Original Article

Assessing the Economic Resilience of Rural Households against Drought (Case Study: Mahidasht District in Kermanshah)

Javad Damanbagh [1]- Bijan Rahmani [*2]- Pegah Moridsadat [3]- Shahriar Khaledi [4]

1- Ph.D. Candidate in Geography and Rural Planning, Faculty of Earth Sciences, Shahid Beheshti University, Tehran, Iran
2- Associate Prof. in Geography and Rural Planning, Faculty of Earth Sciences, Shahid Beheshti University, Tehran, Iran
3- Assistant Prof. in Geography and Rural Planning, Faculty of Earth Sciences, Shahid Beheshti University, Tehran, Iran
4- Full Prof. in Natural Geography, Faculty of Earth Sciences, Shahid Beheshti University, Tehran, Iran

Abstract

Purpose- Currently he occurrence of recent droughts in Iran and the severity of its damage indicate the vulnerability of farmers. The economic-environmental damages and the resilience farmers to this incident are evident in diverse ways. Therefore, recognizing the resilience of the population influenced by drought can offer a tool to prevent life-threatening disaster in high-risk areas. The aim of this study was to evaluate the economic resilience of rural households to drought in plain of Kermanshah and answer the following questions. What is the extent of economic resilience of rural households in Mahidasht to drought? What are the most important factors affecting the economic resilience of rural households to drought?

Design/methodology/approach- This is an applied research and a descriptive-analytical method along with library analysis and field surveys were adopted for data collection. The statistical population of this study consisted of 5081 households, out of whom 357 samples were selected according to Cochran's formula. Descriptive and inferential statistics (One-sample t-test) and structural equation modeling were used for data analysis.

Findings- According to the results of t-test, the variables of vulnerability of villagers' property and assets (mean=3.99) and the impact of drought on the value of assets (mean=3.86) gained the highest average in terms of resilience. On the contrary, the two variables of ability to compensate (mean=1.67) and membership in cooperatives and agricultural companies (mean=1.67) had the lowest averages. Moreover, the test results of all four variables of evaluating farmers' knowledge and awareness indicate a correlation between the independent variables (prevention, preparedness, reconstruction, institutional management) and the dependent variable (economic resilience). Therefore, it can be contended that the economic resilience of Mahidasht is fairly weak.

Keywords- Drought, Resilience, Rural household economy, Mahidasht district, Kermanshah.

*Corresponding Author:
Rahmani, Bijan, Ph.D.
Address: Department of Human Geography & Spatial Planning, Faculty of Geosciences, University of Shahid Beheshti, Tehran, Iran.
Tel: +98912 516 7853
E-mail: bijan.rahmani11@gmail.com

1. Introduction

There are growing concerns about the economic, ecological, and climate change impacts on human settlements in recent decades. According to the UN report, by 2025, more than two-thirds of the world's population will face water crisis and 18 countries will struggle with water shortages (Boretti & Rosa, 2019). Therefore, water scarcity and its challenges in certain geographical areas, especially in rural areas, have increased the risks of rural agriculture, disrupting the natural ecosystems of rural areas (Yang et al., 2005; Hoeppe, 2016; Kamara et al., 2018). Drought is a major threat to households and communities that rely on agriculture for livelihood (Anthopoulou et al., 2017; Pittman et al., 2011). Therefore, in order to reduce the risks of drought on human societies, various solutions have been proposed. Apart from improved methods of using water resources to mitigate the effects of drought, the adjustment of management methods and rural lifestyle for resilience enhancement is also one of the novel and successful solutions to alleviate the harmful effects of drought (Wilhite et al., 2014). According to experts, living in a natural hazard-prone environment does not necessarily imply damages or vulnerability, but the lack of resilience coupled with the population's knowledge of the type and nature of hazardous may cause damage (Cosgrove & Loucks, 2015).

In recent years, there has been a significant change in the perspective on hazards, including a change in the dominant approach focusing on vulnerability alleviation and then improved resilience to disasters (Sadeghloo & Sojasi Gheidari, 2014). According to this approach, risk mitigation programs should seek to strengthen the characteristics of resilience in communities, while focusing on the concept of resilience of local communities in the accident management chain (Scherzer et al., 2019).

The resilient approach, which involves adopting measures to maintain the performance of a system in the face of risks, threats and tensions, is closely linked to economics. Therefore, resilience is considered as a way to strengthen local communities by capitalizing on their capacities (Sojasi Gheidari et al., 2018). Therefore, a necessary step to deal with drought and mitigate its consequences is to understand the dimensions of vulnerability and resistance of individuals to improve their tolerance and resilience, which has been neglected in most developing countries, including Iran (Sadeghloo & Sojasi Gheidari, 2014).

In the last decade, Mahidasht district in Kermanshah city has withstood severe droughts, and its adverse consequences have been beyond usual hazards facing rural farmers. This district, which is home to 108 villages with a population of 17876 people (5333 households), is of special importance in terms of agricultural production in Kermanshah province. For many years, Mahidasht has been known as an area with agricultural potential and its agricultural surplus has been exported to other provinces. However, analyzing the level of SPI in a period of 30 years suggests that this area has been at the mercy of severe, moderate and ordinary droughts. In a period of 20 years, ten drought events have been reported. Since the majority of rural residents in the study area earn a living by farming and agriculture, drought has inflicted deleterious effects on the life of residents, triggering various social and economic problems for the villagers, including migration (seasonal or permanent) of the villagers to the city, unemployment, etc. The elimination of these problems requires a comprehensive and systematic plan. These problems introduce the importance of addressing the issue of drought in Mahidasht as a strategic priority. Therefore, the main goal of this study was to assess the economic resilience of rural households to drought in Mahidasht district of Kermanshah. Hence, we sought to answer these key questions. 1. What is the extent of economic resilience of rural households in Mahidasht district to drought? What are the major factors affecting the economic resilience of rural households to drought?

2. Research Theoretical Literature

The concept of resilience was introduced in social and environmental systems in the 1980s. This concept was first proposed by Holling in ecological studies as a way to understand the nonlinear dynamics of ecological systems (Roknoddin Eftekhari et al., 2014). It was then used by Timmerman for long-term assessment of climate change, Adger in social systems, Carpenter in human and environmental systems, Berks in ecological social systems, and Bruneau for short-term crisis management (Heydari Sarban &

Majnuni, 2016). Resilience is recognized as the potential capacity of a system, community or society at risk to adapt or resist changes in order to achieve or maintain a desirable level of performance and structure (Wannous & Velasquez, 2017). Therefore, in both theoretical and practical fields, a higher status is assigned to the alleviation of accident risks. Psychologists define resilience as a set of actions that help people overcome adversity and stress. According to this definition, resilience, apart from adaptation to adversity, is a process that take place in the face of a constant threat or experience of a stressful event.

