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An Extension Model Compatible with Drought Management in Iran

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ABSTRACT

The main purpose of this research was to design an extension model compatible with drought management in Iran. The research utilized a mixed research approach, combining both qualitative and quantitative methods. In the qualitative section, data was collected through semi-structured interviews, observation, and review of relevant sources. The participants in this section were 15 of extension experts with significant experience in drought management, selected through purposeful and snowball sampling methods. The data was analyzed using the systematic grounded theory approach with MAXQUDA10 software, following Strauss and Corbin's (1998) approach. In the quantitative section, the statistical population included experts, trainers, and professors whose field or organizational post was related to water resources, irrigation and drainage, agricultural extension and development, and drought, working full-time in the Ministry of Agricultural Jihad (N= 6018). The sample size was determined using Cochran's formula, with a total of 372 participants. Structural Equation Modeling (SEM) and PLS software were used for data analysis. The results showed that the main components of the model were the detailed requirements of drought management (coefficient of coefficient 0.013), extensional methods of drought management (0.033), contextual conditions (0.1011), supporting conditions (0.166), conditions and causes (0.102), and consequences of drought management (0.065). Finally, an extension model compatible with drought management in Iran was presented.

Keywords: Contextual conditions, Drought adaptation, Supporting conditions.

INTRODUCTION

Drought is an extreme climatic phenomenon that occurs throughout the world with different intensities, especially in arid and semi-arid regions, and leaves harmful effects on the surface and groundwater resources, agriculture, economy, and generally all aspects of life. Given Iran's location in the arid and semi-arid belt of the world, it is crucial to study drought as a widespread natural disaster with long-term effects in different sectors (Mousavi & Niknami (2021). It can be said that drought is a climatic reality in Iran, considering that 27 droughts have occurred in this country over the last 40 years (Zarafshani *et al*., 2016). Drought and its undesirable consequences for natural resources, agricultural production, and economic and social development are some of the fundamental challenges of Iran and drought-prone regions. Considering the frequency and significant extent of its occurrence, it is essential to implement directional mechanisms to counteract it (Savari and Skandari Damaneh, 2025; Solh and Van Ginkel, 2014). According to a UN report, 18 countries in the world will face water shortages in the near future, and it is predicted that more than two-thirds of the world's population will be in severe water

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shortage conditions by 2025 (Pozzi *et al*., 2013; Shabanali Fami *et al*., 2020). These disasters are partially caused by climate change (Rahman and Alam, 2016), and developing countries are more strongly affected by their risks than other regions due to deficient knowledge and adaptation to this phenomenon (Xenarios *et al*., 2016). The main climatic problem in dry areas is not the drought itself but the attitude toward it as an ordinary natural phenomenon and the lack of regulation of various water programs and uses based on that attitude (Khorambakht *et al*., 2013). Due to its biological nature and strong dependence on nature, agriculture is the largest consumer of water resources in most countries. In Iran, approximately 88% of water resources are used in agriculture (Pouralimoghaddam *et al*., 2022). Rural communities always face many effects of drought, including economic and social problems, which should not be underestimated, and a comprehensive approach is required to mitigate these impacts and achieve successful adaption (Kiem and Austin, 2013).

Various factors contribute to the occurrence of drought and it is beyond human capabilities to make changes or interventions in these factors. Nevertheless, measures can be taken in different dimensions to cope with and reduce the negative consequences of drought. Water-intensive agriculture has suffered significant damage, resulting in the losses and degradation of rangelands and pastures and the decline in livestock numbers and productivity (FAO, 2017). Economically, drought imposes an average annual loss of 6-8 billion USD globally, with adverse effects on farmers' revenue (production quantity and quality) being the most significant risk (Mardy *et al*., 2018). Consequently, it can be inferred that drought substantially threatens agriculture-based communities (Campbell *et al*., 2011; Fanni *et al*., 2016), impacting the productive, economic, social, and environmental sectors (Naderi and Karami Dehkordi, 2019). Various studies have indicated that drought has numerous social effects, including reduced social welfare, physical and mental health decline, increased social isolation, heightened conflicts, decreased trust and cohesion, lowered social capital, increased suspicion toward governmental institutions, longer working hours, decreased leisure time, increased divorce rates, and destabilized family systems, posing a fundamental challenge to farmers' livelihood stability (Keshavarz and Karami, 2010; Keshavarz *et al*., 2013). Therefore, communities exposed to drought are vulnerable to a lower standard of living (De Silva and Kawasaki, 2018). In this regard, improving farmers' capacity in areas like adaptation and resilience in climatic conditions is necessary to sustain livelihoods (Alam *et al*., 2016), along with strategies for adapting to water scarcity and drought conditions (Yazdanpanah *et al*., 2015). In this context, the overall objective of this research was to design a model of extension compatible with drought management in Iran.

Climate and environmental changes significantly impact the livelihoods of communities, especially in rural areas, and affect agricultural activities in different ways (Shakouri and Merseli, 2018). Therefore, farmers need to adopt behaviors compatible with the impacts of climate change to protect their livelihoods (Savari and Eskandari Damaneh, 2019) and minimize the adverse effects of these changes (Nilsen *et al*., 2012). Adaptation strategies mainly consist of medium- and long-term measures that farmers employ to improve the resilience of their farming units to drought-induced stresses (Ghambarali *et al*., 2012). Adaptation strategies are defined in risk management and crisis management (Kheyri *et al*., 2021; Tavakoli *et al*., 2015). In general, they encompass individual, economic, social, environmental, and institutional dimensions, which directly and indirectly affect agricultural production in both predictable and unpredictable ways (Smit and Pilifosova, 2003; Deressa, 2010; Ommani, 2011; FAO, 2012; Gomez and

Blanco, 2012; Feola *et al*., 2015). Therefore, in agricultural and rural areas, it is impossible to rely solely on agriculture to maintain production or improve people's lives. Instead, a wide range of drought adaptation strategies must be chosen (Thieme, 2006).

In order to face the effects of drought, farmers need to be empowered in various economic, social and technical dimensions. In this regard, it seems that educational and extensional activities can be implemented to improve drought management by farmers. Agricultural extension services not only provide information on various aspects of items mentioned, but help secure agricultural related services from banks, organizations and companies. The most important functions of agriculture extension services, however, are transfer of technologies and agricultural education of farmers to equip them with sufficient and suitable alternatives and solutions and place them in a decision making (Al-Zahrani *et al*., 2016). Optimal management, extension, and appropriate use of water in agriculture is essential. Agricultural education experts should implement extensional programs to combat water scarcity at the national and provincial levels. These programs should cover producers of agricultural and horticultural products, as well as the implementing agents. By increasing knowledge and skills among producers and implementing agents, we can increase the efficiency of water resources and improve the quantity and quality of production in farms and orchards (Rahimian, 2015). One of the main challenges faced by water conservation experts is the lack of improvement in water management, particularly in irrigation, as well as the absence of proper organizations for farmers to promote their use of water. This is due to the farmers' lack of awareness about the water crisis and their disregard for it, as well as the insufficient knowledge of extension experts in providing effective plans. The low efficiency of irrigation in agricultural lands is also a result of the lack of timely and effective extension, leading to the loss of water. Furthermore, the absence of integrated water resource management plans in the watershed, and the lack of appropriate farming patterns in accordance with the sustainable capacity of water resources in the region, are also attributed to the lack of extension experts' knowledge. Additionally, the lack of awareness among beneficiaries about modern methods and the absence of specialized and knowledgeable experts in this field are also major issues. Therefore, an extensional model for irrigation management and better coping with the drought in Iran leads to improved irrigation management, increased irrigation efficiency, and improved agricultural development, which is of great importance. Table 1 provides a summary of studies regarding extension and drought management.

