In the Name of Allah

Author Guidelines

To prevent delays in publication, authors should follow these guidelines:

1. The submitted article should not have been published in any local or foreign publications or foreign collection of articles.

2. English articles should be typed in narrow Times New Roman 11 in Microsoft Word format. Articles should be printed on A4 papers (with 3 centimeters spacing from top, 2 cm from below, 2 cm from right and 2 cm from left). Line spacing should be single.

3. The size of the article should not exceed approximately 9500 words or at most 15 printed pages of the size of the publication and at least 15 pages (including tables, figures, abstract and sources list).

4. For articles, the title including word spacing shouldn't exceed 60 words.

5. The author name of the article with the pen name of bold Times New Roman 10, his academic title or job is also marked with narrow Times New Roman 10 and in the case of several authors with the number specified. Moreover, the Email address and telephone number of the corresponding author should be mentioned as footnote.

6. Structured abstracts for article with Times New Roman 10 is one-column.

7. Figures and Charts in the article must be original and have a high quality. The original file of the figures should be sent in Excel, Word or PDF format with a resolution of 300 dpi. The font size, especially for curves (legend), should be big enough to be legible after the sizes are decreased for printing.

8. The structure of the article includes the following elements:

8 -1. Title page: in the identification page, title of the article, name and surname of the author(s), scientific rank, full address (postal code, telephone and fax numbers and email address), location of the research, person in charge for the article and date of sending the article should be mentioned. Corresponding author's name should be specified with a star mark.

8-2. Abstract: includes Structured abstracts (include: Purpose, Methodology, Finding, Practical implications, Original/value) of the article and keywords (3 to 6 words). The abstract should not exceed 300 words and should give a summary of the introduction, method of the research, findings and conclusion. In addition to the structured abstract, it is necessary to have a Persian extended abstract with 750 to 1000 words and include introduction, theoretical framework, methodology, discussion, conclusion and keywords in a way that contains information from the whole article and can be printed separately. Due to the fact that the article will be returned later in English, there is no need to translate the abstract into English.

8-3. Introduction: includes necessity of doing the research, unanswered questions about topics of the article and purpose of the research and the method of article for answering them.

8-4. Research theoretical literature: includes scientific descriptions, latest theories and scientific discussions related to the article's topic, viewpoints of the connoisseurs, background information and finally a conceptive model for the research.

8-5. Methodology of the research: includes designing the research, time and place of doing the research, samples under study, sampling method, and process of gathering data, measurement tools and methods of quantity and quality analysis.

8-6. Findings: presenting precise results of important findings according to scientific principles and using the required tables and charts.

8 -7. Discussion and conclusion: includes the effects and the importance of the findings of the research and those of similar researches emphasizing on the differences between them and the reasons for those differences, explains the article's potential to be universal and the scientific usage of the findings and presents necessary guidelines for continuing relative researches, conclusion, possible suggestions and recommendations.

8-8. Acknowledgment: be submitted before used resources and refrain from mentioning the doctor and engineer.

9. References: the references relied on should be mentioned both in the text and in the end of the article.

9-1. References in the body of the article should be mentioned in parenthesis (APA) with author or authors' name(s), year of the publication and page respectively. Reference to published works should be mentioned in the original language (Persian or English).
For example: (Woods, 2005, p.27).

9-2. In the end of the article, the sources used in the text should be presented in alphabetical order of the authors' surnames as below:
Sample:

- Bourne, L. S. (1981). *The geography of housing*. London: Edward Arnold.
- Turgat, H. (2001). Culture, continuity and change: Structural analysis of the housing pattern in squatter settlement. *Global Environment Research (GBER)*, *1*(1), 17-25.

9-3. Types of quotes (direct and indirect), quotes the content and materials from sources and references, in bold letters and using conventional markings, and the names of the owners of the works, the date and the number of pages of the references, immediately write in parenthesis.

10. Articles extracted from dissertations and master thesis with the name of supervisor, consultants and students are published together with the responsibility of the supervisor.

11. If an institute is in charge of the costs of the research or writing the article, should be noted in the section of acknowledgment.

12. Article Evaluation Method: Submitted papers that qualify for admission, articles are sent to referee's expert on that subject. Reviewer values, besides qualitative evaluation of articles, propose valuable strategies. The suggestions of the referees will be sent to the author in full, but without the referee's name.

13. The Journal reserves the right to reject or accept, as well as to edit the articles, and the articles will not be returned. The original of the articles will be rejected or canceled after three months from the journal archive collection and the Journal of Rural Research and Planning will have no responsibility in this regard.

14. If no response was received by the authors within one week, it means that they agree to the amendments that were made and to be published.

15. In order to submit an article, the esteemed author(s) should visit the publication Website of Journal of Research & Rural Planning   http://jrrp.um.ac.ir/ and send their articles after registration following the instructions given.

16. Dear authors, articles that are not prepared in accordance with the journal's format are returned to the author and will not be included in the evaluation process.

17. The essential files to send through the system are:

a) File Specification Authors: In the MS. Word environment contains names and authors specifications in Persian and English.

b) Main file of the article without specification: In the MS. Word environment contains the main text of the article without the names and authors' specifications.

c) Extended Abstract File: Includes Persian Abstract in the form of a file in the MS. Word environment.

18. More detailed and more precise terms are also provided in the Author's Guide to writing and submission of articles.

19. The article will be returned to English after a scientific evaluation and the author (s) will be obliged to translate it into editing centers and it will not be possible to submit a certificate of acceptance before the translation is completed. Therefore, it is recommended that Persian speakers prepare and submit their article in Persian language and follow the process of scientific evaluation and acceptance of its translation.

Scientific Advisers Journal

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Review Article

Analysis of Articles in the Journal of Rural Research and Planning (JRRP)

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Abstract

Purpose- Scientific papers are presented for benefit in journals. The studies are carried out academically and in accordance with the needs of society. Therefore, examining them is essential to journals and academics. This paper aims to analyze the articles of the Journal of Rural Planning and Research and the connection of these articles with the challenges and obstacles of rural development.

Design/methodology/approach- Scientometrics research was the basis of the current research. Scientometrics is defined as quantitatively studying science or measuring the quality and impact of research. As a field, Scientometrics uses statistical methods and techniques to quantify research and achievements to reveal the research development process and can be a tool for decision-making. The main themes include measuring research quality and impact, citation processes, mapping scientific fields, and using indicators in research policy and management. The method of collecting information was from libraries and the citation database in the "Publish or Perish" software program. The indexes of "Network Density", "Centrality Degree", "Betweenness Centrality", "Eigenvector" and "Clustering Coefficient", as well as "H-Index", were used in this study. Ravar Matrix was used to prepare the self-interaction matrix, and Ucinet and Gephi were used to analyze the indicators and make graphs. Also, the co-occurrence of the keywords of the articles was the basis for identifying the topics of the articles.

Findings- Journal of Rural Research and Planning (JRRP), has published 348 articles in 10 volumes and 35 issues. Authors such as Anabestani, Barghi and Rezvani had the highest number of connections in the collaboration network. On the other hand, researchers like Taghdisi, Anabestani, Afrakhteh and Bouzarjomehri are the most influential authors of the Journal. Moreover, the main topic of the papers is Economic Development in rural areas. According to the changes and evolution of the leading research topics, the issue of sustainable development has been one of the main research approaches in the last few years. After that, studies have been conducted more on sustainable livelihood development, connected with other topics .

Originality / value- Neglecting social and cultural challenges seems to be the common shortcomings of rural research besides rural development programs in Iran. This issue indicates the need for more integration in research and calls for attention in development programs.

Keywords- Geography, Scient metrics, Network analysis, Journal of Research and Rural Planning.

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1. Introduction

Scientific journals spread research findings and disseminate achievements of original studies and research by academics and experts in various fields (Mirzaei et al., 2013). Today, these journals are published in various scientific fields worldwide, whose scientific development requires meticulous investigations. Scientometrics analysis methods are one of the most important scientific methods to investigate this matter. Scientometrics analyzes the quantitative evaluation of research activities, the system and the structure of a scientific field, and external and internal activities. This investigation can help efficiently use scientific sources to optimize economic-social structures (Bagalkoti et al., 2014; Djalalinia. et al., 2012; Sengupta, 1992). These methods are increasingly used to evaluate and compare research performance geographically (W. Liu et al., 2018) and have attracted many researchers in various scientific fields (Merigó et al., 2017). These methods can help to understand the scientific situation and research paths (Mao et al., 2018; B. Wang et al., 2014). Furthermore, they significantly help identify research gaps (Gall et al., 2015), which will be necessary to guide future studies (Baffoe, 2020).

The Journal of Rural Planning and Research, a geography-related journal, has been published continually since 2012 by the Department of Geography of Ferdowsi University in Mashhad, Iran. This journal was ranked Q1 in the latest Islamic World Citation Database (ISC) evaluation. The journal has editorial board members with expertise in rural studies and related scientific fields, indexing in various databases. Moreover, the journal is one of Iran's most critical geographical journals that publish English articles. The present research, using scientometric indicators, investigated the scientific performance of the Journal of Rural Research and Planning after publishing 35 issues. Furthermore, the research will draw and analyze the social networks of research collaborations in the published articles. Therefore, this paper aims to provide a comprehensive view of the scientific interactions of researchers in that field and to create a clear picture of these collaborations, which can identify the journal's primary and critical scientific actors. Finally, studying and knowing the topics of the journal articles and addressing the current needs in rural studies can help improve the journal's scientific role.

2. Research Theoretical Literature

Scientometrics is the study of quantitative aspects of science or the measurable quality and impact of research (Mingers et al., 2015). Scientometrics, or Scientology, was first formed in the Soviet Union when Dobrev and Carnova used the term Scientology for the first time. The turnover was first used in the essays of Cole, Ealse and Hulme, who used published articles to compare scientific production in different countries. Despite many activities in this field, the objectives and techniques of scientometrics were not determined until 1969. It was when Nalimov and Mulchenko defined the subfields of scientometrics and its scope of work. The publication of the International Journal of Science in 1978 by Braun was an essential step towards the global recognition and development of this science (Noroozi Chakoli, 2021; Mingers et al., 2015; Aminpour, 2008).

As a field, Scientology uses statistical methods and techniques to quantify research and achievements to reveal the research development process and can be a tool for decision-making (Olawumi et al., 2018; Qiu et al., 2017). Also, these methods are used when ranking institutions and universities around the world (Ellegaard et al., 2015; De Bellis, 2009) and can show the dynamics of scientific results, spatial and institutional distribution, scientific collaborations and main directions of the trends (H. Wang et al., 2019; Zhang et al., 2009; Chiu et al., 2004). The main themes include methods of measuring research quality and impact, citation processes, mapping scientific fields, and using indicators in research policy and management (Yang et al., 2020; Mingers et al., 2015).

Social network analysis has emerged as a key approach in modern sociology. The social network can be introduced as a set of nodes (social entities) and edges (connections) related to each of these nodes (Bródka et al., 2011). For example, in co-author networks, a number of authors (nodes) are connected through joint authorship (edges) and form a kind of social network; the characteristics of this network can be examined as indicators of social network analysis (Vasfi & Feizollahi 2020). In the current research, these indicators are examined:

Network Density: This index is defined as the ratio of the number of existing links to all possible links. The value of this numerical index is between zero and one. The closer the density score of a network is to 1, the network is denser, and the closer to zero, the looser and more discrete (Soheili & Osareh, 2012). Density shows how the relations are and how coherent these nodes are in the network. In other words, the higher average density of the network indicates more links and close relationships between nodes (Han et al., 2006), hence an increase in the intensity.

Centrality Degree: The centrality of a person means credibility and position in the field of activity. Therefore, people who are more influential in a scientific or social network often gain more centrality value (Salemi et al., 2012). The degree centrality index is the simplest type of centrality in which the value of each node is obtained by counting the number of neighboring nodes. Based on this indicator, the higher one's degree of centrality, the more connections, ergo, influence the person has (Nikzad et al., 2011).

Betweenness Centrality: This index identifies one's position in a network based on the ability of that person to establish relationships with others. A person who has obtained a favorable and strong position in the network and has a significant influence on what happens in the network will also have a high inter-centrality (Sentinel visualizes, 2010). Nodes with high interactivity play an essential role in connecting the network and have a central position in the network. These nodes play an essential role in the circulation of information in the network (Abbasi et al., 2012). In general, the betweenness centrality is a point that is between groups of points. In other words, it is the middle point through which the communication paths of other points shall pass. This powerful node has the ability to increase communication or isolation (Soheili & Osareh, 2013).

Eigenvector Centrality: The centrality of the eigenvector implies the amount of communication of a person with other powerful and central people in a social network. Therefore, this indicator is the point that has the most centrality of the eigenvector and has many central neighbors, hence causing more power.

Clustering Coefficient: This indicator indicates the tendency of people in the network to form different clusters through co-writing.
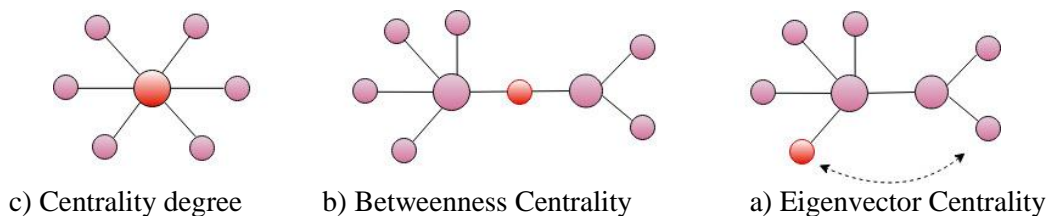
c) Centrality degree   b) Betweenness Centrality   a) Eigenvector Centrality
Figure 1. Network centrality
Source: Tabatabai Amiri et al., 2020 and findings of the researchers, 2021

2.1. *Review of research background*

As yet, little research has been done to review and analyze Iranian geographical scientific journals. Sadat Bashiri and Khorasani (2016) examined the articles of the Journal of Rural Research between 2010 and 2016. In their research, using content analysis and descriptive methods, they concluded that most of the authors were men, and their organizational affiliations were mostly from the University of Tehran. The topics of rural tourism and sustainable development had the largest number of articles. In another research, Bozarjomehri et al., (2015) investigated rural geography research between 1948-2008. In their research, they examined the historical process of printing and publishing articles and then the subject of the articles. In another research, Noee (2011), analyzed the articles of the Journal of Geographical Landscape of the Islamic Azad University, Rasht Branch (2006- 2010). The findings showed that 110 articles were written in this period, and the most active authors were Parviz Rezaei, Nasrollah Molaei Hashjin and Teymoor Amar. Also, most of the authors are male, and Azad University, Tehran University and Shahid Beheshti University are the popular affiliations in the journal. A few studies were conducted about the studied subject. However, in the studies on scientometrics, the contribution to scientific policy-making was considerable in providing a wide range of tools for

measuring, visualizing and evaluating science (Morichika et al., 2016). The following is a review of the literature on scientometrics for scientific research: Natural hazards (Sahil et al., 2021; Emmer, 2018; Sweileh, 2019; X. Liu et al., 2012; Chiu et al., 2007); sustainable development (Xie et al., 2020; Olawumi et al., 2018); Smart city (Zhao et al., 2019), health and health care (Fu et al., 2019; Sun et al., 2021) and most recently after the corona epidemic, research related to this disease (Colavizza et al., 2021; Aristovnik et al., 2020; Haghani et al., 2020). Moreover, some researchers used scientometric methods to examine the scientific research of journals. Among these researchers is Liu for the Journal of Urban Studies and Ecology (Z. Liu, 2005), Business Journal (Fatt et al., 2010), and International Journal of Information Sciences and Information Management (Erfanmanesh & Hosseini, 2014).

Examining articles in scientific journals with the aim of their scientific development always interested scientists. Today, the use of this science in particular geographical subjects is also considered. In Iran, producing science and publishing international articles was discussed for the first time in the country in 1986 (e.i. 1365) at the University of Tehran. This measure was the first step to taking serious action in science production (Mousavi Mohadi, 2003). Since 2000 and after the emphases of the Supreme Leader of Iran and the Ministry of Science, Research and Technology on scientific research, science publication has dramatically increased. Subsequently, scientometrics tools have been used continuously to analyze the production of science. In addition, scientific collaborations and drawing the map of science indicate the expansion of the use of these tools.

3. Research Methodology

In terms of approach, the current research is a quantitative study, which is carried out by the method of scientometrics research. In the research, library research methods have been used to study theoretical literature and collect research information. The focus of the analysis is the articles published in the Journal of Rural Research and Planning. Therefore, the statistical population includes all the articles published in the journal, which were accepted by the reviewers between 2012 and 2021. The information was collected from libraries and the citation database in the

Publish or Perish software program. The study used the counting method to investigate the number of articles. Also, in the case of the cooperation of authors, the same score was given to all authors, so the order of the authors' names in the article was not taken into account. The indexes of network density, centrality degree, betweenness centrality, eigenvector and clustering coefficient were used to analyze the network of scientific collaborations among the authors, in addition to H-Index to identify the key. Also, to analyze and interpret the results, Ravar Matrix and, Ucinet were used to prepare the self-interaction matrix, and analyze the studied indicators. Gephi software was used to draw the graphs and networks. Keywords of the articles were applied to identify the topics and trace the relationships between them in the journal. In the first step, all articles were uploaded in the Mendeley program and the keywords of the articles were checked. Then through Vosviewer, the information was prepared for analyzing and illustrating the co-occurrence of keywords. The study only included keywords with more than three times repetitions. Finally, after defining the topic of the articles, the challenges of development in rural areas were investigated (Figure 2).
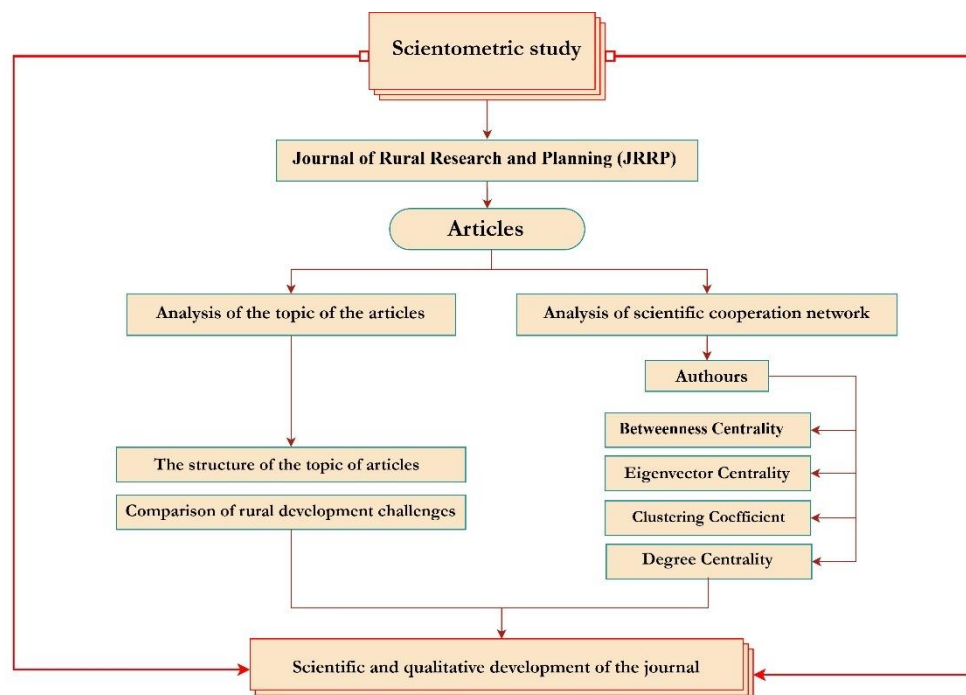
Figure 2. Research Methodology

4. Research Findings
4.1. Descriptive findings
Reviewing scientific texts is always essential for the future policies of scientific journals, research planning and informed decisions. Journal of Rural Research and Planning has published 348 articles in 10 volumes and 35 issues. The authoring pattern of most of the authors was in the form of collaboration of three authors (Table 1).

