Crisis as an opportunity for change?: A case study of applying resilience thinking to extension responses in dairy industry crisis

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Abstract. This paper outlines a study conducted with a regional extension committee in the dairy industry in Western Victoria, Australia. The aim was to understand experiences of crisis within the region's dairy industry and its current crisis response approaches. It also tested alternative extension approaches through applying resilience thinking and farmer segmentation. The study included interviews, a desk-top development of a resilience framework and a role-play workshop of a mock-crisis situation. The effects of crisis were influenced by the capacity farmers and their farming system developed pre-crisis. Factors affecting the capacity to respond included the farmer's personal and financial context, beliefs and expectations concerning farming itself, past experiences related to the crisis, the extent to which goals were threatened and the need for change. Farmers reported a limited ability to respond during a crisis in ways that mitigated its effects. The introduction of a resilience perspective, demonstrated the need to embed alternative approaches at a pre-crisis planning stage or in improved post-crisis learning events.

Keywords: Resilience thinking, extension design, farmer segmentation, role-play, dairy industry

Introduction

The impact and management of crises in agriculture has been a topic of increased interest within agricultural industries and government. Over the last decade, agricultural industries in Australia have faced multiple challenges such as drought, natural disasters (bushfires, floods), volatile farm-gate product prices, and significant policy change (e.g. Murray-Darling Basin plan). Some agricultural industries and policy groups are increasingly questioning their crisis response strategies. Of particular interest is the extent to which crisis responses are designed to support recovery from crisis, as opposed to more strategic responses focusing on longer-term resilience. A great deal of research in recent years has explored elements of these issues, particularly in the context of drought. For instance, explorations of the experience of drought as crisis (e.g. McGuckian and Rickards 2011) and the call for reframing of drought policy away from "crisis" to "risk" management (e.g. Botterill and Wilhite 2005). Further, the need for radical changes and transformation in agricultural industries in the context of climate change are surfacing (e.g. Beilin et al. 2012). Largely unexplored in this burgeoning field is an understanding of crisis and crisis response within agricultural industries themselves, and in contexts outside of drought. Along with this, the options open to extension for supporting change rather than bounce-back or recovery from immediate crisis have also lacked investigation. Developing knowledge in these areas will assist in the formation of extension strategies for both the public and industry sectors with respect to their crisis management.

This paper progresses knowledge in these areas by drawing on results of a study conducted with a regional extension committee in the dairy industry in Western Victoria, Australia. The aim was to understand experiences of crisis within the region's dairy industry and their current approaches to crisis response. The study also tested the potential for alternative approaches in crisis response through applying resilience thinking and attitudinal segmentation to their extension design. Key concepts informing the study are outlined including: the definition of crisis; defining resilience and the contribution of resilience theory to crisis response; attitudinal segmentation and its application in responding to crisis; and extension and its role in crisis response.

Defining crisis in agricultural industries

Crisis is defined differently in fields as diverse as health, economics, the environment, disaster management, war and conflict and organisational communication. For the purposes of this paper, and in light of our interest in the role of extension in agricultural industry crisis, we draw from communication studies to define crisis as an unstable or dangerous situation that usually involves abrupt change, and has the characteristics of uncertainty, unexpectedness, threat to important goals and requiring a need for change (Seeger et al. 1998).

We distinguish this definition from the important field of emergency management or emergency response in which recovery from damage and return to a pre-event state is the primary focus. In this paper, our interest in crisis events is on vulnerabilities and opportunities that such events pose for farmers and their industries, and what change extension can support to minimise impacts of future events. Some examples of agricultural industry crisis include unexpected commodity price slumps, disease outbreaks and product quality problems. We also consider crisis to be socially constructed whereby the individuals or social groups themselves consider a situation or an event as a crisis. We recognise that crisis is created in the discourse of and negotiations among people as social actors (Berger and Luckmann 1967). Therefore, although a slump in commodity prices may be a crisis event shared by a group of farmers in the same market, the experience of this as crisis will differ.

Defining resilience and the contribution of resilience theory to crisis response

In the field of ecology, resilience has been defined as the "capacity of a system to absorb disturbance and still retain its basic function and structure" (Holling 1973, p14). The interactive dynamics between social and ecological systems have more recently been represented in concepts of social-ecological systems (SES) (Walker and Salt 2006). The central features or concepts of SES are: continuous adaptive cycles (exploitation, conservation, release and reorganisation) (Walker and Salt 2006); the organisation and interrelationship between systems-within-systems or nested systems (panarchy) (Holling 2001); basins and thresholds in and between systems (Folke et al. 2010); and the influences of adaptive management across scales. Resilience management has twin aims of preventing the system from moving to undesired system configurations in the face of external stresses and disturbances; and nurturing and preserving the elements that enable the system to renew and reorganise itself following a massive change (Walker et al. 2002).