MATERIALS AND METHODS

This study used a cross-sectional methodology and a survey to gather descriptive data for a practical goal. Employing a mixed approach, incorporating both quantitative and qualitative methods (Johnson and Onwuegbuzie, 2004). In the initial stage of this research, data collection methods included semi-structured interviews, observation, and review of relevant sources. The systematic grounded theory with MAXQUDA10 software was used for data analysis and using Strauss and Corbin (1998) approach. Coding includes three stages: open coding, axial coding and selective coding (Lee, 2001; Creswell and Creswell, 2017). The qualitative section of the study included a sample of 15 senior experts and academic members with practical and scientific experience in drought (Table 2). They were selected using purposeful and snowball sampling methods.

For the second stage, confirmatory factor analysis, structural equation modeling, and Smart-PLS software were employed. For

Table 1. A summary of influential variables in a model of extension compatible with drought crisis management.

Research Title	Author	Method	Findings
Investigating the social consequences of drought on rural areas (Case study: Shosef District, Nehbandan City)	Fal Suleiman *et al*. (2013)	Survey	In the environmental dimension, drought causes the drying up of surface water, the destruction of vegetation, and an increase in dust. In the economic aspect, the income level has decreased, the unemployment rate has increased, and agricultural and livestock production has decreased.
Extension pattern compatible with drought management in Khorasan Razavi Province, Iran	Mousavi *et al*. (2021)	Qualitative	Extension compatible with drought management requires cooperation and coordination between different institutions and organizations, and educational and extensional programs can significantly improve drought management.
Extension pattern compatible with drought management in Alborz Province, Iran	Firouzjani (2018)	Qualitative	Planning, development, and implementation of water resources and drought management plans for each region should be based on the conditions and resources available in that region. It is also essential to educate and promote concepts related to drought management.
Development of extension pattern for drought management in Iran	Rahimi *et al*. (2019)	Qualitative	Drought management requires the development of suitable extension models. Improving the awareness and capability of the society and water users in the field of drought management is one of the main success factors in the implementation of extensional models.
extension management using new media	Azari *et al*. (2017)	Qualitative	Teaching and extension the concepts related to drought management helps improve the awareness of society and farmers, improving drought management in Iran.
The perception of soil erosion and its social and economic factors in different regions of Sri Lanka.	Udayakumara *et al*. (2010)	Survey	agricultural workforce, household size, literacy rate, property security, conservation costs, promotional education, membership in local organizations, professional skills, financial capital, distance to land, and farm income are all important factors in understanding soil erosion in the studied region.
Drought management planning policy: from Europe to Spain	Hervás-Gámez & Delgado-Ramos (2019)	Qualitative	A key milestone in terms of European drought-risk management was set by the 2007 EC Communication "Addressing the Challenge of Water Scarcity and Droughts in the European Union". This presented an initial set of seven policy instruments for tackling water scarcity and drought issues at European, national, and regional levels. These included options in relation to 'putting the right price tag on water', 'allocating water more efficiently', and 'fostering water efficient technologies and practices'. The Communication also recommended the development of DMPs.
The Impacts of Drought and the Adaptive Strategies of Small-Scale Farmers in uMsinga, KwaZuluNatal, South Africa	Lottering *et al*.(2021)	Survey	Farmers adopted various adaptive strategies to adapt to drought such as the use of early-maturing crops, mixed cropping systems and drought-tolerant crops. With regard to mitigation, a majority of farmers did not prepare for drought, and those who did utilized indigenous methods of conserving water such as rainwater harvesting, the use of wells, and migrating for alternative employment.
Assessing agricultural drought management strategies in the Northern Murray–Darling Basin	Aitkenhead *et al*.(2021)	Qualitative	Government Assistance is the most used ADMS for Paroo Shire, the Maranoa Region and Murweh Shire, Whereas the MDB Plan is mainly used in the Goondiwindi Region.

Table 2. Frequency distribution of demographic and professional characteristics of the studied people.

Characteristic	Strata	Abundance
Age Average= 48.36	< 30	1
	40-31	3
	50-41	6
	60-51	5
Gender	Man	12
	Female	3
Educational level	Master's degree	4
	PhD	11
Field of study	Water and irrigation	5
	Agriculture extension	7
	agricultural development	3

this analysis, the statistical population consisted of 6018. They were experts, trainers, and faculty members whose field or organizational post was related to water resources, irrigation and drainage, drought, agricultural extension and development sciences and were employed full-time in the Ministry of Agricultural Jihad in Iran. The statistical sample was determined using Cochran's formula. The number of samples was determined to be 372 experts (Table 3). Sampling method was stratified.

Validity and Reliability

Guba, and Lincoln (1985) method was used to check reliability and validity. The indexes used were Dependability and Transferability. Based on this, re-coding was done in two different time periods and two other researchers were used. Based on the results, the dependability index was 74% and the transferability index was 71%. Considering that they were more than 60%, it can be said that the indicators had a favorable condition.

Confirmatory factor analysis was used within the SEM framework to assess the proposed model's validity (Hosseinizare 2017). To examine the reliability of the questionnaire, a pilot study was conducted with non-sampled respondents to make necessary revisions. The reliability or confidence level of the variables was estimated by Cronbach's Alpha coefficient (Table 4).

Table 3. The number of samples in each of the three fields.

Category	Statistical population	Sample size
Experts	4390	271
Trainers and researches	930	57
faculty members	698	43
total	6018	372

Table 4. Cronbach's Alpha coefficient for questionnaire factors.

Row	Variables	Number of items	Cronbach's Alpha coefficients
1	Management before drought	15	0/691
2	Management after drought	11	0/701
3	Management during drought	11	0/630
4	Extension system adapted to drought	13	0/941
5	Supportive policies	9	0/832
6	Consequences of drought	17	0/852
7	Disseminational and educational methods	12	0/754
8	Causal conditions	14	0/775
9	Contextual conditions of drought	12	0/811

Table 5. Frequency distribution of demographic and professional characteristics of the studied people.

Characteristic	Strata	Abundance	Percent	Cumulative percentage
Age n= 372 Average= 40.46	20-30	79	3.21	3.21
	40-31	93	25	3.46
	50-41	134	36	3.82
	60-51	66	7.17	100
Gender n= 372	Man	284	3.76	Mode= Man
	Female	88	7.23	
Educational level Mode= Master's degree	Bachelor's degree	60	1.16	1.16
	Master's degree	194	2.52	3.68
	Ph.D.	118	7.31	100
Field of study n= 218	Science	55	8.14	Mode= Agriculture
	Agricultural engineering	165	3.44	
	Humanities	73	6.19	
	Other	33	9.8	
Work experience n= 218 Average= 12.99	5-1	6	1.6	1.6
	6-10	75	20.2	21.8
	11-15	136	36.5	58.3
	16-20	123	33.1	91.4
	21-25	14	3.8	95.2
	26-30	15	4.8	100

RESULTS

Examining the age of the responders showed that the highest frequency (36%) was related to the age group of 41-50 years. Also, 284 (76.3%) of the responders were male (the highest frequency), and 88 (23.7%) were female. In terms of the educational level, the highest frequency was related to the MSc degree with a frequency of 194 (52.2%). Among the study fields, agricultural engineering had the highest frequency of 165 people (44.3%). Regarding experience, the highest frequency was related to 11-15 years with a frequency of 136 (36.5%). (Table 5).