In fact, this concept was introduced in light of the rising global change. To Hewitt (1974), in conditions that affect people's security, resilience describes the ability to withstand, resist, mitigate, tackle and compensate for damages or reduce the scale of harms. The Intergovernmental Panel on Climate Change (IPPC) defines resilience as the ability of a system and its components to forecast, absorb, adapt or recover from the effects of a hazardous event at a specified time (Mohammadi

& Pashanjad, 2017). The basic concepts of resilience can be observed in the field of ecological approach. The famous ecologist, C.S. Holling, sees it as a measure of a system stability and ability to deal with changes and disturbances at a time when the relationship between population or state variables is feasible (Li et al., 2020). Therefore, the interdisciplinary nature of resilience in the field of environmental sciences, ecology and geography has introduced several definitions in recent decades with regard to the prevailing approach and sustainability paradigm in scientific circles (Mohammadi & Pashanjad, 2017). Thus, recognizing, understanding, and evaluating resilience and flexibility of systems against environmental change or system shocks prompted 26 NGOs active in climate change and natural risk hazards to present 10 characteristics originated from different schools of thought on resilience (Mohammadi & Pashanjad, 2017). Table 1 summarizes 10 main characteristics of resilient systems along with their relevant schools of thought.

Table 1. Characteristics of a sustainable system
(Source: Mohammadi and Pashanjad, 2017, p. 13)

School of thought	Characteristics
Theoretical ecology + economics on risk management and diversification	Considerable diversity in groups that perform a variety of functions in an ecosystem; economic opportunities in areas such as establishing resilience in the policy-making process; the participation of a community; natural resources exploited by a society and retrieval, response and planning activities
Decentralized governance	Effective governance and institutions that may foster community cohesion should be decentralized. They need to be flexible and in touch with local realities; the comprehensive learning system should be facilitated. Other specialized functions such as interpreting scientific data from climate change as a guide for policymakers should be implemented.
Applied ecology in disaster risk reduction	The goal of preparatory activities is not to resist change but to live with changes.
Participatory / governance	Social and economic justice; resilient programs consider issues of justice and equality when danger spreads throughout the communities.
Participatory / social justice	Recognizing the importance of social values and their structures due to the positive relationship between individual cooperation in the society, which facilitates equal access to natural resources and greater resilience.
Resilience	Substantiating the dynamics of imbalance in a system. An approach to resilience should not be associated with the idea of restoring equilibrium, because systems are not stable when they recover from a disturbance.
Adaptation-Management Learning	Continuous and effective learning is important. Therefore, through iterative policies / institutional processes, organizational learning enables reflective training, adaptive management, and integration with the concept of adaptive capacity

The result of the table above and the analysis of theoretical foundations of resilience can be described as follows. The concept of resilience is an integral part of planning and development

today. Therefore, promoting resilience not only enhances the capabilities of a system in tackling critical situations and mitigating vulnerability, but also inherently brings development and

sustainability with a comprehensive approach. However, in defining the characteristics of a resilient system, it is referred to by terms such as flexibility or reversibility.

A resilient system has basic features that are defined in three categories of adaptability, self-regulation and deformability by Martin Brin and Marty Andries (2011) (figure 1). Accordingly, adaptability describes a system's power to deal effectively with potential damages. In general, a system concentrates on smaller time scales due to its specific characteristics, and the self-regulation comes from internal organization of the system without directing or managing an external source. Finally, deformability refers to the potentials of a system to be reorganized into a new system. That is, when that system fails to cope in its existing form (Shokri Firoozjah, 2017).
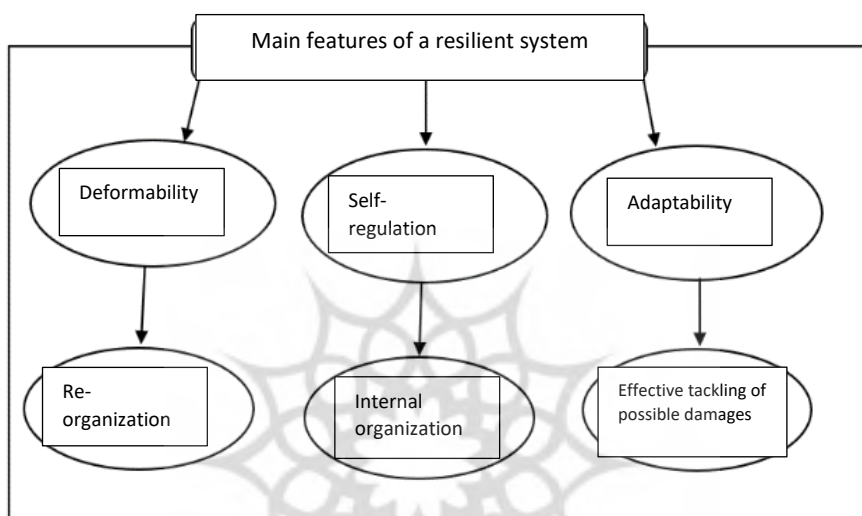

Figure 1. The main features of a resilient system
(Source: Shokri Firoozjah, 2017, p. 33)

Since agriculture is one of the main sources of employment in rural areas, as demonstrated by the bulk of Iranian and international studies, and the consequences of drought particularly influence rural areas. The most widespread effects of drought are evident in agricultural sector and the economy of rural households is heavily dependent on the agricultural sector, so that the diminished economic capacity of this sector threatens rural economy (Sadeghloo & Sojasi Gheidari, 2014, p. 137). Therefore, agriculture is one of the main sources of economy and employment of the villagers, which struggles with the deleterious consequences of drought every year, mounting a great challenge to the rural household economy (Cutter et al., 2016; Adger et al., 2016). Therefore, droughts intensify the vulnerability of all communities, especially the villagers. In some of these communities, survival is a major challenge for many families in the grip of the drought (Campbell et al., 2001). Hence, drought, water scarcity and their effects on agricultural production and economic development are a major global concern (El Kharraz, 2012; Hertel & Liu, 2019). The climate change and its effects on surface water flow and groundwater resources along with improper management of water resources have aggravated the vulnerability of communities to these changes and undoubtedly the intensification of water crises will further complicate this problem (Seyed Akhlaghi & Taleshi, 2018). Drought is more complex than other natural hazards as it covers wide expanses. It is also a most costly natural hazards due to its effect on large population (Hajian, et al., 2018). Statistics presented in International Decade for Natural Disaster Reduction (1990-1999) show that 22% of economic losses originating from crises are attributable to drought and 33% of world population have been affected by this phenomenon (Auld, 2008).

