The use of knowledge partnering as an extension strategy in adaptation to climate variability

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Abstract. To address the challenge of developing an effective extension program for Tasmanian dairy farmers in the context of adaptation to climate variability, a knowledge partnering approach was trialled. Knowledge partnering enabled extensionists to draw on the knowledge and experience of Tasmanian dairy farmers about changing weather patterns and the management implications of these and then design a program that could help farmers meet the adaptation challenges they identified. Face-to-face interviews with dairy farmers across all regions of Tasmania were carried out and the data collated for presentation and discussion to focus group meetings in those regions. The outcomes of these meetings were the identification of key issues related to adaptive change management practices on Tasmanian dairy farms. The wider dairying community in Tasmania was then requested to prioritize those issues as topics for the extension program and the program was designed in response. By providing a structure for identifying and combining different kinds of knowledge (scientific knowledge, farmer knowledge, management knowledge and extension knowledge), the knowledge partnering approach allowed extensionists to design an effective extension program that was directly relevant to farm management needs. It is concluded that knowledge partnerships may be a key factor in extension strategy for climate change adaptation.

Keywords: knowledge partnering, climate change adaptation, dairy farmers

Introduction

There is now strong evidence of climate change which for agriculture, presents opportunities and challenges but in particular, increased risk and uncertainty (IPCC 2008; Howden et al. 2007). Mitigation of greenhouse gas emissions must be addressed and the 'increasing scale of potential climate impacts give urgency to addressing agricultural adaptation more coherently' (Howden et al. 2007, p. 19697). Adaptation considerations and particularly, risk management, will increasingly become key factors in reducing the impact of climate variability on the farming operation. Agriculture is extremely vulnerable to climate variability with reductions in rainfall, extreme weather conditions, floods and drought causing significant impacts on productivity levels (Howden et al. 2008). While 'further change is inevitable', adaptation may halve the likely economic impact of climate change (Heyhoe et al. 2007, p. 168). Nevertheless, there are no definitive forecasts of the 'potential magnitude and likely impacts of climate change' to allow the farming community to make informed management decisions (Heyhoe et al. 2007, p. 168; Jacobs, 2010).

In the face of this, it is widely acknowledged that there has been rapid progress in research into adaptation systems and that information and knowledge are essential skills for adaptation, yet there have been few comprehensive efforts to develop climate risk communication strategies that would be sufficiently effective to stimulate action on adaptation (Taylor et al. 2010). Studies carried out in Canada and in Victoria, Australia, have shown that while farmers will observe climate variability and weather events over the recent past, they may not equate these events or larger trends as being part of the effects of climate change within their locality. In these studies, factors such as region, sector, farming styles and farmer age had strong associations with attitude to climate change (Bryant et al. 2000; Schwartz et al. 2009). Encouraging adaptive management practices is therefore complicated by the fact that for some, the need for adaptation is not readily apparent in the context of climate change and for everyone, there are no definitive answers about the extent of adaptation that may be necessary.

A key role of extension is to assist farmers to build adaptive capacity to make informed decisions about risk management. Traditionally extension has been based on technology transfer or on programmed learning, which comprises delivering specifically designed training programs or workshops to increase understanding or skills in defined areas (Guerin and Guerin, 1994). Dissemination of research findings depends largely on these traditional extension approaches to achieve productivity and environmental objectives (Kreeble et al. 2004). It is to be expected therefore, that the increasing body of research findings predicting climate futures in terms of atmospheric temperatures and levels of greenhouse gases and their management implications for agriculture will in turn be disseminated within the framework of these extension approaches. This will be accomplished with a view to building long term strategic understanding and acceptance of climate change and adaptive management practice changes (Howden et al. 2007).