Incremental adaptation in response to crises can lead to systems becoming locked in to trajectories that are, in the long term, unsustainable (Anderies et al. 2006). In dealing with crises, there is therefore an ongoing tension between the need to protect and develop the current agricultural industry configuration, and the need for transformation and change in a changing environment. Applying resilience thinking to the challenges for agricultural industries includes the extent to which there is systematic consideration in building the resilience of the industry in the long term; recognition of the resilience implications of current industry trajectories and retain (or develop) the capacity to reorganise when necessary; and crisis response consistent with both short- and long-term and multi-scale resilience.

These concepts are considered by the authors to have particular strengths for the situation of crisis response in agricultural industries, particularly in considering the scope of available response options (Cote and Nightingale 2012). Resilience, as it is understood through SES, is not without criticism. Some authors believe SES does not adequately address political economic factors in conceptualising vulnerability (Folke et al. 2010). However, resilience thinking may offer a framework or heuristic for people in crisis response roles to consider alternative response options based on understanding the importance of system dynamics. Resilience thinking means expanding the number of elements considered in decision-making, and forward planning in farming or in industry services to enhance options available, and therefore, resilience (Love et al. 2008; Anderies, et al. 2006) . In the approach outlined in this study, we draw on what Cote and Nightingale (2012) define as "a situated resilience approach" which prioritises local knowledge and situations, and empirical studies of SES dynamics.

Understanding diversity in experience of crisis amongst farmers and service providers

That people experience crisis differently is an important issue for crisis interventions to address. Although much research has focused on documenting and analysing the experience of crisis, the main issue for crisis response is what to do about these diverse experiences of crisis and the different ways crisis may be perceived. For extension teams in crisis response, is there a way to pre-empt or understand diversity in response to crisis amongst a farmer population? Drawing on the definition of crisis used in this paper and resilience thinking ideas, crisis can be considered as any event or situation that challenges important goals and through so doing, creates a level of anxiety or concern for the implications of such changes. Within agricultural industries this would include the goals of farmers. Crisis could be perceived differently depending on farmers attitudes towards their farming (i.e. as a business, as a pathway for the entry of new generations). Understanding diversity of attitudes and beliefs of farming amongst a farming population could offer extension an entry point for considering the impact of crisis and also potential different responses to crisis that would aid in extension design. Previous studies of the diversity of farmers worldviews and attitudes toward farming in the dairy industry had

concluded this understanding as being important for extension design (e.g. Nettle and Lamb 2010; Waters et al. 2009). Could an understanding of different segments of farmers, with respect to attitudes towards their farming, assist crisis response design?

The role of extension in crisis response

Extension is broadly defined as the process of enabling change in individuals, communities and industries involved in the primary industry sector and with natural resource management (SELN 2006). *Enabling change* signals a broader role for extension beyond "extending knowledge and information". Extension and advisory services (both public and private) are resources drawn on in times of agricultural industry crisis and shocks and are considered to play a critical role in helping farming families make decisions, particularly the complex decisions about future plans in a changing environment (McGuckian and Rickards 2011). Some authors suggest this role is increasing as extension moves from situations requiring information delivery to situations involving value-based conflict (Nettle and Lamb 2006) requiring roles in community facilitation (Cartwright et al. 2002), or representing farm change to policy (Nettle and Paine 2009).

In this paper, the role of extension in crisis response for resilience is of particular interest and an important area for extension policy. Could resilience thinking and attitudinal segmentation assist in developing different extension responses to industry crisis that support adaptation beyond recovery and bounce-back? In order to answer this question and progress a "situated resilience approach" (Cote and Nightingale 2012), a research design was proposed in conjunction with an agricultural industry regional extension and education committee (Western Victorian dairy industry regional extension committee or the SW-REC). The following research questions were established:

- How is crisis defined and experienced by people in the dairy industry in Western Victoria?
- What are the routines of crisis response in the region?
- Is it possible to alter crisis response routines using resilience thinking and if so, are there potential benefits?
- How could extension providers support different routines in crisis preparation, crisis response and post-crisis learning?

The next section provides the context in which the study was conducted and details the methods used.

