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Exiting, enduring and innovating: Farm household adaptation to global zoonotic disease

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ABSTRACT

Bovine spongiform encephalopathy (BSE) has been found in 25 countries, costing billions of dollars in those affected economies, and has had profound social and environmental impacts at multiple scales of organization. As a global phenomenon, the impacts of BSE were mediated directly through the environment (animal and human health) but in Canada the indirect socioeconomic impacts of BSE were far more damaging, especially for farm households. Yet, very little research has been conducted on adaptation to the indirect impacts of global environmental change, such as those mediated through the market and governance. Our goal was to examine how farm households adapted to the Canadian BSE crisis in order to better understand rural adaptations to global zoonotic diseases and to agriculture-related global environmental change as a whole. We conducted our mixed methods research in 2004–2006. Data sources included 826 survey responses, 27 individual interviews and 12 group interviews with farmers and ranchers in western Canada. Factor analysis separated out responses into three general adaptation strategies: 'innovating' to pursue new opportunities; 'enduring' or adaptations that seek stability; and 'exiting' from beef production or agriculture altogether. Farm household and community level innovation was a crucial adaptive strategy in the absence of governmental and expert-based support. Enduring adaptations were important to farm household survival in the short term, yet "chronic enduring" can compromise long-term adaptive capacity. Farm exiting was highly problematic during the BSE crisis as these responses were largely unexpected and often left households more vulnerable. Government support at the farm level promoted stability, with little support provided for change-orientated adaptations. Effective farm adaptation will require support for all three types of adaptive strategies and ones that are both expert-based and grassroots in nature to enable farm households in their pursuit of pluriactive and multifunctional livelihood strategies.

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1. Introduction

1.1. Vulnerability to the direct and indirect impacts of global environmental change

Technological progress has driven unprecedented advances in efficiency, productivity and profit in the global agro-food system. However, the paradox of modernity is that the unmet human capacity to manipulate the natural world in the pursuit of progress also results in unpredictable risks. Natural systems have the propensity to "boomerang" back (Beck, 1992) causing global change that can lead to environment, health and market-related crises. To address these challenges, much effort has been expended on better understanding the vulnerability and adaptive capacity of individuals, communities, industries and institutions in the face of global environmental change (GEC) (see Brooks, 2003; McCarthy et al., 2001; Smit and Wandel, 2006 for reviews).

Vulnerability represents the degree to which an individual or a group is susceptible to harm from stressors associated with GEC (Adger, 2006). Most GEC research has focused on vulnerability to the direct physical or environmental impacts of global environmental problems, namely a changing climate (e.g. Parry et al., 2007) and related extreme weather events including drought (e.g. Wandel et al., 2009) and flooding (e.g. Eakin et al., 2010). Vulnerability to the indirect impacts of environmental change, or those that are manifested through socio-economic and political systems (Kulshreshtha, 2011; Smit et al., 2000) has received much less attention. Where non-climatic stressors have been included in adaptation studies, they are usually treated separately, as the outcomes of non-environmental (e.g. societal, political and economic) change (e.g. Belliveau et al., 2006; O'Brien and Leichenko, 2000). Yet, environmental change often affects

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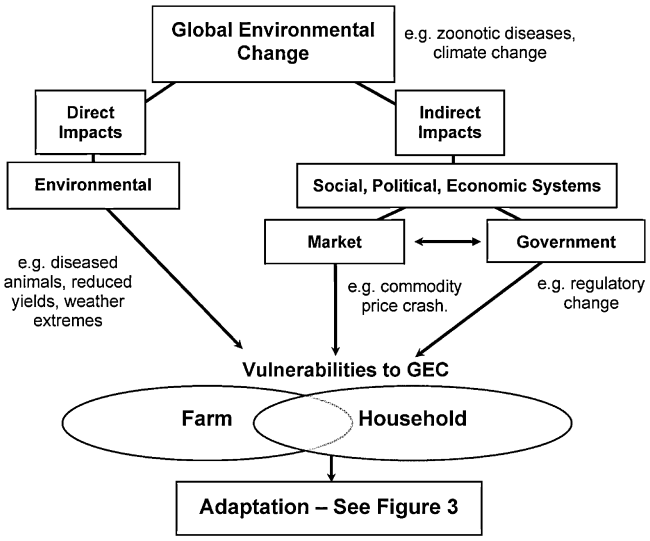

Fig. 1. Schematic outlining farm household vulnerability to the direct and indirect impacts of global environmental change.

economic, political and regulatory change at multiple scales (e.g. Muller, 2011; Oh and Reuveny, 2010), presenting new challenges and opportunities for individuals, communities and society as a whole (Fig. 1).

This paper examines how farm households adapted to the Canadian BSE (bovine spongiform encephalopathy or mad cow disease) crisis – a global environmental disaster with impacts in Canada that were largely mediated through political and economic systems. Our research approach sought to bring the poorly understood voices, concerns and experiences of farm families to the forefront of our methodology whereby research questions and instruments were developed in active consultation with producers throughout an iterative, mixed methods design. Our goal was to explore how farmers adapted to BSE in Canada which would, in turn, inform our understanding of farm household adaptation to GEC and improve our ability to facilitate rural adaptation to zoonotic diseases and agriculture-related global change as a whole.

