South Australian farmers' concerns and adaptation options for climate change

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Abstract

This paper reports some of the suggested adaptations to climate change from about 500 primary producers in South Australia during a series of thirty-five climate risk workshops held from 2006 to 2008. Not surprisingly, many of the impacts that primary producers were concerned about from the early stages of climate change were similar to climate risks associated with year-to-year variability. Earlier and milder projections from climate change reinforced current best practice for dealing with the variable climate. Many adaptations to short term climate change are perceived as low risk.

Producers did not provide a large list of management adaptation strategies for the long-term future of their enterprises. They relied on future research to support their enterprises, including the potential use of GMO crops, the role of bio-fuels and possibilities of carbon sequestration. However, even for those producers who accept the science of human- induced climate change, there is often a reluctance to make large irreversible changes to the business structure given the uncertainty in the projected impacts longer term. Producers reliant upon the River Murray for irrigation or stock water are more concerned about the impact of water policy than climate change *per se* on water availability and quality.

Key Words

Risk, producers, adjust, production risk

Introduction

In South Australia, grain crops are grown in low (250-350 mm annual average rainfall), medium (350-450 mm and high rainfall (> 450 mm) areas. Water for irrigated agriculture relies upon the Murray-Darling Basin, a system under much stress. For large parts of southern Australia, dry conditions have now persisted since October 1996 and the winter of 2007 was the sixth year in a row of lower than average rainfall totals in the Murray-Darling Basin. The extreme dry period from November 2001 to October 2007 was accompanied by high temperatures, surpassing previous records, by a considerable margin (Bureau of Meteorology 2008).

Climate change predictions suggest production from agriculture and forestry in southern Australia will decline by 2030 and there will be reduced water supply for irrigation from the Murray-Darling Basin (Parry et al. 2007). Based on the current water resource outlook for 2008-09 from the Murray-Darling Basin Commission, the most likely initial allocation when the water year began on July 1 will be 0% (Maywald 2008). The annual water allocation for 2007 was 13%. Zero allocations will cause widespread devastation for producers reliant upon irrigation and water for stock.

This paper focuses on the strategies for producers to adapt to climate change impacts on their grain and grazing enterprises. Bryant et al. (2000) found that farmers' concerns regarding climatic change and variability are likely to be influenced by their perceptions of their own adaptive capacity. Farmers are sensitive to, and place particular emphasis on, variability in conditions such as precipitation intensity at critical periods of crop development rather than an average change in conditions long term. Although adaptation will be necessary to address impacts resulting from global warming, there are barriers such as costs in adapting to the impacts, which are not fully understood (Parry et al., 2007).

In this paper, we report some of the suggested adaptations to climate change from about 500 primary producers in South Australia during a series of 35 climate risk workshops held from 2006 to 2008. We separate out the strategies into planned vs autonomous. The autonomous adaptation is a response to change as it occurs, essentially a response induced by realised climate trends or events. By contrast, planned adaptation is a response in anticipation of an event (Allan consulting group, 2005). The autonomous decisions are further classed into into short term (intra seasonal) and long term decisions. We list and discuss the planned policy and research that producers may be reliant upon for their longer term decisions.

Methods

A series of 35 climate risk management workshops were delivered to 500 primary producers in South Australia from 2006 and 2008. The majority of producers attending the workshops were grain growers, graziers or mixed farmers, though they spanned many other enterprises including dairy cattle, horticulture, intensive livestock, viticulture, forestry, vegetables and cut flower production.

The workshops gave clear explanations of the differences between climate change and seasonal risk and variability. Our approach was to present to farmers, statewide and local trends and projections for climate change (Suppiah et al. 2006), and then discuss the attributes of climate change to which their farming systems may be most sensitive and what adaptation strategies they may put in place to manage these climate change concerns (Rebbeck 2007a). To support this discussion, we provided producers with a matrix of information collected from each workshop. The column headings in the matrix included suggestions on short term, long term, policy and research responses and the vertical questions were: 1. What are the aspects of climate change that are a risk to your farming enterprise?; 2. What are the short term strategies to address these risks?; 3. What are the long term strategies to address these risks?; 4. What research and policy are you reliant upon to adapt to the climate change concerns? Producers listed their adaptive strategies under the above columns. Results were collated to provide a basis for discussion in this report.