For adaptation in the short term, however, climate variability, which is inherently unpredictable in its occurrence and severity, does not offer firm and proven evidence of projected extreme climatic events which can be disseminated to farmers. Non-adoption of farming practices developed from research findings occurs for many reasons. It is typically the result of a logical thought process rather than uninformed or recalcitrant attitude (Pannell et al. 2006), so the likelihood of adoption of risk management practices in the face of uncertain and unproven data presentations about future events is likely to be poor. Clearly, traditional extension approaches based on dissemination of proven research evidence are not appropriate in the current complex and volatile climatic and economic environment. In this context, one of the few certainties in climate variability is that risk management has assumed a greater role than ever in farming systems.

Perceptions of risk, knowledge and experience are important factors at the individual and societal level in determining how and whether adaptation takes place. Several studies in developed countries have shown poorly perceived risk from climate change in the urban environment where climate has little impact on livelihood and lifestyle due to technologies which remove a direct dependence on climatic conditions (O'Brian et al. 2006, Wolf et al. 2009). In agriculture, on the other hand, weather events and climate are key to livelihood and quality of life and there is much greater sensitivity to changing weather patterns (Thomas et al. 2007) and the potential risks engendered by these even if there remains a strong ambivalence to whether they are anthropogenic and whether projected climate changes are real and likely to continue (Howden et al. 2007).

In some cases, adaptive measures on farm are already in place while in other cases, challenges and issues around adaptation have been intuitively recognized by farmers. This presents an opportunity to industry service providers to capitalize on the local and farmer knowledge that already exists in rural communities and use this practical expertise as a starting point to assist these communities with effective and timely climate change adaptation strategies. A knowledge partnering approach to regional development (Eversole 2010) brings together insights about farmer knowledge (Cornwell et al. 1994), indigenous knowledge (Warren et al. 1995) and local or rural people's knowledge (Chambers 1983; Kloppenburg 1991) to inform mainstream understandings of the role of 'knowledge' and 'research' in development processes. Knowledge partnering is a methodology for identifying and addressing development issues (such as climate risk and adaptation) by bringing different kinds of knowledge together in structured ways. Knowledge partnering therefore offered a way to conceptualize farmers' existing knowledge and practice as a starting point for strategic capacity building around climate change adaptation.

Taylor et al. (2010) referred to the paucity of recognition by researchers of local knowledge, needs and priorities that has led to missed opportunities to develop local capacity for responding to climate-related threats. Knowledge partnering starts from farmers' own knowledge of the issues that emerge from on- farm management practice, not from research to be disseminated and adopted. By assisting farmers to articulate their knowledge, issues and knowledge gaps, knowledge partnering offers an alternative to traditional extension approaches that privilege externally set content and learning goals. It provides a platform for bringing together the knowledge of farmers, scientists, consultants and extensionists to understand and address issues together.

In this study, knowledge partnering was trialled as an extension approach to meet the challenge of developing an effective and relevant extension program which would assist Tasmanian dairy farmers to develop coping strategies to adapt to climate variability.

Method

To gain an in-depth initial understanding of farmer knowledge and practice related to climate variability, face-to-face in-depth interviews were conducted with a cross-section of farmers in each of six climatic and social regions of Tasmania. These six distinct dairy regions included the far northwest, northwest, central north, northeast, south and King Island. A total of thirty interviews were conducted (five per dairy region) with farmers who accepted the invitation to participate in the project. Within each region, there was a range of farmer ages, farm sizes and herd sizes. A project information sheet and pre-survey form were sent out to the participants before project staff visited to conduct the interviews.

A semi-structured interview script was developed with the purpose of identifying whether

1. farmers had noticed changes in weather patterns over the years they had been on their farms or in the area
2. farmers had changed management practices to adapt to these changes
3. farmers could identify challenging management issues about which they felt they required more information and which they felt could be discussed further in focus group meetings for the purpose of designing and delivering an effective and relevant extension program on climate change adaptation.

