]*
Resources needed	*[What resources will you need to ensure you recover well in this sort of scenario? For example: cash flow, staff, service providers]*

2.4 Insurance

[What insurance policies are currently are available to cover industry / business risks?]

[How can you work with insurers to provide cover?]

[How can you work with businesses to increase uptake of available insurance products?]

Insurance type	Policy coverage	Policy exclusions	Insurance company and contact	Last review date	Payments due
[e.g. Building, Contents, Car, Business Interruption]	*[e.g. Damage from fire, flood, theft, Cyclone]*	*[e.g. Fraud, terrorism, tsunami, landslide]*	*[e.g. XYZ Insurance, D.Higgins (Area code) Number]*	*[Day/Month/Year]*	*[Amount you pay and frequency. e.g. Monthly, yearly]*
[e.g. Building, Contents, Car, Business Interruption]	*[e.g. Damage from fire, flood, theft, Cyclone]*	*[e.g. Fraud, terrorism, tsunami, landslide]*	*[e.g. XYZ Insurance, D.Higgins (Area code) Number]*	*[Day/Month/Year]*	*[Amount you pay and frequency. e.g. Monthly, yearly]*
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2.5 Property & infrastructure

[What have you done to make your property and infrastructure less vulnerable to damage? Is your property secured with alarms, security personnel or video surveillance from unlawful entry? Do you have fire retardant or flood resistant building materials? Is leaf litter grass and gutters maintained regularly to minimise fire risk?]

2.6 Business continuity strategies

[What other strategies will you consider to help maintain business as usual practices? Have you considered a virtual office service, e-commerce website or an online auction or e-marketplace shopfront?]

3 Communications

3.1 Roles and responsibilities

Role	Designated Position	Alternate position(s)	Responsibility
For example . . . *Lead*	*CEO*	*COO*	• *Participate in regional emergency planning processes with relevant agencies* • *Represent the industry in emergency planning and response* • *Assess crisis situation* • *Activate industry response plan*

3.2 Communications plan

A contacts database that is easily accessible and able to be activated during an event?
A protocol to engage in the Local Disaster Management Group?
A protocol to rapidly assess the human health and safety, animal welfare and financial impact within the region?
A protocol for referral to service providers for immediate emergency relief and longer term, mental health and financial counselling services?
A protocol for responding to the media including a nominated spokesperson?

4 Market assessment

[Based on your assessment of the damage to your business and/or surrounding area, list any areas of your market that have changed below. Alternatively, attach a complete market assessment to the back of this plan. Download our Marketing plan template for further guidance.]

Market changes	Impact to business	Business options
[What has changed in the market since the emergency?]	*[What part of your business will be affected by these market changes and how?]*	*[How can your business adapt or change to suit these new market conditions? e.g. Can you move location, trade online, change key products or services or just re-evaluate the way you run your business to make sure you are still meeting market needs?]*
[What has changed in the market since the emergency?]	*[What part of your business will be affected by these market changes and how?]*	*[How can your business adapt or change to suit these new market conditions? e.g. Can you move location, trade online, change key products or services or just re-evaluate the way you run your business to make sure you are still meeting market needs?]*
[What has changed in the market since the emergency?]	*[What part of your business will be affected by these market changes and how?]*	*[How can your business adapt or change to suit these new market conditions? e.g. Can you move location, trade online, change key products or services or just re-evaluate the way you run your business to make sure you are still meeting market needs?]*

3

4.1 Marketing strategy

[Detail your marketing strategy after the emergency. If your business is reopening its doors after the disaster, how will you get the message out? What channels will you use to target customers? How does this strategy differ in light of any changes in the market? e.g. You may consider a targeted marketing effort (such as a social media campaign) to communicate your business reopening.]

4.2 The recovery

4.2.1 Business impact assessment

[Based on your assessment of the damage to your business, complete the table below (in order of severity) or attach your own impact assessment to the back of your plan.]