Results and Discussion

Planned policy adaptation strategies

Producers suggested policy is needed in the short and long term to secure water allocations. Policy suggestions included the purchase of water rights, dam design, reduced water harvesting and improved water licensing and desalination plants. These suggestions are strongly reflective of the current problems with water availability and quality. It was clear that producers do not fully understand either the current water policy or the state and national regulations and they believe that a better presentation of information is needed for decision making. Not surprisingly, planned adaptations dominated the discussion from those in the River Murray Catchment especially given the latest allocation outlooks.

Other suggestions for public policy to support adaptation to climate change included regulation of commodity prices, improved drought policy for better financial and community support, better access to information that might guide producers to the best strategies, and support for carbon trading. Crop insurance was mentioned often, as well as tax rebates and income protection or insurance. Crop insurance is an important adaptive strategy to deal with temporal variations in climate; however, insurance may reduce the sensitivity of producers to poor years and thereby reduce their propensity to adjust crop choice in response to growing season conditions (Bryant et al. 2000). Some argue that current drought policies do the same.

Autonomous adaptation strategies in the short term

Producers suggested water management strategies such as building more dams, on- farm aquifer storage and recovery, storage tanks and contours to make sure rainfall runs into dams, as well as water conservation adaptations like recycling water, irrigating smaller areas, shading small dams to reduce evaporation, consolidating dams over summer, achieving cleaner dams and troughs, removal of feral trees in water courses, removal of algae, fencing dams, reduction of evaporation by using water crystals, liquid on dams (aquatain), building deeper dams, water purchase and carting water. While these adaptation strategies are proactive there may be some implications for surface run off, ground water infiltration and increased salinity.

Some of the short term strategies for grain producers included reconsidering sowing time to avoid heat or frost risk versus spreading sowing times and flowering dates over several weeks to spread the risk; increased shelter belts, including saltbush alleys; grain quality planning, using GPS to apply inputs; low risk crops in dry years/areas and high risk crops in good areas/ years; being flexible in rotations, and flexible to cut hay; soil moisture conservation; work off-farm in bad years; increase sheep numbers; lease more land; and concentrating on the better paddocks rather than sowing in low grade areas. Furthermore their adjustments included more flexibility in decision-making and enhanced timeliness of farm operations. An interesting source of knowledge for high rainfall primary producers came from the low rainfall producers, who possess recognised skills in their ability to respond flexibly to seasonal extremes.

Some of the short-term strategies in livestock management included pasture-related decisions like an increased reliance on perennial pastures or dryland lucerne, choices of persistent grass and clover species/cultivars, various feed conservation measures or stocking rate strategies to prevent overgrazing, selling off livestock in dry years, smaller paddocks to rotate stock on, meeting the market, changing the time of calving or lambing; shelter belts and soil moisture conservation practices.

Financial strategies for all enterprises included spreading risk by owning/leasing properties in other locations (target high rainfall areas), off-farm income, forward contracting, crop insurance, farm management deposits, planning ahead for bad years, diversification and ensuring long-term financial planning with three years supply of seed and cash. In South Australia, many crop insurance products are not available and the potential for producers to deal with unfavourable years is less than in countries like Canada (Bryant et al. 2000).

Autonomous strategies for grain and grazing in the longer term

Producers discussed strategic or proactive strategies in the longer term such as enterprise change from cropping to mixed cropping/livestock or alternatives such as a woodlot and improved irrigation systems. However, even for those producers who accept the science of human- induced climate change, there is often a reluctance to make large irreversible changes to the business structure given the uncertainty in the projected impacts longer term. They relied on future research to support their enterprises long term.