The dairy sector in Western Victoria and crisis events

The Australian dairy industry is the third largest agricultural industry in Australia and generates A$3 billion in pre-farm gate income, ranking third in world dairy trade. The state of Victoria, Australia's principal dairying state, accounts for nearly 60% of Australia's total dairy production, has an annual turnover of A$5,125 million and produces over two-thirds of the nation's fresh milk and cheese (Dairy Australia 2011). Western Victoria is the largest milk producing region in Australia with around 24% of total national milk supply. There are approximately 1,700 dairy farming enterprises producing a total of about 2.4 billion litres of milk annually. The average herd size in the region is larger than the rest of Australia at 312 cows (298 ave) with an average output of 2.3 million litres of milk per farm year. The industry directly employs about 3,955 people on dairy farms and an additional 3,240 people in the processing sector, representing 10% of all employment in the region (Dairy Australia 2011). WestVic Dairy estimates that the current value of the dairy industry to the region is about A$4.6 billion.

Crisis events have affected the dairy industry at different scales in recent times. In late 2009, a crisis in dairy production confidence emerged from ongoing drought, failed spring seasons and in particular, an unexpected collapse in milk prices as a flow-on effect of the global financial crisis. This presented a challenge for the dairy industry in how to effectively respond and support farmers. Farmers were affected differently; some experienced little disturbance while others struggled and in some cases needed to leave their farm businesses. At this time, it was increasingly apparent that over recent years, a large proportion of industry and extension resources had been directed toward responding to immediate crisis rather than setting and implementing longer-term strategies. Further, at the farm or regional scale, there had been limited forward planning for crisis and little structured learning from crisis.

Method

In order to address the research questions, the project team required methods that provided an opportunity to work in a current context of extension responses and collect data about the experience and reflections of crisis and crisis response. Further, it was necessary to work with extension team themselves on considering alternatives to crisis response practice. The methods chosen reflected a cooperative or appreciative inquiry (Heron and Reason, 2006). The study was

conducted between March 2010 and June 2011, and involved three overlapping phases including:

4. Interviews with farmers (n=8) and extension officers (n=4) about their experience of industry crisis. A theoretical rather than representative sampling approach was applied (Mitchell 1983) to provide a range of potential responses to crisis (farm interviews) and years of experience (extension interviews). Farmers interviewed included farms at different stages of the business cycle and a range of farming styles. Farmers completed an attitudinal profile to identify differences in farming worldviews (see Waters et al. 2009). Interviews covered questions concerning their experience of crisis and managing crisis, current crisis preparedness, and key learning's and changes as a response to their experience. Extension people interviewed were chosen to include a range in extension roles (technical specialist or industry development) and years of experience (two years to 21 years extension experience). Interviews were recorded and thematic analysis used to identify common themes that contributed toward understanding diversity of crisis response in farming and extension (Research question 1 and 2).

5. Development of a resilience framework for preparing and responding to crisis drawing on the resilience literature and previous empirical work in the dairy sector (Love et al. 2008). Also, results from attitudinal segmentation of dairy farmers conducted in 2008 were reviewed to consider potential population-level differences in crisis responses (see Waters et al. 2009). This provided a framework for use with the SW-REC (Research question 3).

6. Testing and further development of the framework in a role play of crisis response with the SW-REC and invited stakeholders (n=11) to explore the diversity of responses to a crisis and an examination of alternative response options that could contribute to resilience.

The role-play scenario was designed to allow reflection on routines of crisis response by the people involved (Research questions 3 and 4). Although scenario-planning methods are commonly used to enable divergent thinking about future issues and states (Miller and Cardinal 1994), they are not a particularly strong method for uncovering root problems within current ways of responding. The role play method also allowed for practising crisis response in a safe environment and reflection on this practice through considering the strengths and weaknesses of the practice as an alternative approach to crisis response (e.g. Greenberg and Eskew 1993). The technique was agreed with the input of the leadership group of SW-REC who then acted as key recruiters for the role-play exercise.

The role-play design

To conduct the role play, an artificial crisis was developed and a response role-played by the SW-REC. The scenario developed aimed to present a significant threat to current dairy systems, one which was unexpected and presented significant challenges to existing farm management. The example used was a fictitious cereal ergot infestation that reduced the milk producing potential of infected cereal and possibly decrease cow reproductive performance. A half-day role-play workshop was developed by the project team to include: a) an experience that provided people with a role to play in crisis response close to their current role; b) the application of the resilience and segmentation framework to help in enacting this role; c) enough time for doing and deciding "in-role"; and d) enough time for reflection "out-of-role". Role play participants included farmers, departmental research and extension representatives and near farm professionals (consultants and a vet).

