



# Understanding farmers' intention and behavior regarding water conservation in the Middle-East and North Africa: A case study in Iran



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## ABSTRACT

There is a high risk of serious water shortages in Middle-East and North African countries. To decrease this threat water conservation strategies are gaining overall importance and one main focus is now on farmer's behavior. Among other dimensions it is assumed that normative issues play an important role in predicting environmental oriented intentions and actual actions. To empirically test the possible interactions the Theory of Planned Behavior was used, revised and expanded for the specific case on water management issues and applied to Iranian farmers. The results could not validate the TPB framework which emphasizes the importance of perceived behavioral control for intention and actual behavior and findings are much more in line with the Theory of Reasoned Action. Normative inclinations as well as perception of risk are found to be important for intention as well as actual water conservation behavior. Additionally, the importance and linkages of the dimensions are found to be different between sub-groups of farmers, especially between traditional water management farmers and those who already using advanced water management strategies. This raises the question if one-fits-all behavioral models are adequate for practical studies where sub-groups may very much differ in their actions. Still, our study suggests that in the context of water conservation, normative inclination is a key dimension and it may be useful to consider the role of positive, self-rewarding feelings for farmers when setting up policy measures in the region.

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## 1. Introduction

Strategies to deal with water shortages not only depend on current (local) conditions, including the topography, the extent of water scarcity, available financial resources, as well as technical and institutional capacities (Roudi-Fahimi et al., 2002) but are also influenced by the specific historical background of water use, cultural heritage, the extent of freshwater availability in the past, and long-term socio-economic conditions of the region concerned (Hoekstra, 2000). Middle Eastern and North African (MENA) countries show some homogeneity in relation to culture, religion, socio-

economic conditions, and high risk of experiencing water shortages (see Brooks, 2007). To decrease this risk, water conservation strategies are gaining importance and special attention is now given to farmers and their water usage (Rockstroem et al., 2009). Normative issues play an important role in development of these strategies and are essential for the prediction of environmental oriented intentions and actual water management behavior. Such information on the specific interactions is also needed for the development of public policy measures that aim to increase the application of water conservation techniques which subsequently would also decrease the risk of water shortages in the future (Hurlimann et al., 2009). To shed more light on the possible linkages and to empirically test the possible interactions between the intentions and behaviors of farmers regarding water conservation strategies, we focus on Iran where water scarcity and drought events are directly related to farmer's behavior (Yazdanpanah et al., 2013b). This should also provide the basis for a general discussion on policies to increase water conservation within the MENA countries.

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As in many MENA countries, also in Iran water was and still is a scarce but highly important natural resource (Brooks, 2007). In the recent past Iran experienced a water crisis so severe that the government made a paradigm shift from its supply side driven water management approach to a more demand driven one, particularly in the agriculture sector which is the largest consumer of water (Yazdanpanah et al., 2013ac). The water crises itself, exacerbated by severe droughts, affected nearly all sectors in Iran and caused huge costs both in human and socio-economic terms (Foltz, 2002; Hayati et al., 2010; Yazdanpanah et al., 2013b). To give some indications of the severity some examples are provided. Hayati (2009) estimated the total costs due to droughts between 1998 and 2001 to be more than \$US 4.2 billion. In 2001, more than 100,000 farm workers in the Esfahan Province lost their jobs because of a severe drought event; additionally in the southeast of the country, Lake Hamoun – formerly the largest body of freshwater in Iran – had completely dried up by September. In 2003 more than 100 villages in southeast Iran were evacuated due to lack of water, and more than one million head of livestock perished throughout the country (Beik Mohammadi et al., 2006). Although, Iran has always had cycles of droughts in its history there are strong indications that Iran now faces not only a periodic dry spell, but a severe water crisis (Reza Balali et al., 2009), which is further exacerbated by recent high population growth rates (see FAO, 2006).

Regarding usage of water, the agricultural sector is the main consumer of freshwater (around 90 to 93 percent) compared to the national domestic and hygiene sector (around 5 to 6 percent), and the industrial sector (around 1 percent). Consequently, farmers should be the main target group for water conservation policies and water efficiency enhancements. Geographically, in the central and southern parts of Iran (the most arid parts of the country) most farmers use groundwater (approximately 75 percent) in preference to surface water for irrigation. Consequently, these regions can be seen as “the” hot-spot problem areas. Due to low prices of agricultural water and the fact that water use is subsidized (including the presumption of farmers that water conservation is simply a government responsibility), water was not used very efficiently in the past (Esmaeili and Vazirzadeh, 2009). As already indicated, this supply side driven strategy is unsustainable in the long run and water conservation moves to the forefront for tackling the problem of water shortages. However, to be successful on the macro (country) level, water conservation has to be implemented on the micro (household) level. Accordingly, from a demand side driven perspective, the question is how to encourage farmers’ behavior to apply water conservation strategies which is vital for the success of any overall water management plan.