In the structural equation model methodology, it is first necessary to study the validity of the structure in order to determine whether the indicators selected to measure the desired structures have the necessary accuracy i.e., the questions is to check whether the variables were chosen correctly or not? For this purpose, Confirmatory Factor Analysis (CFA) was used. In this method, the factor load of each indicator with its structure must be higher than 0.4.Factor loadings were calculated by measuring the correlation between indicator and connected construct. This suggests acceptable reliability regarding the measurement model (Table 6).

After ensuring the existence or non-existence of a causal relationship between the research variables and checking the appropriateness of the observed data with the conceptual model, the research hypotheses were also tested using SEM (the PLS approach). Tables 7 and 8 depict the results of running the model, and Tables 11 presents the results of testing the hypotheses.

Table 7 shows the values of R^2 that represent the explained variance. Based on this, supporting conditions with a coefficient of 0.16 has the greatest effect, and consequences of drought with a coefficient of 0.06 has the least effect of drought management. The total variables have explained 0.15 of the variance of the dependent variable.

The values listed in Table 8 shows the T values. For each factor to be significant, the

Table 6. Factor loadings under the modified components of the extension drought management model.

Factors	Manifesting variable	Factor loading
Contextual conditions	The presence of weather and climate information centers	0.731
	Information capacity of agricultural service centers	0.525
	The existence of agricultural and irrigation cooperatives	0.498
	The existence of training centers in the field of drought management	0.494
	Agriculture to financial resources	0.493
	Insensitivity of people and social networks	0.802
	Unauthorized exploitation of water resources	0.462
	The government's insensitivity to the issue	0.460
Causal conditions	Low level of education	0.455
	Weak financial base of farmers	0.447
	Weakness of water infrastructure	0.408
Intervening conditions	Crop insurance coverage	0.675
	Guaranteed purchase of agricultural products	0.671
	Investing in the infrastructure of irrigation networks	0.569
	Water pricing and sale	0.536
	Granting loans and free facilities	0.448
	Effective monitoring of the license of agricultural wells	0.447
	Supporting organizations and cooperative companies in the water sector	0.424
Dissemination variables	Considering and measuring the educational- dissemination needs of farmers	0.612
	Using radio and television agricultural programs (mass media)	0.583
	Holding educational workshops	0.569
	Using dissemination personal messengers	0.558
	Using the Internet and virtual networks	0.516
	Visiting new irrigation systems	0.506
Consequences	Increase in fake jobs	0.905
	Reduction of cultivated area	0.903
	Decrease in income	0.808
	Insecurity	0.795
	Increase in input prices	0.790
	Reducing the price of agricultural land	0.730
	Decrease in production	0.713
	Decreased quality of life	0.707
	Decrease in welfare	0.598
	Reduction of local communication among people	0.591
	Increase in unemployment rate and immigration	0.582
Requirements for extension drought management	Assessing the educational- dissemination needs of farmers	0.842
	Providing extension specialist human resources	0.652
	Reforming the organizational structures of extension	0.591
	Reforming the financial structures of extension organizations	0.462
	Increasing the professional qualifications of extension agents	0.411

Table 7. The measurement of the main model and the results of the hypotheses in the standard mode. Please check the numbers in this Table with the above text.

Variable	R^2	Path coefficient
Drought management (the dependent variable)	0.155	-
Detailed requirements of drought management	0.00	0.013
Extensional methods of drought management	0.00	0.033
Contextual conditions	0.00	0.1011
Supporting conditions	0.00	0.166
Conditions and causes	0.00	0.102
Consequences of drought	0.00	0.065

Table 8. The measurement of the original model and the results of the hypotheses in the standard mode.

Variable	T values
Drought crisis management (The dependent variable)	-
Detailed requirements of drought crisis management	4.874
Extensional methods of drought crisis management	2.207
Contextual conditions	2.094
Supporting conditions	4.661
Conditions and causes	4.812
Consequences of drought	2.029

value of T should be significant at the error level of 0.05, that is, if its value is outside the range (1.96 and -1.96), the effect of this component is significant. Based on the listed results, all paths are significant (Table 8).

Table 9 shows the factor loading values to answer the question of whether the questions to measure the variables are chosen correctly or not. To have the appropriate accuracy, the factor loading should be higher than 0.4. Based on the results listed in Table 9, most factor loadings are greater than 0.4.

Table 10 shows the T values of the indicators used for the structures. For each indicator to be significant, the value of T is significant at the error level of 0.05, that is, its value is outside the range (1.96 and -1.96), and thus, this indicator correctly measures the desired component. Based on the results shown in Table 10, all the indicators used are significant.

The effect of the independent variable on the dependent variables is depicted in Table 11. The significance coefficient (t-statistic) of the output model of SEM was used to test the research hypotheses. If the t-statistic was more than 1.96 or less than -1.96 (with a 5% error level), the hypotheses would be confirmed, and the significant effect of the variable would be achieved. It can also be seen in the measurement model that the factor coefficient for each variable is higher than the value of 0.50%. Table 11 presents a summary of the results of hypothesis testing.

Table 12 presents Composite Reliability (CR), coefficient of determination (R^2), Cronbach's Alpha, communality values, and communal reliability (AVE) for the main components of the research.

To check the model's fit in PLS, we used the global quality criterion proposed by Amato *et al*. (2004).

$$\text{GOF} = \sqrt{\overline{communality} \times \overline{R^2}}$$

The index of Fit Of the General model (Goodness-of-Fit Index for PLS Structural Equation Modeling (GOF) was 0.568%, so, it can be accepted that the general model of the research has a good fit. The high fit of the model shows that this model is well explained (Table 13).

DISCUSSION

Agricultural sector requires specific adaptation to cope with water scarcity and drought (Yazdanpanah *et al*., 2015; Delphian, 2016). To address this challenge, an extension model should be designed based on local needs, culture, local language, and appropriate communication methods in each region to mitigate the negative impacts of these changes (Ifeanyi-obi *et al*., 2012; Engle, 2011).

Due to the level of knowledge and low adaptation to the phenomenon of drought, developing countries are more affected by the risks associated with it than other regions (Xenarios *et al*., 2016). There are many reasons for this, including the lack of access to water and extension specialists, lack of practical solutions for drought management and lack of extensional recommendations in drought management Also, the results of studies indicate an increase in the number of droughts in Iran (Firoozi *et al*., 2019) In this

Table 9. The measurement of the final model in the standard mode.

