Journal of Arid Environments 127 (2016) 128–136

Contents lists available at ScienceDirect

Journal of Arid Environments

journal homepage: www.elsevier.com/locate/jaridenv

Farmers' pro-environmental behavior under drought: Application of protection motivation theory

Marzieh Keshavarz [a, *], Ezatollah Karami [b]

[a] Department of Agriculture, Payame Noor University, Tehran, Iran
[b] College of Agriculture, Shiraz University, Shiraz, Iran

ARTICLE INFO

Article history:
Received 1 April 2015
Received in revised form
21 November 2015
Accepted 23 November 2015
Available online 9 December 2015

Keywords:
Environment
Conservation
Drought management
Drought impacts
Vulnerability
Protection motivation theory

ABSTRACT

Recurrent drought in arid and semi-arid regions poses serious challenges for populations whose livelihoods depend principally on natural resources. In order to mitigate the negative impacts of drought, adoption of pro-environmental measures is imperative. While there is an increasing pressure on farmers to support environmental conservation practices, factors influencing their pro-environmental behavior remain poorly understood. To fill this gap, protection motivation theory (PMT) was used as a basis for identification of the main determinants of the farmers' pro-environmental behavior under drought. A survey of 274 farmers in the Fars Province, selected through a multistage stratified random sampling method, revealed that some farmers postponed the protection measures when facing severe sustained drought. In addition, a low tendency of adopting strategies that are appropriate for reducing the environmental impacts of drought was observed. Analysis of the Bayesian network and partial least squares (PLS) path model illustrated that response efficacy, perceived severity, response costs, perceived vulnerability, self-efficacy, income, and social environment significantly influenced the farmers' pro-environmental behavior under drought. Recommendations and implications for the promotion of pro-environmental behaviors are offered to reduce the negative environmental impacts of drought.

1. Introduction

The sustainability of natural environment depends on providing ecosystem goods and services including a) *provisioning* services such as food, water, and fiber; b) *regulating* services that affect climate, floods, soils, and water quality; and c) *supportive* services such as soil formation, photosynthesis, and nutrient cycling (Millennium Ecosystem Assessment, 2003). Changes in ecosystem goods and services are caused by direct or indirect factors that might be natural or induced by human activities and comprise climate variability and change, habitat change (land-use change and physical adjustment of natural resources), population change, overexploitation, technological change, pollution, and invasive species (European Commission, 2009; Millennium Ecosystem Assessment, 2005).

Climate variability (i.e., drought) and change are the most prominent factors that affect the changes in ecosystem goods and services. Drought, in particular, is a climatic disaster that results in significant disruptions in the natural environment of arid and semi-arid regions of the world (Keshavarz et al., 2014). For example, during the last 50 years, some countries such as Iran and Bangladesh have experienced approximately 27 (Amirkhani and Chizari, 2010) and 19 (Habiba et al., 2011) drought events, respectively. It is expected that some arid countries such as Iran will encounter up to 20–25% reduction in the mean annual rainfall by the 2050s (Ragab and Prudhomme, 2002) and thus experience more severe and prolonged droughts (Faramarzi, 2010). Therefore, environmental problems will become increasingly unwieldy for arid and semi-arid regions unless the vulnerability of ecosystem goods or services to future climate variability is decreased (Prato, 2012). This required environmental protection is considered as a public duty to safeguard the quality of life for both the present and future generations. However, most worldwide conservation efforts have been resisted by local people, whose survival depends on the reliable natural resources (Buijs and Elands, 2013; Lafreniere et al., 2013). The classic top-down policy, which ignores the interests of local stakeholders, appears to make conservation initiatives ineffective (Engelen et al., 2008; Larson et al., 2013). Hence, it is vital to

* Corresponding author. Department of Agriculture, Payame Noor University, PO Box 19395-3697, Tehran, Iran.
E-mail addresses: keshavarzmarzieh@pnu.ac.ir (M. Keshavarz), ekarami@shirazu.ac.ir (E. Karami).

http://dx.doi.org/10.1016/j.jaridenv.2015.11.010
0140-1963/

gain further insight into protection strategies that will be most effective for the implementation at local levels in order to minimize environmental problems.

There is an increasing concern over the environmental degradation caused by agricultural activities (Dohonoe, 2003). Although large-scale agribusinesses are generally implicated, smallholder agriculture is often challenged as culpable (Karlsson, 2007). Small-scale agriculture in much of the developing countries is characterized by the widespread failure to make sufficient soil fertility replenishment, soil conservation investments and improve irrigation efficiency in order to sustain the quality of farmland (Marenya and Barrett, 2007; Keshavarz and Karami, 2014). The current accelerating rates of environmental problems are linked to human behavior (Larson et al., 2013; Price and Leviston, 2014). Therefore, adoption of pro-environmental practices calls for farmers changing their practices in the context of high uncertainty (i.e., climate variability and drought). While there is an increasing pressure on farmers to consistently support environmental conservation efforts, the factors driving their pro-environmental practices remain poorly understood (Fleming and Vanclay, 2010; Sulemana and James, 2014).