Table 1. Descriptive characteristics of the Journal of Rural Research and Planning (JRRP)

Number of Volumes	10		Years	Issues	Articles	Citations
Journal issues	35		2012	2	12	66
The number of unique letters	0		2013	2	25	69
Journal Articles	348		2014	4	40	73
Collaboration of authors	Frequency		2015	4	52	126
One Author	7	7.8	2016	4	52	99
Two Authors	88	25.3	2017	4	52	39
Three Authors	148	42.5	2018	3	28	32
Four Authors	78	22.4	2019	4	35	29
Five Authors	7	2	2020	4	28	2
More than five authors	0	0	2021	4	24	1
Sum	348	100	Sum	35	348	536

The number of citations of an article shows the importance of a topic for the authors of other articles. There are eight highly cited articles in the journal of research and rural planning (Table 2)

Table 2. The most cited articles in the Journal of Rural Research and Planning (JRRP)

Row	Title	Authors	Years	Citations
1	The Effect of Strategic Thinking and Social Capital on Recognition of Entrepreneurial Opportunities among Rural Youths (Case Study: Kangavar County)	Vahid Aliabadi- Pouria Ataiee*- Reza Movahedi	2016	16
2	Measuring the Livelihood Properties in Rural Areas Using a Sustainable Livelihood Approach (Case Study: Rural Areas of Taybad County)	Hamdollah Sojasi Ghidari*- Tahereh Sadeqlu- Esmaiel Shakourifard	2016	14
3	An Investigation of the Factors Affecting Land Use Changing of Agricultural Lands	Jila Kalali Moghadam*	2015	12
4	Identify and Analysis the Factors Affecting the Development of Tourism in Rural Areas (Case Study: Rural Areas of Jiroft County)	Ahmad Taghdisi*- Hamid Reza Varesi; Mehdi Ahmadian- Hamid Asgari	2015	11
5	Rural Women's Empowerment in Improving Household Food Security in the Divandarreh County	Moslem Savari - Hosien Shabanali Fami* - Zhila Daneshvar Ameri	2015	9
6	The Spatial-Local Effects of Return Migration in Miyandoab County	Hasan Afrakhteh- Reza Manafiazar*- Mohammad Valai	2016	9
7	Identification and Analysis of Factors Affecting Agricultural Land Use Change in Rural Areas (Case Study: Sari County)	Amir Ahmadpour*- Esmaeil Alavi	2014	8
8	Locating the Rural Waste Landfills by Using Integrating Multi-Criteria Decision-Making Model in GIS Environment (Case Study: Shahrekord County)	Masoud Safeepour*- Sadegh Mokhtari Chelche- Seyyed Reza Hosseini- Ismaiel Soleymanirad	2016	8

These articles have been indexed from 2014 to 2016, and the topics of "Entrepreneurship", "Sustainable living", "land Use" and "Development of Rural Tourism" are the most cited (Figure 3).
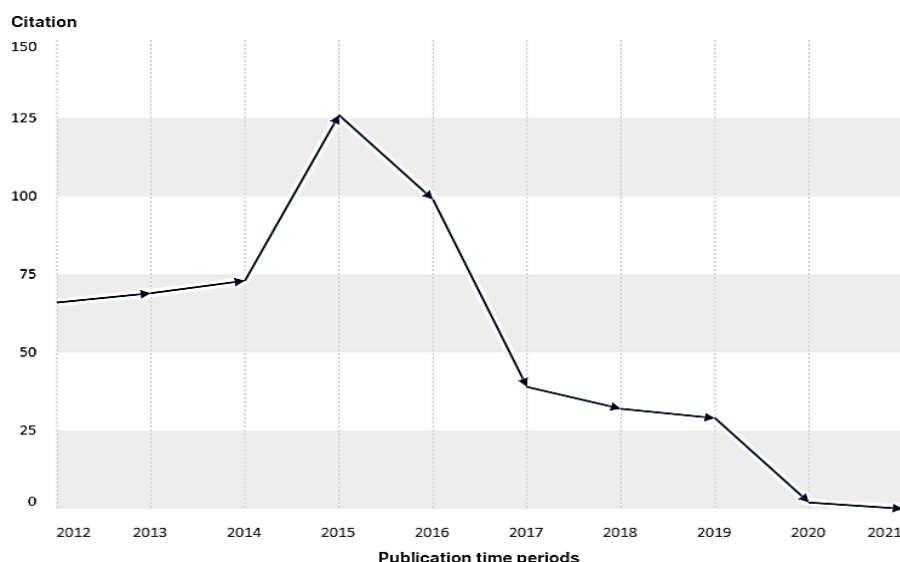
Figure 3. The number of citations of articles in the Journal of Rural Research and Planning (JRRP)

4.2. Analysis of scientific collaborations

Investigating scientific collaborations among researchers has been discussed in scientometrics analysis. The cooperation of researchers has been vastly considered in recent years, and the results of studies can underline its importance and advantages. For this analysis, 598 nodes (authors) and 1972 edges (co-authors) were obtained. According to the results, the authors Anabestani, Barghi and Rezvani had the highest number of connections in the writers' collaboration network. On the other hand, Rizvani, Afarakhte and

Bouzarjomehri have high betweenness centrality. The mentioned writers are the writers who have more power to cooperate with other writers. Also, the authors of Barghi, Rezvani and Bouzarjomehri

have a high value of eigenvector, which means these authors have more cooperation with authors who have more centrality and power in the network (Table 3).

Table 3. Authors of articles based on central indicators

Row	Degree centrality		Betweenness Centrality		Eigenvector Centrality	
1	Aliakbar Anabestani	0.045	Mohammadreza Rezvani	0.068	Hamid Barghi	1
2	Hamid Barghi	0.040	Hasan Afrakhteh	0.055	Mohammadreza Rezvani	0.936
3	Mohammadreza Rezvani	0.038	Khadijeh Bouzarjomehri	0.055	Khadijeh Bouzarjomehri	0.821
4	Khadijeh Bouzarjomehri	0.037	Seyyed Skandar Seydaii	0.042	Aliakbar Anabestani	0.761
5	Abdolreza Roknedin-Eftekhari	0.035	Vahid Riahi	0.038	Mojtaba Ghadiri Ma'soum	0.750
6	Yousef Ghanbari	0.033	Abdolreza Roknedin-Eftekhari	0.038	Yousef Ghanbari	0.749
7	Mojtaba Ghadiri Ma'soum	0.032	Hamid Barghi	0.037	Hamid Shayan	0.717
8	Mehdi Portaheri	0.032	Ahmed Romyani	0.034	Abdolreza Roknedin-Eftekhari	0.709
9	Hasan Afrakhteh	0.030	Seyed Reza Hosseini Kahnuj	0.033	Seyed Hasan Motiee Langroudi	0.682
10	Seyd Hasan Motiee Langroudi	0.030	Mojtaba Ghadiri Ma'soum	0.031	Hamdollah Sojasi Qeidari	0.635
	Network density: 0.006		Nodes: 598		Links: 1972	

The value of network density was also determined to analyze the authors' cooperation network. The network density indicates how close the connection between the nodes of a network is to a complete network. The value is between 0 and 1, and the closer this value is to 1, it indicates the greater

tendency of network people to form clusters and cooperation. The density of the network for cooperation among the authors was 0.006. This low value indicates low cohesion and disunity among network researchers (Figure 4).
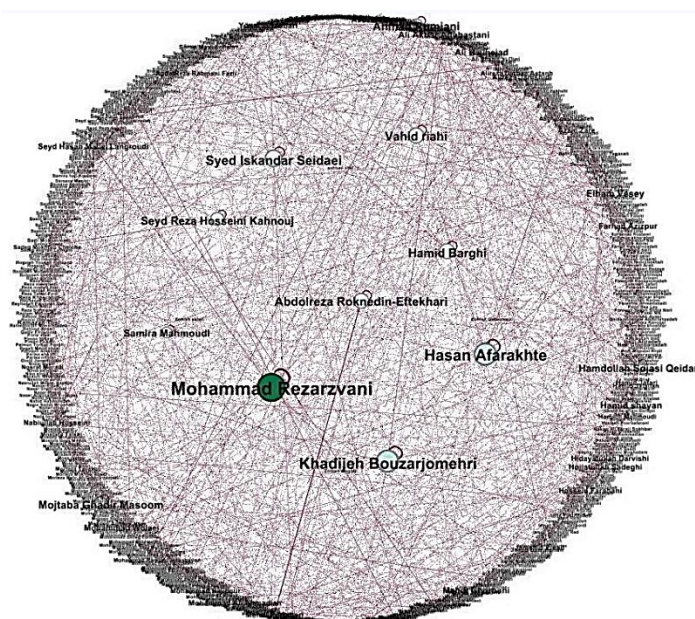
Figure 4. The network of scientific collaborations in the Journal of Rural Research and Planning (JRRP)

Different indexes have been provided to identify the most important authors. One of them is the h-Index which Hirsch presented in 2005 to evaluate

the scientific-research output of researchers individually (Hirsch, 2005). This index shows the role each of the researchers alone has in advancing

the frontiers of science and knowledge. The high value of this index indicates the scientific power and influence of the researcher on the scientific progress in that subject. We selected the authors with the highest citation and obtained their h-index (Table 4).

Table 4. Identification of the most important authors of the Journal based on h_Index

Authors / Articles	1	2	3	4	5	6	7	Sum	H-Index	Rank
Ahmad Taghdisi	11	7	5	2	2	2	2	31	3	1
Hamid Barghi	2	2	2	1	1	1	-	9	2	2
Aliakbar Anabestani	8	4	3	3	1	-	-	19	3	1
Hasan Afrakhteh	9	7	4	2	1	-	-	23	3	1
Mohammadreza Rezvani	6	5	2	2	1	-	-	16	2	2
Abdolreza Roknedin-Eftekhari	5	3	1	1	-	-	-	10	2	2
Yousef Ghanbari	7	3	2	-	-	-	-	12	2	2
Khadijeh Bouzarjomehri	8	8	3	-	-	-	-	19	3	1
Vahid Riahi	5	3	1	-	-	-	-	9	2	2
Seyed Hasan Motiee Langroudi	4	3	2	-	-	-	-	9	2	2

Researchers Taghdisi, Anabestani, Afrakhteh and Bouzarjomehri have the highest number of indicators, and these authors are key and influential authors in the Journal of Rural Planning Research.

4.3. Analyzing the topic of the articles

The keywords specified by the authors in the articles are significant because they are the main concepts of the authors to communicate with the audience. The authors of the journal used 595 keywords to express the topic of their study in the keywords, and these phrases were on different topics. Therefore, we only selected the phrases that were repeated more than three times and the 21 phrases are illustrated in Figure (5).
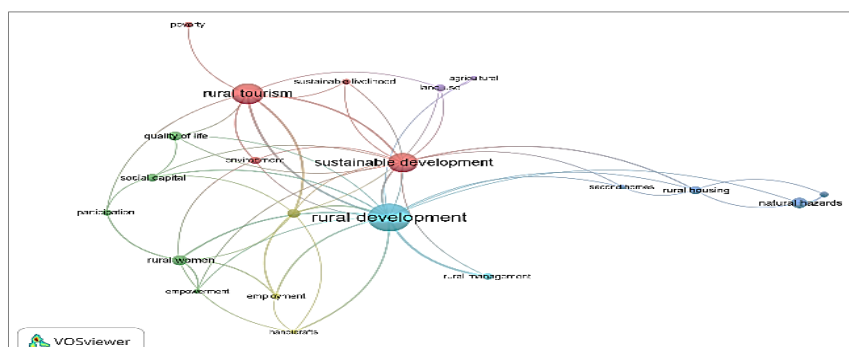
(a)
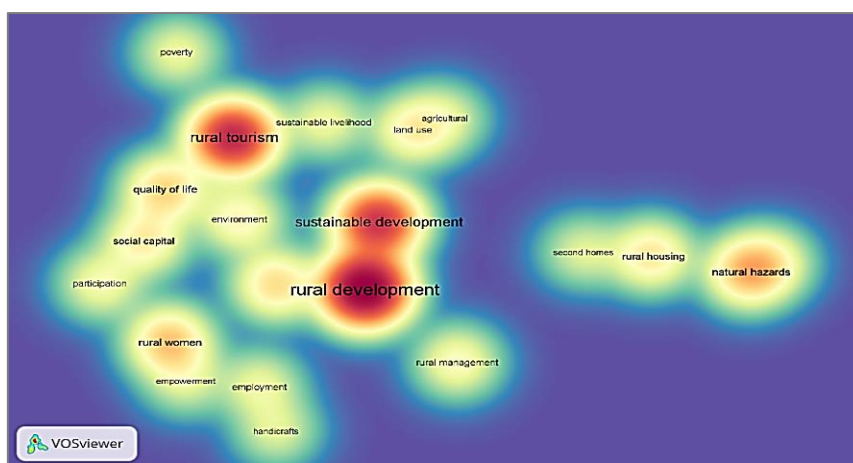
(b)

Figure 5. (a) keyword connection network & (b) keyword co-occurrence network 2012-2021

The method of clustering words based on co-occurrence was used to check the keywords in detail (Table 5). Keywords in this method were grouped in 6 clusters. There are five keywords in the first and second clusters. Tourism and sustainable development in the first cluster and quality of life and women in the second cluster are the most significant keywords and had the most co-occurrence with each other.

Table 5. Clustering and co-occurrence of keywords of the Articles

Cluster		Keyword
Cluster (1)	**Keyword (Occurrence)**	Environment (9); Poverty (6); Tourism (44); Sustainable Development (39); Sustainable Livelihood (6)
Cluster (2)		Empowerment (5); Participation (7); Quality of Life (13); Rural Women (15) Social Capital (10)
Cluster (3)		Natural Hazards (6); Vulnerability (6); Rural Housing (11); Second Homes (5)
Cluster (4)		Employment (6); Entrepreneurship (12); Handicrafts (5)
Cluster (5)		Agriculture (5); Land Use (9)
Cluster (6)		Rural Management (8); Rural Development (66); Immigration (7)

The highest number of co-occurrences are four keywords in the third cluster, 3 keywords in the fourth cluster, and 2 keywords in the fifth and sixth clusters. After clustering of keywords, another analysis was to determine the evolution of the keywords in the subject of the articles. Vosviewer software program was used for this purpose, and the results are shown in Figure 6.
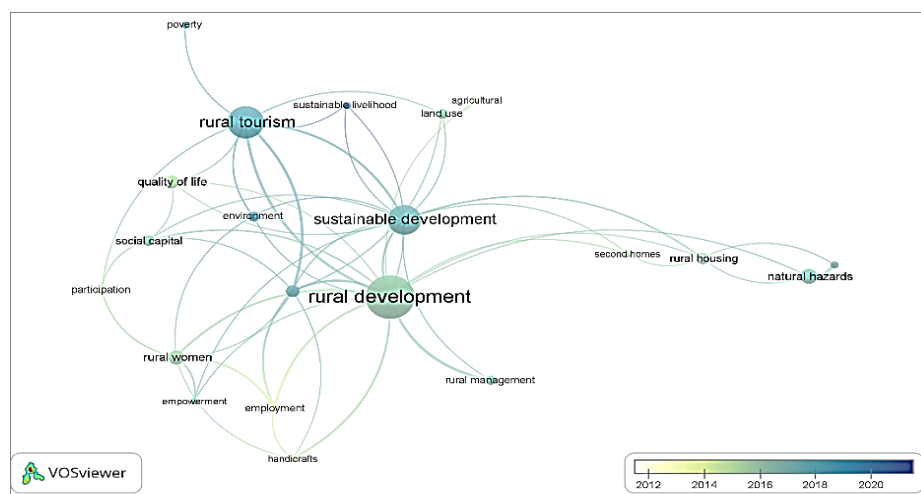
Figure 6. Evolution of article keywords in the period of 2012-2021

The transformation of keywords was done in three periods. "Economy" and "Employment" was the first topic of the magazine articles, which was mostly noticed by the authors. Moreover, "Tourism" and "Sustainable Development" was the second topic, and the "Development of Sustainable livelihood" in rural areas was the third general topic in the articles.

Figure 7. Transformation of the topic paradigms of the articles in the Journal of Rural Research and Planning (JRRP)

Another analysis is to compare the subject of the articles with the challenges and obstacles of rural development. These challenges were prepared in the form of a checklist, and after reviewing and combining them, they were categorized into four dimensions. The purpose of this comparison was to identify the topics that have attracted less attention in rural development (Table 6).

Table 6. Comparison of the challenges and obstacles of rural development and the topic of articles in the Journal of Rural Research and Planning (JRRP)

Dimensions	Challenges of rural development	subject	Keywords of articles
Economic	Reducing the share of employment in the agricultural sector	Re-creation and renewal of rural life	Sustainable livelihood/Agriculture
	Reducing the attractiveness of agricultural activities		Sustainable livelihood/Agriculture
	The low rate of the guaranteed price of products to the labor wage index		Poverty/Sustainable livelihood/Quality of life
	Market margin and reducing the producer's share of the final price of the product		Poverty/Sustainable livelihood/Quality of life/Agriculture
	The high percentage of changes in the prices of consumer goods and services		Poverty/Sustainable livelihood/Quality of life
	A slight decrease in the unemployment rate		Poverty/Sustainable livelihood/Employment/Entrepreneurship
	Increasing the amount of outstanding bank claims from farmers and villagers		Poverty/Quality of life
	Increasing economic inequalities between rural and urban society	Economic justice	Poverty/Quality of life/Employment/Entrepreneurship
	Decreasing personal ownership in residence and increasing renting		Poverty/Quality of life/Rural housing
Social-cultural	Decrease in population growth rate (negative rate)	Population development and control policies	Migration
	Reducing the size of the household		Migration
	migration from villages and reducing the share of villages as a destination for immigrants		Migration
	Increasing the average age of the population and ageing of the population		Migration
	Reduction of marriage and continuation of the divorce process		Quality of life/ Rural women
	Increasing illiteracy rate		Quality of life/ Rural women
	Reducing the contribution of popular institutions in the development		Participation/Social capital/Rural management/Rural development
	Attention to rural values and capabilities		Tourism/Handicrafts /Rural development
	Reducing sustainable food security		Poverty/Sustainable livelihood/Quality of life/Sustainable development

Dimensions	Challenges of rural development	subject	Keywords of articles
	Reducing the quality of the food basket	Livability and quality of life	Poverty/Sustainable development/Sustainable livelihood/Quality of life
	Increase in crime and social crimes (social problems)		-
Physical	Vulnerability of rural houses against natural hazards	Organization of the physical fabric of the village	Empowerment/Natural hazards/Vulnerability/Rural housing
	Development of urban (architectural) textures in rural areas		Rural housing/Second homes/Land use
	Unprincipled change of rural practices		Environment/Sustainable development/Second homes/Land use
	Deterioration of many rural infrastructures		Rural development
	Drainage of passages and collection of surface water		Environment/Rural development
	Destruction of agricultural lands		Environment/Sustainable development/Sustainable livelihood
environmental	Conservation of natural resources, including water resources	Ecological development of the village	Environment/Sustainable development/Sustainable livelihood
	Destruction of protected areas and natural resources		Environment/Sustainable development
	Proper disposal of waste and rural sewage		Environment/Sustainable development/Rural development
	Inadequacy of economic activities with the ecological capacity of the village		Environment/Sustainable development/Sustainable livelihood/Employment/Entrepreneurship/land use

Source: Journal Database and Research Findings, 2021

Most of the topics of the articles are better related to challenges and obstacles of rural development. Nonetheless, social challenges are the issue that has been less addressed.