Variable	Sign	Factor loading	Correlation coefficient
Drought management (The dependent variable)	Critical	1.00	--
Extensional methods of drought crisis management	M1	0.498	0.560
	M2	0.569	
	M3	0.612	
	M4	0.320	
	M5	0.506	
	M6	0.516	
	M7	0.622	
	M8	0.715	
	M9	0.573	
	M10	0.396	
	M11	0.583	
	M12	0.658	
Contextual conditions	AR1	0.407	0.170
	AR2	0.525	
	AR3	0.494	
	AR4	0.731	
	AR5	0.498	
	AR6	0.557	
	AR7	0.435	
	AR8	0.677	
	AR9	0.671	
	AR10	0.438	
	AR11	0.508	
	AR12	0.493	
Supporting conditions	MD1	0.571	0.167
	MD2	0.675	
	MD3	0.424	
	MD4	0.447	
	MD5	0.669	
	MD6	0.538	
	MD7	0.448	
	MD8	0.420	
	MD9	0.497	
Causal conditions	F1	0.460	0.440
	F2	0.802	
	F3	0.447	
	F4	0.455	
	F5	0.462	
	F6	0.408	
	F7	0.505	
	F8	0.446	
	F9	0.477	
	F10	0.471	
	F11	0.461	
	F12	0.595	
	F13	0.584	
	F14	0.776	

Table 9 continued…

Continued of Table 9

Variable	Sign	Factor loading	Correlation coefficient
Drought management (The dependent variable)	Critical	1.00	--
Consequences	CH1	0.808	0.001
	CH2	0.906	
	CH3	0.591	
	CH4	0.571	
	CH5	0.795	
	CH6	0.707	
	CH7	0.490	
	CH8	0.682	
	CH9	0.733	
	CH10	0.598	
	CH11	0.713	
	CH12	0.903	
	CH13	0.510	
	CH14	0.833	
	CH15	0.742	
	CH16	0.601	

Table 10. The measurement of the final model and the results of the hypotheses in the significant state.

Variable	Sign	T value	Correlation coefficient
Drought management (Dependent variable)	Critical	1.00	--
Extensional methods of drought management	M1	3.463	2.428
	M2	3.552	
	M3	3.877	
	M4	3.285	
	M5	2.485	
	M6	2.270	
	M7	2.706	
	M8	2.592	
	M9	2.272	
	M10	2.928	
	M11	3.862	
	M12	0.588	
Contextual conditions	AR1	2.681	2.248
	AR2	2.329	
	AR3	4.399	
	AR4	2.270	
	AR5	2.168	
	AR6	3.043	
	AR7	3.359	
	AR8	2.866	
	AR9	2.678	
	AR10	2.176	
	AR11	3.327	
	AR12	2.027	
Supporting conditions	MD1	3.523	2.931
	MD2	2.329	
	MD3	3.983	
	MD4	3.399	
	MD5	2.844	
	MD6	2.206	
	MD7	3.305	
	MD8	4.597	
	MD9	2.346	

Table 10 continued…

Continued of Table 10

Variable	Sign	T value	Correlation coefficient
Drought management (Dependent variable)	Critical	1.00	--
Causal conditions	F1	3.038	3.719
	F2	3.141	
	F3	2.211	
	F4	3.997	
	F5	2.010	
	F6	3.933	
	F7	2.160	
	F8	4.757	
	F9	2.960	
	F10	3.951	
	F11	2.110	
	F12	2.160	
	F13	1.035	
	F14	2.138	
Consequences	CH1	4.044	2.008
	CH2	3.634	
	CH3	3.107	
	CH4	2.760	
	CH5	3.137	
	CH6	2.682	
	CH7	2.161	
	CH8	2.935	
	CH9	2.751	
	CH10	2.557	
	CH11	3.358	
	CH12	3.747	
	CH13	2.213	
	CH14	4.112	
	CH15	3.512	
	CH16	2.811	

Table 11. A summary of hypotheses testing results.

Hypotheses	Path coefficient	Significance coefficient	Result
Main hypothesis: Drought-adapted extension requirements affect agricultural drought management.	0.113	4.874	Confirmed
The first hypothesis: Extension methods affect the management of agricultural drought.	0.550	2.428	Confirmed
The second hypothesis: Contextual conditions affect the management of agricultural drought.	0.170	2.248	Confirmed
The third hypothesis: Causal conditions affect the management of agricultural drought.	0.440	3.719	Confirmed
The fourth hypothesis: The consequences of drought affect the management of agricultural drought.	0.001	2.008	Confirmed
The fifth hypothesis: Management policies affect the management of agricultural drought.	0.167	2.931	Confirmed

case, there is a need for adaptation and drought management by farmers. The decision-making process around adaptation is complex (Bunham and Ma, 2016; Harmer and Rahman, 2014) and includes a wide and interconnected range of socio-political, social and environmental factors. Weather, its intensity and the level of confidence of farmers about receiving yield due to adaptation are closely related (Tucker *et al*.,

Table 12. The general model's quality criteria.

Research components	Composite Reliability (CR)	Coefficient of determination (R^2)	Cronbach's Alpha	Communal values (Communality)	Shared reliability (AVE)
Methods of extension drought management	0.76	0.58	0.84	0.49	0.43
Support policies	0.80	0.54	0.82	0.41	0.46
Contextual conditions	0.59	0.74	0.75	0.45	0.49
Causal conditions	0.71	0.83	0.88	0.31	0.54
Consequences	0.64	0.55	0.90	0.42	0.52
Background conditions	0.75	0.71	0.79	0.27	0.48
Drought management	1	--	1	1	1

Table 13. The final model's fit.

Index name	R^2	Communality
Methods of extension drought management	0.58	0.49
Consequences	0.63	0.52
Drought support policies	0.54	0.41
Background conditions	0.74	0.45
Causal conditions	0.83	0.31

2011; Anik *et al*., 2012). People's participation in the adaptation of drought management is one of the necessary things in the success of programs in this field (Wani *et al.,* 2013). Publication of magazines, brochures, books, guidelines and extension books about new methods of irrigation with traditional and old methods and comparing them in a demonstration for a group of farmers. Holding extension meetings in the presence of water and extension experts, extension exhibitions (new irrigation tools and methods) and extension films and videos about new irrigation methods, farmers visits to the office of the Agricultural Extension Service, visit of agricultural extension workers to the farmers, interaction with consulting service companies and extension organizations (Al-Zahrani *et al*., 2016). These activities are aimed at addressing informational and educational needs related to drought management (Harvey *et al*., 2014; Singh *et al*., 2017; Tripathi and Mishra, 2017). Such as to create these conditions need to Existence of extension specialists and access to them, Expansion of social networks and local networks to disseminate information.

Also, formation of agricultural cooperatives and water bodies in order to create irrigation groups, providing facilities in the field of extension services, supportive policies in low water consumption (Cheng and Tao, 2010; Eriksen and Silva, 2009; Keshavarz and Karami, 2013). It can help a lot to establish an extension model that is compatible with the management of drought. In the end, it can be said that the establishment of this extension model can include the followings:

- Increasing the resilience of farmers in dealing with drought,
- Access to meteorological and drought information,
- Access to drought management information,
- Increasing participation of farmers in drought management.

Figure 1 shows extension model compatible with drought management in Iran.