Roles chosen for the workshop included: people acting as themselves (e.g. farmers, extension officers) and a small number of fictitious roles not represented by the current members, including a milk factory representative and a farmer asked to take on a very conservative and pessimistic role. The workshop process was:

1. All participants received a media release on the crisis a week before the workshop and were allocated roles. This allowed some time to consider the implications of the crisis to their situation.

2. At the start of the workshop, each participant talked about a crisis they had faced and how they had responded.

3. The "ergot crisis" was introduced.

4. The group was asked to come up with a response to the crisis from the SW-REC without any guidance. (This was used as a proxy for describing current crisis responses in this context.)

5. The group was then given the resilience framework for crisis response (see Figure 1) to use as a guide. Further, the dairy farmer attitudinal segmentation results (see Waters et

al. 2009) were provided to the group (Table 1) and they were asked to reflect on how this might inform or change their response.

6. During the workshop a sign was used to indicate when role play was "in progress" or not.

7. The local dairy extension team from the Department of Primary industry Victoria (DPIV) presented a standard crisis response program, and the SW-REC group was asked to critique and modify this plan.

8. The workshop finished with a time of reflection, identifying what worked well and what could be improved, as well as reflecting on the group function during the workshop.

The unit of analysis for the entire study was the extension crisis response group. The overall findings of the study were presented to DPIV and other agricultural industry extension staff to consider the applicability of findings to other contexts. The findings from this step are presented in a project report (Love et al. 2010) but are outside the scope of this paper. The next section outlines the findings from study presented against the research questions.

Figure 1. Summary of a resilience framework developed to assist extension response teams

Resilience concept (from Walker and Salt 2006 and Love et al. 2008)	Application to extension team response in crisis: questions for extension to consider
Situation analysis: What's the nature of the crisis?	What are the emerging responses to crisis (radical/conservative)? Which groups of farmers would perceive this situation as crisis? What are the key scales that you will focus on for this crisis? Who are you developing the response for (i.e. what scales?)? What is the timeframe of the crisis?
Adaptive cycle analysis: To what extent will the crisis create opportunities for reorganisation?	Where are the majority of farm businesses "at" in the adaptive cycle (exploitation, conservation, release and reorganisation)? What are your strengths in the current system to respond? What opportunities are there to change or reorganise the system (internal control and adaptive capacity)? Are there particular vulnerabilities because of this?
Possible futures Decide on appropriate scale of action and focus for action What is the most relevant boundary of the system? What are the most important values to conserve?	What options or ideas for crisis response emerge (other than information provision)? What is the purpose of our crisis response (e.g. preserve farmers in their current farming systems)? In the longer term, will the purpose of our response create vulnerability? What is the most relevant scale for our action (e.g. individual person, dairy herds, farm businesses, dairy company, community) across both social and biophysical scales? What is the boundary for our response (particular groups of farmers, a geographic location)? What are the cross linkages that need to be considered or drawn upon? (e.g. farmer-farmer networks, dairy company arrangements)?
Human system aspects	Who can be mobilised to respond? Existing networks in this challenge. Communication and technology resources
Implications of each trajectory and resource allocation – monitor change and progress	Prioritise time and resources based on trajectory Evaluate emergent properties of the crisis: e.g. scale of impacts. Is the crisis response accounting for the diversity of responses? Is communication reaching the right people? Are perceptions of the crisis changing? Are limits being "hit"? Are conversations being fostered about these limits (e.g. on a farm, the possibility of leaving farming; or the potential for dairy industry to decline significantly within a region)?
Has adaptive capacity been built?	Are we in a different position on the adaptive cycle? Have the values to be preserved changed? What scales have emerged as being important and to whom?

Table 1. An overview of potential diversity of crisis response amongst dairy farmers based on a segmentation analysis of the dairy farming population (%) with respect to attitudes towards farming (for a full explanation of the segmentation method and characteristics of each segment, see Waters et al. 2009)

The dairy farmer segments (Waters et al. 2009)	Segment 1 Family first (5.5 %)	Segment 2 Winding down (3.6 %)	Segment 3 Love farming (17 %)	Segment 4 Establish-ed and stable (25 %)	Segment 5 Open to change (22 %)	Segment 6 Growing for the kids (27 %)
Segment character-istics pertinent to crisis response	Could be considered resilient to shocks due to financial reserves Unlikely to be involved in industry crisis responses Some shocks may threaten sustain-ability	Shocks may prompt exits if timing right Unlikely to change farming practices during crisis This group would "fly under the radar" of industry response Some shocks may threaten key goals	Confident in current system to "bounce back" from shocks More likely to "fine tune" than change More likely to attend groups/ industry workshops and therefore a key entry point for supporting change.	Self-reliance and in-dependence means this group hard to reach in a crisis Potential to be exposed to shocks as they are less likely to consider different or "outside the box" options	More interested in profit impacts of shock than other groups Open to new ideas and change More likely to use advisers and consultants If new ideas are important – this group should be engaged in crisis response	Would be concerned about the impact of shocks on next generation Depending on the shock, it may delay succession Change may be needed to maintain goals

Adapted from Waters et al. 2009. The dairy farming sample is a random survey of 450 farms and cross-referenced to situational, demographic and behavioural indicators.