5. Discussion and Conclusion
Scientific studies are carried out academically and in accordance with the needs of society. Examining and evaluating them is essential to journals and academics. Rural areas of the country have many challenges in development factors, including: Environmental factors (Karim et al., 2018), Economic and Environmental factors (Hajipour and Karimipour, 2020; Hosseini et al., 2019), Policy-Making and planning (Fali et al., 2010) and Social problems. Therefore, understanding these obstacles in scientific studies can be pivotal to rural areas of the country and be a practical guide for development policymakers. The theme of rural development is the improvement of living conditions in rural areas. Apart from the construction purposes of various Development programs in Iran, Economic development and growth have been central topics to focus on among policymakers and planners. Based on our findings in the Journal of Rural Research and Planning

(JRRP), the main topic of the papers is "Economic development" in rural areas. Also, according to the changes and evolution of the leading research topics, the issue of "Sustainable Development" has been one of the main research approaches in the last few years. The concept of Sustainable development is a dominant issue in the context of rural studies in the country due to the extent theoretical and methodological framework of development theories. Sustainable development in rural areas includes the sustainable growth of rural communities in a combined way in all economic, social, political and environmental dimensions. However, sustainable development has yet to lead to integrated rural development and only happens in the agricultural sector. This part of the results was consistent with the research of Nasire Zare and Riahi (2022) and Bashiri and Khorasani (2017). After that, studies have been conducted more on "Sustainable Livelihood Development", connected with the two topics mentioned above. However, the "Economic" dimension in Rural development was more researched, and the "Social" and "Cultural" dimensions have yet been less addressed. This issue is more highlighted if we regard the

"Migration" and "Marginalization" of rural residents as the major social predicaments of urban areas. Therefore, studies should address the country's Social and Cultural challenges of rural development. Although we identified key authors in the journal, we raised attention to scientific cooperation and communication between the authors. More scientific cooperation between authors and academic centers promotes productivity and innovation and the exchange of information in journals (as stated by many researchers such as Guan & Pang (2018), Ceballos et al. (2017), Contractor et al. (2006) and Newman (2001).

Authors' contributions
The authors equally contributed to the preparation of this article.

Conflict of interest
The author declares no conflict of interest.

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تحلیل مقالات مجله پژوهش و برنامه‌ریزی روستایی(JRRP)

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چکیده مبسوط

۱. مقدمه

پژوهش‌های علمی برای بهره‌مندی در مجلات علمی ارائه می‌شوند. این که، این پژوهش‌ها به صورت علمی، هدفمند و منطبق بر نیازهای یک جامعه انجام بگیرند، نیاز است تا در دوره‌های علمی خاص، بررسی گردند. تحلیل مقالات مجله پژوهش و برنامه‌ریزی روستایی (JRRP) و جهت‌گیری تحقیقات آن با چالش‌ها و موانع توسعه روستایی، هدف مورد نظر پژوهش بود. مجله مورد نظر در زمره مهم‌ترین مجلات جغرافیایی قرار دارد که مقالات و تحقیقات علمی را به صورت انگلیسی منتشر می‌کند. پژوهش حاضر با استفاده از شاخص‌های علم‌سنجی سعی می‌کند تا عملکرد علمی مجله را پس از انتشار ۳۵ شماره از مقالات، مورد بررسی قرار دهد. از سوی دیگر پژوهش علاوه بر بررسی و تحلیل موضوع مقالات مجله، به ترسیم و تحلیل شبکه‌های اجتماعی حاصل از همکاری‌های پژوهشی در مقالات منتشر شده مجله خواهد پرداخت. این موضوع از این جهت می‌تواند دیدگاه جامعی درباره نحوه تعاملات علمی محققان آن حوزه فراهم آورد و بر ایجاد تصویری روشن از این همکاری‌ها، بازیگران اصلی و کلیدی موجود در شبکه علمی مجله را نیز شناسایی کند. همچنین بررسی و آگاهی از موضوعات مقالات مجله و پرداختن به نیازها و اهداف کنونی به ویژه در مطالعات روستایی نیز می‌توانند بیش از پیش به ارتقای جایگاه علمی مجله کمک نماید.

۲. مبانی نظری تحقیق

چارچوب روش پژوهش، مبتنی بر تحقیقات علم‌سنجی است. علم‌سنجی شامل مطالعه جنبه‌های کمی علم که می‌توان بر اساس آن به اندازه‌گیری کیفیت و تأثیر تحقیقات پرداخت.

علم‌سنجی از روش‌ها و تکنیک‌های آماری برای تعیین کمی تحقیقات و دستاوردها و آشکار کردن روند توسعه علمی استفاده می‌کند که می‌تواند زمینه را برای تصمیم‌گیری‌های علمی فراهم کند. برخی از مضامین اصلی آن شامل روش‌های سنجش کیفیت و تأثیر تحقیق، درک فرآیندهای نقل قول، نقشه‌برداری از زمینه‌های علمی و استفاده از شاخص‌ها در سیاست تحقیق و مدیریت است.

۳. روش تحقیق

پژوهش از لحاظ رویکرد، مطالعه کمی و از نظر هدف کاربردی که به روش تحقیقات علم‌سنجی انجام می‌گیرد. در پژوهش از روش‌های مطالعات کتابخانه‌ای به منظور مطالعه ادبیات نظری و جمع‌آوری اطلاعات پژوهش استفاده شده است. در این پژوهش تمام مقالات منتشر شده از مجله پژوهش و برنامه‌ریزی روستایی مورد بررسی قرار می‌گیرد. بنابراین جامعه آماری شامل تمام مقالات منتشر شده در مجله بوده که در میان سال‌های ۲۰۲۱- ۲۰۱۲ توسط نویسندگان تدوین و مورد پذیرش داوران قرار گرفته است.

روش جمع‌آوری اطلاعات از نوع کتابخانه‌ای و جستجوی اطلاعات مقالات مجله در برنامه Publish or Perish بود. از شاخص‌های تراکم شبکه، مرکزیت درجه، مرکزیت بینابینی، بردار ویژه، ضریب خوشه‌بندی و شاخص H_Index برای شناسایی نویسندگان کلیدی استفاده شد. برای تحلیل و تفسیر نتایج، از Ravar Matrix برای تهیه ماتریس خودتعاملی، از Ucinet و Gephi نیز برای تحلیل شاخص‌ها و گراف‌ها استفاده شد. همچنین هم‌رخدادی کلمات کلیدی مقالات مبنای شناسایی موضوع مقالات بود.

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۴. یافته‌های تحقیق

در مجله پژوهش و برنامه‌ریزی روستایی، ۳۴۸ مقاله در ۱۰ دوره و ۳۵ شماره چاپ شده که الگوی تألیفی بیشتر نویسندگان به صورت همکاری ســه نویســنده بوده اســت. عنابســتانی، برقی و رضــوانی بیشـــترین تعداد ارتباطات را در شـــبکه همکاری نویســـندگان و تقدیسـی، عنابسـتانی، افراخته و بوزرجمهری؛ به عنوان نویسـندگان کلیدی، که در توســعه علمی مجله نقش مهمی داشـــته‌اند. از نظر موضوع پژوهش‌ها نیز، بیشـترین مضمون اصلی تحقیقات منطبق بر توسـعه و رشـد اقتصـادی در مناطق روسـتایی بوده اسـت. براسـاس تغییرات و تحول؛ موضــوع توســعه پایدار یکی دیگر از رویکردهای مقالات پژوهش‌ها بوده که پس از آن مورد توجه قرار گرفته اســـت.

پس از آن نیز موضـوع پژوهش‌ها بر محور توسـعه معیشـت پایدار که به طوری ترکیب دو موضوع پیشین بوده انجام شده است.

۵. نتیجه‌گیری

چالش‌های اجتماعی و فرهنگی توسـعه روسـتایی، جدا از بی‌توجهی به آن در برنامه‌های توسعه؛ در موضوع پژوهش‌ها نیز وجود دارد. این موضـوع حاکی از تک‌بعدی بودن پژوهش محققان به صـرف توجه به موضوعات مورد توجه در برنامه‌های توسعه است.

کلیدواژه‌ها: جغرافیا، علم‌ســـنجی، تحلیل شـــبکه، مجله پژوهش و برنامه‌ریزی روستایی.

تشکر و قدردانی

Original Article

Assessing and Measuring the Sustainability of Rural Settlements Active in the Field of Medicinal Plants
(Case Study- Kohgiluyeh & Boyerahmad Province)

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Abstract

Purpose- Medicinal plants have a special value and significance in providing hygiene, health and food resources. Although the human attitude towards the products of medicinal plants has a long history, the issue of increasing the production of these products at the level of fields and gardens has taken on a new scientific form since the second half of the 20th century. The purpose of this research is to assess and measure economic, social, environmental sustainability of expanding the activities of medicinal plants in the rural development in Kohgiluyeh and Boyer Ahmad province.

Design/methodology/approach- It is an applied descriptive research based on field data collection (questionnaire). The statistical population of this research included 13 villages in cold region of Kohgiluyeh and Boyer Ahmad province. According to a report by Natural Resources of the Province in 2022, 383 medicinal plant producers were determined and among all of whom the questionnaires were distributed. Descriptive statistics (mean, standard deviation and variance) and inferential (one-sample t-test and VIKOR model) were used for data analysis.

Findings- The findings showed that the mean score of the social and environmental indicators is over the theoretical average value (3), while the mean score was 2.80 in terms of economic indicators. The results of VIKOR model revealed that Sepidar village with a VIKOR index of (0.157) has the highest rank and Sadat Mahmoudi village with a VIKOR index of (0.993) has the lowest rank in terms of the sustainability of the activities of medicinal plants among the villages in the study area.

Original/value- This study is promising the activities of rural areas in the production of medicinal plants, which is considered as a strategy for diversification in rural settlements. Therefore, the results of this research can be given special consideration in recognizing the effects of medicinal plants in different geographical areas and have an effective role in the development of rural areas.

Keywords- Economic sustainability, Social sustainability, Environmental sustainability, The activities of medicinal plants, Kohgiluyeh & Boyerahmad province.

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1. Introduction

Nowadays, considering the role and sustainability status of the villages in the processes of economic, social and political development on a local, regional, national and international scale and the consequences of the underdevelopment of rural areas such as widespread poverty, growing inequality, rapid population growth, unemployment, migration, urban marginalization, etc. has led attention to villages and rural communities and even its precedence over urban communities (Roumiani, 2021). On the other hand, having environmental potential, rural areas are rich in natural resources and agricultural products, which require attention and prioritizing them in line with sustainable rural development (Omisore, 2018).

Since the villages have been the place of producing agricultural products, a high percentage of the villagers' livelihood is associated with the use of land which is in a traditional and subsistence way in the rural settlements. Such economic and occupational structure in rural areas has led to specific issues (Matiei Langroudi, et al., 2019). Accordingly, a dynamic and sustainable movement towards the optimal use of available resources, increasing the quality and quantity of agricultural production and diversifying it in rural areas is known as one of the key strategies in the development of rural areas (Tohidyanfar & Rezaei- Moghaddam, 2019). The diversity of agricultural activities, while strengthening this sector, not only facilitates the diversity of agricultural jobs and the strengthening the incomes and rural development process, but also improves job opportunities in rural areas and has a significant impact on rural households' welfare (Riahi & Nouri, 2015). Hence, it can be sated that the diversity of the rural household economy is in the direction of rural development as this diversity raises the villagers' living standards, makes it possible to build a new place, and makes their economic participation in the development of the villages practical (Safi, 2009: 21).

One of the diverse activities in rural areas is the cultivation of medicinal plants and its related economic activities, which can pave the way for the economic development of rural areas. The diversity of medicinal species, climatic diversity, human force and available energy resources are important potentials for the development of cultivation and industries related to medicinal plants (Jafari et al., 2017). Medicinal plants have been and are of special value and significance in providing health and wellness to communities, both in terms of treatment and prevention of diseases. This part of natural resources is as old as humans and has been one of the most important sources of human food and medicine supply for generations. Although the human attitude towards the medicinal products of plants has a deep history, the issue of increasing the production of these products in fields and gardens have taken a new scientific form since the second half of the 20th century (Noorhosseini et al., 2018). Therefore, the activities of medicinal plants can have effects in terms of economic dimensions (Employment diversification, employment creation, income generation and savings), social dimensions (improving the quality of life, reducing inequalities, health and treatment) and environmental dimensions (reducing water consumption, environment preservation, and environmental awareness) in rural development (Riva et al., 2018; Shalizi, 2003; Elachouri, 2018). Iran has more than 8000 species of valuable plants in the world with diverse weather and climate conditions (Jafari et al., 2017). One of these areas is the Zagros region in the cold region of Kohgiluyeh and Boyer Ahmad province, which has been the focus of local rural people and private companies in the last three decades. In this region, based on the information received from the Province's Natural Resources, 127 medicinal plant projects have been implemented or developed in the province from 2017 to 2020 whose administrators were introduced to Omid Entrepreneurship Fund and Agricultural bank by Agriculture Jihad Organization, 52 ones (40%) of which were in the study area, namely Dena and Boyer Ahmad counties, which were worth approximately 87 billion Tomans. Approximately 300 people directly and 1000 ones indirectly benefit seasonally from its benefits and incomes. In addition, in Zardband company[1], approximately

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1 Zardband Pharmaceuticals is a knowledge-based company that started its activity in 1993 with the aim of producing and processing medicinal plants. At the beginning, this company procured the seeds of different and special species of medicinal plants

2000 people directly and indirectly and about 517 households, i.e. roughly 1100 people are working seasonally in the villages of Tange Sorkh region as a pilot area for medicinal plants in the province.

They make a living receiving an income or selling medicinal plants. However, it is worth noting that most administrators of the medicinal plants project do not settle in villages; rather they are villagers settling in the city, and the stages of cultivating, protecting, and harvesting are kept with the help of the villagers. Although passing years, the diversity of medicinal plants in the villages of Iran is increasing, it should be noted that the participation of the local people is still at a very limited and unacceptable level, which needs studying and recognizing the obstacles in the way of the activities of medicinal plants in rural development and planning in order to overcome them. Thus, this research aims to answer this question: What is the degree of economic, social, and environmental sustainability of the development of medicinal plants in the villages of Kohgiluyeh and Boyer Ahmad province?

2. Research Theoretical Literature

Sustainability, as a descriptive aspect of development, is a situation in which the desirability of available facilities does not decrease over time. Derived from Latin word "sustinere" with the meaning of keeping alive, it implies long-term support or durability. In its broadest meaning, sustainability refers to the ability of society, ecosystem or any ongoing system to continue functioning in the indefinite future, without being weakened by force due to the depletion of the resources that the system depends on or imposing an excessive burden on them. Furthermore, the system ability for endurance and reliability is inevitably dependent on the success of the system in establishing a relationship with the external environment (Asadi & Naderi, 2009). Therefore, it can be deduced that sustainability is a form of distributive justice: The fair distribution of development opportunities

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through reliable international sources and focused its efforts on their reproduction and adaptation to the climatic conditions of the country. In parallel with these activities, research was also conducted in the field of optimal extraction and processing methods of plant products.

between current and future generations on the one hand and its inclusiveness on the other hand, which means empowering people and supporting and paying attention to all human rights, including political, economic, social rights and etc. (Zahedi & Najafi, 2006). According to the existing literature, rural sustainability has three dimensions: 1- ecological or environmental sustainability, 2- social sustainability and 3- economic sustainability, which are explained in details in the following:

2.1. Ecological/ environmental sustainability

This dimension refers to the total components and elements existing in the ecosystem and paving the way for activity and production. Ecological sustainability means "maintaining basic resources at levels which do not negate future options or maintain and improve the capacity, quality and resilience of the ecosystem." Environmental experts focus more on this aspect of development and are concerned about the limitations caused by human activities on the environment. They are anxious about preserving what is named natural capital by economists and are well aware that the viability condition of every living being on earth depends on the primary production of plants. According to them, nature is the most enormous and wonderful treasure (Kalantari & Shabanali Fami, 2008). Undoubtedly, no matter how profitable or socially acceptable the economic and social system of rural areas is, if not environmentally sustainable, it cannot maintain its productivity over time and will inevitably move towards instability.

2.2. Social sustainability

In defining social sustainability, a group of researchers have mentioned four main and determining elements: 1- Social justice, 2- Social cohesion, 3- Participation, 4- Security. In this meaning, components such as equal opportunities along with progress for all human beings, life with cooperation and cooperation, equal opportunities for all people to play social roles along with security of livelihood and safety in human settlements against natural hazards, are the basis of assessing social sustainability. In terms of social sustainability, resources should be exploited in such a way that future generations also have the ability to make decisions in order to meet their needs at the best level of satisfaction. In this definition, win-win policy is emphasized by decision makers and aims to achieve

economic, social and environmental improvements (Martin, 2001). In this regard, social sustainability in rural areas is defined as "a healthy life through meeting the basic needs of the rural community members, taking into account the quality of life and simultaneously maintaining the environmental quality and related to the economic systems in order to achieve the highest level of life satisfaction." (Badri & Taher Khani, 2008). In general, it can be said that social sustainability is measured and assessed with its main indicator, which is the quality of life, which "means providing better living conditions in which balance, harmony, desirability and fair equality for life are along with health, security, comfort, vitality, creativity and beauty (Cheraghi, 2011).

2.3. Economic dimension

Economic sustainability means the systems are competitive and sustainable in interaction with the economic environment. Any system that is not appropriate in terms of economic point, no matter how much it is accepted by the society, in harmony with the ecological requirements and politically supported, cannot sustain" (Zahedi, 2009).

The sustainability of economic activities can be explained from different points of view as follows: 1- A situation is called sustainable in which the desirability of the society does not decrease over time; 2- A situation is said to be sustainable in which natural resources are managed in such a way that production opportunities and economic growth remain sustainable for the future; 3- A situation is called sustainable in which natural capital reserves do not decrease during economic growth and development; 4- A situation is named sustainable in which natural resources are managed in such a way that the performance of the used resources does not decline (Cheraghi, 2011). Meanwhile, economic sustainability in rural areas means strengthening the foundations of the economy and achieving economic security in terms of access to sustainable livelihoods, in continuous and stable affairs, profitable employment and reliable financial resources, and finally, appropriate technology compatible with the environment by exploiting human resources" (Planning Committee of Processing and Complementary Industries and Rural Development, 2013).

Although the concept of rural sustainability and its strategies have not been considered in relation to the activities of medicinal plants, it has had a significant impact on the medicinal plants sector. The goal of rural sustainability is to ensure a stable and secure livelihood that reduces resource depletion, environmental destruction, cultural disruption and social instability (Bodeker, 2007). Therefore, the concept of rural sustainability has been considered as a potential solution to prevent environmental and social industrial destruction, and medicinal plants are an industrial resource dependent on the natural endowment and heritage of the society (Karunamoorthi et al., 2013).

Since ancient times, people have collected plant and animal resources for their needs. For example, it can be pointed out to edible nuts, mushrooms, fruits, plants, spices, gum, fodder, fibers used to make shelter and housing, clothes or utensils, and plant or animal products for medicinal and cosmetic or cultural purposes. Nowadays, hundreds of millions of people, mainly in developing countries, obtain a significant part of their subsistence needs and income by the collection of plant and animal products (Agelet et al., 2000). Collection of high-value products such as mushrooms (morels, matsutake, truffles), medicinal plants (ginseng, goldenseal, black cohosh) also continues in developed countries for cultural and economic reasons (Jones et al., 2002). Among these uses, medicinal plants play an essential role not only as traditional medicines used in many cultures, but also in the trade of goods that meet the demand of often distant markets (Anon, 2002).

