



Drought impact assessment on rural livelihood systems in Iran



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ABSTRACT

The present study aimed to analyze the effects of drought on rural livelihood systems in Iran with an emphasis on the mediator role of livelihood assets in relationship between drought and livelihood outcomes. The relationships between these concepts were explored through the lens of sustainable livelihoods approach. A conceptual model was developed based on the literature review and was evaluated using cross-sectional data based on 11 years average of each variable from 2002 to the end of 2012. Regarding research objectives, a documentary review was applied to collect necessary data and information. So, secondary data were obtained from national surveys and statistical sources of governmental organizations. Data were analyzed using multiple regression. We followed the Baron and Kenny's (1986) three-step procedure to test mediating relationships between variables. Results generally showed that drought duration had destructive effects on rural livelihood capitals and outcomes, while the negative influences of drought severity were far more restricted than drought duration. Complete mediation of livelihood assets in the relationship between drought intensity and inequality was confirmed. We also found support for partial mediation of livelihood assets in the relationship between drought severity and duration with the added value of the agricultural sector as well as in the relationship between drought duration and inequality.

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1. Introduction

Livelihoods issues have been central to rural development thinking and practice over the past decade (Scoones, 2009). The concept of livelihood evolved under the influence of development initial approaches and was increasingly accepted through the activities carried out by various international institutions and development agencies. The term sustainable livelihoods was, for the first time, introduced by Brundtland (WCED, 1987), in her report to World Commission on Environment and Development entitled Our Common Future (Krantz, 2001; Mahdi et al., 2009; Daskon, 2010; Gregoire, 2011). But sustainable livelihoods were not the mainstream of development until the late 1990s. However, the beginning of what was later called the sustainable livelihoods approach, rooted in Chambers and Conway (1992) seminal article which had led to its widespread use throughout the world (Morse and McNamara, 2013; Singh et al., 2014; Scoones, 2009; Cahn, 2006). Basically, livelihood concept was affected by primary development approaches and became a practical tool for development

by various international agencies such as DFID, UNDP, CARE and OXFAM (Daskon, 2010; Ansoms and McKay, 2010; Gregoire, 2011; Fang et al., 2014; Glavovic and Boonzaier, 2007). Finally, Scoones (1998) developed a structured framework for sustainable livelihoods. Numerous empirical studies were conducted in the field of rural and urban livelihoods based on this framework, especially in developing countries (Gumoi, 2010).

The term livelihood is well recognized as humans inherently develop and implement strategies to ensure their survival. The hidden complexity behind the term comes to light when governments, civil society, and external organizations attempt to assist people whose means of making a living is threatened, damaged, or destroyed. From extensive learning and practice, various definitions have emerged in an attempt to represent the complex nature of a livelihood (UNISDR, 2010). According to Chambers and Conway (1992), a livelihood comprises the capabilities, assets (capitals) and activities that contribute to a means of living. A livelihood is in reality sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets without undermining natural resources.

A livelihood can be seen as a system composed by a number of elements, including capital assets, vulnerability context, institutional process and organizational structure, livelihood strategies

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and livelihood outcomes (Uy et al., 2012; Speranza et al., 2014; Fang et al., 2014). Assets lie at the core of livelihood system. The capital assets refer to the resources owned, controlled, claimed, or accessed by the household and are grouped into human, natural, financial, physical and social (Kemkes, 2015; Tesfaye et al., 2011; Forsyth, 2007; Allison and Horemans, 2006). The capitals vocalize a stock of tangible and intangible assets which can be stored, accumulated, exchanged, and utilized to generate a flow of income (Fang et al., 2014; Babulo et al., 2008; Forsyth, 2007). Households' livelihood and their access and control on assets can be influenced by trends, shocks and seasonality that are largely out of their control. These factors are referred to as vulnerability context, embodied external environment in which people operate and live (Cahn, 2006; Hossain et al., 2006; Glavovic and Boonzaier, 2007). Livelihood strategies "are the range and combination of activities and choices that people make in order to achieve their livelihood goals" (DFID, 2001; Fang et al., 2014). Livelihood outcomes are the outputs or consequences of pursuing livelihood strategies. A livelihood system can generate different outcomes, some of which include increased income, improved well-being, reduced vulnerability, and improved food security (Babulo et al., 2008; Faiz et al., 2012). In a general view of the livelihood system, assets combined in a given context through a number of strategies make desirable livelihood outcomes (Etana, 2011).