Results

Research question 1: How is crisis defined and experienced by people in the dairy industry in Western Victoria?

Farmers indicated they had experienced two different "shocks" or events in recent times (2006/2010), the milk price drop of late 2008 and the failed spring or late spring break of 2006/2007. Farmers perceived these events differently; each event was experienced as a crisis for some and not for others. The main reasons for the diversity of experience of crisis were clustered into themes and summarised:

The nature of the crisis event influenced which farmers were likely to be more affected. The milk price drop affected farmers who were more vulnerable to income variability, such as those without cash reserves and with relatively high levels of fixed costs. One farmer (600 cow herd) mentioned that he had pre-purchased feed inputs at a fixed cost as a risk management strategy to insulate the farm against rising costs, but this had back-fired in the crisis. Poor seasons, such as the failed spring, had less impact on those with extensive feed reserves (irrigation and silage), and hit harder for those who were already experiencing high levels of stress from other events on their farms.

The business goals and strategies of farmers can create vulnerability to particular crisis events. A young farmer who suffered during the milk price drop commented: "If you're running your business as efficiently as possible, there shouldn't be anything left to cut". In another situation, a farmer had turned the failed spring into an opportunity by investing in a lucerne growing property which then provided enough hay for his farm, and to sell in a time of high demand.

Life stage, personal circumstances and beliefs also amplified the effects of a crisis event. Older farmers who experienced the milk price drop as a crisis commented that they felt particularly stressed because they did not believe that at their stage of life this sort of stress would arise again.

> "I was stressed, because I've been there before, and I was thinking 'How did I get into this position again?' I felt like I couldn't do much and if you can't do much, you're annoyed.

> "I went into a state of depression, and last year's been personally my worst, I thought that we had the score on the board. A lifetime's work was just about fulfilled."

By contrast, a younger farmer for whom this was a new experience, felt excited at having handled the crisis as well as he did. Of the farmers who experienced the failed spring as a crisis, one had a family crisis, with her husband seriously injured, and another was in a "development" phase of increasing property size and milk herd numbers while simultaneously building a new house.

Previous experience of crisis appeared to have been critical in preparing farmers. Of the farmers interviewed, most did not experience the failed spring in 2006/2007 as a crisis. Previous variability in seasons gave these farmers experience which shaped the way they managed their farms prior to the 2006/2007 event. Their prior experience had equipped them with both an expanded sense of what was possible, as well as skills for managing feed in a tough season. Other farmers described the strategies they adopted prior to 2006/2007 as intentionally "drought-proofing" themselves. In this regard, the timeframe for crisis situations was important, with events being defined as crisis at different times.

Those who had *not* experienced the events of the milk price drop and/or the failed spring as crises had strategies in place that helped mitigate negative effects. It was observed that mitigating strategies were not always intentional or carefully planned

In summary, the affects of crisis were very much influenced by the capacity farmers had to respond at the time the crisis occurred. A farmer's personal and financial context and beliefs along with their past experiences mediated the impact of the unexpected situation, the extent to which goals were threatened and the need for change.

Research question 2: What are the routines of crisis response in the region?

The dairy industry has tended to support farmers in industry crisis in three main ways:

1. Providing support to short-term farm management decisions in the context of the crisis (e.g. cash-flow budgeting, debt strategies, feed alternatives, sign-posting to government support).
2. Communicating clear and consistent messages about the operating environment to farmers and service providers (e.g. changes in input availability and prices such as weekly hay and grain reports), shifts in global demand for dairy products such as DairyLive regional broadcasts, Industry Situation and Outlook sessions (Dairy Australia 2011). This has the dual aim of reducing the likelihood of conflicting information circulating and to convey the collective response and acknowledgment of the situation as widely as possible.
3. Ensuring dairy industry organisations work together to ensure consistent and widely understood information (e.g. cross-organisation working groups, delivery of 1:1 information and advice).