The diversity and availability of native plants helps to use them by different people and communities such as rural (non-traditional) communities, traditional communities, native populations and riverside communities. Rural communities are able to identify many plant species that produce numerous products such as food, firewood, medicine, fodder and tools for their daily needs (Miguéis et al., 2019). For example, in India, the cultivation of medicinal plants is considered important for two reasons: a) Cultivation provides an alternative source of supply and thus reduces the need to collect these plants from nature. This decreases the pressure on endangered species and promotes their protection. b) Cultivation provides an additional source of income to the poor rural population of the states. Therefore, in this country, the cultivation of medicinal plants is known as an important source

of income owing to several advantages namely high price, low transportation cost due to higher value per volume unit and long shelf life compared to traditional products (Alam & Belt, 2009). Egamberdieva et al. (2017) reported that a large number of medicinal plants have been studied according to their phytochemical compounds, including plants that are usually used in the treatment or prevention of specific diseases and economic marketing. In general, they have a useful role in health care. Their use in the treatment of humans and animals for various diseases is well documented as the local plants used for medicinal purposes have biological and socio-cultural heritage (Mbuni et al., 2020). Cultivating, harvesting, processing, using and marketing of medicinal plants provide valuable contributions to the economic well-being of local communities (Bareetseng, 2015). Therefore, it can be deduced that medicinal plant fields are considered as pioneers for the future supply of rare plant species with commercial and medicinal value in southern Africa. Furthermore, they are effective on the livelihood of many local people (Rathore and Mathur, 2018).

Noorhosseini et al. (2018) found out in their research that providing training through visual, audio, and written media, credit financial facilities with low interest for cultivating medicinal plants in the fields and holding educational-extension classes are known as the most important economic and extension activities effective on the development of medicinal plants. Mohammadzadeh et al. (2019) pointed out that the two strategies of following global processing and packaging standards and supporting the establishment of production, marketing and export management companies have the highest priority. Therefore, they suggested that considering the important role of medicinal plants in Razavi Khorasan Province, the government, as the executive of the National Medicinal Plants Plan, should pave the way for the development of medicinal plants production in accordance with global standards by supporting the establishment of production and export companies. Shahi et al. (2017) indicated that the villages of Iran have a great comparative advantage and potential in terms of medicinal plants. Although the numerous challenges are big obstacles for the villagers, the results reveal that familiarizing the users with the correct methods of cultivation and exploitation,

the use of mechanization and explaining the results of research on medicinal plants will increase the share of medicinal plants in the gross national product. In addition to the stability of the rural economy, it will play a significant role in rural development. Sojasi Qhidari & Azizi (2019) found out that most people prefer to use medicinal plants obtained from the nature for treatment which they experienced better compared to chemical medicine at least once in their lifetime. The source of people's knowledge in the use of medicinal plants has been from previous generations. Among the effective factors on the villagers' tendency to use medicinal plants, the indicators including cultural adaptability and medicinal plants adaptability with the body are considered to be the most effective factors, respectively. Alipour Khesht et al. (2022) reached to the conclusion that the production of medicinal plants constitutes 1.50% of the total income of the agricultural sector in the study area. Moreover, cultivating each hectare of medicinal plants generates 6.53% more income rather than other crops on average.

Smith-Hall et al. (2012) pointed out that a large number of people rely on herbal medicinal products to maintain health or treat diseases, and it is unlikely that this number may decrease in the foreseeable future. They proposed a framework based on the typology of the main groups of users of medicinal plants (hunters, farmers and ranchers, urban and suburban dwellers and entrepreneurs) and three major types of benefits (producer, consumer and society-wide). In the proposed framework, the factors and links vary from international to domestic levels and, although necessarily broad, can therefore be a facilitator to construct internationally comparable knowledge. Nonetheless, the proof of success is whether this framework stimulates empirically and theoretically richer research than before and whether the obtained results more effectively contribute towards improving human health and better managing of medicinal plant resources. Sen & Chakraborty (2017) found out that traditional Indian medicine or medicinal plants are also considered as a vital source of new medicine. It is important to make such medicine available for people. Several initiatives have been taken in India to promote such medicine and integrate them into clinical practice. Evidence-based integration of traditional Indian medicine into

clinical practice helps provide high-quality health care for all. Tnah et al. (2019) pointed out that 30 herbal products from the local market were tested for their authenticity. The recovery of DNA barcodes from plant products was 73.4%, 56.7% of the tested products were valid, while 10% of the plant products were replaced by other plant species and 6.7% were contaminated. The research by Yadav & Misra (2010) revealed that the use of information and communication technology systems solves problems in development and helps suppliers, producers and consumers. They also stated that the production of medicinal plants has increased the quality of plants and helped consumers and suppliers to recognize medicinal plants. Kalauni & Josh (2018) in their research on medicinal plants and the economy of Nepal, found that more than 75% of the Nepali community (and 60% of the global community) depend on local medicinal plants. Although these medicinal and aromatic plants have a large share in the cash of Nepalese villagers, approximately 90% of them are exported to India in the form of raw materials due to the lack of a wholesale collection system, the lack of processing industries, and the lack of investment by the government. Hence, it is necessary to increase the share of medicinal and aromatic plants in the national economy of Nepal through commercializing and turning them into large commercial crops.

Astutik et al. (2019) in their research titled "Asian medicinal plants' production and utilization potentials: A review" emphasize on the essential role of medicinal plants and their impact on reducing rural poverty and improving the level of community health in Asian countries. Reviewing 247 journal articles in the field of medicinal plants, they have reached the conclusion that studies in this field have been carried out in a scattered and non-systematic manner without an overall view to achieve a certain purpose. They pointed out that most of the studies have been conducted on the role of medicinal plants on livelihood and health and very few studies on the commercialization of medicinal plants, especially with regard to the role of middlemen, boom–bust

cycle, raw material readiness, and product quality. Mbuni et al. (2020) found out that rural communities in the Cherangani Hills are rich sources of plants with medicinal properties, and the therapeutic uses of the collected plants provide basic information which can contribute to further research by scientists for species conservation and pharmacological studies of the most important species. Da Costa Ferreira et al. (2021) reported that diverse knowledge of local pharmacology and in-depth studies are needed to confirm the effectiveness of medicinal plants and understand the dynamics of local knowledge. In a research by Ssenku et al. (2022) the plant species used to treat human diseases in Butalja District of Eastern Uganda and their associated TMK were documented.

Reviewing the background of the studies, it is deduced that most of the studies conducted so far in the field of the activities of medicinal plants in rural areas have focused on the aspects of health and treatment benefits and less have addressed to the issue of economic, social and environmental effects, and this study is focused on its effects as investigating the effects of the activities of medicinal plant can pave the way for improving the quality of rural development for villagers.

3. Research Methodology

It is an applied research and descriptive analytical one in terms of nature. The data has been collected using the library method (in order to review the theoretical literature) and the field method.

The statistical population of this research included medicinal plant producers in 13 villages in Kohgiluyeh and Boyer Ahmad province including 383 medicinal plant producers based on a report by Natural Resources of the Province, among all of whom the questionnaires were distributed.

In addition, the questions in the research questionnaire were designed based on a Likert scale (very little, little, medium, much and very much). According to the review of the studies conducted in the theoretical literature, related indicators were extracted (Table 1).

Table 1. Research indicators

Indicators	Items	Resources
Economic sustainability	The demand for medicinal products, The stability of appropriate marketing systems for selling medicinal plants, Purchasing medicinal products by the government, Creating income and employment obtained due to the activities of medicinal plants, Distributing income due to activities of medicinal plants, Strengthening the local economy due to the activities of medicinal plants, Economic diversification due to the activities of medicinal plants, Economic added value of medicinal plants, Investing of non-local people in the production of medicinal plants, Government investment in the production of medicinal plants, Benefiting from the activities of medicinal plants, Investing of local people in the production of medicinal plants	Safi (2009), Matiei Langroudi et al. (2019), Mohammadzadeh et al. (2019), Omisore (2018), Tohidyan Far & Rezaei-Moghaddam (2019)
Social sustainability	Access of local community to processing and complementary facilities, Booming the activities of medicinal plants and reducing migration, Supporting the progress of promoting and exporting products produced in the village, The effects of medicinal plants on quality of life and making a living, The cooperation and participation of the village council and manager in paving the way for the activities of medicinal plants in order to encourage people and producers, People's awareness of the benefits of products and creating motivation in the activities of medicinal plants, Holding appropriate educational-extension classes on how to cultivate and harvest medicinal plants, Improving non-governmental and local institutions (cooperatives, associations) in the field of medicinal plants, The cooperation of local institutions associated with medicinal plants, Supporting sample models (flower and plant festivals), The cooperation and contributions of local people in medicinal plants, The local community's satisfaction with the booming of medicinal plants	Riahi & Nouri (2015), Sojasi Qhidari & Azizi (2019), Alipour Khesht et al (2022), Shahi et al. (2017), Noorhosseini et al. (2018), Tnah et al. (2019), Smith-Hall et al. (2012).
Environmental sustainability	The optimum use of water, Reducing the extinction of plant species, The effects of climate and booming the activities of medicinal plants, Supporting medicinal plant and species, Increasing environmental vulnerability in the village, The activity and advertisement of village residents to preserve medicinal plant species, Learning opportunities to use better plant species, Raising environmental awareness	Sojasi Qhidari & Azizi (2019), Alipour Khesht et al (2022), Shahi et al. (2017), Jones et al. (2002), Anon (2002).

13 villages in cold regions of Kohgiluyeh and Boyer Ahmad province were used to conduct the study. On the one hand, the selection of the villages was due to the fact that the activities of medicinal plants was more than other villages. On the other hand, they were selected based on the job creation as the local people were engaged in the activities of medicinal plants. This province has 46 types of native plants and three rare medicinal plants in the world, including *Ferula golbaniflua, Ferula assa-foetida,* and *Astragalus brachycalyx Fischer. Dorema aucheri Prangos ferulacea, Allium ampeloprasum, Kelussia odoratissima Mozaff, Allium Jesdianum, Arum detruncatum, Thymus vulgaris, Fritillaria imperialis, Astragalus brachycalyx Fischer, Carthamus tinctorius, Artemisia annua, Artemisia vulgaris, Cichorium intybus* and *Nigella sativa* are among the medicinal and edible plants in Kohgiluyeh and Boyer Ahmad. The document for the development of medicinal plants in this province has been compiled and so far, more than 50 thousand hectares have been restored using the cultivation of medicinal plants (Table 2).

Table 2. Examples of local medicinal plants

County	Region	Popular medicinal plant
Boyer Ahmad	Yasouj	*Ferula assa-foetida, Melissa officinalis, Crocus sativus, Apium graveolens, Rosa damascene, Cuminum cyminum, Glycyrrhiza glabra, Astragalus brachycalyx Fischer, Allium iranicum, Allium Jesdianum, Arum detruncatum*
	Margoon	*Ferula assa-foetida, Descurainia sophia, Matricaria chamomilla, Cuminum cyminum, Mentha piperita, Allium iranicum, Allium Jesdianum, Arum detruncatum*
	Ludab	*Dorema aucheri, Rheum* ribes, *Apium graveolens, Rosa damascene, Lavandula angustifolia, Mentha piperita*
	Kabgian	*Rheum ribes, Aloysia citrodora, Allium stipitatum, Artemisia vulgaris, Cichorium intybus*
Dena	Sisakht	*Ferula assa-foetida, Cuminum cyminum, Crocus sativus, Rosa damascene, Lavandula angustifolia, Glycyrrhiza glabra, Mentha piperita, Astragalus brachycalyx Fischer, Allium iranicum, Allium Jesdianum, Arum detruncatum*
	Pataveh	*Matricaria chamomilla, Echium amoenum, Ferula golbaniflua, Astragalus brachycalyx Fischer*

The validity of the questionnaire was confirmed by 18 academic experts. Using SPSS software, Cronbach's alpha was calculated and obtained 0.85 for the producers of medicinal plant which confirmed its reliability. Finally, descriptive statistics (mean, standard deviation and variance) and inferential (one-sample t-test and VIKOR model) were used for data analysis.

4. Research findings
The descriptive findings of the 383 questionnaires distributed among the producers of medicinal plants showed that most respondents (38.5%) were in the age group of 31-40 years old, at high school (23.5%) level of education. In addition, most respondents were male (56.9%), married (66.6%), with a history of activities in medicinal plants, more than 5 years (15.2%). (Table 3)

Table 3. Respondents' descriptive characteristics

Respondents' Characteristics	Mode	Frequency	Percentage
Age	31-40	149	38.5
Education	High school	123	23.5
Gender	Male	218	56.9
Marital status	Married	236	66.6
History of activities in medicinal plants	More than 5 years	61	15.5

Economic, social and environmental indicators are a combination of components and therefore the research scale is changed to an interval scale. To check the normality of the distribution of the research indicators, the standard error of the Skewness and Kurtosis has been used. If the value of the standard error of the Skewness and Kurtosis is more than +2 or less than -2, then the

assumption of normality of the distribution is rejected (Habibpour & Safari, 2009). At the same time, if the numerical value of the Skewness and Kurtosis is between +1.5 and -1.5, the distribution of research indicators and variables is normal. The results of the normality test for economic, social and environmental indicators can be seen in Table 4.

Table 4. Normality test results for the studied indicators
Source: Research findings, 2022

Indicators	N	Skewness		Kurtosis		Test results
	Statistic	Statistic	Standard Error	Statistic	Standard Error	Skewness & Kurtosis
Economic sustainability	383	-0.389	0.206	-0.583	0.410	Confirmed normality
Social sustainability	383	-0.198	0.251	0.363	0.412	Confirmed normality
Environmental sustainability	383	0.582	0.325	0.456	0.325	Confirmed normality

4.1. Assessing and measuring the economic, social, and environmental sustainability of expanding the activities of medicinal plants

In order to find out which items of the activities of medicinal plants have had the greatest effects on the sustainability of economic, social and environmental indicators of rural development in Kohgiluyeh and Boyer Ahmad province, standard deviation and variance were used. The results showed that in terms of economic indicators the items including "Investing of non-local people in the production of medicinal plants" with a variance of 1.94, "Government investment in the production of medicinal plants" with a variance of 1.92 and "The stability of appropriate marketing systems for selling medicinal plants" with a variance of 1.79 have more effects on economic

sustainability. In the social indicator, the items including "People's awareness of the benefits of products and creating motivation in the activities of medicinal plants " with a variance of 1.99, "Improving non-governmental and local institutions (cooperatives, associations) in the field of medicinal plants" and "The cooperation of local institutions associated with medicinal plants" with a variance of 1.71 have more effects on social sustainability. In the environmental indicator, items such as "Increasing environmental vulnerability in the village" with a variance of 1.93, "Supporting medicinal plant and species" and "The activity and advertisement of village residents to preserve medicinal plant species" with a variance of 1.80 have the most effects on environmental sustainability (Table 5).

Table 5. Assessing the activities of medicinal plants from the producers' point of view

Indicator	Item	Mean	Standard deviation	Variance
Economic sustainability	The demand for medicinal products	2.70	1.24	1.55
	The stability of appropriate marketing systems for selling medicinal plants	2.68	1.34	1.79
	Purchasing medicinal products by the government	2.82	1.19	1.42
	Creating income and employment obtained due to the activities of medicinal plants	3.01	1.32	1.76
	Distributing income due to activities of medicinal plants	2.41	1.18	1.41
	Strengthening the local economy due to the activities of medicinal plants	2.85	1.31	1.71
	Economic diversification due to the activities of medicinal plants	1.86	1.08	1.18
	Investing of local people in the production of medicinal plants	4.26	1.02	1.05
	Investing of non-local people in the production of medicinal plants	2.85	1.39	1.94
	Government investment in the production of medicinal plants	2.63	1.38	1.92
	Benefiting from the activities of medicinal plants	2.78	1.30	1.70
	Economic added value of medicinal plants	2.69	1.23	1.52
Social sustainability	The local community's satisfaction with the booming of medicinal plants	3.21	1.24	1.55
	Supporting sample models (flower and plant festivals)	2.51	1.16	1.36
	The cooperation and contributions of local people in medicinal plants	2.70	1.28	1.62
	The cooperation of local institutions associated with medicinal plants	3.27	1.30	1.71
	Improving non-governmental and local institutions (cooperatives, associations) in the field of medicinal plants	3.52	1.09	1.71
	Holding appropriate educational-extension classes on how to cultivate and harvest medicinal plants	3.30	1.28	1.65
	People's awareness of the benefits of products and creating motivation in the activities of medicinal plants	3.26	1.40	1.99

Indicator	Item	Mean	Standard deviation	Variance
	The cooperation and participation of the village council and manager in paving the way for the activities of medicinal plants in order to encourage people and producers	3.22	1.29	1.68
	The effects of medicinal plants on quality of life and making a living	2.81	1.32	1.76
	Supporting the progress of promoting and exporting products produced in the village	2.72	1.28	1.66
	Booming the activities of medicinal plants and reducing migration	2.71	1.28	1.65
	Access of local community to processing and complementary facilities	2.62	1.22	1.50
Environmental sustainability	The optimum use of water	3.85	1.06	1.13
	Reducing the extinction of plant species	3.53	1.26	1.60
	Raising environmental awareness	3.53	1.32	1.76
	Supporting medicinal plant and species	3.47	1.34	1.80
	Increasing environmental vulnerability in the village	3.41	1.39	1.93
	Learning opportunities to use better plant species	3.62	1.24	1.54
	The effects of climate and booming the activities of medicinal plants	3.42	1.29	1.66
	The activity and advertisement of village residents to preserve medicinal plant species	3.49	1.34	1.80

To have a better perception of the status of villages, the mean score of villages are compared in terms of economic, social and environmental sustainability of the activities of medicinal plants. Figure 1 shows that the environmental sustainability indicator has the highest mean score as most of the villages have a higher level of this indicator compared to other indicators. This indicates that the environmental indicators that have a closer relationship and interaction with the production of medicinal plants have become a fundamental issue in the studied villages. Furthermore, the production of medicinal plants has led people to cooperating and participating in order to pave the way for more activities of medicinal plants, and the mean score of social sustainability indicator is at a higher level than (3). However, the economic sustainability is at a lower level rather than other indicators among the studied villages.
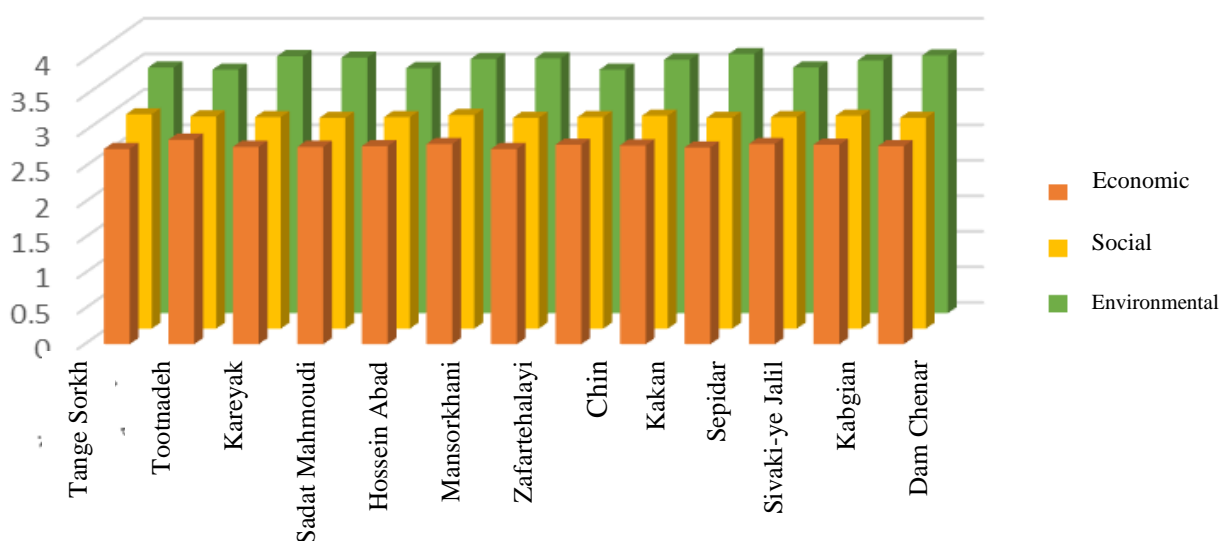
Figure 1. The mean scores of villages in terms of economic, social and environmental sustainability indicators

In the following, the status of sustainability indicators (economic, social and environmental) from the producers' point of view are assessed considering the assumed average of 3 by SPSS software. The results of the single-sample t-test indicate that the mean score of social and environmental indicators is higher than the theoretical average value (3) whereas the mean score of economic indicators is 2.80.