The aim of this paper is therefore to provide empirical evidence about the intentions of farmers toward water conservation management, as well as their actual behavior with respect to it. As a starting point for the discussion, the Theory of Planned Behavior (TPB) is used and the usefulness of the concept (or variations of it) is tested for the given purpose. This should (ideally) provide a first knowledge base for the development of public policy measures that aim to increase water conservation among Iranian farmers. Additionally, as indicated, the question is also highly relevant for other countries in the MENA region as well, which not only have similar (arid and semi-arid) environments, but also, to a large extent, share the same religion and history and risk of water shortages (Brooks, 2007; Reza Balali et al., 2009).

The paper is organized as follows. Section 2 presents an overview of water conservation approaches and outlines the main components of the Theory of Planned Behavior and discusses the modifications made for the case study application which is discussed in section 3. Section 4 presents the results and Section 5 discusses the implications for the MENA countries.

## 2. Methodology

Next, some general water conservation approaches are introduced and conditions which would encourage/discourage the use of water conservation techniques discussed. Afterwards, the framework of the “Theory of Planned Behavior” is presented and expanded for the special case of water conservation.

### 2.1. Water conservation approaches

Conserving water during periodic water shortages is frequently imposed on households and farmers in many countries, for example in Australia (Pannell et al., 2000; Cary, 2008; Dolnicar and Hurlimann, 2010), China (Blanke et al., 2007), USA (Pirie et al., 2004), Greece (Jones et al., 2011), UK (Gilg and Barr, 2006), or in Egypt (Luzi et al., 2008). However, on a conceptual level various divergent water conservation frameworks and corresponding policy suggestions can be found in the literature (see for example Sabatier et al., 2005; Pearce et al., 2007; Jorgensen et al., 2009; Blackstock et al., 2010). The basic question is “how” farmers can be encouraged to accept water conservation as important and implement it effectively through voluntary action. One necessary (but not sufficient) requirement for water conservation to be implemented is the understanding of the multi-dimensional facet of the water problem (Boland and Whittington, 2000) and the acceptance of the need for water conservation (Hurlimann et al., 2009). Furthermore, attempts to promote voluntary action will require an understanding of existing behaviors, and also an understanding of how behavioral change can be influenced. Thus, the success in changing farmers’ demand strategies also depends on how good their thinking on water and water use-management is understood by policy makers. An in-depth understanding of the mechanisms that lead people to be supportive of such initiatives seems crucially important for setting the right strategies. This should include information about the attitude towards water conservation among water users, what encourages them to accept or reject water conservation as part of their daily lives as well as what factors determine their intention to conserve water, to name but a few (Hurlimann et al., 2009). As in similar studies, the Theory of Planned Behavior is used here as the starting point for tackling these questions which should provide more information for policy makers to facilitate changes in intention and behavior regarding appropriate water conservation techniques. It should be noted that little research of this kind has been undertaken in Iran yet (see Yazdanpanah et al., 2011) and this paper should fill part of the knowledge gap.

### 2.2. Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is an important social cognitive model that aims to explain variance in volitional behavior (Ajzen, 1985; Ajzen, 1991). TPB was developed as an extension of the Theory of Reasoned Action (TRA) model (Fishbein and Ajzen, 1975, Fig. 1) and is a social-psychological model which claims that a person’s actual behavior in performing a certain action is directly guided, as a central factor, by his or her behavioral intention, which in turn is jointly determined by the attitude, subjective norm and perceived behavioral control toward the behavior (Ajzen, 1991).

To date the TPB has been used to understand a range of behaviors with respect to water such as water conservation (Clark and Finley, 2007; Trumbo and O’Keefe, 2005), saving water (Gilg and Barr, 2006), reducing water usage (Lam, 1999), paying water utility bills promptly (Mugabi et al., 2010), recycling water (Dolnicar and Hurlimann, 2010; Nancarrow et al., 2008), as well as to

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