Other studies worldwide suggest that the signs of water shortage crisis have already appeared in countries such as China, India, Thailand, Mexico,

Egypt, Iran and African countries, and the world's major rivers, including the Nile in Egypt, the Ganges in South Asia, Yellow River in China and the Colorado in the United States are seriously threatened. Eleven major rivers in the UK have less than a third of their water capacity (Wines, 2014). Since the vulnerability of rural communities is one of the constraints facing the development of these communities especially in areas that are constantly affected by threats, the resilience of rural communities can be a facilitating approach to achieve development or improve the living conditions of residents (Anabestani et al. 2017). In this regard, Beckman (2006) states that the access of households and local residents to resources, social criteria for survival and reconstruction, support of organizations and institutional conditions that affect the distribution of resources are important in risk management. In other words, to him, the discrepancy of societies in coping with disasters is due to their different capacities in variables such as social class, economic status, social and cultural characteristics, social networks, access to resources, climate, political structures, income diversity, infrastructural constraints, old technology, lack of market access, capital, etc. in rural areas.

Therefore, rural management based on the resilience approach provides a structuring method to consider the complexities, uncertainties and interdependencies of systems and processes, which lays the ground for a novel method of planning and more effective use of evaluation and sustainability approach (Folke et al., 2002). In other words, rural resilience describes conditions that maintain a rural area's capacity to adapt to changes in external conditions, such as satisfaction with the standards. It also involves the capacity to recover from mismanagement and governance faults. Therefore, increasing resilience, the level of adaptation and coping with changes and environmental crises as well as mitigating the level of risk among local communities enable the sustainable development of community despite threats posed by environmental hazards. Meanwhile, people's access to suitable living conditions can wield influence on the level of villagers' resilience (Rafieian et al., 2011).

A number of studies have explored resilience and vulnerability of rural communities and their relationship with drought, some which are briefly mentioned in table 2.

Table 2. Studies on economic resilience to drought

Researchers	Title	Summary of results
Mohammadi Yeganeh et al. (2015)	Explaining the relationship between the diversity of economic activities and sustainable rural development, case study: Tarjan County, Saqez County)	The results of this study showed that drought has inflicted enormous damage to agriculture and rural community during the past year. The approach to tackling natural hazards and events has been substituted by a coping and enduring strategy. Therefore, the resilience of households in the studied villages is not desirable
Heydari Sarban and Majnuni Tutakhaneh (2016)	The role of livelihood diversity in the resilience of rural households around Lake Urmia to drought	The results of this study revealed that the adoption of sustenance approach has improved the resilience of households against the drought of Lake Urmia. In villages subjected to more severe drought, the sustenance diversity was higher.
Hajian et al. (2016)	The role of diversity of agricultural and non-agricultural economic activities on the resilience of rural farming households exposed to drought (Case study: Chenaran city)	The results of this study manifested that diversity of economic activities fosters the resilience of rural agricultural households. As a result, the average resilience is 2.40 in households with non-diverse, 2.48 in semi-diverse and 2.83 in diverse income sources.
Lin (2011)	Agricultural resilience through agricultural diversity	They concluded that climate change can produce harmful consequences for agricultural production. Hence, one approach to reduce the adverse effects of climate elements is diversifying production and improving the resilience of farmers
Carlisle et al. (2014)	Diversity, flexibility, and resilience effect. Case study of agricultural ecology in the North American Plain	They concluded that farmers in broad North Plains in the United States, due to the diversity of economic activities,

Researchers	Title	Summary of results
		have high economic power, but it is not the case in other areas.
Liebman et al. (2015),	Increased yield and resistance to ecosystems by promoting diversity in agricultural harvesting systems	They reported that the diversification of agricultural products can pave the way for resistance and resilience to climate change, plant pests, droughts, which in turn boosts flexibility.
Asfaw et al. (2018)	Diverse strategies compatible with agricultural production; evidence from rural communities in Nigeria	In their study, they concluded that vulnerable farmers in Nigeria have adopted resilience and diversification of agricultural products as a strategy to adapt to climatic changes.
Scherzer et al. (2019)	Indicators of agricultural community resilience in Norway	The results of this study manifested a significant relationship between vulnerability reduction and resilience of rural communities in the Solomon Islands.

3. Research Methodology

This study investigated the economic resilience of rural households to drought in Mahidasht district of Kermanshah city. This is an applied research that used a descriptive-analytical method along with library and field survey methods (observation, questionnaire) for data collection. The population consisted of villages in Mahidasht district of Kermanshah, which are located in two counties (Mahidasht and Chogha Narges) with 108 villages (39 villages in Chogha Narges and 69 villages in Mahidasht). To determine the sample size, villages were classified into four groups according to number of households and sampling was conducted proportional to each category. Also, in each category, the rainfed and irrigated cultivation was considered to investigate the resilience of rural residents to drought from the perspective of rainfed and irrigated cultivation. Relative to the number of villages in each village, the samples were selected directly. In the end, 108 villages were classified into four groups (based on the number of households, irrigation and rainfed cultivation).

The first group consisted of 44 villages with less than 30 families. The second group included villages with 30 to 60 families (35 villages). The third group comprised villages with 60 and 90 households (16 villages). The fourth group contained 13 villages with a population of more than 90 families. Finally, sample villages were selected, and questionnaires were distributed using simple random sampling to collect required data. Moreover, there were 5081 households in the villages of Mahidasht district. Cochran's formula was used to estimate the sample size. Therefore, based on this formula, the sample size of n statistical population in Mahidasht district was estimated (357 households) (table 3).

Table 3. Sample villages along with the number of questionnaires
(Source: The Census conducted by Statistics Center of Kermanshah, 2016)

	Group	Village	Selection criterion	Population	Household	Number of questionnaire
1	(A) Less than 30 households	Qomsheh-ye Baba Karam Khan	Irrigation	73	17	6
2		Lalabad-e Kol Kol-e Do	Rainfed	81	25	9
3		Tazehabad-e Namivand	Irrigated	87	26	10
4		Zalakeh-ye Vaziri	Irrigated	68	22	8
5	(B) 30 to 60 households	Banlarini	Rainfed	163	43	16
6		Gheymas	Rainfed	91	31	11
7		Rahim Abad-e Sofla	Irrigated	127	39	14
8		Kashanbeh-ye Sofla	Irrigated	194	56	20
9	(C) 60 to 90 households	Goharabad	Rainfed	265	68	25
10		Tolatif	Rainfed	252	73	27
11		Jameh Shuran	Irrigated	235	79	29
12		Choqa Ginu	Irrigated	240	70	26
13	(D) Over 90 households	Lalabad-e Hoseyn-e Qolikhani	Rainfed	330	92	34

	Group	Village	Selection criterion	Population	Household	Number of questionnaire
14		Ghomeshah Tapeh	Rainfed	338	91	33
15		Seh Choqa	Irrigated	330	95	35
16		Qaleh Darab Khan	Rainfed	494	145	54
		Total		3368	972	357

From a geographic perspective, the study area is a plain. Hence, the villages are almost identical in natural position. The total population of Mahidasht district according to 2016 General Population and Housing Census was 17876 people (5333 households) of which 823 people (252 households) dwelled in the urban area of Robat and 17053 people (5081 households) resided in villages.