Based on the results, it is recommended to involve knowledgeable agricultural extension experts in providing the necessary training and technical advice to farmers. It will be helpful to establish constructive communication between farmers and extension agents through social networks to address the existing water-related issues and convey them to the relevant authorities for appropriate solutions. Also, the importance of water and the impact of water scarcity challenges on economic, social, and security sectors should be recognized. Additionally, it is necessary to prioritize this issue as a

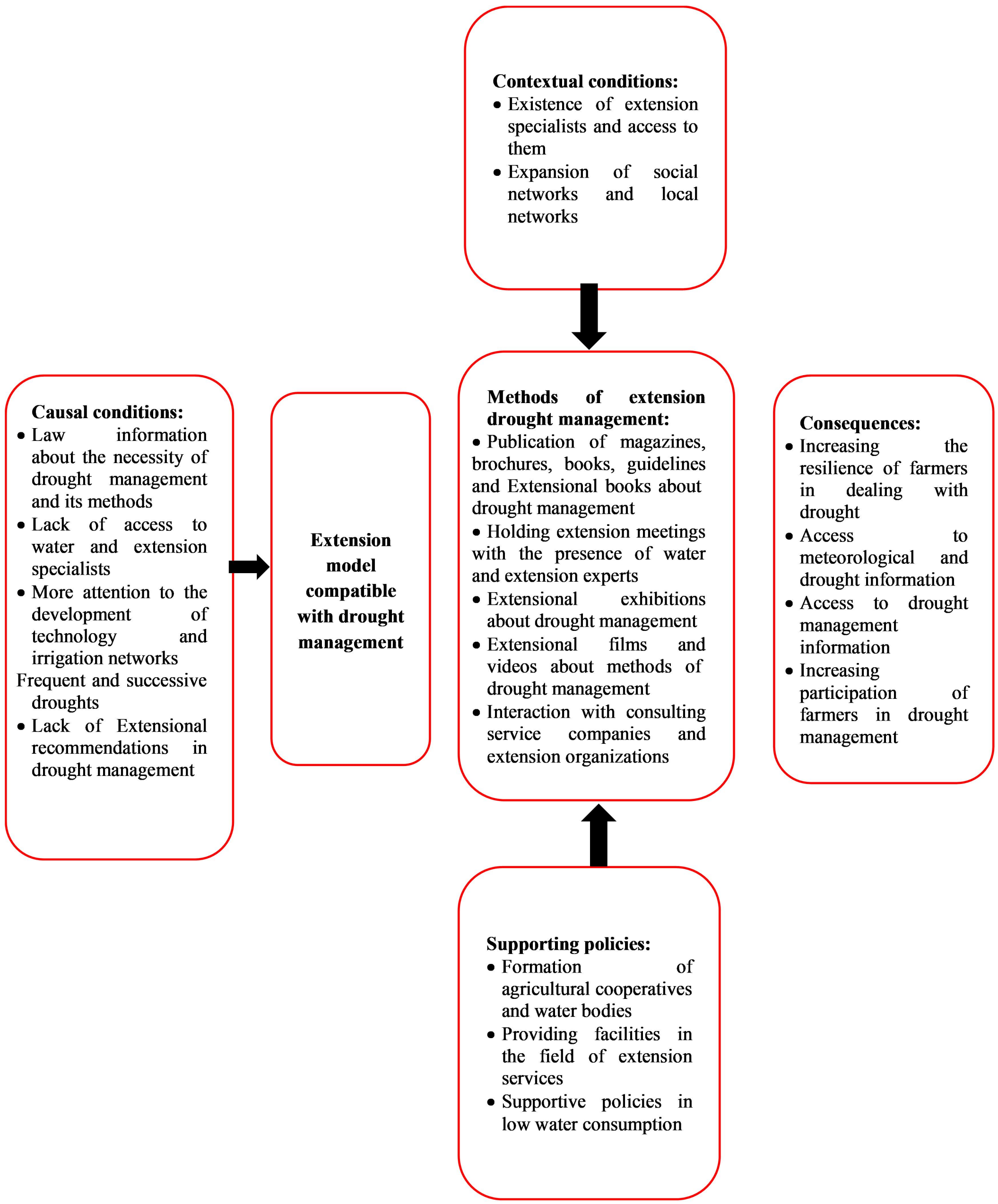

Figure 1. The final extension model compatible with drought crisis management.

fundamental strategy in the annual budget and Iran's Seventh Development Plan. Last but not least, it is recommended that the government supports farmers through facilities such as low-interest loans and subsidies to assist in implementing adaptation strategies and drought management.

REFERENCES

1. Abedi Sarvestani, A., Ghorbani, Kh., and Khaksar Moghadam, G. 2017. Investigating Methods of Coping with Drought by Farmers (Case Study: Shirvan city, North Khorasan Province). *J. Geogr. Environ. Sustain*., **8(3):** 13-31.
2. ACC (American Commodity Company). 2016. *Facts About California Rice Production*. As reported in the October 2016 Environmental Sustainability Report prepared by the California Rice Commission. https://www.accrice.com/facts-about-california-rice-production
3. Aitkenhead, I., Kuleshov, Y., Watkins, A. B., Bhardwaj, J. and Asghari, A. 2021. Assessing Agricultural Drought Management Strategies in the Northern Murray–Darling Basin. *Natural Hazards*, **109(2):** 1425-1455.
4. Alam, G. M., Alam, K. and Mushtaq, S. 2016. Influence of Institutional Access and Social Capital on Adaptation Decision: Empirical Evidence from Hazard-Prone Rural Households in Bangladesh. *Ecol. Econ.,* **130:** 243-251.
5. Al-Zahrani, K. H., Aldosari, F. O., Baig, M. B., Shalaby, M. Y. and Straquadine, G. S. 2016. Role of Agricultural Extension Service in Creating Decision Making Environment for the Farmers to Realize Sustainable Agriculture in Al-Qassim and Al-Kharj Regions -Saudi Arabia. *J. Anim. Plant Sci.,* **26(4):** 1063-1071
6. Amato, P. R. 2004. Tension between Institutional and Individual Views of Marriage. *J. Marriage Fam.,* **66(4):** 959-965.
7. Anik, S. I., Khan, M. A. S. A. 2012. Climate Change Adaptation Through Local Knowledge in the North Eastern Region of Bangladesh. Mitig Adapt Strateg Glob Change 17, 879–896. https://doi.org/10.1007/s11027-011-9350-6
8. Azadi, H., Verheijke, G. and Witlox, F. 2011. Pollute First, Clean up Later? *Glob. Planet. Change,* **78(3-4):** 77-82.
9. Azari, H, Talebi, M. and Abri, M. 2017. Promoting Concepts Related to Drought Management Using New Media. *J. Foreign. Lang. Dev. Learn.*, **9(5):** 101-112.
10. Bagheri, M., Nik Nami, M. and Shabanali Femi, H. 2017. The Role of Agricultural Extension in the Application of Drought Management Operations (Case Study: Tafarsh City). *J. Desert Manage.*, 9: 46-57.
11. Burnham, M., and Ma, Z. 2016. Linking Smallholder Farmer Climate Change Adaptation Decisions to Development. *Climate and Development*, **8(4)**: 289-311.
12. Campbell, D., Barker, D. and McGregor, D. 2011. Dealing with Drought: Small Farmers and Environmental Hazards in Southern St. Elizabeth, Jamaica. *Appl. Geogr*., **31(1):** 146-158.
13. Carey, C. 2008. E051 Governmental Use of Voluntary Standards Case Study 6: Kenya and the KenyaGAP Standard for Good Agricultural Practice. ISEAL Alliance.
14. Chen, D., Wang, S., Cao, B., Cao, D., Leng, G., Li, H. and Deng, X. 2016. Genotypic Variation in Growth and Physiological Response to Drought Stress and Re-Watering Reveals the Critical Role of Recovery in Drought Adaptation in Maize Seedlings. *J. Front. Plant Sci.*, **6**: 1-15.
15. Cheng, J. and Tao, J. P. 2010. Fuzzy Comprehensive Evaluation of Drought Vulnerability Based on the Analytic Hierarchy Process: An Empirical study from Xiaogan City in Hubei Province. *Agric. Agric. Sci. Procedia,* **1**: 126-135.
16. Chipatu, L. 2017. Environmental Learning for Coping with Drought Among Small Scale Farmers of Luangwa District, Zambia (Doctoral dissertation, The University of Zambia).
17. Creswell, J. W. and Creswell, J. D. 2017. *Research Design: Qualitative, Quantitative,*