These strategies have been largely effective in ensuring farmers have the best available information and support to their dairy business operations.

In interviews, farmers reported a limited ability to respond during a crisis in ways that mitigated its effects. Generally, either farmers had mitigating strategies in place prior to the crisis, or they continued doing what they could to maintain their business with what they had. In each case, there was a sense that the farmers felt very close to failing but continued because of a faith in a better future. One farmer indicated that he had consciously chosen his response when he spoke of making a commitment to himself when the milk price drop took effect, that if he was going to go down; he was going to go down trying. Others generally saw their response as the only one they had available, giving the sense that they felt locked in to particular actions.

With respect to seeking help in responding to crisis, farmers sought information and advice from the range of advisors, consultants and networks in which they were already involved. Milk factory consultants, other consultants, accountants, banks and discussion groups were mentioned as primary sources of support or advice. Some had talked to friends and neighbours, finding this reassuring, while others actively avoided talking about bad times. Some noted that their position in their community as "better off" prevented them from being able to discuss their situation openly. Some farmers had found information days and farmer meetings helpful in gauging the crisis and gathering information without explicitly asking for help.

Extension officers also provided insight into their observations of common routines of crisis response in their region. On one hand they identified that not all farmers wanted support from the industry and did not associate strongly with the dairy community nor see it as a source of support during difficult times. In addition, the wider media often focus on the sensational and the negative in the midst of crisis. Extension staff considered a key part of their role in crisis situations was in balancing such messages. Forms of decision paralysis and social isolation on the part of farmers were also observed. Extension staff were often contacted by farmers concerned about their neighbours or by farm input supply company representatives who were concerned about their lack of social contact. Extension staff mentioned a number of famers were reacting to needs on a daily basis, such as not ordering feed until it had run out or, more commonly, working harder and longer to cope.

Research question 3: Is it possible to alter crisis response routines using resilience theories and if so, are there potential benefits?

As part of the study, a resilience framework for preparing and responding to crisis was developed drawing on the resilience literature and previous empirical work in the dairy sector (Love et al. 2008). This framework is summarised in Figure 1.

Results from attitudinal segmentation of dairy farmers conducted in 2008 were reviewed to consider potential population-level differences in crisis responses based on differences in farmers beliefs and attitudes to farming (i.e. their farming "worldview") (see Waters et al. 2009; Nettle and Lamb 2010). Table 1 provides a summary of the diversity of world views of Australian dairy farmers and pertinent differences in potential responses to crisis. In particular, the segments reflect diversity in four main areas that were found to be important in understanding diversity in the experience of crisis in the interviews. These include: a) farmers perceptions of risk (see O'Kane et al. 2010); b) farmers motivations for farming (i.e. for some segments, change that threatens the long-term viability of the dairy industry and the ability of their family to take over the farm may be more important than change which affects the short-term profitability of the farm; c) the extent to which dairying is an important lifestyle (e.g. 76 % of dairy farmers do not have any plans to leave the dairy industry, and would choose to stay and adapt if possible rather than leave as a response to a crisis); and d) interest in innovation and change (i.e. there are segments that prefer to leave the trialling of new ideas to others). Therefore, some crisis preparation and resources may be best directed to segments that are more open to trialling new ideas in order to identify possible alternative opportunities).

These frameworks were tested and further developed in the role play of crisis response with the SW-REC. The role-play workshop proved powerful for revealing established routines of crisis response amongst local groups. Quite early in the role-play exercise, the group decided they needed more information before they could work on a response and this issue remained for the entire role play. The dependence on more information before making plans or acting proved to be the key constraint to acting differently and applying the frameworks. The uncertainty crisis situations create and the need to rapidly accumulate information about the crisis to inform action was an important learning. However, striking a balance between acting in the light of inadequate information and accumulating information proved difficult. However, the frameworks provided the role-play members with some indication of information they may need to source alongside technical information about the crisis.