Rank	Damage	Impact to business	Severity	Action	Recovery steps	Resources needed	Actioned by	Estimated date of completion
1	*[List any damage to buildings, assets, stock, documents or surrounding area/community.]*	*[Describe any direct or indirect impacts the damage will have on your business' critical functions.]*	*[High, Medium, Low.]*	*[Repair, replace, rebuild.]*	*[List the steps needed to recover the damage.]*	*[List the resources needed to recover including any cost estimates, service providers, employees, building materials.]*	*[Assign someone to each task.]*	*[Due date for completion.]*
2	*[List any damage to buildings, assets, stock, documents or surrounding area/community.]*	*[Describe any direct or indirect impacts the damage will have on your business' critical functions.]*	*[High, Medium, Low.]*	*[Repair, replace, rebuild.]*	*[List the steps needed to recover the damage.]*	*[List the resources needed to recover including any cost estimates, service providers, employees, building materials.]*	*[Assign someone to each task.]*	*[Due date for completion.]*
3	*[List any damage to buildings, assets, stock, documents or surrounding area/community.]*	*[Describe any direct or indirect impacts the damage will have on your business' critical functions.]*	*[High, Medium, Low.]*	*[Repair, replace, rebuild.]*	*[List the steps needed to recover the damage.]*	*[List the resources needed to recover including any cost estimates, service providers, employees, building materials.]*	*[Assign someone to each task.]*	*[Due date for completion.]*

4.2.2 Recovery contacts

[Include all of the organisations/people that will be essential to the recovery of your business. See also Emergency contacts above.]

Contact Type	Organisation Name	Contact	Title	Phone/Mobile number
Insurance	*[e.g. XYZ Insurance]*	*[e.g. G. Jones]*	*[e.g. Claims Advisor]*	*[(Area code) Number]* *[Mobile number]*
Telephone/internet services provider				
Bank/building society				
Employee				
Supplier (Main)				
Supplier (Backup)				
Customer				
Business advisor				
Accountant				
Lawyer				

5 Supporting resources

Attached is my supporting documentation in relation to this Emergency management & recovery plan. The attached documents include:

- *[List all of your attachments here. These may include copies of your floor plan, detailed emergency procedures, impact and market assessments and financial documents.]*

6 References and other resources

- Department of Resources, Energy and Tourism and Tourism Australia. Don't Risk It! A guide to assist Regional Tourism Organisations to prepare, respond and recover from a crisis.
- IBM Business Continuity and Resiliency Services, 2009. Business resilience: The best defense is a good offense. Develop a best practices strategy using a tiered approach.
- CRISIS ESSENTIALS – Crisis Management for tourism business. Preparing for the unexpected. Responding to a crisis. Recovering from a crisis.
- Emergency management and recovery plan template. – business.gov.au
- Emergency management and recovery guide – business.gov.au

The agriculture sector in Queensland is exposed to, and indeed dependent on, a highly variable climate. It needs to improve industry self-reliance in the face of climate extremes.

Resilience in agriculture is the ability to recover and attain full business functionality after a disruption. Building resilience is about changing industry and governments attitudes toward risk and developing capacity to adapt to change.

The agriculture sector in Queensland is exposed to, and indeed dependent on, a highly variable climate. It needs to improve industry self-reliance in the face of climate extremes.

The Disaster Resilience Planning for Agriculture in Queensland Project was initiated to improve the preparedness of Queensland's agricultural sector to manage the impacts of natural disasters – cyclone, flood, storm and fire. QFF gratefully acknowledges the funding provided for the project by the Queensland Government through the Department of Agriculture, Fisheries and Forestry; as well as the time generously contributed by the many industry participants.

The Implementation Strategy

Research is only as good as how it is used. Implementation of considered strategies is what will effect change. In this case, applying the findings of this project to improve resilience planning.

An implementation plan details actions to reach an objective and usually specifying activities, costs and schedules. Resilience planning for agriculture is not yet at that point. This Implementation Strategy presents a process for achieving the longer term aim of improving resilience.