and Mixed Methods Approaches. 4th Edition, Sage Publication, Newbury Park.
18. De Silva, M. M. G. T. and Kawasaki, A. 2018. Socioeconomic Vulnerability to Disaster Risk: A Case Study of Flood and Drought Impact in a Rural Sri Lankan Community. *Ecol. Econ*., **152:** 131-140.
19. Delphian, F., Yazdanpanah, M., Forozani, M. and Yaghoubi, J. 2016. Investigating Farmers' Management Behaviors during Drought as Preventive Responses (Case Study: Dehloran City). *J. Spatial Anal. Environ. Hazards,* **4(4):** 79-92. (in Persian)
20. Deressa, T. T. 2010. Assessment of the Vulnerability of Ethiopian Agriculture to Climate Change and Farmers' Adaptation Strategies. Doctoral Dissertation, University of Pretoria.
21. Desalegn, C. E., Babel, M. S., Gupta, A. D., Seleshi, B. A. and Merrey, D. 2006. Farmers' Perception of Water Management under Drought Conditions in the upper Awash Basin, Ethiopia. *Int. J. Water Resour. Dev.*, **22(4):** 589-602.
22. Engle, N. L. 2011. Adaptive Capacity and Its Assessment. *Glob. Environ. Change*, **21(2):** 647-656.
23. Eriksen, S. and Silva, J. A. 2009. The Vulnerability Context of a Savanna Area in Mozambique: Household Drought Coping Strategies and Responses to Economic Change. *Environ. Sci. Policy*, **12 (1):** 33-52.
24. Fal Suleiman, M., Mekaniki, J. and Senjeri, H. 2013. The Inspection of Social Consequences of Drought in Rural Regions Case Study: Shoosf District of Nehbandan County. *Khorasan Soc. Cult. Stud.*, **8(4):** 111-127. (in Persian).
25. Fanni, Z; Khalilulallahi, H. A., Sajjadi, J. and Fall Soleiman, M. 2016. Analysis of the Causes and Consequences of Drought in South Khorasan Province and Birjand. *J. Plan. Space Design,* **20(4):** 175-200. (in Persian)
26. FAO, IFAD, UNICEF, WFP and WHO. 2017. *The State of Food Security and Nutrition in the World 2017. Building Resilience for Peace and Food Security*. Rome, FAO. https://openknowledge.fao.org/server/api/core/bitstreams/5bc8dad9-a192-439f-827b-354acc9653de/content
27. FAO. 2012. *Citrus Fruit Fresh and Processed Annual Statistics.* https://www.fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Citrus/Documents/CITRUS_BULLETIN_2012.pdf
28. Fatahi, M. H. and Behrouzi, M. 2016. The Application of Water Governance Management Model in Urban Wastewater Use Planning by Farmers. *J. Urban Plan. Dev.*, **8(31):** 299-319.
29. Feola, G., Lerner, A. M., Jain, M., Montefrio, M. J. F. and Nicholas, K. A. 2015. Researching Farmer Behaviour in Climate Change Adaptation and Sustainable Agriculture: Lessons Learned from Five Case Studies. *J. Rural Stud.*, **39:** 74-84.
30. Firoozi F, Malakinezhad H, Nikpur N. 2023. Evaluation of Soil Salinity, Actual Evapotranspiration and Soil Moisture Using Remote Sensing (Case study: Herat Dry Region). *Water Resources Engineering Journal*. **15(55)**: 35-52
31. Firozjani, I. 2018. The Extension Model Compatible with Drought Management in Alborz Province; Iran. *Water Resour. Manag*., **15(2):** 229-251.
32. Ghambarali, R: Popzan, A. and Afsharzadeh, N. 2012. Analysis of Farmers' Perception of Climate Changes and Adaptation Strategies. *J. Rural Res.*, **3(11):** 192-213. (in Persian)
33. Gomez, C. M. G. and Blanco, C. D. P. 2012. Do Drought Management Plans Reduce Drought Risk? A Risk Assessment Model for a Mediterranean River Basin. *Ecol. Econ.*, **76:** 42-48.
34. Harmer, N., and Rahman, S. 2014. Climate Change Response at the Farm Level: A Review of Farmers' Awareness and Adaptation Strategies in Developing Countries. *Geography Compass*, **8(11)**: 808-822.
35. Harvey, C. A., Rakotobe, Z. L., Rao, N. S., Dave, R., Razafimahatratra, H., Rabarijohn, R. H. and MacKinnon, J. L. 2014. Extreme Vulnerability of Smallholder Farmers to Agricultural Risks and Climate Change in