According to the research subject, which highlights the greater resilience of rural households against drought, the villages in both counties were selected based on their important agricultural activities as well as the farming method (rainfed and irrigated). Population and the activities of people working in the agricultural sector will also have a bearing on the selection of samples (figure 2).
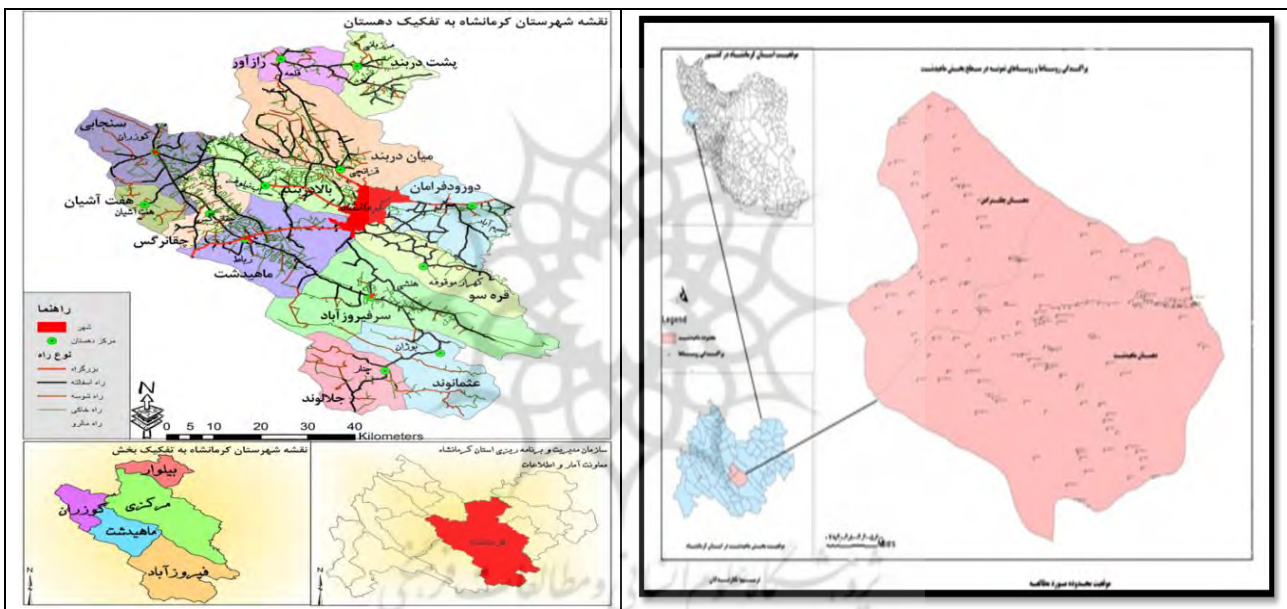

Figure 2. Map of the study area

The validity of the questionnaire was assessed by experts before identifying the final indices and items. The questionnaire developed at this stage was pre-tested and after confirming its reliability (Cronbach's alpha=0.831) the questionnaire was finalized for the field research. Descriptive (mean) and inferential (single sample t) statistical methods

and Amos models were used for data analysis. In this study, the indicators of economic resilience of rural households to drought are investigated (table 4). Therefore, 18 indices were identified to assess economic status and 36 indices to measure the awareness and knowledge of villagers regarding drought (adaptation).

Table 4. Dimensions and indices of drought resilience
Source: Sadeghloo & Sojasi Gheidari, 2014; Mohammadi Yegan et al., 2015; Anabestani et al., 2017; Sojasi Gheidari et al., 2018; Roknoddin Eftekhari et al., 2014; Rafieian et al., 2011

Indices	Dimension	Concept
Economic stability - Entrepreneurship - Job skills - Income diversity - Economic - Non-agricultural income - Land areas - Membership in cooperatives and agricultural companies - Damage to farms, gardens and pastures of villagers - Vulnerability of villagers' property and assets - Household saving	Economic	Resilience

Index	Variable	Dimensions
capacity (higher savings) - Impact of drought on asset value - Use of financial credits (loans) - Product sales market - Capital - Ability to compensate - Insurance - Revival of economic activities after the crisis - Income level		
Indices and variables of measuring the awareness and knowledge of villagers about drought (adaptation)		
Awareness of drought signs	Identifying risks and effects	Prevention
Awareness of the effects of drought risk		
Awareness of areas affected by drought risk		
Awareness of drought forecast	Risk forecast and warning	
Drought warning methods		
Awareness of irrigation patterns (selection of a new irrigation system) – timely irrigation	Preventive measures to reduce injuries	
Awareness of changing cultivation patterns - Recognizing and using seeds and drought-resistant species - Using organic farming systems – Accurate cropping period - Strengthening soil and soil erosion control measures - Changing planting history		
Knowing about product insurance (insuring agricultural products)		
Knowing how to manage water consumption		
Knowledge of groundwater resources		
Knowledge of water storage resources and its supply for emergencies	Providing resources for response and confrontation	Preparedness
Knowing the benefits of membership in cooperatives and agricultural companies		
Knowing the importance of saving at the time of drought exacerbation		
Knowing how to provide food, etc. in the face of drought		
Knowledge of alternative jobs and opportunities (gardening)	Alternative sources of income	
Awareness of alternative jobs and opportunities (livestock)		
Knowledge of non-agricultural methods to earn a living (handicrafts)		
Knowing how to reconstruct livestock farming	Reconstruction	Rebuilding
Knowledge of agricultural sector reconstruction methods (increasing the diversity of cultivated crops - using indigenous knowledge to cope with drought - using intercropping methods		
Knowledge of reconstruction methods for the groundwater resources		
Knowledge of reconstruction methods for service infrastructure		
Awareness of ways to organize water consumption		
Knowledge of methods to reduce water loss (repair of water canals - attention to the coverage of irrigation canals - modification of irrigation methods		
Knowledge of related credits	Institutional support	
Familiarity with responsible institutions		
Familiarity with the duties of Dehyars	Performance of local managers	

4. Research Findings

Of the total subjects, 1.1% were in the age range of less than 25 years, 42.6% were 25 to 45 years old and 56.3% were more than 45 years old. As regards gender, 39 (10.9%) were female and 318 (89.1%) were male. As for marital status, 94.9% were married and 4.5% were single. Moreover, most of the people working in farms were illiterate or had elementary primary education (reading and writing). In total, 70.3% of farmers had primary and lower education, 18.9% had middle school degree and 10.8% have a diploma or higher. There was an inverse relationship between education and employment in agriculture. Under the current conditions, agriculture is devoid of attraction to draw in educated people so these people prefer to engage in non-agricultural and high-income jobs to fulfil their aspirations. They also do not see

agriculture as a job. Moreover, since the literacy of people engaged in agriculture is not consistent with modern farming requirements, it will not improve production.