There is an increasing recognition that environmental behavior depends on the way people think about the environment (Ives and Kendal, 2014). Focusing on the drivers of positive behaviors helps facilitate environmental behavior change (Fleming and Vanclay, 2010), but the lack of suitable theoretical framework limits research on farmer's pro-environmental behavior (Price and Leviston, 2014). General theories of environmental behavior often fail to identify the role of individual motivations in environmental protection (Lafreniere et al., 2013; Price and Leviston, 2014). However, studies show that the farmers' psychological characteristics are pivotal in the adoption of conservation practices (Bamberg and Möser, 2007). Among the various theories in environmental psychology, that is, the theory of planned behavior (Ajzen, 1991), the norm activation model (Schwartz and Howard, 1981), the protection motivation theory (PMT; Rogers, 1983), and the value–belief–norm theory of environmentalism (Stern, 2000), this study applies the PMT as a basis for the identification of the chief determinants of the farmers' pro-environmental behavior. The PMT employs a wider set of predictors compared to the theory of planned behavior, norm activation model and value–belief–norm theory and can enhance our understanding of the motivators governing the pro-environmental behavior in the context of uncertainty (Bockarjova and Steg, 2014). PMT not only focuses on the individual costs of adaptive behavior, similar to the theory of planned behavior, but also considers the aspects of collective action such as response efficacy, which are the key factors in the norm activation model and the value–belief–norm theory. The PMT has been widely applied in health studies (Greening and Stoppelbein, 2000; Houlding and Davidson, 2003; Plotnikoff et al., 2009). It has also been extended to natural hazards and environmental problems (Bender et al., 2007; Grothmann and Reusswig, 2006; Mulilis and Lippa, 1990; Zaalberg and Midden, 2010), social concerns and food safety (Cates et al., 2003; Cox and Bastiaans, 2007; Henson et al., 2008, 2010), water conservation (Kantola et al., 1983), and climate change (Grothmann and Patt, 2005; Osberghaus et al., 2010). While PMT has mainly been successfully applied in the domain of acute environmental risks such as floods and wildfires to predict self-protective behavior (Grothmann and Patt, 2005; Grothmann and Reusswig, 2006; Martin et al., 2007; Bubeck et al., 2012), to the best of our knowledge it has not been applied in the context of drought as a slow-onset risk. Therefore, the aim of this study is to explain the pro-environmental behavior of the farmers in the Fars province in order to reduce the negative consequences of drought using the theoretical framework of PMT. In this paper, first, the impact of drought on the natural environment of the Fars province is described and then the PMT is explained. We then focus on the study design, followed by an analysis of the results and the concluding remarks.

1.1. Environmental impacts of drought: the case of Fars province

Drought, as a natural hazard, caused immense environmental damages in the central, southern, and eastern regions of the Fars province. In the early stages of 2007–2011 drought, some temporary water bodies dried up and in all others, the water levels reduced to a series of diminishing pools (IRNA, 2014). With drought progression, the water levels and volumes in the natural perennial sources dropped. Many internationally renowned lakes such as Kaftar, Bakhtegan, Arjan, and Tashk have completely dried up, and in all other wetlands water levels have reduced to a critical level (Jam-e-jam, 2014). Furthermore, most of the traditional groundwater irrigation systems (*qanats*) have experienced reduced discharge or have completely dried up (Bostani et al., 2009). Changes in water balances greatly reduced the diversity and abundance of many aquatic taxa, from small invertebrates to fish, and have led to localized extinctions in some areas such as Bakhtegan and Parishan Lakes (IRNA, 2010). Furthermore, increased levels of nutrients and salinity have caused the deterioration of water quality in the channels of large rivers (Keshavarz et al., 2013).

The increasing number and severity of bushfires and sandstorms have also negatively affected animal and plant population (Taninepasargad, 2015). Moreover, the phenology and distribution of plants and animals in the arid regions have changed extensively (Taninepasargad, 2015). For instance, in the Ghatrooyeh district, some plants died due to lack of moisture, and others survived at a reduced level of productivity. Animal survival depends on water and plants for food; hence, their fate is linked to that of the plants (Kemp, 2004). Some animals and birds (e.g., Dalmatian pelican) responded to the changing conditions by migrating to areas where their life requirements can be met (Tebna, 2013). Drought also has a profound influence on the agro-ecological environment. For example, the quality and productivity of the farm lands are considerably influenced by the 2007–2011 drought (Parizanganeh et al., 2011). In addition, in some regions, the heterogeneity of vegetation is severely affected, thus resulting in promotion of weed growth or loss of desirable perennial species (Taninepasargad, 2015).

In summary, drought has major ecological effects on population and structure of both fauna and flora. Loss of habitat, poor water and land quality, weak biotic interactions, changes in nutrient cycling, and reduction of primary productivity have major effects on the ecosystem functionality and are associated with social and economic implications.

1.2. Protection motivation theory

PMT was originally proposed by Rogers (1975, 1983). It offers a well-accepted set of psychological constructs (i.e., the expectancy–value theories and the cognitive processing theories) to help clarify how people deal with health protection choice (Scarpa and Thiene, 2011). Although the original model was developed to study the health protection behavior (Rogers, 1975, 1983), it has already been applied to several other contexts, including technical and environmental risks, as well as natural hazards (Bubeck et al., 2013). The basic assumption of the model is that people consider current behavior besides their expectation of a new behavior in terms of respective costs and benefits when making pro-environmental decisions. Therefore, PMT, as a process of deliberation and decision making, allows identifying the barriers and