Madagascar. *Phil. Trans. R. Soc. B*, **369:** 1-12.
36. Hayati, D., Ranjbar, Z. and Karami, E. 2011. Measuring Agricultural Sustainability. In: "*Biodiversity, Biofuels, Agroforestry and Conservation Agriculture",* (Ed.): Lichtfouse, E., Springer, PP. 73-100.
37. Heydari Sarban, V. 2011. Investigating the Social and Economic Factors Affecting the Knowledge of Wheat Farmers about Agricultural Water Management (Case Study: Meshkinshahr City). J. *Agric. Ext. Educ. Res*., **4(4):** 96-111. (in Persian)
38. Hosseinizare, N. and Saadati, N. 2017. Quantitative and Qualitative Monitoring of Gregar River in Drought 87-86 in Khuzestan Province. *First international Conference on Water Crisis, Hamoon International Wetland Research Institute, Zabul University, Zabul,* **12 PP.**
39. Hosseinzad, J. Kazimieh, F. Javadi, A. and Ghafouri, H. 2012. Agricultural Water Management Basis and Mechanisms in Tabriz Plain. *J. Soil Water Knowl.,* **23(2):** 85-98. (in Persian).Ifeanyi-Obi, C. C., Etuk, U. R. and Jike-Wai, O. 2012. Climate Change, Effects and Adaptation Strategies; Implication for Agricultural Extension System in Nigeria. *Green. J. Agric. Sci*., **2(2):** 53-60.
40. IPCC (The Intergovernmental Panel on Climate Change). 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change: 582. Cambridge University Press.
41. Johnson, R. B. and Onwuegbuzie, A. J. 2004. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educ. Res.*, **33(7):** 14-26.
42. Keshavarz, M. and Karami, E. 2010. Structures Affecting Farmers' Drought Management and Its Consequences (Use of Structural Equation Modeling). *J. Agric. Sci. Technol.,* **43(12):** 267-283
43. Keshavarz, M. and Karami, E. 2013. Institutional Adaptation to Drought: The Case of Fars Agricultural Organization. *J. Environ. Manage.*, **127**: 61-68.
44. Keshavarz, M., Karami, E. and Vanclay, F. 2013. Social Experience of Drought in Rural Iran. *Land Use Policy*, **30(1):** 120-129.
45. Kheyri, R., Mojarrad, F., Masompour, J. and Farhadi, B. 2021. Evaluation of Drought Changes in Iran Using SPEI and SC-PDSI. *J. Spat. Plan. Geomat.,* **25(1)**: 143-174. (in Persian)
46. Khorambakht, A. A., Moshiri, R. and Mahdavi, M. 2013. Evaluation of Climatic Drought Characteristics in Larestan Region. *J. Region. Plan.* **4(13):** 103-120. (in Persian)
47. Kiem, A. S. and Austin, E. K. 2013. Drought and the Future of Rural Communities: Opportunities and Challenges for Climate Change Adaptation in Regional Victoria, Australia. *Glob. Environ. Change*, **23(5):** 1307-1316.
48. Levidow, L., Zaccaria, D., Maia, R., Vivas, E., Todorovic, M. and Scardigno, A. 2014. Improving Water-Efficient Irrigation: Prospects and Difficulties of Innovative Practices. *Agric. Water Manag.*, **146:** 84-94.
49. Li, G., Long, Z., Jiang, Y., Huang, Y., Wang, P. and Huang, Z. 2022. Entrepreneurship Education, Entrepreneurship Policy and Entrepreneurial Competence: Mediating Effect of Entrepreneurship Competition in China. *Educ. Train.*, **65(4):** 607-629.
50. Lottering, S. J., Mafongoya, P. and Lottering, R. 2021. The Impacts of Drought and the Adaptive Strategies of Small-Scale Farmers in uMsinga, KwaZulu-Natal, South Africa. *J. Asian Afr. Stud.*, **56(2)**: 267-289.
51. Mahboubi, M. R., Esmaili I, M. and Yaqoubi, J. 2011. Impeding and Facilitating Factors Influencing on Using New Irrigation Methods by Farmers: Case of West Boshroyeh Township in Southern Khorasan. *Water Irrig. Manag.*, **1(1):** 87-98. (in Persian)
52. Mardy, T. Uddin, M. N. Sarker, M. A. Roy, D. and Dunn, E. S. 2018, Assessing Coping Strategies in Response to Drought: A Micro-Level Study in the NorthWest Region of Bangladesh, *Climate*, **6(2):** 1-18.

53. Mfitumukiza, D., Barasa, B., Kiggundu, N., Nyarwaya, A. and Muzei, J. P. 2020. Smallholder Farmers' Perceived Evaluation of Agricultural Drought Adaptation Technologies Used in Uganda: Constraints and Opportunities. *J. Arid Environ.,* **177:** 104137.
54. Mousavi, S. and Niknami, M., 2021. Explaining the Driving Policies of Drought Management: the Case Study of Tehran Province. Strategic Studies of Public Policy, **11(40)**: 132-153.
55. Mousavi, A., Zarei, M. R., Asadi, M., and Ataei, M. 2021. Extension Model Compatible with Drought Management in Razavi Khorasan Province, Iran. *Water Resour. Manag.*, **18(6):** 155-169.
56. Movahedii, Saeed, Asakareh, Hossein, Sabzi Parvar, Ali Akbar, Masoudian, Abolfazl, and Merianji, Zahra. 2012. Investigating Changes in the Seasonal Pattern of Rainfall in Hamadan Province. *Geogr. Res*, **28(2):** 33-47.
57. Naderi, L. and Karami Dehkordi, I. 2019. Impact of the BeheshtAbad Dam Construction on the households' Livelihood Strategies of Local Communities. *J. Spat. Plan. Geomat.,* **23(1):** 25-51. (in Persian)
58. Nicholas, K. A. and Durham, W. H. 2012. Farm-Scale Adaptation and Vulnerability to Environmental Stresses: Insights from Winegrowing in Northern California. *Glob Environ. Change*, **22(2):** 483-494.
59. Nilsen, P., Nordström, G. and Ellström, P. E. 2012. Integrating Research-Based and Practice-Based Knowledge through Workplace Reflection. *J. Workplace Learn*, **24(6):** 403-415.
60. Ommani, A. R. 2011. Affecting Factors on Adoption of Sustainable Water Resources Management in Agriculture. *Res. J. Environ. Sci.*, **5(1):** 36-48.
61. Poortaheri, M., Eftekhari, A. and Kazemi, N. 2013. The Role of Drought Risk Management Approach in Reducing Social-Economic Vulnerability of Farmers and Rural Regions Case Study: Sulduz Rural District. Azarbaijan Gharbi, *J. Rural Res.*, 4 (1): 1-22.
62. Pouralimoghaddam, S., Zare Mehrjerdi M. R., Amirtaimoori, S. and Naghavi S. 2021. Investigating the Effect of Knowledge Based Economy Components on Water Productivity and Consumption in Iran's Agricultural Sector. *Irrig. Water Eng.,* **11(3):** 305-318. (in Persian)
63. Pozzi, W., Sheffield, J., Stefanski, R., Cripe, D., Pulwarty, R., Vogt, J. V. and Van Dijk, A. I. 2013. Toward Global Drought Early Warning Capability: Expanding International Cooperation for the Development of a Framework for Monitoring and Forecasting. *Bull. Am. Meteorol. Soc.*, **94(6):** 776-785.
64. Qiu, H. J., Zhu, W. B., Wang, H. B. and Cheng, X. 2007. Analysis and Design of Agricultural Sustainability Indicators System. *Agric. Sci. China*, **6(4):** 475-486.
65. Rahimi, M., Pourmohammadi, M. R., Mohammadi, A. and Mehdipour, F. 2019. Development of Extension Model for Drought Management in Iran. *J. Agric. Educ.*, **14(4):** 123-138.
66. Rahimian, M. 2015. Factors Affecting the Sustainable Management of Water Resources among Irrigated Wheat Farmers in Kohdasht City. *Iran. Agric. Ext. Educ. J.,* **12(2):** 233-247. [in Persian with English Abstract]
67. Rahman, M. H. and Alam, K. 2016. Forest Dependent Indigenous Communities' Perception and Adaptation to Climate Change through Local Knowledge in the Protected Area- A Bangladesh Case Study. *Climate,* **4(1):** 1-25.
68. Rezadoost, B. and Allahyari, M. S. 2014. Farmers' Opinions Regarding Effective Factors on Optimum Agricultural Water Management. *J. Saud. Soc. Agric. Sci.,* **13(1):** 15-21.
69. Sabir, N., Riazuddin, S. A., Kaul, H., Iqbal, F., Nasir, I. A., Zafar, A. U. and Riazuddin, S. 2010. Mapping of a Novel Locus Sssociated with Autosomal Recessive Congenital Cataract to Chromosome 8p. *Mol. Vis.*, 16: 2911.
70. Saifi, B. and Drake, L. 2008. A Co-Evolutionary Model for Promoting Agricultural Sustainability, *Ecol. Econ*., **65(1):** 24-34.
71. Sangpenchan, R. 2011. Vulnerability of Thai Rice Production to Simultaneous