Research recommendations for adaptation (planned)

There were three main themes from the discussion about future research to adapt to climate change:

- Breeding both animals and plants for drought, salinity and heat tolerance, and plants that use little moisture for high yields. New biodiesel crop varieties and GMO varieties with the above characteristics are sought. Breeding better foraging animals and new perennials and grasses are also requested.
- Reliable seasonal rainfall and temperature outlooks including pasture and crop growth predictions, outlooks for the next week, month, 2 and 3 months and year, timing of temperature changes, temperature humidity indexes, use of seasonal climate forecasts for stocking rates, use of outlooks to better plan fertiliser application.
- Alternative enterprise research and diversification, including research and or extension of grain/graze strategies.

Other research that would support producer’s adaptation to climate change included water use efficiency research, new methods to reduce evaporation from crops such as plastic sheets, weed reduction research and reduction of soil compaction research. Suggestions were made for invasive pest and weed threat research, food mile calculations, and dung beetle research. According to Carter et al. (1994), adaptation strategies can also be listed as administrative/organisational, regulatory, educational, financial incentives and subsidy mechanisms. These all play a role in a primary producer’s ability to adapt to climate change. Financial incentives and subsidies may reduce a farmer’s ability to become more robust to climate change and variability. However in South Australia's highly variable climate, incentives are needed and are often not provided until a producer is ready to sell up or leave the land.

Education was perceived to be extremely important. Since each season is unique, producers need to know where to access seasonal outlook information and support before and during each season to support management decisions. It is important to know when to implement adaptation strategies. As with seasonal adaptations, producers are reliant upon seasonal outlooks, shorter-term weather predictions and local circumstances like stored soil moisture, to implement their strategies. The outlooks and predictions in relation to local circumstances can be termed trigger points. Whilst we have prepared general lists of adaptive responses, these will vary according to the local regional circumstances such as the variety of agricultural enterprises, economic strategies, off-farm income, farmer's perception of risk, soil type and water availability. There is significant geographic differentiation between regions and communities in relation to vulnerability to stress, and in relation to the capacities of farmers and communities to develop effective adaptation strategies (Bryant et al. 2000).

Conclusions

We found that producers were more concerned about extremes in climate, such as the heat wave received in March 2008 rather than the likely change in average conditions. We also found that primary producers were much better able to list intra-seasonal climate change adaptation strategies, such as cutting back their crop area or stocking rates than coping with year to year variation. Low rainfall producers are accustomed to having greater flexibility in management practices to respond to seasonal variability and are perhaps therefore more attuned to coping with increased longer term variability. This study has raised many research questions regarding how farmers perceive climatic change versus seasonal variability. Despite the ambiguities, focusing on actual experience with climatic variability does have considerable merit because climatic change will be experienced via on-going variability in climatic conditions (Smit et al. 1999). Many adaptations to short term climate change are perceived as low risk. However, even for the many producers who accept the science of human-induced climate change, there is often a reluctance to make large irreversible structural changes to the business given uncertainty in the projected impacts longer term.

Producers are more reliant upon research and policy to drive their adaptation strategies longer term. For those producers reliant upon water from the River Murray, policy risk associated with climate change was of greater concern than production risk, especially for those reliant upon water from the River Murray. It may be important to evaluate different adaptation strategies, both autonomous and those involving public and institutional measures, to assess their appropriateness and effectiveness (Bryant et al. 2000).

Farmers might adopt a range of adaptive strategies, some cultural and some technological, either to cope with climatic change or to capitalise on new production opportunities (Rosenzweig and Parry 1994). Public intervention can provide aid for infrastructural development, can encourage agricultural associations to introduce educational programs and information sessions for their members on climatic change and variability, and undertake or encourage research and development, particularly on strategies to manage risks associated with a variable and changing climate (Bryant et al. 2000). Education and ongoing within-season support will be important to show producers where to access information about trigger points so they can implement their adaptation strategies. As indicated in the report of the Intergovernmental Panel on Climate Change (2001), a wide array of adoption options is available but more extensive adaptation than is currently occurring is required to reduce vulnerability to future climate change. Future extension and policy as a result of this report could approach some of the barriers limits and costs.

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