The context of rural livelihoods is exposed to various shocks and stresses that increase their vulnerability. There is wide consensus among scholars that climate-induced extreme events are the most important factors increasingly affecting livelihood context (Singh and Nair, 2014; Reed et al., 2013; Mubaya et al., 2012; Badjeck et al., 2010). Among the different climatic events, drought is one of the main factors influencing the livelihoods of more than two billion people in the world's arid regions (Matarira et al., 2013; Solh and Ginkel, 2014). In this case, agriculture and the related activities can be sources of valuable strength to countless numbers of rural people's livelihoods. In rural communities where access to income is limited, various agriculture-related activities which strongly depend on soil and water can contribute significantly to livelihood security. Therefore, the frequency and duration of drought are influential issues in the sustainability of rural livelihoods.

The frequency of droughts in many countries reduces GDP growth and threatens development achievements (Shiferaw et al., 2014). Migration, increasing social conflicts, malnutrition, decreasing income and welfare are some other widespread effects of the drought on human societies (Udmale et al., 2014). A large number of studies have demonstrated that the global droughts have considerably increased since the second half of the 20th century under global warming (Dai, 2011, 2012; Wang et al., 2015). Drought is a natural climatic feature of most parts of Iran and one of the most costly natural disasters in this country (Zarafshani et al., 2012). Over the past decade, Iran has experienced its most prolonged, extensive and intensive drought in over 30 years. This drought that began in 2003 and is still ongoing, has involved many rural communities across most parts of the country (Keshavarz et al., 2013; Bannayan et al., 2010).

Despite the extensive consequences of drought to human life, especially natural resource-based livelihoods, our knowledge about its impacts on rural livelihoods is still limited to some environmental aspects (Gentle and Maraseni, 2012). Many studies illustrate drought negative impacts on crop production (Melkonyan, 2015; Wang et al., 2015; Yu et al., 2014; Bannayan et al., 2010). Also, climate events can annihilate a wide range of assets on which people livelihoods depend (Gasper et al., 2011). As a social problem, Inequality is another issue affected by drought. In the relevant literature, inequality may have different origin such as age, gender, socio-economic status, ownership or control over resources, power

relation, institutional arrangements, health, ethnicity, nationality and place (Kajjser and Kronsell, 2014; Choudhury, 2014). Hence, climate variability may potentially make new inequities through its undesirable outcomes and may intensify existing inequalities. This is so important that climate change and extreme events such as drought will be reframed as an equity issue (O'Brien and Leichenko, 2006; Leichenko and Silva, 2014; Olsson et al., 2014).

Majority of studies on the effects of climate events on livelihood systems have focused on the adaptation to climate-related disasters (Shiferaw et al., 2014; Solh and Ginkel, 2014; Pasini et al., 2012; Nielsen et al., 2013; Kiem and Austin, 2013; Osbahr et al., 2008; Paavola, 2008). But there have been little concern and empirical work on the effects of climate extreme events especially drought on rural livelihoods within or across countries. In addition, the changes in inequality due to drought and reduced inequality as one of the livelihood outcomes are issues that have received less attention. Climate variability and extreme events synergistically add on to and often amplify other environmental, social, and political catastrophes. Despite the exploration of these complex interactions, there is no unique conceptual framework in the literature that simultaneously includes all of them (Olsson et al., 2014: 803). Livelihoods approach is an appropriate framework for understanding the effects of drought on the livelihood systems because it provides a theoretical framework and an operational tool for analyzing both the major elements that make up livelihoods and the contextual factors that influencing them (Reed et al., 2013). Therefore, in order to achieve holistic and systematic analysis of the effects of drought on rural livelihoods this approach was considered. According to the literature and previous studies, the research questions were formulated as follows:

- 1) What is the impact of drought on rural livelihoods assets?
- 2) What is the impact of drought on rural livelihoods outcomes?
- 3) What is the impact of rural livelihoods assets on livelihood outcomes?
- 4) What is the role of livelihood assets in the relationship between drought and livelihood outcomes?

Using livelihood systems approach, the present study makes it possible to understand how different aspects of drought affect the livelihood assets and outcomes. It also provides development planners and policy makers with a greater insight on the possible entry points and interventions that can be used as directions for setting up proper policies that increase income, improve equity and well-being, and reduce rural households' vulnerability to drought (Verner, 2010). Finally, the conceptual model drawn in Fig. 1 based on the questions and relationships explained between variables. This model reflects a causal chain in which drought as independent variable affects livelihood outcomes (dependent variables) both directly and indirectly through the mediating variable livelihood assets.

2. Material and methods

This is a descriptive and analytical research aimed at studying the drought impact assessment on rural livelihood systems in Iran. The study area constitutes the rural territory of Iran, a country with the area of more than 1.6 million km² and the population of around 79 million of which 27 percent reside in rural areas (Statistical Center of Iran, 2015a). Due to its geographical location and topographical features the country experiences various climatic conditions and has arid and semiarid climates. Its average annual precipitation varies from 224 to 275 mm which is less than one third of the global average (ca 990 mm) (Keshavarz et al., 2013; Bannayan et al., 2010). The amount of annual rainfall varies

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