Future work is needed to better understand resilience in agriculture particularly the cost-benefits of improving the different elements of capacity and the intra-sector priorities for planning.

QFF recommends a staged approach to future resilience planning on a 'no-regrets' basis and would like to reiterate that this is still a work-in-progress.

IMPLEMENTATION STRATEGY

4

1 The policy context

Natural disasters pose direct risks to property and communities . The cost of damage, disruption and wellbeing is difficult to measure. The two measures that are relied upon – insurance costs (insured value of property damaged) and Natural Disaster Relief and Recovery Assistance payments – underestimate the total cost.

Natural disasters impact on agricultural systems in a number of ways. Disasters result in the loss of livestock, crops and produce; damage to infrastructure, equipment and buildings; damage to standing crops; and erosion of land and waterways. Like other sectors of the economy, agriculture can also be impacted by the loss of electricity supply and communication services; and community infrastructure particularly transport.

One of the challenges of early response to a natural disaster impacting on agricultural industries is to identify the extent and intensity of impact. This will differ between locales and production systems. Many of the impacts of natural disaster on agriculture are not well understood. Their importance can be underplayed since they may not be immediately obvious but become evident as time from event increases, and/or may not be considered newsworthy.

Agriculture will continue to intensify, become more reliant on mechanisation, and supply chains become integrated. The impact of natural disasters is therefore likely to increase.

Farmers and agribusiness owners do 'self-insure'. They use commercial insurance products, although in many cases there are no feasible private insurance schemes available. They also use Farm Management Deposits scheme, debt management, an investment of off-farm income or simply absorbing the costs. The hours of 'work' the sector volunteers in restoring natural assets and rebuilding physical assets although unaccounted for, would be enormous.

Governments have indicated that the ongoing costs of natural disasters, particularly of post-event assistance measures, represents a substantial burden on public expenditure. QFF recognises the need to improve the effectiveness and efficiency of natural disaster mitigation, resilience and recovery efforts. We continue to support a repositioning of investment from relief and recovery to improved emphasis on mitigation i.e. measures taken in advance of disasters to reduce their impacts. Investment in resilience planning will reduce the net cost of a disaster.

However repositioning of investment does not detract from the need for industry and government to work together to support farming communities to respond to a disaster. By definition a disaster is a situation that overwhelms a community.

It is poignant to reflect on the fact that nearly ten years after the devastation wrought by Cyclone Larry we are still discussing the best approach to improving resilience planning for agriculture.

The emphasis in this project work has been on severe events. However, building resilience is a fundamental concept which will assist in agri-business planning to help the sector grow profitability through many times of change.

4

1.1 The challenge of future work

The overall aim of future work is to improve resilience. This can be represented visually as in Figure 2.