Concerning occupations, 73.4% (262 people) of respondents were involved in livestock breeding, 20.7% (74 people) had agricultural jobs and only 5.5% (21 people) were simultaneously engaged in three jobs of agriculture, livestock breeding and horticulture. The diversity of agriculture-related jobs is considered as an advantage, because it ensures the variety of income sources and protects the exploiter from the adverse consequences of making a single product. This is even more important for agricultural activities that are at risk of drought and pests. Moreover, 56% of respondents stated that they have equipped and modernized agricultural machinery to varying degrees (36.4% poorly, 19.6% very poorly, 22.4% moderately, 14% great, 6% very great).

In order to evaluate the resilience of the studied rural areas to drought, considering the normality of the research indices (the significance of the Kolmogorov–Smirnov test for these indices was above 0.05). A One-sample t-test was used for this purpose. In this test, if both the upper and lower limits are positive, the average population of that variable will be higher than the tested value.

Moreover, if the former is positive and the latter is negative, the average population calculated indicates the test value (the theoretical median 3). Also, when these two variables are negative, the mean of variable in question is less than the test value and these variables are fairly low in the study population. Therefore, the estimated average of indices related to the resilience of rural areas to drought is measured by a hypothetical average (3), showing that the real average of the total respondents' opinion is less than 3 (below average). Given the significance of all indices, which is less than 0.05, it can be generalized to the entire study population.

Moreover, the upper and lower limits of all indices are negative, revealing that the average of these indices is below the desired value. This suggest that the resilience of rural areas to drought is low. Therefore, the results of t-test for the 18 variables of the economic index show that the two variables of "the vulnerability of villagers' property and assets" (mean=3.99) and "the impact of drought on the value of assets" (mean=3.86) have the highest average in terms of economic resilience. In contrast, the two variables of "ability to compensate" (mean=1.67), and "membership in cooperatives and agricultural companies" (mean=1.67) have the lowest averages (table 5).

Table 5. One-sample t-test to measure the criteria (variables) of economic resilience in Mahidasht

Dimension	Variable	Mean	Mean difference	T value	Df	Significance
Economic	Economic stability	3.16	0.168	1.57	356	0.09
	Entrepreneurship	3.61	0.610	6.72	356	0.000
	Job Skills	15/3	0.156	1.21	356	227.0
	Income-economic diversity	69.3	69.1	14.80	356	0.000
	Non-agricultural income	2.18	0.817	12.77	356	0.000
	Land area	62/3	627/0	20/7	356	0.000
	Membership in cooperatives and agricultural companies	1.76	1.23	11.5	356	0.000
	Damage to farms, gardens and pastures of villagers	2.82	0.179	7.20	356	0.032
	Vulnerability of villagers' property and assets	3.99	0.997	2.14	356	0.000
	Household saving capacity (increase savings)	3.12	0.123	7.51	356	0.163
	Impact of drought on asset value	3.86	0.868	1.39	356	0.000
	Use of financial credits (loans)	2.78	0.218	7.34	356	0.000
	Market for selling products	3.70	0.705	2.82	356	0.000

Dimension	Variable	Mean	Mean difference	T value	Df	Significance
	Capital	2.01	0.982	5.81	356	0.000
	Ability to compensate	1.67	0.328	14.10	356	0.000
	Insurance	2.14	0.245	11.7	356	0.000
	Revival of economic activity after the crisis	3.12	0.425	4.7	356	0.000
	Income level	2.12	0.356	2.25	356	0.000

Moreover, a single-sample t-test was run to assess the criteria (variables) of knowledge and awareness in Mahidasht district. The analysis of data obtained from respondents based on single-sample t-test indicates the low effect of resilience in the economy of rural households in the study area. Therefore, considering the spectral range of the indices, which is between 1 and 5 (based on the Likert scale), the results of single-sample t-test manifest that agricultural companies (mean=1.67), the use of indigenous knowledge to cope with drought (mean=1.706) and the use of organic farming systems (mean=1.17) have the lowest important, respectively. (Hence, the results suggest a very low tendency to join agricultural cooperatives among residents in the study area. Also, familiarity and use of organic farming methods by residents is fairly low. The villagers, thought mostly farmers, lack the indigenous knowledge to deal with the drought, and their knowledge of this area is low. Therefore, the results of assessing the economic resilience of rural farmers in Mahidasht district are presented in Table 6.

Table 6. One-sample t-test to measure the criteria (variables) of knowledge and awareness of people in Mahidasht

Dimension	Variable	Mean	SD	T value	Df	Significance
Prevention	Knowing the signs of drought	1.966	1.034	27.219–	356	0.00
	Knowing the effects of drought risk	2.722	0.278	2.150–	356	0.00
	Knowing areas affected by drought risk	1.958	1.042	17.831–	356	0.00
	Awareness of drought forecasts	1.786	1.214	22.673–	356	0.00
	Familiarity with drought warning methods	1.798	1.202	18.525–	356	0.00
	Knowledge of irrigation patterns (use of a new irrigation system)	2.510	0.490	5.417–	356	0.00
	Knowledge of timely irrigation	2.762	0.238	0.786–	356	0.00
	Knowledge of changing cultivation pattern	2.066	0.934	13.119–	356	0.00
	Recognition and use of drought-resistant seeds and species	2.562	0.438	4.818–	356	0.00
	Use of organic farming systems	1.723	1.277	23.783–	356	0.00
	Knowing the time of crop cultivation	2.566	0.434	5.038–	356	0.00
	Fostering soil erosion control measures	2.434	0.566	7.102–	356	0.00
	Knowing change in cultivation date	2.502	0.498	6.356–	356	0.00
	Knowing about product insurance (insuring agricultural products)	2.962	0.038	1.934–	356	0.00
	Knowledge of water consumption management	2.672	0.328	2.812–	356	0.00
	Knowledge of groundwater resources	2.350	0.650	8.879–	356	0.00
	Knowledge of water storage resources and its supply for emergencies	1.814	1.186	20.883–	356	0.00
Preparedness	Knowing the benefits of membership in cooperatives and agricultural companies	1.674	1.326	24.367–	356	0.00
	Knowing the importance of savings for the time of drought exacerbation	2.298	0.702	10.194–	356	0.00

