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Understanding farmers' adaptation intention to climate change: A structural equation modelling study in the Mekong Delta, Vietnam

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ABSTRACT

Socio-economic factors and resource availability are commonly shown to influence the adaptation intention and behaviour of farmers in response to climate change. This study additionally incorporates psychological factors building on protection motivation theory to investigate the adaptation intention of farmers. Data was obtained from structured interviews with 598 rice farmers in the Mekong Delta, Vietnam. Structural equation modelling was used for investigating the relationships between constructs. The findings indicate that farmers are more likely to have an adaptation intention when they perceive higher risks of climate change and greater effectiveness of adaptive measures. In contrast, they are less likely to intend to adapt when they are subject to wishful thinking, denials of climate change risk, and fatalism. Adaptation intention increases when farmers perceive greater influences of the increases in electricity, water, and fuel prices; or when they are under pressure from other people to conduct adaptive measures. The study demonstrates that protection motivation theory is a useful framework to understand the adaptation intention and behaviour of farmers in response to climate change. However, further research is necessary to improve and generalise the measurement model.

1. Introduction

Adaptation to climate change has been an important research topic, especially in agriculture, ever since climate change has been commonly recognised (Adger et al., 2003). There have been several studies investigating factors that affect adaptation to climate change in agriculture (Apata et al., 2009; Below et al., 2012; Bryan et al., 2009; Deressa et al., 2009, 2011; Hassan and Nhemachena, 2008; Seo and Mendelsohn, 2008a,b). Most of them have been conducted in developing economies where agriculture plays an essential role. In Southeast Asian countries, there have been significant changes in the frequency and intensity of extreme climate events associated

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with climate change. The understanding of adaptation, however, is still limited as far as those countries are concerned (Francisco et al., 2008).

Adaptation is a complex process which consists of different elements: the characteristics of stress, the characteristics of systems, scales and adaptive responses (Bryant et al., 2000). Stress refers to the attributes of climate significantly influencing farming systems (Bryant et al., 2000), or the stimulus fostering the reaction of stakeholders and farming systems towards climate change (Bryan et al., 2009). Stress is also described as climatic disturbance (Smithers and Smit, 1997). Stress can refer to either long-term changes in average climate variables or the current characteristics (e.g. types, magnitude, and frequency) of extreme climate events (Smithers and Smit, 1997).

There have been different views on the characteristics of agricultural systems. Several features of agricultural systems make them sensitive to climate and influence their reactions to climate change. Those features include cultural, social, economic, political, and institutional factors (Bryant et al., 2000). From another perspective, the characteristics of systems cover stability, resilience, vulnerability, flexibility, and the scales of the systems (Smithers and Smit, 1997).

The process of adaptation to climate change can occur on different scales ranging from individual, regional, sectoral, national, and global settings (Bryant et al., 2000). The adaptation on each scale has its own characteristics. In this study, we focus on the adaptation at individual farm level in order to understand driving factors of farmers' adaptation intention.

Adaptive responses include autonomous responses and conscious adaptation (Bryant et al., 2000). The former refers mostly to the coping measures of individual farmers and other stakeholders in farming activities. Examples of autonomous responses can be irrigation, diversification, changing the growing calendar, using highly heat-tolerant varieties, or buying insurance. These responses are different across regions and farming systems. The latter emphasises the intervention of governments and public policies in dealing with climate change impacts (Bryant et al., 2000). Funding for research, reinforcing infrastructures, introducing technologies, taxing, and subsidising are typical examples of conscious adaptation (Bryant et al., 2000).

Adaptive responses can also be categorised into short-term and long-term responses. There are opposite perspectives regarding the effects of short-term to long-term responses. On the one hand, there is support for the positive influences of short-term responses to climate variability on adaptation to long-term climate change (Burton, 1997). On the other hand, it is argued that farmers' short-term coping responses to climate variability may increase vulnerability to farming in long-term climate change (Smithers and Smit, 1997). Hence, current adjustments must be strategically based on an anticipation of long-term climate change (Bryan et al., 2009). The adaptive measures discussed in this study are basically autonomous responses. However, they are associated with not only farming activities but also other dimensions of farmers' lives (e.g. safety of humans and assets).

Adaptive responses can be affected by socio-economic factors and resources which have been commonly described (Below et al., 2012; Bryan et al., 2009; Deressa et al., 2009, 2011; Hassan and Nhemachena, 2008). For instance, wealth, access to extension, credit, and climate information were factors affecting the adaptive decisions of farmers in Ethiopia. In South Africa, those factors were wealth, government farm support, access to fertile land, and credit (Bryan et al., 2009). Demographic factors (e.g. education level, household size, and gender) were found to significantly affect farmers' adaptation (Deressa et al., 2011). Information was emphasised to influence farmers' attitude (Evans et al., 2010). Access to land was shown to be more clearly associated with the adaptive responses of coffee farmers to climatic and non-climatic stressors than the perception of risk (Tucker et al., 2010).

Although the role of perception in adaptation to climate change has been highlighted (Deressa et al., 2011; Mertz et al., 2009; Patt and Schröter, 2008), a minimum adaptation to climate change appeared to be the results of farmers' perceptions and attitudes to climate change for Western Australian farmers (Evans et al., 2010). Specifically, psychological factors have received minor attention (Grothmann and Patt, 2005; Grothmann and Reusswig, 2006; Lopez-Marrero, 2010; Osberghaus et al., 2010). Importantly, no studies that associate psychological factors with adaptation have been found for Southeast Asian contexts.

To address the role of psychological factors in adaptation to climate change, protection motivation theory (PMT) has been used as the foundation of a socio-cognitive model to understand private adaptive behaviour (Grothmann and Patt, 2005). The explanatory power of this model was demonstrated by two case studies: one about the decisions to adapt to flooding risk in Germany and the other about adaptation to seasonal rainfall in Zimbabwe. These extreme events were commonly interpreted as the features of climate change (Deressa et al., 2011; Mertz et al., 2009; Smit et al., 1996; Thomas et al., 2007). Although PMT has only emerged recently in climate change research, it has been demonstrated to be useful in introducing psychological factors to explain adaptive behaviour.

Therefore, this study attempts to investigate psychological factors in a conceptual model that was built on protection motivation theory (PMT). The study uses data from structured interviews with 598 rice farmers in the Mekong Delta, Vietnam. The purpose is to obtain a better understanding of farmers' adaptation intention to climate change. Such understanding can help generate policy options for the authorities in the Mekong Delta. Furthermore, the possibility of further PMT applications in the context of climate change can also be devised.

2. Conceptual framework

PMT (Floyd et al., 2000; Maddux and Rogers, 1983; Rogers, 1975) was originally established as a major theory in studies of health risks. It has been applied in other research on protective behaviours in the contexts of nuclear war (Wolf et al., 1986), water conservation (Kantola et al., 1983), and in marketing communication (Cismaru and Lavack, 2006; Tanner et al., 1989). PMT has also been used in the research on natural hazards, environmental problems (Grothmann and Reusswig,