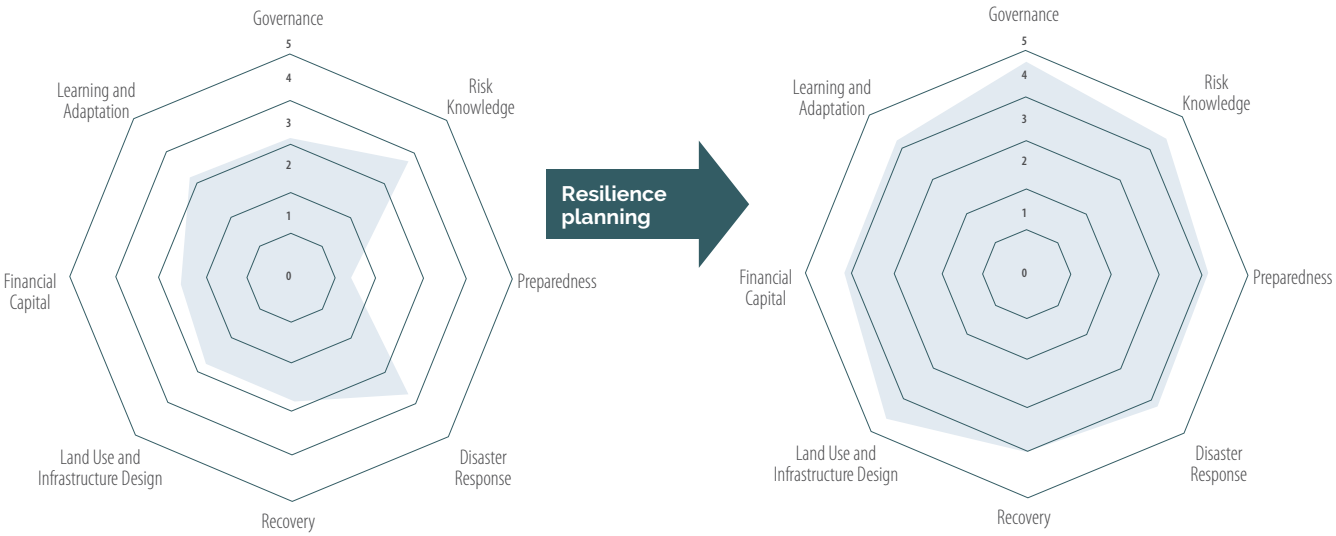

Figure 2: Visualisation of improved resilience for agriculture in Queensland.

All elements of resilience need to be in place to achieve an optimum outcome. Intuitively this would require improvement in all elements. However no work has been undertaken to determine the relative importance of each of the elements. Questions remain regarding the application of the Framework viz:

- Is each element equally as important as another in improving resilience?
- Is one element more easily improved than another?
- Is investment in one or more elements better value for money because of a higher benefit-cost ratio?

The process of answering these questions is complicated by differences between industries and within businesses, between geographic regions, as well as by the complexity of mixed enterprises.

Where to Start?

The dilemma for the sector is literally 'Where to start?'. That is, where to roll-out a resilience planning process – in which industry, commodity or agri-business, and in which region/s. For example, should resilience planning focus on those most in need of planning assistance either because of repeated recent experience of natural disasters or because of marginal viability? Or, should the focus be on more buoyant industries since they are more likely to have resources available to invest in resilience planning? Even in these two examples resilience planning would emphasise different elements of planning.

Aside from the issues of who will champion resilience planning within each industry, whether there will be resources to support it, and the precise method that would be used; there is a larger question of priority. The point has repeatedly been made that prioritisation of effort within the agricultural sector (for almost all types of planning) is challenging because of the diverse nature of landscape, production, and business systems; which are further complicated by complex supply chain arrangements.

To approach the problem objectively, a number of criteria could be used to select priorities for implementation of resilience planning process. This includes:

Criterion		For example
Resilience element	Apply one of the eight elements universally to all agricultural industries	Improve risk knowledge for the sector.
Commodity	Select a homogenous group of agribusinesses.	All irrigated cotton farmers in Queensland.
Geographic Location	Select a specific geographic region.	All agri-business in the Fitzroy River Catchment.
Industry status	Defined by size, viability, location within supply chain.	All 'small' agri-enterprises (defined by no more than 5 employees in a financial year).

These criteria can also be applied in combination for example, resilience planning for:

Financial capital (resilience element) for all dairy farmers in north Queensland.

Fruit tree croppers across the Wide-Bay Burnett Catchment.

Viable medium sized agri-businesses within the Southern Downs Regional Council.

The application of these criteria each has trade-offs, and the likelihood is that a combination will be needed to address different industries.

To better address the challenge of prioritisation continued applied research is needed. However it is important that resilience planning not wait until less ambiguous information is available before commencing.

QFF proposes that resilience planning work proceed with a 'no-regrets' approach which identifies priorities for investment and actions that provide benefits whether or not there is a natural disaster in the immediate future. This is a proactive approach focussed on protecting assets and livelihoods.