Based on this, the effects of the activities of medicinal plants in the social dimension with a mean score over average lead to cooperation and participation of local people in medicinal plants,

supporting sample models (flower and plant festivals), improving non-governmental and local institutions (cooperatives, associations) in the field of medicinal plants and holding appropriate educational-extension classes on how to cultivate and harvest plants, etc. In terms of environmental aspects, on the one hand, there has been an increase in environmental vulnerability in the village, and on the other hand, there has been a decrease in the extinction of plant species, raising environmental awareness and learning opportunities to use better plant species in the studied villages (Table 6).

Table 6. The status of sustainability indicators from the producers' point of view using the one-sample t-test

Indicator	Mean	t	df	Sig. (2- tailed)	Mean Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Economic sustainability	2.80	-11.732	282	0.000	-0.19952	-0.2330	-0.1661
Social sustainability	2.99	-0.482	282	0.630	-0.00805	-0.4090	0.0248
Environmental sustainability	3.54	23.233	282	0.000	0.54308	0.4971	0.5890

In order to use the VIKOR model to measure the differences between sample villages in terms of economic, social and environmental sustainability, the questionnaire data was first

averaged and presented in the initial matrix. Table (7) displays the indicators used and their mean score in the studied villages in the province.

Table 7. Matrix of current status of research indicators in the studied villages

Villages	Economic sustainability	Social sustainability	Environmental sustainability
Tange Sorkh	2.757	3.026	3.471
Tootnadeh	2.881	2.997	3.436
Kareyak	2.786	2.981	3.632
Sadat Mahmoudi	2.784	2.977	3.604
Hossein Abad	2.819	2.989	3.433
Mansorkhani	2.821	3.012	3.586
Zafartehalayi	2.759	2.976	3.595
Chin	2.819	2.989	3.374
Kakan	2.808	3.002	3.579
Sepidar	2.779	2.972	3.655
Sivaki-ye Jalil	2.823	2.983	3.471
Kabgian	2.819	3.000	3.563
Dam Chenar	2.799	2.979	3.640

In order to rank the proposed villages in the studied province and to determine the weight of each of the criteria, first, a questionnaire was compiled. Then, 12 experts in the production of medicinal plants were asked about the importance of sustainability indicators (economic, social and

environmental). Finally, their importance was determined in the form of the weight of the variables. To determine the weight, firstly, the items were added together. Secondly, the average is calculated. Finally, they are multiplied (Table 8).

Table 8. The weight of the indicators

Sustainability	Economic	Social	Environmental
Weight	0.36	0.33	0.29

According to Figure (2), the spatial analysis of the distribution of villages in the studied province shows a significant difference in terms of sustainability indicators (economic, social and environmental). Sepidar village has the highest rank in terms of sustainability indicators with a VIKOR index of (0.157) which is due to its geographical location, the reduction of geographical isolation and their long-term activities in the region. Sadat Mahmoudi village with a VIKOR index of (0.993) has the lowest rank in terms of the sustainability owing to the increased geographical isolation and having poor infrastructure, etc. (Table 9).

Table 9. Final ranks

Villages	VIKOR index	Rank
Sepidar	0.157	1
Kareyak	0.392	2
Tange Sorkh	0.392	3
Sivaki-ye Jalil	0.419	4
Hossein Abad	0.448	5
Kakan	0.458	6
Mansorkhani	0.466	7
Chin	0.496	8
Zafartehalayi	0.508	9
Kabgian	0.757	10
Tootnadeh	0.786	11
Dam Chenar	0.903	12
Sadat Mahmoudi	0.993	13
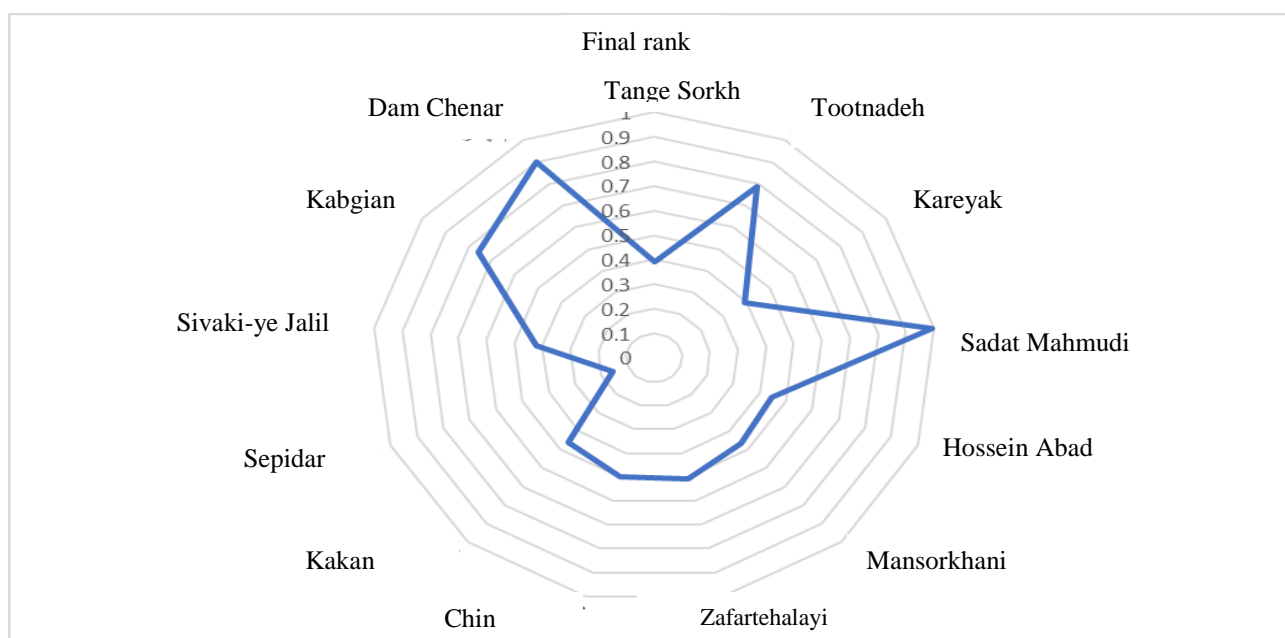
Figure 2. The final ranking of villages in terms of sustainability indicators

5. Discussion and Conclusion

One of the approaches that plays an effective role in the development of rural areas is the diversification of activities, which in recent years has led to the expanding of employment among the local people. Therefore, this approach has emphasized on comprehensive and integrated thinking about poverty reduction and rural

development and has attracted the attention of many researchers. Considering that there are abundant natural resources in the rural areas; planning and applying efficient methods for its optimal exploitation and management can solve many environmental and economic-social problems in rural development. Medicinal plant industry is considered a huge economic resource with added value in many rural areas in Kohgiluyeh and Boyer Ahmad province. Therefore, knowing the potentials and employment programs can provide a valuable position for this industry, both inside and in the export sector, and a successful presence of the villages of Kohgiluyeh and Boyar Ahmad province in local and regional markets.

Half of the area of the province, approximately 8037 square kilometers with an average altitude of 900 meters, is located in the north and east of province including Boyar Ahmad and Dena counties, and the north of Kohgiluyeh and Gachsaran counties. In the cold region, there is a lot of snow and rain covered with dense forests of oak, pine, almond, cypress, etc. The rains start from the cold months of the year and continue until the beginning of the hot season, the average rainfall ranges from 600 to 800 mm, which plays a significant role in the growth of medicinal plants in this region. In this regard, attention to the production and consumption of medicinal plants and the prevalence of traditional medicine has been the focus of the support and planning of the economic-social managers and the health sector of the province and the country. Hence, the development and facilitation of rural development requires knowledge of the effevtive indicators and variables. Therefore, this research was carried out in order to assess and measure the economic, social, and environmental sustainability of the expansion of the activities of medicinal plants in the rural development of Kohgiluyeh and Boyar Ahmad province. The attitude of producers in 13 villages of this province was assessed and measured; and to address the mentioned goals, descriptive statistics (mean, standard deviation and variance) and inferential statistics including single-sample t-test and VAKOR model were applied.

The descriptive findings of the research showed that the items of "Investing of non-local people in the production of medicinal plants" and "Government investment in the production of

medicinal plants" had the highest effects on economic sustainability. In the social indicator, the items of "People's awareness of the benefits of products and creating motivation in the activities of medicinal plants", "Improving non-governmental and local institutions (cooperatives, associations) in the field of medicinal plants" and "The cooperation of local institutions associated with medicinal plants" were the most effective on social sustainability. In the environmental indicator, items such as "Supporting medicinal plant and species" and "The activity and advertisement of village residents to preserve medicinal plant species" had the most effects on environmental sustainability. The inferential findings of the one-sample t-test revealed that the mean score of social and environmental indicators was higher than the theoretical average value (3), while the mean score of economic indicators was 2.80. The results of the VAKOR model showed that Sepidar village with a VIKOR index of (0.157) had the highest rank and Sadat Mahmoudi village with a VIKOR index of (0.993) had the lowest rank in terms of the sustainability of the activities of medicinal plants among the villages in the study area. The results of this research can be compared with the findings of other researches, such as Sojasi Qhidari & Azizi (2019); Safi (2009); Noorhosseini et al. (2018); Astutik et al. (2019), Mbuni et al. (2020); Ssenku et al. (2022). Their results showed that firstly, attention should be paid to the identification of the benefits of medicinal plants. Paving the way for expanding the cultivation of medicinal plants can lead to increasing the diversification of rural economy. In this regard, their findings are in line with the results of this study. Accordingly, the issue of the activities of medicinal plants is of paramount importance in order to strengthen sustainable rural livelihoods, and should be taken into consideration by authorities and people. What can play a fundamental role in increasing the production of medicinal plants is the education and promotion of the benefits of medicinal plants. In this regard, the following solutions can be proposed to improve the sustainability of the activities of medicinal plants in the study area.

1- Paying attention to economic indicators which are at a lower level rather than other social and environmental indicators.
2- Paying more attention to the villages of Sadat Mahmoudi and Dam Chenar, where are in a

lower status in terms of the activities of medicinal plants.

3- Strengthening the level of the activities of medicinal plants through the cooperation of producers and authorities in providing expansion of these activities for villagers.

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Authors' contributions

The authors equally contributed to the preparation of this article.

Conflict of interest

The author declares no conflict of interest.

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Original Article

ارزیابی و سنجش پایداری سکونتگاه‌های روستایی فعال در حوزه گیاهان دارویی (مطالعه موردی- استان کهگیلویه و بویراحمد)

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چکیده مبسوط

۱.مقدمه

یکی از فعالیت‌ها متنوع در مناطق روستایی، کاشت گیاهان دارویی و فعالیت‌های اقتصادی مرتبط با آن است که می‌توانـد زمینه‌سـاز توسعه اقتصادی نواحی روستایی باشد. تنوع گونه‌های دارویی، تنـوع اقلیمی، نیروی انسانی و منابع انرژی در دسترس از جمله پتانسـیل‌ های مهمی در جهت توسعه کشت و صنایع مرتبط با گیاهان دارویی می‌باشد. گیاهان دارویی از ارزش و اهمیت خاصی در تامین بهداشت و سلامتی جوامع، هم به لحـاظ درمـان و هـم از نظـر پیشـگیری از بیماری‌ها برخوردار بوده و هستند. این بخش از منابع طبیعی قدمتی هم پای بشر داشته و یکی از مهمترین منابع تامین غذایی و دارویی بشر در طول نسل ها بوده اند. با آن که نگرش انسان به فراورده های دارویی گیاهان، پیشینه عمیقی دارد ولی از حـدود نیمـه دوم قـرن بیستم، مسئله افزایش تولید این فراورده‌ها در سطح مـزارع و باغ‌هـا شکل علمی نو به خود گرفت. بنابراین هدف از این پژوهش بررسـی موانع کشت و تولید گیاهان دارویی در مناطق روستایی سردسـیری کهگیلویه و بویراحمد است و به دنبـال پاسـخ‌گویی بـه ایـن سـوال کلیدی می‌باشد. میزان پایداری اقتصادی، اجتماعی، زیست‌محیطی گسترش فعالیت گیاهان دارویی در روسـتاهای اسـتان کهگیلویـه و بویراحمد چگونه است؟

۲.مبانی نظری تحقیق

از زمان‌های بسیار قـدیم، مـردم منـابع گیـاهی و جـانوری را بـرای نیازهای خود جمع‌آوری کرده‌اند. به عنوان مثال می‌توان بـه آجیـل خوراکی، قارچ، میوه‌ها، گیاهان، ادویه جـات، صـمغ، بـازی، علوفـه، الیاف مورد استفاده برای ساخت سرپناه و مسکن، پوشاک یا ظروف،

و محصولات گیاهی یا حیـوانی بـرای مصـارف دارویـی، آرایشـی یـا فرهنگی اشاره کـرد. حتی امـروزه، صـدها میلیـون نفر، عمـدتاً در کشورهای در حال توسعه، بخش قابل توجهی از نیازهای معیشتی و درآمد خود را از جمع‌آوری محصولات گیاهـی و حیـوانی بـه دسـت می‌آورند. جمع آوری محصولات بـا ارزش بـالا ماننـد قـارچ (مـورل، ماتسوتاکه، ترافل)، گیاهان دارویی (جـین سـینگ، کوهـوش سـیاه، گلدن سیل) نیز به دلایل فرهنگی و اقتصادی در کشـورهای توسـعه یافته ادامه دارد. در میان این مصارف، گیاهان دارویـی نـه تنها بـه عنوان داروهای سنتی مورد استفاده در بسیاری از فرهنگ‌هـا، بلکـه در تجارت کالاهایی که تقاضای بازارهای اغلب دوردسـت را بـرآورده می‌کنند، نقش اساسی دارند. تنوع و در دسترس بودن گیاهان بومی به استفاده از آنهـا توسـط مـردم و جوامـع گونـاگون ماننـد جوامـع روستایی (غیرسنتی)، جوامع سنتی، جمعیت‌هـای بـومی و حاشـیه رودخانه کمک می‌کند. جوامع روستایی قادر به شناسایی بسیاری از گونه‌های گیاهی هستند که محصولات متعددی از جمله غذا، هیزم، دارو، علوفه و ابزار مورد نیاز روزانه خود را تولید می‌کنند.

۳. روش تحقیق

نوع تحقیق کاربردی و بر اساس ماهیت توصـیفی، تحلیلـی اسـت و اطلاعات آن با استفاده از روش کتابخانه‌ای (به منظور تدوین مبـانی نظـری موضـوع) و روش میـدانی جمـع‌آوری شـده اسـت. پـس از مشخص شدن متغیرهـای تحقیـق، از روش تمـام شـماری جهـت تکمیل پرسشنامه‌ها استفاده گردید. جامعه آماری این تحقیق تولید کنندگان محصولات گیاهان دارویی در ۱۳ روستای تولید کنندگان گیاهان دارویی بالغ بر ۳۸۳ نفر واقع در استان اسـتان کهگیلویـه و بویراحمد است و طبق گزارش‌های منابع طبیعی استان بـه عنـوان

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از میزان پایداری فعالیت های گیاهان دارویی در بین روسـتاهای محـدوده مورد مطالعه بوده است.

۵.بحث و نتیجه‌گیری

به منظور ارزیابی و سنجش پایداری اقتصـادی، اجتمـاعی، زیسـت- محیطی گسترش فعالیت گیاهان دارویی بر توسعه روستایی اسـتان کهگیلویه و بویراحمـد ایـن تحقیـق صـورت گرفت. نگـرش تولیـد کنندگان در ۱۳ روستای این استان مـورد بررسـی و سـنجش قـرار گرفت؛ و برای پاسخ به اهداف مطرح شده از آمار توصیفی (میانگین، انحراف معیار و واریانس) و استنباطی از آزمون t تک نمونـه و مـدل وایکور بهره گرفته شد. یافته‌های استنباطی حاصل از آزمون t تـک نمونه‌ای نشان داد که مقدار میانگین وضعیت شاخص‌های اجتمـاعی و زیست محیطی از مقدار میانگین نظری (۳) است. امـا در شـاخص اقتصادی این مقدار برابر ۲/۸۰ بوده است. نتایج مدل وایکور نشـان داد که روستای سپیدار با میزان (۰/۱۵۷) بالاترین رتبه و روستای سـادات محمودی با میزان (۰/۹۹۳) دارای پائین‌ترین رتبه از نظر میـزان پایداری فعالیت های گیاهان دارویی در بین روسـتاهای محـدوده مـورد مطالعـه بوده است. بنابراین یافته‌های این تحقیق را می‌تـوان بـا یافتـه‌هـای تحقیقات دیگران از جمله سجاسی قیداری، و عزیزی(۱۳۹۸)؛ سفی (۱۳۸۸)؛ نور حسـینی و همکـاران(۱۳۹۶)؛ اسـتوتیک و همکـاران (۲۰۱۹)؛ مبنی و همکاران (۲۰۲۰)؛ اسـنکو و همکـاران (۲۰۲۲) مقایسه کرد. نتایج آنها نشان داد که ابتدا بایـد بـه شناسـایی فایـده گیاهان دارویی توجه کرد و با بستر سازی زمینه گسـترش پـرورش گیاهان دارویی را بوجود آورد و این باعث افزایش تنوع بخشـی در اقتصادی مناطق روستایی می‌شود؛ لذا با پـژوهش حاضر همسـوی خاصی دارد.

کلیدواژه‌ها: پایداری اقتصادی، پایداری اجتماعی، پایداری زیسـت- محیطی، فعالیت گیاهان دارویی، استان کهگیلویه و بویراحمد.

تشکر و قدردانی

جامع آماری تحقیق انتخاب شدند. همچنین سوالات در پرسشـنامه تحقیق با مقیاس رتبه‌ای براساس طیـف لیکـرت (بسـیار کـم، کـم، متوسط، زیاد و خیلی زیاد) طراحی شد.