Dimension	Variable	Mean	SD	T value	Df	Significance
	Knowing how to provide food, etc. in time of intensifying drought	1.974	1.026	16.548-	356	0.00
	Familiarity with alternative jobs and opportunities (gardening)	1.906	1.094	18.602-	356	0.00
	Knowing alternative jobs and opportunities (livestock breeding)	1.954	1.046	17.230-	356	0.00
	Knowledge of non-agricultural methods of earning a living (handicrafts)	1.731	1.269	22.171-	356	0.00
Rebuilding	Knowledge of livestock farming reconstruction methods	1.782	1.218	20.136-	356	0.00
	Knowledge of agricultural sector reconstruction methods (increasing the diversity of cultivated crops)	1.882	1.118	18.166-	356	0.00
	Use of indigenous knowledge to deal with drought	1.706	1.294	23.462-	356	0.00
	Use of intercropping methods	1.870	1.130	19.405-	356	0.00
	Knowing how to reconstruct groundwater resources reconstruction methods	1.758	1.242	21.264-	356	0.00
	Knowing how to reconstruct service infrastructure	1.750	1.250	21.754-	356	0.00
	Knowing how to organize water consumption methods	1.970	1.030	16.314-	356	000.0
	Knowing how to reduce water loss (repair of water canals	2.450	0.550	6.649-	356	000.0
	Improving irrigation practices	2.610	0.390	3.833-	356	000.0
Management institutions	Awareness of related credits	1.838	1.162	19.167-	356	000.0
	Knowing responsible institutions	2.010	0.990	16.297-	356	000.0
	Knowing the duties of villagers	2.050	0.950	14.642-	356	000.0
	Knowing the duties of the Agricultural Services Center	2.054	0.946	15.604-	356	000.0
	Knowing the district duties	2.026	0.974	14.702-	356	000.0

4.1. Evaluating the impact of farmers' knowledge and awareness on economic resilience

In studies on the economic resilience of villagers in the face of drought, knowledge and awareness represent an important approach to address problems, which can ultimately promote the level of resilience. In this regard, in order to identify and measure the factors affecting the level of economic resilience to drought in the villages of Mahidasht district in Kermanshah city, knowledge and awareness of farmers was studied. The goal was to investigate the role of dimensions and components of knowledge and awareness of the economic resilience to drought. Therefore, after inputting data, the output of the model can be viewed both graphically and textually. Here are the main parts related to the model and interpretation. Table 7 shows the results of text analysis including CMIN, DF, P, CFI, RMSEA, etc.

Table 7. The values of the fit indices of the structural equation model of the research

Fit index	CMIN	DF	P	CFI	RMSEA
Value	1.563	68	0.0001	0.973	0.03

The values of CFI=0.973, RMSEA=0.003, CMIN=1.563 show that the model fits data well. Therefore, it can be concluded that the model used to measure the relationship of knowledge and agricultural awareness with economic resilience to drought is significant. Moreover, according to table 8, the association of knowledge and awareness of agriculture and economic resilience to drought was also significant (sig=0.000).

Table 8. Standard estimated values of variables

Variable	Estimate	sig
Agricultural knowledge and awareness ---> Economic resilience to drought	0.731	0.000

In the next step, the correlation of components of agricultural knowledge and awareness, including prevention, reconstruction, preparedness and institutional management with economic resilience to drought is measured to investigate the relationship of components separately.

4. 2. Measuring the relationship between prevention variables and economic resilience

"Prevention" is one of the dimensions of drought knowledge and awareness for which relevant measures were designed and data collection was performed via a questionnaire. Considering "prevention" as an independent variable, we used structural equations to investigate its correlation with the level of agricultural knowledge and awareness in Mahidasht, the results of which are shown in table 9. As the table shows, CAMIN (1.396,), CFI (0.895) and RMSEA (0.48) indices show the good fit of the model. P-value <0.005 is a criterion that denotes significant difference of values at 0.95% CI.

Table 9. The values of the fit indices of the structural equation model of the research

Fit index	CMIN	DF	P	CFI	RMSEA
Value	1.396	68	0.0001	0.895	0.48

According to figure 3 and table 10, the correlation coefficient of drought prevention and economic resilience is significant (sig=0.001), and therefore their correlation is confirmed.
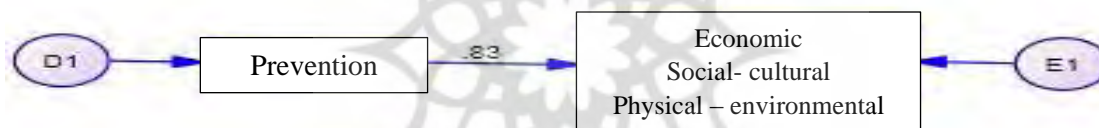

Figure 3. Correlation between prevention and economic resilience

Table 10. Standard estimated values of variables in economic prevention and resilience

Variable	Estimate	sig
Prevention ---> Economic resilience	0.834	0.000

4. 3. Measuring the relationship between economic preparedness and resilience variables

In order to investigate the effect of the "preparedness" on economic resilience, its various dimensions were identified and the required data were collected in Mahidasht. The results are shown in table 11. Moreover, according to the information presented in the table, CAMIN (0.256), CFI (10.916) and RMSEA (0.35) indices show the good fit of the model. Therefore, the developed model appears to be acceptable.

Table 11. The values of the fit indices in the structural equation model of the research

Fit index	CMIN	DF	P	CFI	RMSEA
Value	1.256	72	0.000	0.916	0.35

As figure 4 and table 12 show, the correlation coefficient between economic preparedness and resilience was significant (sig=0.000) and therefore their correlation is confirmed.
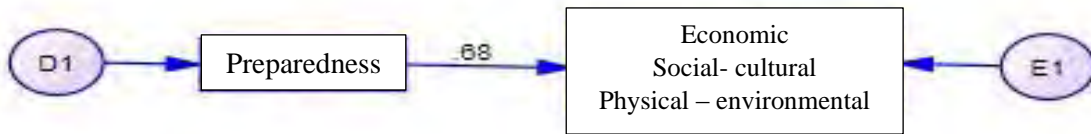
Figure 4. Correlation between economic preparedness and resilience

Table 12. Standard estimated values of variables in economic readiness and resilience

Variable	Estimate	sig
Preparedness ---> Economic resilience	0.687	0.000

4. 4. Measuring the relationship between the reconstruction and economic resilience

Reconstruction is one of the independent variables of the present study. Here, the structural equations of its correlation with the dependent variable, i.e. economic resilience, was investigated in the study area, the results of which are shown in table 13. Therefore, as listed in the table, CAMIN (1.730), CFI (0.941) and RMSEA (0.22) exhibited the good fit of the model. Therefore, the developed model appears to be acceptable.

Table 13. The values of the fit indices of the structural equation model of the research

Fit index	CMIN	DF	P	CFI	RMSEA
Value	1.730	72	0.000	0.941	0.22

The correlation between reconstruction and economic resilience was assessed using structural equation modeling, the results of which are shown in figure 5.
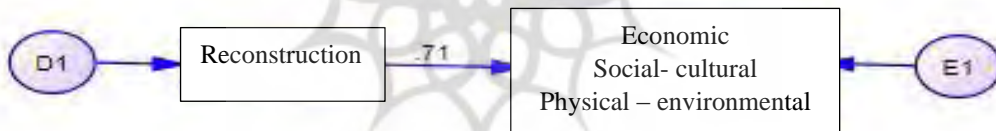

Figure 5. Correlation between reconstruction and economic resilience

As table 14 shows, the correlation between reconstruction and economic resilience was significant (sig=0.000) and hence their correlation is confirmed.