Prioritisation of effort within the agricultural sector is challenging because of the diverse nature of landscape, production, and business systems; which are further complicated by complex supply chain arrangements.

2 Future resilience planning

Resilience planning requires a cultural change. Like other large scale changes that have occurred this requires time and effort. Having completed the first stage of foundational work, future efforts need to focus on tailoring of community approaches to agriculture, and then implementing resilience planning as business as usual.

Philosophy underpinning future work

Resilience planning for agriculture needs to firstly move the sector as a whole into a 'safeguard mindset'. This means changing assumptions and systems to better protect against loss or damage. Leadership is needed to address the mental inertia that exists within industry organisations and individuals about risk management behaviour and choices.

In the longer term, resilience planning needs to be embraced as a strategic enabler i.e. a capability that contributes to the success of an industry or enterprise; and one that will assist with adapting to the inevitability of ongoing change for the sector.

2.1 The next stages of planning

The next stages for resilience planning for agriculture are summarised in Table 1 and detailed below.

Stage	Objective	Description
1	Understand resilience in agriculture:	Systemically identify the issues for resilience planning in agriculture.
2	Mainstream agriculture in disaster response:	Methodically address the community disaster management response to better address the needs of agriculture.
3	Instil resilience planning as business as usual:	Integrate resilience planning into farm management systems.

Stage 1. Understanding resilience in agriculture.

This work is nearing completion. It has developed and tested a framework to determine factors which influence resilience. It has also identified 'good practice' for resilience capacity in agriculture.

Stage 2. Mainstream agriculture in disaster response.

The agricultural sector has specific needs in terms of disaster response. Previous experience has shown that these needs are not generally understood by disaster management professionals nor well communicated by the sector. More work is needed in the preparedness space to have these issues spelt out and event responses tailored to address them.

This stage of work would include for example:

2.1 Resilience planning at the industry organisation level. Industry organisations need to implement resilience planning on behalf of their industries. At the very least, this requires development of a response and recovery plan. The Model Plan developed through this project can be applied as a basis for planning at the industry organisation level.

2.2 Review of disaster management arrangements from an agricultural perspective. To be clear, there is no inference that the existing arrangements are not serving the Queensland community adequately. Neither is there an intention to make any major change to the arrangements. This review is purely focused on how the arrangements address agricultural issues.

A review would compare the effectiveness in which managing response and recovery for agriculture. It would also look at the connection between the Local and District Disaster Management Groups (DMG), the Agricultural Coordination Group, the State Disaster Management Group, and industry representative to review the effectiveness of this current approach.

2.3 Standardising agricultural business continuity. Ideally, a pre-planned triage of agricultural issues would be available to each Local or District DMG. This would address the priorities of human safety (first) and animal welfare (second).

As part of this planned response, agricultural premises would be geocoded together with associated risks and recovery needs. Pre-processing of this information would reduce response times and in doing minimise the impact of events.

- Systemised assessment of damage. The challenge of accurately assessing the scale and scope of damage to agriculture following an event has implications for a rapid response and sustained recovery. It can also hinder the learning and evaluation processes through the use of a continuing loop of misinformation. A systematic approach is needed for geo-identifiers, assessment of impact (human health, animal welfare, financial and social), and market impact. The data and collection method would be pre-agreed to reduce the time taken to assess the impact and implement response and recovery approaches.
- Prioritising energy and telecommunications reconnection. Business continuity in the agriculture sector is contingent on energy and telecommunication services. Work with service providers is needed to prioritise reconnection of these services.

2.4 Commercial insurance. One of the most pressing needs for industry is the availability/affordability of commercial insurance products. Not insuring or underinsuring assets is growing common, increasing the burden on government for assistance in the recovery from a natural disaster. A review is needed to assess existing shortfalls in the commercial insurance market and to identify how to work with insurers to improve the situation. This could include an agreed 'accreditation' of FMS or BMPs components as leverage for discounted premiums.