۴. یافته های تحقیق

از ۳۸۳ پرسشنامه که بین تولیدکنندگان گیاهـان دارویـی توزیـع و پخش گردید، یافته‌های توصیفی پرسشنامه نشان داد کـه از لحـاظ ویژگی‌های سن پاسخگویان، افراد بین ۴۰-۳۱ سال، با ۳۸/۵ درصد پاسخ، از لحاظ تحصیلات، گزینه دبیرستان با ۲۳/۵ درصد، از لحـاظ جنسـیت، مردهـا بـا میـزان ۵۶/۹، بیشـترین پاسخهـا را بـه خـود اختصاص داده‌اند. یافته های انحراف معیار و تحلیل واریانس نشان داد که شاخص‌های اقتصادی، گویه سرمایه‌گذاری افراد غیر بومی در تولید گیاهان دارویی با مقدار واریانس ۱/۹۴، سرمایه گذاری دولتـی در تولید گیاهان دارویـی بـا مقـدار ۱/۹۲ و پایـداری سیسـتم هـای بازاریابی مناسب برای فروش گیاهان دارویی با مقـدار ۱/۷۹ بیشـتر اثرات بر پایداری اقتصادی را به دنبال داشته اند. در شـاخص پایـدار اجتماعی، گویه‌های آگاهی مردم از مزایای تولیدات و ایجـاد انگیـزه در فعالیت گیاهان دارویی با مقدار واریانس ۱/۹۹؛ بهبـود نهادهـای غیـردولتـی و محلـی (تعاونی‌ها، انجمن‌ها) در عرصۀ گیاهان دارویی و همکاری نهادهای محلی مرتبط با گیاهان داوری هر کدام با مقدار واریانس ۱/۷۱ را بـه خـود اختصـاص دادنـد. در پایـداری اجتمـاعی گویه‌های مانند افزایش آسـیب‌پذیری زیسـت‌محیطی در روسـتا بـا مقدار واریانس ۱/۹۳ و حمایت از گونه‌های گیاهی و دارویی با میزان ۱/۸۰ و فعالیـت و تبلیغـات سـاکنان روسـتا بـرای حفـظ گونـه‌های گیاهان دارویی با مقدار واریانس ۱/۸۰ بیشتر اثرات بر پایدار توسعه روستایی را به دنبال داشته‌اند. تحلیل فضایی توزیع روسـتاها در استان مـورد مطالعـه در شـاخص‌هـای پایـداری (اقتصـادی، اجتمـاعی و زیست‌محیطی) نشان‌دهنده تفاوت معنـادار زیـادی اسـت. بـه طـوری کـه روستای سپیدار با میزان (۰/۱۵۷) بدلیل موقعیت ارتباطی و کاهش انزوای جغرافیایی و فعالیت طولانی مـدت‌تر آنهـا در منطقـه، تولیـدات گیاهـان دارویی بیشتری صورت گرفته است که بـالاترین رتبه و روسـتای سـادات محمودی با میزان (۰/۹۹۳) بـدلیل افـزایش انـزوای جغرافیـایی و داشـتن زیرساخت های ضعیف و غیره دارای پائین‌ترین رتبه به لحـاظ برخـورداری

Original Article

Studying the Effects of Women empowerment on the Evolution of Human Settlements (Case Study: RFLDL Project Settlements in Sarayan County)

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Abstract

Purpose- How to move toward community empowerment is one of the most crucial challenges in local and regional development programs. This is essential for the role of women in measures and programs for sustainable development that is founded on environmental activities. One of the South Khorasan province's local development measures is the RFLDL project in Sarayan county, and one of its selected techniques for achieving the project's main objectives is the local women empowerment. This study aims to evaluate the geographical and spatial aspects of the effects of women empowerment in the implementation area of the RFLDL project in Sarayan county .

Design/methodology/approach- The current research is practical in terms of purpose and descriptive-analytical in terms of nature and method. Among the households whose women participated in the RFLDL project, 273 women was determined using Cochran's formula.

Findings- The findings demonstrated that local women empowerment has increased greatly over the past ten years as a result of implementing the RFLDL project in the studied area. Women empowerment has resulted in improving the economic environment of human settlements and increasing the income of residents through the creation of small and home-based employment. In addition, self-confidence has improved, self-esteem has developed, and group participation has been promoted. The settlements are changing more and more in terms of ecology. Additionally, the development of human settlement ties and the strengthening of spatial links have benefited greatly from women empowerment.

Research limitations/implications- The spread of the Coronavirus complicated efforts to collect data in the studied villages and significantly decelerated the article's production. Accordingly, surveys and interviews were conducted online to lessen the negative effects of this constraint .

Practical implications- The development of human settlements and their transformations are significantly accelerated by women empowerment through spatial dynamism .

Originality / value- The findings of the research are mentioned in this article, and according to the guidelines, the sources used, such as theses, articles and books all are cited. The use of traditional statistical indicators and the investigated villages within the RFLDL project's purview in Sarayan county provide the value and originality of this research.

Keywords- Sustainable development, Empowerment, Women, Spatial developments, RFLDL international project.

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1. Introduction

Humans are the most crucial component of development, and women represent half of all human resources in any society. Therefore, fundamental planning for them should be the pillars of any society, especially considering this population, whether as a service provider or even a consumer, which plays an essential role in the development balance. Future generations are nurtured and created by women. They are valuable perspective human resources for national socioeconomic and cultural growth, thereby it is crucial to pay close attention to how their skills are developing (Taleghani et al., 2009: Nejati Aji Bisheh & Jamali, 2007). A common belief is that women give birth and are causes of fertility, and they are mothers of humans and the earth. The form and structure of the plates from the earliest agricultural period demonstrate the center and main character of a woman, which is a reflection of her real and potential talents in gathering, cultivating, guarding, feeding, and giving life. These works serve as an analogy for the nature, social standing, and skills of women (Lahiji & Kar, 2011). In 1980s and 1990s, hunger increased as a result of the expansion of economic gaps between developed industrial nations and developing and underdeveloped ones, as well as the widening of class divisions within the mentioned societies. At this time, attention was focused for the first time on women's labor and their potential to generate income. The inclusion of gender issues in the development process has prompted consideration of some principles, including welfare, equality, eradication of poverty, efficiency, and women empowerment. Role distinctions, social expectations for men and women, and gender structures have also been considered. As a result, as strong evidence can be observed throughout the world, it is essential to elevate women and increase their participation in the development, planning, and implementation of fundamental measures (Alwani & Zarghami Fard, 2010).

Women make up a large part of the population in smaller communities, especially rural villages. As a result, this aspect of human resources is always crucial for reaching development objectives. Although women play an important role in development, their degree of access to facilities is at the minimum level. It is claimed that economic, social, cultural, and ecological conditions have a greater impact on local and rural women than they do

on male society. When the effect of their roles is considered on a global scale, a trend toward encouraging local women to participate in development can be observed since 1970s. To encourage women to participate in the development, it is necessary to find effective ways to enhance their sense of self-esteem (Bouzarjemehri and Naibzadeh, 2018). Women should play a large role in local and rural communities, not only in the home economy, which is planned primarily within its framework, but also in the economic, cultural, social, and political spheres. Undoubtedly, without the participation of rural women, it is often difficult for various economic and productive activities to continue in the village, or at the very least, it would face some significant problems. Therefore, women's roles in development should receive special attention so that they recognize their importance and effectiveness, their various educational demands and technical gaps, and the need to make an effort to improve and empower themselves. As stipulated in World Conference on "Agrarian Reforms and Rural Development" (1979), rural women should equally participate in the rural development process. The conference's formal stances were focused on issues like equality in the legal system, access to rural resources and services, equality of opportunity in school and work, obtaining data on rural women, and supporting organizations. The fundamental objective of this measure was to assist rural women in their role as "producers" and to give them optimal access to resources for production, particularly technology that can minimize their suffering, and workloads that women must burden while also increasing their productivity. While some philosophers relate empowerment to more participation, others see it as one of its enabling aspects. People should evolve to the point where they are capable of making decisions based on their preferences as part of the empowerment process (Shadi Talab, 2011).

The adoption of participatory approaches is one of the most effective ways to promote the empowerment of local and rural women. The international project called "The Rehabilitation of Forest Landscapes and Degraded Land (RFLDL)" in Sarayan county is a significant and worthwhile experience in the nation because of the indispensable role that women play in the development process and the need to strengthen their participation in resolving spatial (settlement) issues of development in various economic, social, cultural, and environmental dimensions. It aims to

combine empowerment strategies with the utilization of women's power to make the areas desert greening, save natural resources, and support family economies under the supervision of national and international organizations. As argued by the systemic thinking that every change and transformation in one area of the social space causes changes in other areas of the system, a fundamental question rises here as how women empowerment (as a part of human society) affects the settlement scale (macro system)? The answer to the above question can aid in providing a more logical explanation of the effects and results of women empowerment in the local society. Moreover, it increases knowledge of the factors affecting the system of changes and transformations in human settlements. For this purpose, this study aims to investigate the knowledge and analysis of the spatial aspects of the effects of empowering rural women in the implementation area of RFLDL project in Sarayan County (containing the Sehqaleh city and Zanagu, Doust Abad, and Bostaq villages).

2. Research Theoretical Literature

To address current development concerns such as poverty, unequal resource distribution, and environmental deterioration, regional and local development studies and the integration of micro-level research in particular locations with macro-projects in the economy and society are required. That is, understanding these demands is important since many planning issues are the result of improper usage of the notion of space. Integrating and focusing on space and place with established standards necessitates meeting these needs. Space and the body are traditionally viewed as unacceptably different from other facets of life and growth. In other words, the relationship between space and social, political, and economic power is not considered, and spatial structure is provided without considering social relations. Such a viewpoint serves to reflect and mold certain notions about how the world is or ought to be. According to this perspective, the regions are appropriate for case studies that focus on the social development process. Communities and societies are defined as areas of land where social identity is linked to land continuity. According to this paradigm, a new area of study known as "location studies" has emerged in the fields of geography and its surrounding disciplines in recent years as a result of the growing interest in the role of space and place in development (Eftekhari et al., 2011). Regarding the development of villages, it should be mentioned that

planning needs to give a multidimensional image of the studied area in sustainable development approach. To plan for the sustainable development of rural areas, it is crucial to connect the dimensions of sustainability, particularly in social, institutional, economic, and environmental areas. In essence, the body of rural settlements is considered the foundation for these areas' economic and social performances. Therefore, the first stage in enhancing settlement performance is physical organization and transformation (Rezvani, 2014). Planning for physical growth is a reflection of social life's progress and is considered an endeavor to give direction to the evolution of the environment of human life. The physical structure of rural regions has a major impact on how settlements develop physically. Then, it relates to subjects and elements like land usage, communication and transportation, infrastructural facilities and equipment, housing, employment, recreation, tourism, and general welfare that the villages cannot supply independently. In physical development, social processes are attempted to be guided by the physical program. As a result, social campaigns may be directed by making better use of natural world and space for human existence. Therefore, both the components of space and society are tied to physical development. Planning physical development in rural areas is thus an effort to find the most advantageous level of compatibility between space and society for society's benefit (Pourtaheri et al., 2010).

One of the transformational actions at the core of society is "empowerment and expansion of power" among the core components of society (men and women). The process through which people, communities, and organizations take charge of the difficulties and problems they encounter is known as empowerment. It is intended to do these things to assist weak people to strive to overcome their weaknesses, enhance the positive aspects of their lives, and develop their skills and abilities for smart control over life (McWhirter, 1994). Briefly, empowerment refers to a person's capacity to manage and control their own life. They must organize themselves for this shift. The ability to self-organize is a sign of competence. People identify their difficulties and problems, set objectives for themselves, develop a plan of action, gather resources, and begin to take action. The consequences of this action are reflected in this activity (Rappaport, 1985). By enhancing women's self-confidence, empowerment enables them to freely defend their

rights and exercise control over resources. Women learn to recognize their inner desires and needs during this process, and they develop the skills needed to carry out their desires (Shakuri, et al, 2007; Mardani, 2009; Sivayojanathan, 2003). The process of women empowerment involves empowering them to change the systems and beliefs that have put them in a position of inferiority (dependence). Women feel more independent, self-assured, and in command of their lives thanks to this procedure, which also helps them obtain more resources and control over their life. It also enhances their self-esteem and self-image (Ugbomeh, 2001). Government must provide grounds for Women empowerment to support knowledge-based economic development and progress.

The ideas describing how women contribute to development has been the feminist approach, particularly the discoveries of scholars like Boserup. Reportedly, lack of attention to the topic of gender and the growth of gender inequality (gap), which is also a result of the presence of gender discrimination in society, has been one of the primary causes of failure of development programs and even their oppositive results (Lange, 1993). It is easy to comprehend the three opposing ideas of "integration," "marginalization," and "exploitation" from the perspective of feminists like Tiano who attempts to explain the consequences of economic and social progress on women's living conditions. According to proponents of the "integration" hypothesis, development is defined as a growth in women's participation in socioeconomic issues, which leads to their liberation and a narrowing of the gender gap. According to the "marginalization" theory, a capitalist approach to development prohibits women from working in the production and economy and confines them to the household, which places them in financial dependence and restricts their access to material resources. In addition, according to the "exploitation" hypothesis, the modernization of society makes women involved into cheap labor since they are treated as inferior to males in industrial production units, which exposes them to exploitation (Abbott & Wallace, 2011). Buvinic claims that the aforementioned tactics have not yet had a positive impact on women's affairs while criticizing the development strategy and the methods used to implement it. The distribution of resources and advantages from the development process for women

will also expand as a result of taking into account a portion of women in employment and the labor market to address this challenge. In this situation, socioeconomic development will be accompanied by the emergence of equality (Moser, 1993). The women participation in the phases and measurements of development, as well as its outcomes and advantages, should be well considered to actualize development, especially the ones that are acceptable to both groups. The physical development of human settlements with a sustainable approach necessitates planning attention in the two dimensions of space and society, as can be seen from the presented theoretical perspectives (Figure 1). The central position of society and people as the primary participants in spatial arenas suggests a twofold focus on the core components of society, i.e. women and men. If they have enough strength and power, they can start changes and spatial transformations. As a result, every change in the social impact of society has the potential to specifically affect spatial and residential development. One of the key elements in the reconstruction and transformation of rural (and even urban) communities' sustainable development aspects is women empowerment.

The position of women and the type of their participation is one of the significant crietrion for measuring development in any country, and women empowerment is considered as a development objective. Few studies have been conducted to fully grasp the spatial implications of the "Women empowerment method" in human settlements. Also, the majority of the limited studies have focused on the examination and justification of how participation, local empowerment, and rural Women empowerment contribute to the advancement of plans and measures, some of which are briefly listed below. Therefore, the analysis of the results and spatial impacts of empowering women in the development of their settlements distinguishes the current research from earlier studies (Table 1).

Table 1. Literature review

Researchers	Year	Results summary
Fallsoleyman et al	2011	The carbon sequestration project has been effective in enhancing rural women's cultural, social, and economic emancipation, and the level of women's awareness, income, variety of job activities, financial independence, greater participation in decisions, and change of their attitude to the project activity, has been more satisfied with an ascending trend.
Chermchian Langroudi and Ali Beigi	2013	Group techniques, such as holding educational workshops on the processing of agricultural commodities, were the most effective way to offer extension-educational services to rural women in Sari County. Lack of trust among women was the biggest barrier to the psychological empowerment of rural women in Sari County, and providing loans and credit to these women was the most crucial remedy.
Ghanbari and Ansari	2015	The findings indicated that participation in economic activities, as well as individual and social variables, are the most significant elements influencing rural women empowerment. Additionally, obstacles to empowerment are positively and significantly correlated with the features such as a lack of career prospects, poor level of education, the presence of familial biases, and lack of legal assistance and communication networks.
Khairdoust Langroudi et al	2019	The assumptions of equality, fairness in consequences or opportunities, equality of education, the assumption that women work, and that men are the primary providers of income, and the equality of employment between men and women in the definition of this index have been identified and examined in this article. The women empowerment index is based on Amartya Kumar Sen's theory of capacities and agency as well as feminist economics, which is one of the study's most significant findings.
Taklou et al	2021	According to the findings of Friedman's test, economic considerations such as lack of employment, income, available land, enough assurance for purchasing goods, and insurance issues were ranked first with an average score of 2.3, followed by cultural and social variables such as those that attract people to the county, youth issues with family and the rural environment, the presence of relatives in the county, marriage, and the rapid increase of the village population with an average rating of 2.08. Finally, service and infrastructure factors with an average rating of 1.63, such as the lack of educational, medical, recreational, and construction facilities, have been effective in the third stage of generating the issue of human resources in rural regions.
Jahantigh et al	2021	The findings demonstrated that in the development of a creative village, the criteria of promotion and education have the most effectiveness, while risk-taking has the greatest impressionability. Considering the results of the geographical study of the influence of creative village indicators, six villages have a good condition, eleven villages have an average condition, and three villages have a low status.
Parveen& Leonhauser	2004	Six indicators—contribution to family income, possession of assets, access to resources, participation in family decision-making, perception of gender awareness, and tolerance for family issues—have been used to examine the empowerment of rural women. According to the findings, compared to other features, rural women are less capable of participating in the economy and property ownership.
Sanayang & chi Hang	2008	They discovered that to empower and promote rural women, there should be some supports for the women's groups in the villages, and one of the most effective methods for doing this is through the establishment of these groups' organizations and the use of microcredits. In this regard, the Social and Economic Commission of the United Nations (ESCAP) has noted that by offering microcredits, it is possible to achieve significant objectives like creating employment, self-employment, increasing self-reliance, earning income, reducing poverty, socioeconomic development, promoting self-esteem, and improving the health and nutritional status as well as the level of literacy of underprivileged people, women, and children.
Sathiabama	2010	The signs of rural women empowerment include increased empowerment in income and economic issues, living standards, high self-confidence, increased awareness, a sense of success, increased social interaction, participation in political activities, an increase in participation level, an improvement in leadership quality, participation in problem-solving related to women and society, and an increase in a decision-making capacity in the family and society.
Lima-Constantino, P.A., et. al	2012	Enhancing local capacity will increase local engagement, promote literacy and awareness, improve people's income and standard of living, and market the goods made in the target villages.

3. Research Methodology

3.1 Geographical Scope of the Research

The settlements where the RFLDL project was performed, including one city (Sehqaleh city) and three villages, (Zanagu, Doust Abad, and Bostaq villages) were part of the study area in Sarayan county (Figure 1). In their capacity as representatives of the government of the Islamic Republic of Iran, Global Environment Facilities (GEF), the Food and Agriculture Organization of the United Nations (FAO), and the National Forests, Ranges and Watershed Organization (FRWO) are collaborating on the international project for the restoration of forest and degraded lands with a focus on lands sensitive to wind erosion and saline soils (RFLDL). In addition, it supports the national measures to create and implement sustainable development methods in the arid and semi-arid regions through the execution of long-term, inclusive watershed management plans. This project was supposed to last for 5 years (2011-16) and help restore land in arid and semi-arid areas and so help people live in a sustainable way, have food security, keep biodiversity, and prevent desertification. It has been implemented since December 2010 in two pilot projects, Sarayan and Regan, in the provinces of South Khorasan and Kerman, respectively, with a total area of 462,068 hectares. Due to its success over the previous five years, the project has been extended for an additional four years to the end of June 2020. With a total size of 163,568 hectares, the Sarayan watershed was divided into two phases, the first of which was 51,229 hectares under the Sehqaleh (Hembo) watershed (General Administration of Natural Resources of South Khorasan Province, 2019).
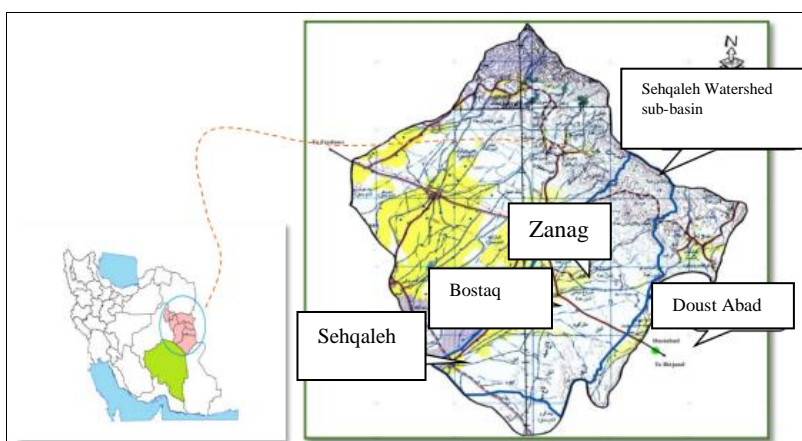
Figure 1. Location of the study area

3.2. Methodology

The current research was practical in terms of purpose and descriptive-analytical in terms of nature and method. The data was collected through the use of surveys and library studies (document reviews), and a researcher-made questionnaire was the instrument utilized to explore the survey in the studied area. Experts in rural geography and sociology from Birjand University evaluated and verified the questionnaire's validity, and a pre-test (the completion of 30 questionnaires) and Cronbach's alpha (with a value over 70%) were used to determine the questionnaire's reliability. The housewives (15–64 years old) who participated in the global RFLDL experiment made up the research population. The city of "Sehqaleh" and the villages of "Doust Abad," "Zanagu," and "Bostaq" with 1959 households (as of the 2015 census) make up the examined settlements. The most recent statistics show that 939 households have participated in the project. Random-stratified probabilistic sampling has been used to determine the size of the study sample among the households. A sample size of 273 women was acquired at the level of each household following the pretest and the application of Cochran's method to estimate the variance of the community feature. Table 2 displays the spatial distribution of the sample size.

$$n = \frac{N(t{\cdot}s)^2}{Nd^2+(t{\cdot}s)^2}$$

$$n= \frac{939(1/96\times0/5)^2}{939\times(0/05)^2+(1/96\times0/5)^2} =273$$

n = sample size

N=statistical population
t^2 = Confidence level of sample estimation at 1.96
D= Probable accuracy
S=variance

Table 2. Spatial distribution of the sample size based on the households that participated in the project

Studied settlement	Total household consensus (2015)	Total households participated in the project	Sample size
Doust Abad	494	236	69
Bostaq	263	126	37
Zanagu	182	87	25
Sehqaleh	1020	490	142
Total	1959	939	273

A database was first made in the SPSS software and used to evaluate the data collected from the analyzed samples. Subsequently, a summary of the data status has been presented using descriptive statistics. Then, the normality of the data distribution was checked by performing the Kolmogorov-Smirnov test, as a result of which it was determined that the binomial non-parametric test should be used to infer the effects of women empowerment measures in the three dimensions of rural spaces (social, economic and biological). environment) be used.