After a briefing on use of the "resilience response tools" prior to the role-play, the group did not draw on the tools to any extent in deciding their new crisis response strategy. The session was run again, with one of the project team acting as an independent facilitator, and this prompted different decisions particularly regarding crisis message content, types of communication and roles for the crisis response team to operate at different scales. It was suggested at the end of the workshop that a skilled facilitator would be useful for taking the group through the steps of responding to a crisis.
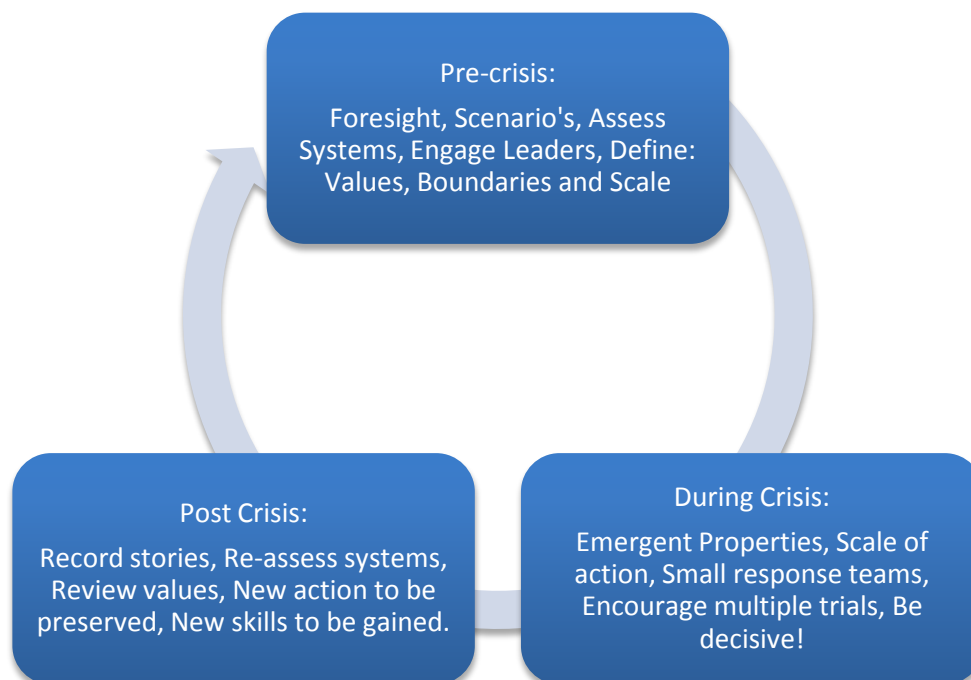
Research question 4: How could extension providers support different routines in crisis preparation, crisis response and post-crisis learning?

The focus of the role-play workshop was on activities to undertake during a crisis. On reflection, it emerged that more effective action can be taken before a crisis, in areas of prevention and preparation. In the interviews with extension officers, participants were asked to comment on the extent to which concepts from resilience theory resonated with their lived experience in crisis. Of particular interest were the assumptions of the precariousness of farming systems. Extension officers described the features of "highly optimised systems" that made them more susceptible to shocks as those with reduced system flexibility, high debt levels and exposure to more market variability (through bought-in feeds). However, they also provided some counter

evidence of characteristics that they believed helped these farmers manage crisis situations. Even though the systems were less flexible, the people managing them had more adaptive capacity and were more willing to try new things. They also tended to plan ahead better and were more willing to make decisions earlier. This does not mean that highly optimised systems are more resilient, rather, that when faced with less options farm managers did more with what they had. It could be argued that these managers would be even more resilient with less precarious systems. An awareness and acknowledgment of system precariousness by the extension community would help both researchers and farmers make informed decisions about current and proposed system vulnerability to shocks. As a significant link between the research and farming communities, extension has the opportunity to provide critical thinking in systems development.

In response to results from the role play workshop and interviews with extension, the frameworks developed to support application of resilience thinking to extension responses in industry crisis were adapted to assist in building pre-crisis capacity and support post-crisis learning. This is represented in Figure 2. **Pre-crisis capacity** is focused on developing the knowledge of vulnerabilities of farm systems, the networks and resources across different scales that can be drawn upon in times of crisis. **Crisis response** is focused on adapting established routines toward longer term resilience, such as considering the formation and characteristics of a response team, intelligence gathering about the crisis to recognise potential "tipping points" early, acknowledge radical versus conservative trajectories and consider implications for crisis response rather than promoting or favouring a particular trajectory. **Post-crisis learning** concerns the encouragement of debriefing processes, which should be intentional about capturing learning's from the crisis situation.

Figure2. A summary resilience framework for crisis response developed from the study

Pre-crisis:
Foresight, Scenario's, Assess Systems, Engage Leaders, Define: Values, Boundaries and Scale

Post Crisis:
Record stories, Re-assess systems, Review values, New action to be preserved, New skills to be gained.

During Crisis:
Emergent Properties, Scale of action, Small response teams, Encourage multiple trials, Be decisive!