Stage 3. Instil resilience planning as business as usual

Farm management systems or Best Management Practice Systems are voluntary agricultural business management programs. They provide an approach to systemically identify and manage risks and opportunities arising from their farming activity including management of the enterprise, natural resources, chemicals and fertilisers, and farm workers.

Programs have been developed to address individual industry priorities such as the cotton industry's Best Management Practice Program and the dairy industry's Dairying Better N Better for Tomorrow Program.

The issue of improving disaster resilience has common ground with managing risk from other sources. The use of FMSs or BMPs will be the most successful approach to changing industry attitudes. Industry organisations need to identify how to assimilate resilience messages within existing business planning and/or best management practice systems.

Where FMS or BMPs are in place or in development, industries could adapt these to include resilience planning. This may require a modular addition or a modification of existing materials. Industry organisations are likely to require resources to customise manuals for specific application to resilience planning and to deliver this training and information to members.

3 Project challenges

1. As previously stated the scope of works described in this proposal represents the first steps in a long journey of improving disaster resilience planning. The project develop products to contextualise the situation, define the challenges and deliver tools to assist planning. However the rollout of disaster resilience planning across all industries within the agricultural sector is a major challenge and rollout across all farms/businesses will require an exponential increase in effort and funding.
2. The changing of staff towards the end of the project presented the project with some small challenges. The change of staff delayed the finalisation of the project for a number of weeks. Although generally this would be a small challenge to the management of the project the timing of the staffing change increased the complexity and exaggerated the problem.

4 Future work

More work is needed to better understand resilience in agriculture, particularly the cost-benefit of improving the different elements of capacity and the intra-sector priorities for planning. This project essentially undertook an academic review, looking into the resilience in the Queensland Agricultural system.

The project has outlined and indicated areas of improvement and has started to enable industry groups to better prepare for this work. This project was able to highlight the work completed on resilience planning so far, the 'Framework for development for disaster resilience planning'. Outline where agriculture needs improvement, 'Implementation of pilot studies' and set out a realistic strategy of implementation of what's available at the moment, 'Model plan' and 'Implementation strategy'.

1. This all leads to future work being done to further the implementation of disaster resilience planning at industry levels, flowing down on to farm planning ensuring that disaster resilience planning is business as normal. With Queensland currently in drought, it's timely to include a disaster resilience planning to incorporate specific natural disasters i.e drought.
2. Currently disaster resilience planning is solely focused on the business aspects of Queensland primary industry; recovering business continuity in the aftermath of a disaster; operation sustainability of farms and agriculture business; improving resilience to rebound from disaster and adapt to the post-disaster environment. It should be noted that natural disaster does not only affects farms and business. Rural mental health and suicide is a major concern. 'A recent study on mortality has shown that average in regional and remote areas were 1.3 to 2.6 time more likely to end their life by suicide then their urban counterparts (AIHW 2007). This is likely to increase in the aftermath of a natural disaster. Agricultural industries need to be active in this area to help prevent these statistics from worsening, and resilience planning should increase its scope to include this to provide industry with a framework to address this problem.
3. The Farm Management System (FMS) framework and industry Best Management Practice (BMPs) programs have been developed as a means to improve their industries on farm profitability, productivity and environmental stewardship. Some incorporate up-to-date triple bottom line accounting. Currently no industry developed BMPs or FMS have a robust natural disaster section.

   A natural disaster section with simple questions could have a number of outcomes;

   - Change the perception to natural disasters to normal due to its location in an industry developed BMP or FMS.
   - Highlights natural disasters and natural disaster planning/resilience to the landholder.
   - Natural Disasters are addressed by the farm business outside the 'event and recovery' time of a natural disaster.

   Further work needs to be done to develop a natural disaster BMP section that could sit inside an industries BMP or FMS. Then tested with in a pilot study group, willing industry and see if perceptions of natural disasters change. Resilience and preplanning tools and information (industry specific) need to be improved and developed to meet the demands of landholders.

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