Table 14. Standard estimated values for variables of economic reconstruction and resilience

Variable	Estimate	sig
Reconstruction ---> Economic resilience	0.69	0.000

4. 5. Measuring the relationship between institutional management variables and economic resilience

The data related to "institutional management" component was collected via a questionnaire and subjected to analysis. To test the correlation between institutional management as an independent variable and economic resilience as a dependent variable, the structural equation model was used. The results are shown in table 15. As listed in the table, CAMIN (1.220), CFI (0.923) and RMSEA (0.36) indices revealed the good fit of the model and therefore the proposed model is acceptable.

Table 15. The values of fit indices of the structural equation model of the research

Fit index	CMIN	DF	P	CFI	RMSEA
Value	1.220	56	0.00	0.923	0.36

As figure 6 and table 16 show, the correlation between institutional management and economic resilience was significant (sig=0.000) and hence their correlation is confirmed.
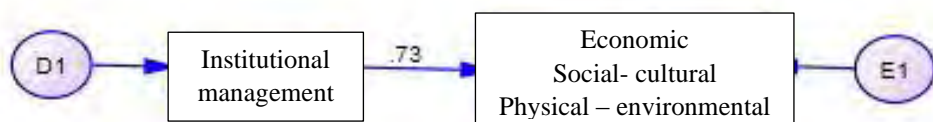

Figure 6. Correlation between institutional management and economic resilience

Table 16. Standard estimated values of variables in institutional management and economic resilience

Variable	Estimate	sig
Institutional Management ---> Economic Resilience	0.76	0.000

5. Discussion and Conclusion

A review of the literature and research background suggests that improving the resilience of residents and strengthening the resilience of rural settlements is the best strategy to alleviate the effects of natural disasters, especially drought. Iran sits on a dry belt and the persistence of droughts in the last two decades due to climate change have triggered multiple drought crises, especially for in villages that are heavily dependent on water for production.

Drought has caused enormous damage to agriculture and rural communities over the years. In the last decade, the approach to tackling natural disasters and events has given its place to coping strategy. A review of the literature manifests that improving the resilience of residents and increasing the resilience of rural settlements in general is the most effective strategy to mitigate the effects of natural disasters, especially drought.

Droughts in the study area were no exception to this rule, imposing considerable adverse effects on the life of rural farmers, which can be partially due to their low level of resilience to this risk. Therefore, reducing the vulnerability of rural farmers by fortifying the level of resilience and promoting resilience to the consequences of drought risk can be one of the special tasks of agricultural management, planning and development in Iran. It can be conducted through accurate identification of factors that have a bearing on resilience. Therefore, the present study was conducted to evaluate the economic resilience of rural households to drought in Mahidasht district of Kermanshah. According to the results of t-test, the variables of vulnerability of villagers' property and assets (mean=3.99) and the impact of drought on the value of assets (mean=3.86) had the highest average in terms of resilience. On the contrary, the two variables of ability to compensate (mean=1.67) and membership in cooperatives and agricultural companies (mea=1.67) had the lowest averages. These findings were confirmed by t-test at a significance level of 96%. That is, there was a significant difference (sig=0.000) between the theoretical mean (3) and the calculated mean (experimental mean). Therefore, it can be posited that Mahidasht district is vulnerable to the risk of drought. The analysis of the study area shows that the tendency to join agricultural cooperatives among residents was very low. Moreover, the test results of all four variables of evaluating farmers' knowledge and awareness indicate a correlation between the independent variables (prevention, preparedness, reconstruction, institutional management) and the dependent variable (economic resilience). However, the results of this study could be compared with the results of Mohammadi Yeganeh et al. (2015), Heydari Sarban & Majnuni Tutakhaneh (2015), Hajian et al. (2019), Lin (2011), Carlisle et al. (2014). In line with this study, these authors stressed indices such as diversity of livelihood, diversity of economic activities, awareness raising, organization, and prevention. Therefore, the performance of resilience indices is highly important in order to reduce the risk of drought in rural areas. Thus, authorities and the people should pay special attentions to this issue. A key factor in the interaction of people regarding resilience to drought is to provide education and training in order to create opportunities for participation, empowerment, social networks, social norms, etc. which can contribute to the local risk reduction.

Therefore, the improvement of above-discussed issues, which are main components of economic resilience, should be high on the priority of rural planning managers and officials that are in charge of administrative affairs of villages.

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Research Article

ارزیابی تاب‌آوری اقتصادی خانوارهای روستایی در برابر خشکسالی
(مطالعه موردی: بخش ماهیدشت شهرستان کرمانشاه)

جواد دامن باغ[1]- بیژن رحمانی*[2]- پگاه مریدسادات[3]- شهریار خالدی[4]

1- دانشجوی جغرافیا و برنامه ریزی روستایی، دانشکده علوم زمین، دانشگاه شهید بهشتی، تهران، ایران.

2- دانشیار جغرافیا و برنامه ریزی روستایی، دانشکده علوم زمین، دانشگاه شهید بهشتی، تهران، ایران.

3- استادیار جغرافیا و برنامه ریزی روستایی، دانشکده علوم زمین، دانشگاه شهید بهشتی، تهران، ایران.

4- استاد جغرافیای طبیعی، دانشکده علوم زمین، دانشگاه شهید بهشتی، تهران، ایران.

چکیده مبسوط

۱. مقدمه

رویکرد تاب‌آوری اتخاذ تدابیر به منظور حفظ عملکرد یک سیستم به هنگام مواجهه با مخاطرات، تهدیدات و تنش‌ها، قرابت بسیاری با اقتصاد دارد. از این رو تاب‌آوری‌به منزله راهی برای تقویت جوامع محلی با استفاده از ظرفیت‌های آنها مطرح می‌شود. بنابراین گام ضروری برای مقابله با خشکسالی و تعدیل تبعات آن، شناخت و درک دقیق از ابعاد آسیب‌پذیری و مقاومت افراد برای ارتقای تحمل و انعطاف‌پذیری آنان است که در اغلب کشورهای در حال توسعه از جمله ایران مورد غفلت قرار گرفته است.

۲. مبانی نظری تحقیق

از آنجایی که کشاورزی یکی از منابع اشتغال عمده روستاییان تلقی می‌شود و مطالعات صورت گرفته داخلی و خارجی نیز آن را تایید می‌کنند. آنها نشان دادند که پیامدهای مختلف خشکسالی بر مناطق روستایی برجسته می‌باشد، زیرا ضمن اینکه گسترده‌ترین اثرات خشکسالی اثرات تحمیل شده بر بخش کشاورزی می‌باشد و اقتصاد خانوارهای روستایی وابستگی قابل توجهی به بخش کشاورزی دارد، با کاهش ظرفیت‌های اقتصادی این بخش، اقتصاد روستاها نیز به مخاطره افتاده و پیامدهای بعدی را نیز در پی خواهد داشت. بنابراین کشاورزی یکی از منابع اصلی اقتصاد و اشتغال عمده روستاییان تلقی می‌شود که هر ساله در معرض پیامدهای مخاطرات خشکسالی قرار می‌گیرد، زیرا اثرات ناگواری بر بخش کشاورزی وارد می‌کند و اقتصاد خانوارهای روستایی

را با چالش بزرگی روبرو می‌کند. بنابراین تفکر مدیریت روستاها براساس رویکرد تاب‌آوری، روش ساختاربندی برای توجه به پیچیدگی‌ها، عدم قطعیت و وابستگی‌های درونی سیستم‌ها و فرآیندها فراهم می‌آورد و زمینه را برای روش جدید برنامه‌ریزی و استفاده کارآمدتر از ارزیابی و تفکر پایداری فراهم می‌کند.