4. Research Findings

Examining any subject in the area of social studies requires considering the unique traits of the respondents. To better understand the investigated women, four key factors were examined, including marital status, education level, employment status, and primary household occupation. The results of the study indicate that 81.7% of the subjects were married, and 18.3% were single (Table 3).

Table 3. Frequency distribution of the studied subjects in terms of their marital status

Marital status	Frequency	Percentage
Single	51	18.3
Married	227	81.7
Total	278	100

Women's education levels were examined, and 4.3% of them were illiterate, 16.6% had completed elementary school, 18.1% had a middle school diploma, 39.4% had a diploma, and 21.7% had an associate degree or higher (Table 4).

Table 4. Frequency distribution of the studied people in terms of their level of education

Education level	Frequency	Percentage
Illiterate	12	4.3
Elementary school	46	16.5
Middle school diploma	50	18
Diploma	109	39.2
Associate degree or higher	60	21.6
Not answered	1	0.4
Total	278	100

Considering the frequency distribution of the studied women in Sarayan county based on their employment status, 69.9% were employed and 30.1% were unemployed (Table 5).

Table 5. Frequency distribution of the studied people in terms of their employment status

Employment status	Frequency	Percentage
Employed	188	67.6
Unemployed	81	29.1
Total	269	96.8
Not answered	9	3.2
Total	278	100

The findings revealed that 19.8% of the women were household heads, 14.8% worked in agriculture, 4.9% were involved in horticulture, 15.2% worked as workers, 13.6% were employees, and 31.7% worked in other occupations (Table 6).

Table 6. Frequency distribution of the studied people in terms of the type of main household occupation

Type of job	Frequency	Percentage
Animal husbandry	48	17.3
Agriculture	36	12.9
Gardening	12	4.3
Worker man	37	13.3
Employee	33	11.9
Others	77	27.7
Not answered	35	12.6
Total	278	100

The Kolmogorov-Smirnov test was used to determine the normality of data distribution. The assumption of normality of data distribution was rejected based on test findings (Table 7). Therefore, a non-parametric test was used in the inferential analysis of the data.

Table 7. The Kolmogorov-Smirnoff test to examine the assumption of normality of the research variables

Data Domain	Test statistics value	p-value
Economic impacts of empowering measures	0.151	0.000
Social impacts of empowering measures	0.148	0.000
Environmental impacts of empowering measures	0.158	0.000
Impacts of empowering measures on spatial links	0.174	0.000

The study variables' data (Table 7) do not follow a normal distribution, hence the binomial test was used for the inferential analysis of these variables. The following are the H_0 and H_1 hypotheses for this test:

$$H_0 : P = 0.5$$

$$H_1 : P \neq 0.5$$

The data were divided into two groups: answers with no impact and answers with low impact were classified in the first group, and answers with moderate impact, high impact, and very high impact were classified in the second group. Considering the null hypothesis in this test, the ratio of responses from the two groups was equal. This hypothesis was rejected and the alternative hypothesis was accepted if the test's sig value was less than 0.05.

The findings of the binomial non-parametric test on the economic impacts of women empowerment measures in the studied settlements revealed that except for the cases of "Purchasing power of luxury goods", "Purchasing power of housing", "Purchasing power of vehicles", "Purchasing power of agricultural and garden land and water" where the ratio of answers is equal in both groups, the sig value of the test in the other cases is less than 0.05. Therefore, the ratio of the observed responses in the two groups is not equal. The survey respondents believed that empowering measures had significant economic benefits in

both situations since there were fewer responses in the first group than in the second group, as proved by the number of responses in the two categories.

According to the last line of Table (8), the null hypothesis is often rejected when the magnitude of the economic consequences of empowering measures is considered since the sig value of the

test is less than 0.05. Because the ratio of responses in the two groups is not equal and the number of responses in the two groups indicates that the first group's number of responses was lower than the second group's, empowering measures have generally had significant economic benefits.

Table 8. The results of the binomial test in examining the economic impact of empowering measures

Economic indicators	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Level of monthly income	First group	27	251	0.5	0.05	0.000
	Second group	0.10	0.90			
Level of monthly savings	First group	39	238	0.5	0.05	0.000
	Second group	0.14	0.86			
Household appliances purchasing power	First group	98	179	0.5	0.05	0.000
	Second group	0.35	0.65			
Agricultural and garden land and water purchasing power	First group	132	145	0.5	0.05	0.471
	Second group	0.48	0.52			
Housing purchasing power	First group	140	138	0.5	0.05	0.952
	Second group	0.50	0.50			
Financial potential to perform major housing repairs	First group	108	169	0.5	0.05	0.000
	Second group	0.39	0.61			
Entrepreneurship generating power	First group	33	244	0.5	0.05	0.000
	Second group	0.12	0.88			
Possibility of processing agricultural products	First group	39	237	0.5	0.05	0.000
	Second group	0.14	0.86			
Ability to calculate profit and cost of economic activities	First group	44	233	0.5	0.05	0.000
	Second group	0.16	0.84			
Consumer goods purchasing power	First group	41	237	0.5	0.05	0.000
	Second group	0.15	0.85			
Vehicle purchasing power	First group	130	148	0.5	0.05	۰/۳۰۸
	Second group	0.47	0.53			
Luxurious goods purchasing power	First group	124	154	0.5	0.05	۰/۰۸۲
	Second group	0.45	0.55			
Increasing investment power	First group	52	226	0.5	0.05	0.000
	Second group	0.19	0.81			
Level of activity in the handicraft sector	First group	28	250	0.5	0.05	0.000
	Second group	0.10	0.90			
Level of activity in home jobs	First group	28	249	0.5	0.05	0.000
	Second group	0.10	0.90			
Job opportunities for family members	First group	24	254	0.5	0.05	0.000
	Second group	0.09	0.91			
Reducing the economic poverty of the family in the village	First group	26	252	0.5	0.05	0.000
	Second group	0.09	0.91			
Self-reliance and financial independence	First group	23	255	0.5	0.05	0.000
	Second group	0.08	0.092			
Economic effects of empowering measures	First group	25	253	0.5	0.05	0.000
	Second group	0.09	0.91			

The results of the binomial non-parametric test on the social effects of empowering measures in the

investigated human settlements indicated that in all cases, since the test's sig value is less than

0.05, the ratio of responses in the two groups is unequal, and based on the number of responses in the two groups, the first group had fewer answers than the second. Therefore, the survey respondents believed that in these situations, empowering actions had significant social consequences.

According to the last line of the table, the null hypothesis is generally rejected when the number of social effects of empowering actions is considered since the sig value of the test is less than 0.05. As a result, the ratio of responses observed in the two groups is not equal, and based on the number of responses observed in the two groups, the first group's number of responses was lower than the second group's, indicating that empowering measures have high social effects (Table 9).

Table 9. The results of the binomial test in examining the social impact of empowering measures

Social indicators	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Independence	First group	19	0.07	0.5	0.05	0.000
	Second group	259	0.93			
Spirit of self-confidence and self-belief	First group	19	0.07	0.5	0.05	0.000
	Second group	259	0.93			
Spirit of innovation	First group	19	0.07	0.5	0.05	0.000
	Second group	258	0.93			
Decision-making and planning power	First group	15	0.05	0.5	0.05	0.000
	Second group	262	0.95			
Creativity and innovation	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
Acquiring legal personality	First group	31	0.11	0.5	0.05	0.000
	Second group	243	0.89			
Willingness to educate and participate in the community	First group	23	0.08	0.5	0.05	0.000
	Second group	254	0.92			
Self-control over abilities	First group	22	0.08	0.5	0.05	0.000
	Second group	256	0.92			
Having more time and opportunity	First group	25	0.09	0.5	0.05	0.000
	Second group	253	0.91			
Easiness in children's upbringing	First group	35	0.13	0.5	0.05	0.000
	Second group	243	0.87			
Improve living conditions	First group	20	0.07	0.5	0.05	0.000
	Second group	258	0.93			
Improving welfare	First group	29	0.10	0.5	0.05	0.000
	Second group	248	0.90			
Reduced emigration	First group	29	0.10	0.5	0.05	0.000
	Second group	249	0.90			
Creating the ground for collective activity	First group	13	0.05	0.5	0.05	0.000
	Second group	263	0.95			
Social trust	First group	16	0.06	0.5	0.05	0.000
	Second group	262	0.94			
social solidarity	First group	26	0.09	0.5	0.05	0.000
	Second group	251	0.91			
Participating in activities	First group	18	0.07	0.5	0.05	0.000
	Second group	258	0.93			
Increasing profit	First group	24	0.09	0.5	0.05	0.000
	Second group	254	0.91			
Creating an exchange of ideas and cooperation to solve existing problems	First group	18	0.07	0.5	0.05	0.000
	Second group	258	0.93			

Social indicators	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Accessing to credits, market and decision-making authorities	First group	24	0.09	0.5	0.05	0.000
	Second group	254	0.91			
Decreasing family biases and opposition of husbands to fathers with the presence of women in social and economic activities	First group	38	0.14	0.5	0.05	0.000
	Second group	240	0.86			
Reducing the negative attitude toward women's ability	First group	33	0.12	0.5	0.05	0.000
	Second group	254	0.88			
Reducing gender discriminations	First group	34	0.12	0.5	0.05	0.000
	Second group	244	0.88			
Eliminating patriarchy and not allowing women to participate in group activities	First group	37	0.13	0.5	0.05	0.000
	Second group	241	0.87			
Increasing scientific and practical information, knowledge, and awareness	First group	17	0.06	0.5	0.05	0.000
	Second group	261	0.94			
Interest in training rural and artistic industries through the project	First group	17	0.06	0.5	0.05	0.000
	Second group	261	0.94			
Interest in teaching agriculture, horticulture, and animal husbandry through the project	First group	26	0.09	0.5	0.05	0.000
	Second group	252	0.91			
Interest in teaching transformation and processing of agricultural and livestock products	First group	37	0.13	0.5	0.05	0.000
	Second group	241	0.87			
Interest in teaching housekeeping, health, and family planning	First group	56	0.20	0.5	0.05	0.000
	Second group	222	0.80			
Individual and social effects of empowering actions	First group	10	0.04	0.5	0.05	0.000
	Second group	268	0.96			

The analysis of the environmental impacts of women's empowering measures in the research region demonstrated that in all the cases examined in this table, it is decided that the ratio of the answers in the two groups is not equal since the sig value of the test is less than 0.05. The first group had fewer responses than the second one based on the number of answers in the two groups. Therefore, the survey respondents believed that in these situations, empowering measures had a great impact on the environment.

Considering the last line of the table, since the sig value of the test is less than 0.05, the null hypothesis is generally rejected when the extent of the environmental impacts of empowering measures is considered. Given the number of responses in the two groups, the first group had fewer responses than the second one since the ratio of responses observed in the two groups is not equal. Therefore, empowering actions generally have strong environmental consequences (Table 10).

Table 10. The results of the binomial test in examining the environmental impact of empowering measures

Environmental impacts	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Increasing awareness and acquiring environmental skills	First group	22	0.08	0.5	0.05	0.000
	Second group	256	0.92			
Changing the traditional views to scientific and technical ones in environmental issues	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			

Environmental impacts	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Usefulness and efficiency of environmental training	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
Attention to preserving animal and wild species of the environment	First group	31	0.11	0.5	0.05	0.000
	Second group	247	0.89			
Attention to the values of herbaceous species in the environment	First group	24	0.09	0.5	0.05	0.000
	Second group	254	0.91			
Using clean energy for heating and baking	First group	20	0.07	0.5	0.05	0.000
	Second group	258	0.92			
Generating the capabilities needed to perform environmental activities	First group	22	0.08	0.5	0.05	0.000
	Second group	256	0.92			
Reducing pulling out of bushes to meet various consumptions	First group	24	0.09	0.5	0.05	0.000
	Second group	254	0.91			
Transferring new environmental knowledge and experiences to family members	First group	28	0.10	0.5	0.05	0.000
	Second group	250	0.90			
Cooperating with and participating with other rural women in performing environmental activities	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
Supplying the local species' seeds for the project seedling	First group	34	0.12	0.5	0.05	0.000
	Second group	244	0.88			
Principle of becoming aware of pastures protection and maintenance	First group	25	0.09	0.5	0.05	0.000
	Second group	253	0.91			
Performing activities in the project for pruning and irrigating the seedling	First group	28	0.10	0.5	0.05	0.000
	Second group	250	0.90			
Collecting and separating garbage at the rural level	First group	33	0.12	0.5	0.05	0.000
	Second group	245	0.88			
Getting the potential required to continue pasture restoration-related activities at the time of project termination	First group	25	0.09	0.5	0.05	0.000
	Second group	253	0.91			
Getting the potential required to train environmental issues to others	First group	28	0.10	0.5	0.05	0.000
	Second group	250	0.90			
Reducing the number of livestock for preserving pasture given the project training	First group	28	0.10	0.5	0.05	0.000
	Second group	250	0.90			
Increasing the potential needed to plant pharmaceutical plants	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
Purchasing the facilities and tools required for alternative firewood fuels (gaseous oven, gas stove, etc.)	First group	26	0.09	0.5	0.05	0.000
	Second group	252	0.91			
Increasing afforestation and making a flower bed around the settlement	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
Environmental impacts of empowering measures	First group	9	0.03	0.5	0.05	0.000
	Second group	269				

Since the test's sig value is less than 0.05, all the cases examined in this table demonstrate the influence of women empowerment measures on spatial connections. According to the response rate in the two groups, the first group had fewer responses than the second one based on the assumption that the ratio of responses observed in the two groups is not equal. Therefore, the survey respondents believed that in these situations, empowering measures had a significant impact on spatial connections.

According to the last line of the table, the null hypothesis is often rejected when the effect of empowering measures on spatial connections is considered since the sig value of the test is less than 0.05. As a result, the ratio of responses in the two groups is not equal, and based on the number of responses in the two groups, the first group's response rate was lower than that of the second group. As a result, empowering measures have a high influence on spatial connections (Table 11).

Table 11. The results of the binomial test in examining the impact of empowering measures on spatial connections

Spatial connections indicators	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
Level of project effectiveness on population relations with the center of the village	First group	32	0.12	0.5	0.05	0.000
	Second group	246	0.88			
Level of project effectiveness on population relations with the district center	First group	29	0.10	0.5	0.05	0.000
	Second group	249	0.90			
Level of project effectiveness on population relations with the pre-province center	First group	31	0.11	0.5	0.05	0.000
	Second group	247	0.89			
Level of project effectiveness on population relations with the province center	First group	91	0.22	0.5	0.05	0.000
	Second group	217	0.78			
Level of project effectiveness on population relations with the national center	First group	81	0.29	0.5	0.05	0.000
	Second group	197	0.71			
The impact of the project on the marketing of village products in other settlements	First group	19	0.07	0.5	0.05	0.000
	Second group	259	0.93			
The impact of the project on better supply of raw materials from other settlements	First group	31	0.11	0.5	0.05	0.000
	Second group	247	0.89			
The impact of the project on the reputation of the village at the district level	First group	15	0.05	0.5	0.05	0.000
	Second group	263	0.95			
The impact of the project on migration from the village	First group	22	0.08	0.5	0.05	0.000
	Second group	256	0.92			
The impact of the project on emigration from the village	First group	28	0.10	0.5	0.05	0.000
	Second group	250	0.90			
The impact of the project on the presence of non-native teachers and facilitators	First group	21	0.08	0.5	0.05	0.000
	Second group	257	0.92			
The impact of the project on the establishment of skill workshops by non-native people	First group	23	0.08	0.5	0.05	0.000
		255	0.92			
Impressionability on the supply of manpower outside the village	First group	29	0.10	0.5	0.05	0.000
	Second group	249	0.90			
The impact of the project on the investment of household financial resources in the banking system in the rural center	First group	38	0.14	0.5	0.05	0.000
	Second group	240	0.86			
The impact of the project on the investment of household financial resources in the banking system in the district center	First group	37	0.13	0.5	0.05	0.000
	Second group	241	0.87			
The impact of the project on the	First group	39	0.14	0.5	0.05	0.000

Spatial connections indicators	Group	Number of observed responses	Rate of observed responses	Test ratio	Significance level	sig
investment of household financial resources in the banking system in the pre-province center	Second group	239	0.86			
The impact of the project on the investment of household financial resources in the banking system in the province center	First group	42	0.15	0.5	0.05	0.000
	Second group	236	0.85			
The impact of the project on group meetings in the market outside the village	First group	35	0.13	0.5	0.05	0.000
	Second group	243	0.87			
The impact of the project on the financial and credit cooperation of the market outside the village	First group	35	0.13	0.5	0.05	0.000
	Second group	243	0.87			
The impact of empowering measures on spatial connections	First group	11	0.04	0.5	0.05	0.000
	Second group	267	0.96			

5. Discussion and Conclusion

Social spaces change and evolve through spatial feedback. In addition to having an impact on human settlements and physical space, the empowerment of "women" as a fundamental transformation in a significant area of human civilization can also have such effects. In other words, empowerment is a multifaceted phenomenon that necessitates understanding and exposing all of its impacts, particularly in the context of the local women's community considering its close connection to development. As a result, an analysis of the role of women empowerment in the development of human settlements was made within the context of the RFLDL international people-oriented project in the Sarayan district. One of the project's fundamental strategies is the empowerment of local women, and some significant steps have been taken in this direction. Investigations revealed that local women have been empowered in the socioeconomic and environmental fields because of their interests and participation in group activities, their authenticity in social and economic activities, and the elimination and reduction of gender discrimination and negative attitudes toward women's abilities. One of the key factors in the success of the empowerment measures may be attributed to the relatively high literacy rate of the local women's community in the studied region. These results are consistent with those of Fallsoleyman et al. (2013) since innovation and self-reliance are more accepted in societies where levels of literacy are greater, and people are also more empowered and confident. Human settlements have undergone major changes in socioeconomic and environmental dimensions as well as geographical connections as a result of the shift in the empowerment of local women within the context of the RFLDL project's implementation in the Sarayan district. These findings are consistent with those of Lima-Constantino et al. (2010) and Satyabama (2012). Generally, the women empowerment and the effects of this phenomenon on people and households (such as income growth, etc.) have been able to change the behavior of housewives. Some families have been given the chance to take unusual or unexpected measures (either updating tools or buying newly produced tools in the usual part of the household or daily life consumables). The range of social, economic, and geographical connections has grown as a result of the shift in how people and households consume. In the area of the environment, empowered women have played a major role in promoting and supporting the environment, which has affected how other settlers interact with nature and increased everyone's concern for preserving the natural environment. The development of human settlements and their transformations are significantly accelerated by women empowerment through spatial dynamism. Moreover, the following is a list of possible policy suggestions:

- Inviting experienced consultants and trainers to provide women training;
- Incorporating participated and empowered women in the planning and decision-making processes for the settlement, including the guiding plan and the creation of the employment development document;

- Granting selected elite women genuine participation in Sarayan County's administrative council, employment working group, and planning committee;
- A commitment from organizations in charge of rural development (such as the governorate, district administration, department of agriculture, housing foundation, cooperative administration, and relief committee) to regularly meet with women involved in social and economic activities to hear their needs and

potential solutions, remove any barriers in their way, and obtain their approval before action.