Climate and Socioeconomic Change: A Double Exposure Analysis. Abstract ID. GC11A-0903, Fall Meeting 2011, American Geophysical Union.
72. Savari, M. and Eskandari Damaneh, H. 2019. The Role of Participatory Management in Empowering Local Communities in Coping with Droughts in Southern Kerman Province. *J. Spat. Plan.*, **23(2):** 123 -171.
73. Shabanali Fami, H., Savari, M., Motaghed, M., Mohammadzadeh Nasrabadi, M., Afshari, S. and Baghaee, M. 2020. Formulating and Analysis of Adaptation Strategies of Farmers to Drought Conditions in Isfahan Province Using TOWS Matrix. *J. Spat. Plan.*, **24(1):** 21 - 47.
74. Shahmohammadi, Z., Haghighatjoo, P. and Afrasiab, P. 2001. Determining Droughts and Droughts Based on Long-Term Annual Rainfall Statistics in Iran. The First National Conference on Mitigation of Water Crises, 8 PP.
75. Shakouri, A. and Merseli, I. 2018. Study of the Impact of Climate and Environmental Factors on Promoting Water Productivity in Rural Communities. *J. Spat. Plan. Manage.*, **23(2):** 47-73.
76. Singh, R.K., Zander, K.K., Kumar, S., Singh, A., Sheoran, P., Kumar, A. and Padung, E. 2017. Perceptions of Climate Variability and Livelihood Adaptations Relating to Gender and Wealth among the Adi Community of the Eastern Indian Himalayas. *Appl. Geogr.,* **86:** 41-52.
77. Smit, B. and Pilifosova, O. 2003. Adaptation to Climate Change in the Context of Sustainable Development and Equity. *J. Sustain. Dev.,* **8(9):** 9.
78. Solh, M. and van Ginkel, M. 2014. Drought Preparedness and Drought Mitigation in the Developing World's Drylands. *Weather Clim. Extrem.,* **3**: 62-66.
79. Strauss, A. and Corbin, J. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 2nd Edition, Inc., Sage Publications, Thousand Oaks, CA.
80. Tavakoli, J., Almasi, H. and Qochi, P. 2015. Investigation and Analysis of Drought Adjustment Strategies in Kermanshah Province. *J. Rural Res.*, **7(1):** 217-241.
81. Teisman, G., van Buuren, A., Edelenbos, J. and Warner, J. 2013. Water Governance: Facing the Limits of Managerialism, Determinism, Water-Centricity, and Technocratic Problem-Solving. *Int. J. Water Gov.*, **1(1-2):** 1-11.
82. Thieme, S. 2006. *Social Networks and Migration: Far West Nepalese Labour Migrants in Delhi*. Series on Culture, Society, Environment, Vol. 7, LIT Publishing House, Münster-Hamburg-London, 270 PP.
83. Tripathi, A. and Mishra, A. K. 2017. Knowledge and Passive Adaptation to Climate Change: An Example from Indian Farmers. *Clim. Risk Manag.*, **16**: 195- 207.
84. Tucker, S. S., Craine, J. M., and Nippert, J. B., 2011. Physiological Drought Tolerance and the Structuring of Tallgrass Prairie Assemblages. *Ecosphere*, **2(4)**: 1-19.
85. Udayakumara, E. P. N., Shrestha, R. P., Samarakoon, L. and Schmidt-Vogt, D. 2010. People's Perception and Socioeconomic Determinants of Soil Erosion: A Case Study of Samanalawewa Watershed, Sri Lanka. *Int. J. Sediment Res.,* **25(4):** 323-339.
86. Wani, R. A., Sheema, S., Dar, N. A., Angchuk, S., and Parray, G. A., 2013. Irrigation Regimes Effecting Drought Tolerance of Grape Rootstocks Under Cold Arid Conditions. *International Journal of Science and Technology Research*, **2**: 113-117.
87. Werkheiser, I. and Piso, Z. 2015. People Work to Sustain Systems: A Framework for Understanding Sustainability. *J. Water Resour. Plan. Manag.*, **141(12):** 315.
88. Xenarios, S. Nemes, A. Sarker, G. W. and Sekhar, N. U. 2016. Assessing Vulnerability to Climate Change: Are Communities in Flood-Prone Areas in Bangladesh More Vulnerable than Those in Drought-Prone Areas Are?. *Water Resour. Rural Dev.*, **7(2):** 1- 19.
89. Yazdanpanah, M., Forouzani, M and Zobeidi, T. 2015. A Typology of Iranian Farmer Perceptions of Climate change:

Application of the Q Methodology. *Proceedings of 31st Q Conference*, Università Politecnica Delle Marche: 121-123. Ancona. Italy.
90. Zarafshani, K., Sharafi, L., Azadi, H., & Van Passel, S. 2016. Vulnerability assessment Models to Drought: Toward a Conceptual Framework. *Sustainability,* **8(6):** 588.
91. Zarafshani, K., Sharafi, L., Azadi, H., Hosseininia, G., De Maeyer, P. and Witlox, F. 2012. Drought Vulnerability Assessment: The Case of Wheat Farmers in Western Iran. *Glob. Planet Change,* **98**: 122-130.

یک مدل ترویجی سازگار با مدیریت خشکسالی در ایران

جلال محمودزاده، محمدصادق صبوری، مهرداد نیکنامی، و الهام دانایی

چکیده

هدف اصلی این تحقیق، طراحی یک مدل ترویجی سازگار با مدیریت خشکسالی در ایران بود. این تحقیق از رویکرد تحقیق ترکیبی، شامل تلفیق روش‌های کیفی و کمی، استفاده کرد. در بخش کیفی، داده‌ها از طریق مصاحبه‌های نیمه‌ساختاریافته، مشاهده و بررسی منابع مرتبط جمع‌آوری شد. شرکت‌کنندگان در این بخش، ۱۵ نفر از کارشناسان ترویج با تجربه قابل توجه در مدیریت خشکسالی بودند که از طریق روش‌های نمونه‌گیری هدفمند و گلوله برفی انتخاب شدند. داده‌ها با استفاده از رویکرد نظریه زمینه‌ای سیستماتیک با نرم‌افزار MAXQUDA10، مطابق با رویکرد(1998) Strauss and Corbin ، تجزیه و تحلیل شدند. در بخش کمی، جامعه آماری شامل کارشناسان، مربیان و اساتیدی بود که رشته یا پست سازمانی آنها مرتبط با منابع آب، آبیاری و زهکشی، ترویج و توسعه کشاورزی و خشکسالی بود و به صورت تمام وقت در وزارت جهاد کشاورزی مشغول به کار بودند .(N= 6018) حجم نمونه با استفاده از فرمول کوکران، در مجموع ۳۷۲ نفر تعیین شد. برای تجزیه و تحلیل داده‌ها از مدل‌سازی معادلات ساختاری (SEM) و نرم‌افزار PLS استفاده شد. نتایج نشان داد که اجزای اصلی مدل شامل الزامات تفصیلی مدیریت خشکسالی (ضریب ۰.۰۱۳)، روش‌های ترویجی مدیریت خشکسالی (۰.۰۳۳)، شرایط زمینه‌ای (۰.۱۰۱۱)، شرایط پشتیبان (۰.۱٦٦)، شرایط و علل (۰.۱۰۲) و پیامدهای مدیریت خشکسالی (۰.۰٦٥) بودند. در نهایت، یک مدل ترویجی سازگار با مدیریت خشکسالی در ایران ارائه شد.