The interviews were conducted in an informal manner following a flexible format and recorded with a digital voice recorder. The interviews were conducted over the six week period from 4th May to 7th June 2010. The recordings were transcribed and observations, management implications and challenges were noted from each interview. The data was collated and a 'theme grid' based on this analysis was prepared for each region. The theme grid is used in knowledge partnering to share information in a mutually comprehensible way. In this case, the theme grid summarised the topics, issues, and related management implications and practices that farmers identified in the interviews, for discussion and further elaboration in focus groups (see Table 1). Participating farmers, along with other interested farmers, were invited to a focus group meeting in each region to discuss the outcomes of the interviews as presented in the theme grid, and agree on key issues required to be addressed in an extension program that would meet their needs.

The discussions at the focus group meetings were recorded to allow further distillation of the issues into major topics common across regions. The list of topics was incorporated into a proposed draft program. This was sent with a questionnaire to all Tasmanian dairy farmers requesting them to prioritize these topics for the final draft of the program. Of the recipients of the mailed questionnaire to prioritize topics for the extension program, forty-four farmers returned their feedback sheets. While this was a reasonable amount of feedback, it represented only eight percent of the state's dairy farmers. The responses from the farmers were again collated to determine key topics to be addressed in the extension program.

Results

The following outcomes were noted from the farmers' interviews and focus group meetings:

1. There were a notable number of observations by farmers of changing weather patterns, temperatures and rainfall over time. This was particularly marked when the time period was over ten years spent in their area and was common to all regions.
2. Some farmers reported both practical changes and contemplated changes in farming systems over this time, suggesting that adaptive practices to weather changes had taken place, common to all regions.
3. There were many issues and management challenges to adaptation identified by the farmers and put forward for discussion by the focus groups.
4. Through facilitated discussion, the focus group meetings were able to effectively distill the issues into key issues which were grouped again into theme grids in order to present to the wider community for prioritization.

The data collated from the outcomes of the interviews and focus group meetings are shown in Table 1. A small number of priority topics were consistently chosen by the dairy farming community (Table 2). It was evident that the weather pattern changes observed by farmers were reflective of climate variability and that broadly, the following challenges and threats were identified as important factors in adaptation strategies :

1. Animal health and welfare: heat stress from the increasing frequency of very hot days in summer; lameness and mastitis from prolonged wet seasons.
2. Feedbase systems: limited water to drought proof the farm; production of pastures and forage crops under dryland conditions in increasingly seasonally dry conditions; pugging of pastures under prolonged wet seasons.
3. Increasing costs of energy.
4. Increased conflict and tensions from working with people under stressful conditions.

Table 1. Theme grid on outcomes of interviews and focus group meetings for all regions of Tasmania

Topic Raised in Interviews	***Management Implications***	***Practice changes already in place or being considered***	***Management Option(s) discussed***	***Key topics for extension program***
Hotter, drier summers	Heat stressed cows in extreme heat	More shelter belts, rotating cows to shady paddocks	If heat becomes the norm, could use feedlotting & sprinklers Shading Changing milking times to suit cooler periods	Heat stress
	Low pasture growth	Farm dams, dam sizes increased, pivot irrigators installed	Increase water storage & irrigation	Water storage and water flow management
	Moisture stress in dryland pastures; less soil moisture for cropping	Greater use of dry tolerant species in some dryland paddocks; Growing green fodder in October instead of December	More drought tolerant pasture species (e.g. cocksfoot, brome, fescues) and forage crops	Farm planning for pastures and forage crops; supplementary feeding; forage banks
	Soaks/springs disappearing	More reliance on irrigation but power costs increasing		Water storage, Irrigation schemes, environmental water flow management
Very wet periods & rain dumps	'Wrecked farm' - saturated soils & pugging	Autumn calving, calving earlier in spring; more drainage; moving cows to higher ground	Option to move calving forward to miss wet period, feed pads; moving cows to higher ground;	Farming systems planning, infrastructure
	Downer cow		Calving pads; herd homes	Infrastructure
	Lameness; mastitis		Gravelled lanes and drainage	Infrastructure
	Less silage made, poorer quality			Farm planning for pastures; supplementary feeding; forage banks
Erratic weather patterns, extreme events	Flooding, power cuts, Severe drought, Storms damage, Working with staff under stress			Use of meteorology reports; insurance; Risk management; Coping with stress; human resource management
Winters drier, warmer/less severe frosts (snow melts faster on ranges)	Pasture renovation earlier using direct drilling for quicker establishment			Research in Climate futures; pasture yields and other cropping opportunities with increasing temperatures and CO_2 emissions
Power costs increasing	Solar and wind energy; improving energy efficiency- explore options		Solar, small wind turbines, microhydro systems, biogas from dairy effluent	Renewable energy