1.2. Zoonotic disease as a global environmental disaster

Global environmental change includes both systemic change in global systems (e.g. climate change) and cumulative change where localized environmental problems aggregate at a global scale (e.g. aggregate pollution of local waterways) (Turner et al., 1990). Global zoonotics (or cross animal–human diseases) represent both cumulative and systemic forms of GEC whereby localized zoonotic epidemics aggregate on a global scale and are also spread through the global agro-food system with direct and indirect impacts that have caused profound changes at a global scale. Along with other livestock-related diseases (e.g. foot-and-mouth, blue tongue), zoonotic diseases (e.g. BSE, avian flu, and swine flu) undermine the stability of global trade (Tilman et al., 2002). The speed, scale, and complexity of animal and meat trade have also contributed substantially to the emergence of zoonotic diseases as a global environmental problem (WHO, 2004). Despite international efforts to control zoonotic diseases, they continue to spread and reemerge as global livestock trade expands and intensifies (Delgado et al., 1999).

BSE is a global zoonotic disease that has had devastating impacts at multiple scales. First identified in England in 1986, BSE represents one of the most significant environmental disasters associated with the modern agro-food system (Leiss and Nicol, 2006). BSE is a fatal neurodegenerative prion disease (Dalsgaard, 2002) that is transmitted amongst cattle through the ingestion of BSE-infected central nervous system tissue. Although the recycling of animal materials as a high-protein feed source represents an effective way of reducing slaughterhouse waste to increase profits, the introduction of BSE-tainted animal materials into otherwise herbivorous bovine diets provided the BSE agent with a novel anthropogenic infection pathway (Smith and Bradley, 2003).

Once BSE-tainted meat was linked with the fatal human variant Creutzfeldt–Jakob Disease (vCJD), the disease escalated from an ostensibly manageable agricultural issue into a zoonotic disease epidemic having devastating socio-economic, animal health and human health consequences around the world. The subsequent global spread of BSE was facilitated by British exports of BSE-tainted meat, bone meal and live cattle incubating the disease (Brown, 2001), and has since been documented in 25 countries across Europe, Asia, and the Americas (World Organization for Animal Health, 2011). Trade moratoria levied on countries found to have BSE infectivity and the costs associated with eradication programs have led to billions of dollars in economic loses worldwide.

1.3. The Canadian BSE crisis

On May 23, 2003, the first of only 19 Canadian cases of BSE was found in the province of Alberta (WOAH, 2011), causing 38 countries to close their borders to Canadian live cattle and beef products. In 2002, almost half of the cattle sold in Canada had been exported as either live animals or meat, the majority of which was destined for the US. In contrast, the US exported only 10% of its beef and cattle, leaving it much less vulnerable to border closures (O'Neill, 2005). In Canada, the loss of these export markets in turn depressed commodity beef prices triggering a socio-economic crisis that devastated the agricultural sector, the Canadian economy and especially farm households and rural communities (Mitra et al., 2009; Stozek, 2008). Losses over the following year averaged $20,000 per farm household (Mitura and Di Pietro, 2004) and these immediate impacts resonated across the Canadian rural landscape. The overall economic impact on the agricultural sector in 2005 was estimated at $7 billion (Leiss and Nicol, 2006).

The Canadian BSE crisis provides a useful opportunity to explore farm household adaptation to the indirect impacts of GEC. Despite originating as a global environmental disaster (global disease emergence), the environmental impacts (animal and human health) of BSE in Canada, and also in countries including Japan and South Korea, were dwarfed by those mediated through the marketplace. In Canada, only 19 BSE-infected cattle have been detected and only one case of the human variant Creutzfeldt–Jakob disease in contrast to the UK, for example, where 184,607 and 174 detected cases of BSE and vCJD, respectively, have thus far been documented (EUROCJD, 2008; WOAH, 2011). It is further estimated that in the U.K. over 900,000 cattle were infected, that 8.54 million high-risk animals were destroyed through the BSE eradication program and, despite these precautions, that over 460,000 infected animals ultimately entered the food system (Valleron et al., 2001).

Research on the Canadian BSE crisis has focused on public policy and trade e.g. (Le Roy and Klein, 2005; O'Neill, 2005; Rude et al., 2007), risk management and perception of risk (Boyd et al., 2009; Krewski et al., 2008; Leiss et al., 2010; Lemyre et al., 2009), the farm and community level impacts of BSE (Ashraful and McLachlan, 2009; McIntyre and Rondeau, 2009; Mitra et al., 2009; Stozek, 2008) and locating the BSE crisis within the context of multiple interacting stressors (Schaufele et al., 2009; Stozek, 2008). The Canadian BSE Integrated Risk Management Framework (IRMF)

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