Discussion

Farmers experienced crisis differently depending on a range of personal, situational and temporal factors. The study suggests that the diversity in farmers' experience of crisis was influenced by the nature of the crisis event or situation itself (e.g. whether it is a natural event or economic situation). Therefore, in crisis response it is important not to assume all crises are the same and a response to one type of crisis can be replicated for another. A detailed understanding of the nature of the crisis and how it may be changing over time will be important. Secondly, the particular business goals and strategies of farmers were seen to expose some farmers to being more vulnerable to particular crisis situations than other farmers. Rather than predicting the vulnerabilities of strategies to particular crisis, extension requires a good understanding of the range of goals and business strategies within an industry/farming

population at any time. This knowledge could be drawn upon in considering the impact of crisis across a population of farms. The attitudinal segmentation (Waters et al. 2009) tested in this study is an example of such a population-level understanding particularly related to different goals in farming. Thirdly, it was found different life-stage and personal circumstances affected the experience of crisis. Although this area may be considered to be a potentially large source of diversity that cannot be meaningfully addressed through extension, a consideration of these as factors could assist in the formation of useful partnerships (e.g. if young farmers are considered to be more vulnerable in particular crises, extension could draw upon young farmer social networks in their responses). Fourthly, previous experience of crisis was found to be important in mitigating impacts of crisis events. Farmers with experience of previous crisis can be a knowledge resource for extension to draw on in considering suitable technical advice, or if there is limited experience of similar crisis in a region, this may help build a case for additional resources to support learning. Finally, the time frame of crisis and the potential for crisis events to become prolonged suggests a need for extension to have a "watching brief" on how crisis events are changing and how on-farm responses to crisis are changing.

The findings regarding the application of resilience theories and attitudinal segmentation for supporting change in extension responses to crisis suggest there are a number of challenges to overcome. The strong reliance on detailed information about a crisis before acting and the influence of the people who make up a crisis management team (i.e. their own favoured responses and stage of their own business cycle) were two critical issues. The make-up of response teams is important in that teams require members who are action-oriented in ambiguous and uncertain situations. Facilitation in crisis response was also shown to be influential for considering different or a wider range of response options. For this reason, expanding the awareness of resilience frameworks amongst extension teams and developing facilitation skills in guiding alternative response options is necessary to progress resilience outcomes.

Changing the outcomes from crisis toward resilience was shown to begin with changes to the type of thinking and planning that occurred before crisis response. This "pre-crisis" phase is where there is the greatest opportunity to commit resources to different options, and to develop resilience for future crises. However, it was also recognised that there is not always the opportunity for planning and preparation – crisis, after all, is mostly unexpected. Further, "post-crisis learning" is a critical opportunity for improving crisis preparation but is often ignored in the haste to "move on" from crisis, or not done as well as it could be.

In working as part of this study, the extension team were seeking alternative options from constantly responding to crisis events with the same process of information delivery and a one-size-fits-all approach. In considering the applicability of resilience thinking and applying results from farmer segmentation, the team developed more nuanced understanding of the underlying reasons for diverse experiences of crisis and therefore the need for more nuanced approaches to extension response. This has important implications for extension policy and investment in crisis preparation. The potential application of resilience thinking and farmer segmentation to build adaptive capacity should therefore be further investigated.

Conclusions

The study outlined in this paper aimed to progress understanding of crisis and crisis response within an agricultural industry, and the options open to extension for supporting change rather than bounce-back or recovery from immediate crisis (resilience). The potential for alternative approaches in crisis response were tested through applying resilience thinking and attitudinal segmentation to extension design using a role-play technique. In applying these frameworks, an extension team considered different system boundaries in their response (e.g. the family farm, or the regional agricultural industry?) and which system functions need to be retained through the challenge of crisis (e.g. agricultural production, employment or family wellbeing?) and considered what constitutes an "undesirable" system configuration (and for whom).

In addition, considering the different responses of farmers to crisis by drawing on population level understanding of diversity in attitudes toward farming provided insight into potential different target audiences in crisis response. The study concluded that changing the outcomes from crisis towards resilience began with changes to the type of thinking and planning that occurs before crisis response, and through effective post-crisis learning that can establish new routines for future crises.

Given the public investment in crisis response and management, and the stakes for agricultural industries, extension teams are central participants, operating as a key connect between industry, broader government services and communities. As increasing volatility and uncertainty

in market and policy conditions appears to be a new normal for primary industries, having regional mechanisms that support adaptation and responsiveness in coping with uncertainty is necessary for configuring new routines. Situated resilience approaches (Cote and Nightingale, 2012), such as that tested in this research appear to hold promise as such a mechanism, particularly through active engagement with crisis response teams applying action research methodologies. Further research and development is warranted in particular in the intersect between local and industry-wide responses.

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