Table 1. continued

Topic Raised in Interviews	***Management Implications***	***Practice changes already in place or being considered***	***Management Option(s) discussed***	***Key topics for extension program***
Greenhouse gas emissions	Nitrous oxide from nitrogen fertilizer loss; applying nitrogen in wet, cold conditions; methane loss from effluent tanks; feeding for reduced methane emissions; soil carbon sequestration	Use of biological fertilizers; application of nitrogen in liquid form		Research into forms of nitrogen application; trapping methane for biogas; research into feeding for minimum methane emission

Table 2. Priority topics chosen by dairy farmers and to be incorporated into the extension program

Main theme	***Topics covered***
Energy efficiency	Efficiency in the shed and irrigation, negotiable power
Animal health and welfare	Heat stress management, lameness, mastitis and downer cow management under stressful conditions.
Water	Water storage, irrigation development, water use efficiency, environmental water flows
Renewable energy systems	Viability of solar, wind, microhydro, biogas
Feedbase management	Pastures for dry tolerance, efficient management of irrigated and dryland pasture and crops; supplementary feeding; forage banks.
Infrastructure and farm system planning	Laneways, calving pads, feed pads, stand off areas, drainage
Greenhouse gas emission mitigation	Soil carbon sequestration, nitrogen management, effluent management for biogas, optimal rumen nutrition
People and stress	Coping with stress, risk management in the business, human resource management

Based on these priority issues, it was then possible to draw up the final draft of the extension program relevant to the needs of Tasmanian dairy farmers to build capacity to adapt to climate variability.

Discussion and conclusion

Farmers are more sensitive to, and place more emphasis on variability in conditions such as precipitation intensity at critical periods of crop or pasture development and variation in local conditions and will often implement on-farm changes following a climatic event perceived as extreme in agricultural terms (Reid et al. 2007). In the abovementioned Victorian study (Schwartz et al. 2009), it was found that even as acknowledgement of climate change was ambivalent, four major adaptations that were already in place on some farms were adoption of water use practices, adoption of new technologies, changes to crop, pasture or grazing systems and changes to business structure. These findings validate our argument that in order to build climate change adaptive capacity, farmers should be engaged by stimulating, encouraging and helping them become involved with learning projects they see as relevant to improving their situations. When farmers are recognized by stakeholders as active in the process, they become both learners and teachers, contributing to information flow, generation and adoption (Taylor et al. 2010). This was substantiated by the results of our study where it was found that farmers' knowledge and intuitive understanding of the need to adapt to what were clearly changing weather patterns, whether or not they were acknowledged as representing climate change, were significant. It was further validated in the outcomes of the focus group meetings where discussion led to general concurrence that issues raised in the interviews warranted attention. Extensionists were then able to identify topic experts in the broader community who could speak about these issues with farmers in the resulting extension program.

It is concluded that this study has provided strong indications that knowledge partnering is a valuable approach in extension methodology for advisors and extension strategists, particularly in the complex and difficult sphere of adaption to climate variability. However, the sample used in this study was small and derived from one sector of the agricultural industry. It is recommended that the scope of the study be widened to trial the knowledge partnering approach in other primary industry sectors and across regions with a greater range of topo-climatic and social conditions to establish whether knowledge partnering is applicable to extension planning for adaptation in national rural systems and natural resource management.

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