۳. روش تحقیق

این پژوهش به بررسی و ارزیابی تاب‌آوری اقتصادی خانوارهای روستایی در برابر خشکسالی در بخش ماهیدشت شهرستان کرمانشاه پرداخته است. نوع پژوهش کاربردی و روش مورد استفاده توصیفی- تحلیلی می‌باشد. برای گردآوری داده‌های مورد نیاز از روش کتابخانه‌ای و میدانی(مشاهده، پرسشنامه) استفاده شده است. جامعه آماری این پژوهش، شامل روستاهای بخش ماهیدشت شهرستان کرمانشاه می‌باشد که در دو دهستان (ماهیدشت و چقانرگس) با تعداد ۱۰۸ روستا (چقانرگس ۳۹روستا و ماهیدشت ۶۹روستا) قرار دارند. برای حجم نمونه بطور متوسط روستاها در چهار طبقه جمعیتی براساس خانوار دسته‌بندی و از هر دسته به نسبت تناسب نمونه‌گیری اقدام شد، همچنین در داخل طبقه به کشت دیم و آبی توجه شد تا وضعیت تاب‌آوری ساکنین در مقابل خشکسالی را از منظر کشت دیم و آبی مورد بررسی قرار دهیم. براساس تخصیص متناسب نسبت به تعداد روستاهای هر دهستان، تعداد روستاهای نمونه به صورت مستقیم شدند، که در مجموع از ۱۰۸ روستا، در چهار گروه (براساس خانوار، نحوه کشت آبی و دیم) دسته‌بندی شدند.

* نویسندهٔ مسئول:

دکتر بیژن رحمانی

آدرس :گروه جغرافیای انسانی و آمایش، دانشکده علوم زمین، دانشگاه شهید بهشتی، تهران، ایران.

پست الکترونیکی: Email: bijan.rahmani11@gmail.com

۴.یافته‌های تحقیق

یافته‌های تحقیق نشــان داد که براســاس آزمون t-test که متغیرهای آســیب پذیری اموال و دارایی های روستاییان ۳.۹۹ و تاثیر خشکسالی در ارزش دارایی ۳۸۶ بالاترین میانگین را از نظر اهمیت تاب‌آوری اقتصادی می‌باشد. در مقابل نیز ســه متغیر توانایی جبران خســارت با میانگین ۱.۶۷، عضــویت در تعاونی و شــرکت‌های کشاورزی با میانگین ۱.۶۷ کمترین میانگین‌ها را به خود احتصاص دادند. این مطلب را t آزمون در سطح معناداری ۹۶ درصد تایید می‌کند، یعنی بین میانگین نظری(۳) با میانگین بدســت آمده(میانگین تجربی) تفاوت معناداری(sig=0.000) وجود دارد. پس می‌توان گفت بخش ماهیدشــت در برابر مخاطره خشکسالی آسیب‌پذیر اسـت. بنابراین بررسـی محدوده مورد مطالعه نشان می‌دهد که میزان گرایش به عضویت در تعاونی‌های کشاورزی در میان ســاکنین در سطح بسـیار پایینی قرار دارد. همچنین نتیجه آزمون تمامی چهار متغیر سـنجش دانش و اگاهی کشــاورزان نشــان از همبسـتگی میان متغیرهای مسـتقل(پیشــگیری، آمادگی، بازسـازی، مدیریت نهادی) و متغیر وابسته(تاب‌آوری اقتصادی) است.

۵. بحث و نتیجه‌گیری

بررسی ادبیات نظری و پیشـینه های موفق نشـان می‌دهد که بهبود تاب آوری ساکنان و به طورکلی افزایش تا بآوری سکونتگاه های روستایی، بهترین شیوه در جهت کاهش اثرات بلایای طبیعی به ویژه خشــکسـالی اسـت. قرار گیری کشـور ایران بر روی کمربند خشـک و تداوم خشـکسالی‌های دو دهه اخیر به واسطه تغییرات اقلیمی منجر به شکل گیری بحران‌هایی با منشاء خشکسالی به ویژه برای روستاییان که وابستگی عمیقی به آب برای تولید دارند، شده است. خشکسالی‌های رخ داده در منطقه مورد مطالعه پژوهش حاضر نیز از این قاعده مســتثنی نبوده و منجربه تاثیرات منفی فراتر از حالت عادی و وقوع مخاطره

خشکسالی در بین کشاورزان روستایی شده است که می تواند به دلیل پایین بودن ســطح تاب‌آوری آنها در برابر این مخاطره باشــد. لذا کاهش ابعاد آسیب‌پذیری کشاورزان روستایی از طریق افزایش سـطح تاب آوری و ارتقای انعطاف‌پذیری در برابر پیامدهای مخاطره خشــکســالی می‌تواند یکی از کار ویژه‌ای مدیریت، برنامه‌ریزی و توسـعه کشاورزی در کشور باشـد که از طریق شــناسـایی دقیق عوامل تاثیر گذار در تقویت تاب‌آوری امکان‌پذیر اسـت. لذا تحقیق حاضر با هدف ارزیابی تاب‌آوری اقتصادی خانوارهای روستایی در برابر خشکسالی در بخش ماهیدشت شهرستان کرمانشاه انجام شد. بحث عملکرد شـاخص های تاب آوری در جهت کاهش مخاطرات خشــکسالی در مناطق روسـتایی اهمیت بسـیاری دارد که باید مسـئولین و مردم به آن توجه ویژه‌ای داشته باشند. لذا آنچه که بیش از همه در حضور و تعامل افراد در تاب آوری در برابر مخاطرات خشـکسالی نقش دارد، ایجاد و تقویت کلاس های آموزشـی اسـت که می‌توان به ایجاد فرصت‌های مشـارکت، توانمندسازی، شبکه‌های اجتماعی، هنجارهای اجتماعی و غیره بینجامد و زمینه را برای افزایش کاهش مخاطرات محلی فراهم کرد. بنابراین بهتر اسـت تقویت زمینه‌های فوق که‌به عنوان مولفه های مهم تاب آوری اقتصـادی هسـتند در اولویت کار مدیران و مسـئولان برنامه ریزی روسـتایی و نهادهایی که به صـورت اجرایی با روسـتا در ارتباط هستند قرار گیرد.