Authors' contributions
The authors equally contributed to the preparation of this article**.**
Conflict of interest
The author declares no conflict of interest.

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Original Article

اثرات توانمندسازی زنان بر تحولات سکونتگاه‌های انسانی

(مطالعه‌ی سکونتگاه‌های پروژه RFLDL در شهرستان سرایان)

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چکیده مبسوط

۱- مقدمه

از مهمترین مسائل در پروژه‌های توسعه محلی و منطقه‌ای این است که چگونه می‌توان در جهت توانمندسازی جامعه گام برداشت. این مهم بالاخص در مورد جایگاه زنان در برنامه‌ های توسعه پایدار و پروژه‌ هایی که بر مبنای فعالیت‌ های زیست محیطی آغاز می‌ شود، اهمیت ویژه‌ ای دارد. پروژه RFLDL در شهرستان سرایان از پروژه‌ های توسعه محلی استان خراسان جنوبی است که یکی از راهبردهای اتخاذی آن در جهت نائل آمدن به اهداف کلان پروژه، توانمندسازی زنان محلی بوده است. این تحقیق به دنبال واکاوی و تحلیل ابعاد مکانی و فضایی اثرات توانمندسازی زنان در ناحیه‌ی اجرای پروژه RFLDL در شهرستان سرایان بوده است.

۲- مبانی نظری

در بطن جامعه، از اقدامات دگرگون‌ساز «توانمندسازی و رشد قدرت» در بین عناصر بنیادین جامعه (مردان و زنان) است. توانمندسازی به عنوان فرآیندی تعریف می‌شود که در آن افراد، گروه‌ها و سازمان ها بر مسائل و مشکلاتی که با آن مواجه هستند، کنترل پیدا کنند. بنابراین، هدف توانمندسازی کمک به افراد ضعیف است تا تلاش نمایند بر ضعف‌های‌شان غلبه، جنبه‌ های مثبت زندگی‌شان را بهبود بخشیده، مهارت‌ها و توانایی‌های‌شان را برای کنترل عاقلانه بر زندگی افزایش داده و آن را در عمل پیاده نمایند.

توانمندسازی زنان فراگردی است که با ارتقاء اعتماد به نفس زنان این امکان را فراهم می‌سازد تا ضمن دفاع مستقل از حقوق خود، کنترل بر منابع داشته باشند، در طی این فراگرد زنان از نیازها و

خواسته های درونی خود آگاه می‌شوند و از توانایی لازم برای عملی ساختن خواسته های خود برخوردار می شوند.

توانمندسازی زنان فرآیندی پویاست که توانایی زنان برای تغییر ساختارها و ایدئولوژی هایی که آنها را در موقعیت فرودستی(وابستگی) نگه داشته است، در بر می گیرد. این فرآیند که به زنان برای دستیابی بیشتر به منابع و کنترل بر زندگی کمک می کند، موجب احساس استقلال و اعتماد به نفس بیشتر آنها می‌شود و عزت نفس آنها را افزایش می دهد، یعنی موجب بهبود تصویری می شود که زنان از خودشان دارند. دولت موظف است با فراهم سازی زمینه‌های توانمندسازی زنان به رشد و توسعه اقتصادی مبتنی بر دانش کمک نماید.

۳- روش تحقیق

تحقیق حاضر از حیث هدف، کاربردی است و به لحاظ ماهیت و روش، توصیفی – تحلیلی است. داده‌ها و اطلاعات با انجام مطالعات کتابخانه‌ای (بررسی اسناد) و پیمایشی گردآوری شده است. ابزار مورد استفاده برای بررسی پیمایشی در جامعه مورد مطالعه، پرسشنامه محقق ساخته بوده است. روایی پرسشنامه با نظرخواهی از اساتید متخصص در جغرافیای پیش‌آزمون (تکمیل ۳۰ پرسشنامه) به کمک محاسبه آلفای کرونباخ (با مقدار بالای ۷۰ درصد) مورد ارزیابی و تایید واقع شده است. جامعه تحقیق شامل زنان (۱۵-۶۴ سال) خانوارهایی که در پروژه بین المللی RFLDL مشارکت داشته است، بوده است. سکونتگاه‌های مورد مطالعه مشتمل بر شهر "سه قلعه" و روستاهای "دوست آباد"، "زنگویی" و "بسطاق" با ۱۹۵۹ خانوار (طبق سرشماری سال ۱۳۹۵) در شهرستان سرایان

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بوده است. از کل جمعیت ساکن در سکونتگاه‌های مورد بررسی طبق آخرین آمار ۹۳۹ خانوار در پروژه مذکور فعالیت داشته‌اند. نمونه گیری به روش احتمالی از نوع تصادفی – طبقه ای انتخاب شده است. محدوده مورد مطالعه در شهرستان سرایان شامل سکونتگاه‌های محل اجرای پروژه RFLDL اعم از یک شهر (شهر سه قلعه) و سه روستا (دوست آباد، بسطاق و زنگویی) بوده است. در خصوص پروژه بین المللی احیای اراضی جنگلی و تخریب یافته با تاکید ویژه بر اراضی حساس به فرسایش بادی و خاک‌های شور (RFLDL) اقدامی مشترک بین سازمان جنگلها، مراتع و آبخیزداری کشور (FRWO) به عنوان نماینده دولت جمهوری اسلامی ایران، تسهیلات جهانی محیط زیست (GEF) و سازمان خوارو بار و کشاورزی ملل متحد (FAO) می باشد که از کوشش های دولت جمهوری اسلامی ایران در توسعه و اجرای رویکردهای توسعه پایدار در مناطق خشک و نیمه خشک کشور از طریق اجرای طرح های مدیریت پایدار، جامع و مشارکتی حوزه های آبخیز حمایت می کند.

۴- یافته های تحقیق

تاثیرات اقتصادی اقدامات توانمندسازانه زنان در سکونتگاه های مورد مطالعه نشان داد که به غیر از موارد" قدرت خرید وسایل تجملی "، " قدرت خرید مسکن "، " قدرت خریدوسایل نقلیه "، " قدرت خرید زمین و آب زراعی وباغی " که نسبت پاسخ ها در دو گروه برابر است در بقیه موارد مورد بررسی از آنجایی که مقدار sig آزمون کمتر از ۰/۰۵ می باشد نتیجه می شود که نسبت پاسخ های مشاهده شده در دوگروه برابر نیست و با توجه به تعداد پاسخ ها در دو گروه نتیجه می گیریم که تعداد پاسخ های مشاهده شده در گروه اول کمتر از گروه دوم بوده است، بنابراین از نظر افراد مورد بررسی تاثیرات اقتصادی اقدامات توانمند سازانه در این موارد زیاد بوده است. بررسی تاثیرات اجتماعی اقدامات توانمند سازانه در سکونتگاه های انسانی مورد مطالعه نشان داد که در همه موارد مورد بررسی نسبت پاسخ های مشاهده شده در دوگروه برابر نیست و با

توجه به تعداد پاسخ ها در دو گروه نتیجه می گیریم که تعداد پاسخ های مشاهده شده در گروه اول کمتر از گروه دوم بوده است، بنابراین از نظر افراد مورد بررسی تاثیرات اجتماعی اقدامات توانمند سازانه در این موارد زیاد بوده است. تاثیر اقدامات توانمند سازانه زنان در جامعه مورد مطالعه بر پیوند های مکانی نشان داد که نسبت پاسخ های مشاهده شده در دوگروه برابر نیست و با توجه به تعداد پاسخ ها در دو گروه نتیجه می گیریم که تعداد پاسخ های مشاهده شده در گروه اول کمتر از گروه دوم بوده است، بنابراین از نظر افراد مورد بررسی تاثیر اقدامات توانمند سازانه بر پیوند های مکانی در این موارد زیاد بوده است.

۵- بحث و نتیجه گیری

بررسی‌ها نشان داد که تاکنون علاقه زنان محلی به فعالیت‌های گروهی و مشارکت آنان و همچنین باورپذیری زنان در فعالیت‌های اجتماعی، اقتصادی و حذف و کاهش تبعیض‌های جنسیتی و نگرش منفی نسبت به توانایی زنان باعث توانمندسازی زنان در عرصه‌های اقتصادی، اجتماعی و زیست محیطی شده است. در تبیین آن، وضع سواد نسبتاً بالای جامعه زنان محلی در محدوده مورد مطالعه یکی از عناصر اصلی موفقیت برنامه‌های توانمندسازی بوده است. توانمندسازی زنان منجر به بهبود فضای اقتصادی سکونتگاه‌های انسانی شده و افزایش درآمد اهالی از طریق ایجاد مشاغل خانگی و خرد را به دنبال داشته است. بهبود روحیه اعتماد به نفس، رشد خودباوری و ارتقا مشارکت گروهی از دیگر پیامدهای به دست آمده بوده است. در بعد زیست محیطی، سکونتگاه‌ها دارای تحول رو به رشد شده است. همچنین توانمندسازی زنان اثرمعناداری در تقویت پیوندهای مکانی و رشد مناسبات سکونتگاه‌های انسانی داشته است.

کلیدواژه‌ها: توسعه پایدار، توانمندسازی، زنان، تحولات مکانی - فضایی، پروژه بین المللی RFLDL.

Original Article

Investigating the Changes in Spatial Pattern of Rural Settlement Network of Qazvin Province with the Emphasis on the Role of Ecological Elements During the Period 1976-2016

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Abstract

Purpose- Initial and preliminary review of distribution of rural settlements of Qazvin province indicates a special pattern in this province (the densely populated villages in some areas of the province and being devoid of population in some other villages) which has been changed during different census periods and it raises the following questions: what factors have created such a pattern? Do ecological factors play a role in the formation of this pattern? Hence, the purpose of the present study is to answer these questions.

Design/methodology/approach- The present study was conducted using a descriptive-analytical method. First, the Getis-Ord Gi* statistic was used to review the spatial pattern of rural residents' network in Qazvin province, then k'luster analysis method through edge removal (SKATER) was used for grouping rural areas based on ecological conditions, and finally using the obtained results, the correlation coefficients between the ecological factors and the spatial distribution of the population in the obtained ecological groups were calculated .

Findings- examining the spatial distribution pattern of rural settlements of Qazvin province according to Getis-Ord statistic indicates a cluster pattern of population spatial distribution in rural areas of Qazvin province. This pattern has high density in some areas and low density in other areas. The central parts of the province which include the Qazvin plain, have hot spots, and the northern areas of the province which include the mountainous areas, have cold spots. Based on the ecological grouping of villages through SKATER method and calculated correlation coefficients, the highest impact belonged to the grouping related to access to underground waters (existence of aquifer) and the next ranks belong to the distance from the river and slope. This shows the high impact of ecological variables on the distribution of rural population of the province during different periods.

Keywords: Spatial pattern, Rural settlements, Ecological factors, SKATER method, Qazvin province.

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1. Introduction

N   The spatial distribution of human settlements in different spatial levels (national, regional, and sub-regional) are affected by different ecological, social, economic, political and other factors of that period and place. At the beginning of human story, the distribution of pattern of rural settlements has been mostly influenced by ecological factors such as access to water and suitable slope. Early humans chose the place of their settlements where they could access their needs and at the same time be safe from natural disasters. Choosing caves near the rivers as the first places of human settlement shows the significance of ecological factors and it is proved by numerous researches of archaeologists. For instance, the study by Mousavi Kouhpar et al., (2011) showed the high impact of natural environment on residential patterns in different ancient periods of Mazandaran province. Bahrami et al., (2016) examined the effect of natural factors on the distribution of ancient habitats in Ardabil province and the results showed a significant relation between land vegetation and slope and dispersion distribution of this settlements. In another research, Rezaee (2015) investigated the role of environmental factors in Bakun period settlements in Kazeroun plain and the results indicated a strong relationship between the settlement patterns of Bakun period and the slope classes and vegetation.

With the change in human's life and technological and technical advances made by humans in recent centuries in addition to ecological factors, economic, social, and political factors (and other factors such as population distribution policies by governments, investment in different economic sectors, income, employment, etc.) are also involved in the spatial distribution of human settlements. Despite the decrease in the role of ecological factors during the contemporary period, these factors are still strong and undeniable, especially in the rural settlements of developing countries such as Iran, whose way of life and livelihood depends on water and soil resources. ecological resources such as water, height and slope changes, soil, precipitation, etc. influence the spatial distribution and size of these settlements. Qazvin is one of the provinces of Southern Alborz, where the settlement dates back to 4500 to 6000 years BC (Fazli Nashli et al. 2011). Initial and preliminary review of distribution of rural settlements of Qazvin province indicates a special pattern in this province (the high density of rural population in some areas of the province and being devoid of population in some other villages) which has changed during different census periods and it raises these questions: what factors have created such a pattern? ? Do ecological factors play a role in the formation of this pattern? Hence, the purpose of the present study is to answer these questions.

The necessity of such research can be seen in the better identification of planning environments for regional and rural planners and relevant managers, which helps them in identifying and making policies related to villages.

2. Research Theoretical Literature

The accommodation pattern in the rural settlements of each region is more than anything a reflection of the characteristics of the natural environment (weather, vegetation, environment, how to access water and resources, spatial dispersion of water networks and the quality of soil) (Saeedi, 2009). Also, based on hydraulic theory, the main factors in the emergence of settlements have been the irrigation of arable land, population increase and its density in natural favorable areas (Shakoei, 2010). Numerous studies have been conducted on the impact of ecological conditions on residential patterns, especially the rural settlements. Among these researches, the following can be mentioned:

Liu et al. (2022) in their study reviewed the distribution of villages in Jiangxi province in China in relation with some natural factors such as height, slope, distance from the river, soil resources and some man-made factors including distance from the road and the effect of nearby cities. In this study methods such as Kernel density, spatial autocorrelation (SA) and modeling approaches such as simple and multiple linear regression analysis were used. Findings of the research showed that, rural settlements in the study area have a spatial distribution pattern of "dense north and scattered south" and the investigated factors play a great role in the distribution pattern of villages. According to this, a new rural development inequality assessment index, i.e. socio-environmental assessment index, (SEI) was created. Areas with an SEI index of less than 0.40

should be prioritized for the implementation of the revitalization strategy in this province.

In a study conducted by Zhang et al. (2021) the relationship between the climate and spatial distribution of rural population in Poyang lake area was examined. Spatial autocorrelation and spatial regression modeling methods were used in this study. The results of this research also indicates a significant relationship of spatial correlation between distribution of rural population and climatic factors and the role of climatic factors is greater than economic factors.

In a research, Zhang et al. (2020) investigated the evolution and factors affecting the distribution pattern of China's rural population since 1990 using the geographical detector method. In this research, natural, social, and economic data were used to identify the distribution pattern. The results of the study indicated that the distribution of the rural population of China is a function of natural, social, and economic conditions, and among the natural factors, the potential efficiency of product and the degree of surface fragmentation have had the greatest impact.

In a study carried out by Guanghui et al. (2007) factors affecting the change of villages in mountainous areas of Beijing were examined. Logistic regression method and GIS and SPSS were used in this study. The results show the effective and obvious role of natural, accessibility and economic factors in the location selection and changes of the villages in these areas.

Ma et al. (2012) in their research article examined the spatial and temporal distribution of rural settlements in Gangu region in China during 1998-2008. The data of landset 5 remote sensing satellite and SPOT were used in this study and the results showed that, there was a strong relationship between the location of rural settlements and height, slope, traffic and water resources and the villages were mainly located in areas with low height, gentle slope and near the road or the river.

Xoe-Lan et al. (2010) in their study investigated and analyzed the factors affecting the spatial distribution of rural settlements in Mayang town in China, using GIS and spatial analysis techniques and landscape analysis indices. The findings of the research show the impact of natural, socio-economic, and productive environmental factors on the spatial distribution of these settlements.

Chen et al. (2022) in a study reviewed the spatial pattern of settlements and factors influencing the formation of this pattern in Qinba mountainous area in Shanxi province in China. The data analysis of this research has been done by GIS using landscape and spatial distribution analysis indices. The results show that, there is a strong and significant relationship between the spatial distribution pattern of rural settlements in this area and the influential factors such as shape of the land, slope, distance from urban centers, distance from main roads, and distance from main rivers.

Shahi (2021) in a study has examined the distribution of rural settlements and influential factors in Har Ki Dun region in Himalaya Mountains. This area is a high mountainous area with a rural population of 22000 people. The results of this study also indicates the high impact of factors such as slope and height on the spatial distribution and size of settlements in this region.

In a study conducted by Wang et al. (2020) the spatial distribution pattern of small cities and factors affecting the formation of this pattern in China were investigated. The findings of this study show a certain pattern in spatial distribution of small cities in China. Several factors including natural environment, population density, level of economic development, location advantage, road traffic conditions, and political factors are involved in the formation of this pattern.

In a study by Qiu et al. (2019) the spatial distribution pattern of rural settlements in the high hills of southern Jiangxi located in Chongqing country, China, was investigated and analyzed in relation to various natural and social factors. Findings show the high density of rural areas in the north and low density in the southern area. This pattern is significantly influenced by height changes, distance from the river, and distance from roads.

Xo et al. (2021) in a study examined the distribution pattern of villages in Shaanxi, China. In this study in order to review the spatial distribution and evaluate its relationship with the influential factors, spatial metrics and spatial autocorrelation were calculated using GIS. The results indicated the clustering pattern in the spatial distribution of rural settlements in the region. Factors influencing the formation of this pattern were geomorphological conditions, population and land use.

In an applied research Tao et al. (2017) examined the macro climatic factors in the formation of spatial distribution of rural settlements in eastern China. Single variable point pattern analysis

method was used in this study. The statistical modeling of this study showed that, on a macro scale, potential evaporation and transpiration and topographic heterogeneity had negative impact on the size of the realm, while they had positive effects on territorial clustering.

Sadr Mousavi et al. (2017) in a study investigated the role of natural factors on geographical distribution of rural settlements in terms of numbers in Sahneh town using overlay analysis in GIS system and regression analysis. The natural factors indices included height, slope, climate, water resources, soil resources, vegetation, and land use. The results showed that, natural factors play an important role in the location of rural settlement in Sahneh town and the greatest impact was related to water and soil resources.

In another research, Aliaee (2018) examined the role of natural factors in the distribution and establishment of rural settlements in Zanjan city. Overlay analysis and Moran's I in GIS system and calculating correlation coefficient methods were used in this study. The results showed that, there was a weak relationship between natural factors (height, slope, slope direction, precipitation, and temperature) and location and establishment of rural settlements in Zanjan city.

In their research paper,Motiee langroudi et al. (2016) analyzed the spatial distribution of rural settlements in Sabzevar-Neishabour region based on ecological resources. Overlay analysis in GIS and zoning methods were used in this study. The results showed a high correlation between ecological elements and the number of villages in the created areas.

In a study titled "reviewing the role of natural factors in geographical distribution of population and urban settlements using GIS and Geoda", Mousavi et al. (2012) analyzed the role of natural factors in the population distribution in cities of west Azarbaijan. The results showed a strong and significant relationship between climate and access to water resources with population density of cities of the province.

Nematullahi and Ramesht (2021) in a study analyzed the spatial distribution of rural settlements according to natural factors (height, slope, slope direction, convex and concave surfaces, earth surface temperature, precipitation, and relative humidity in Iran. Overlay analysis in GIS system was also used in this research and descriptive method was used for data extraction.

The results indicate that, spatial arrangement pattern of rural settlements is related to formative systems and morphologic-climatic components.

Estelaji & Jafari (2014) in their study investigated the role of natural factors in spatial arrangement of rural settlements in Mahneshan town. Overlay analysis in GIS and calculation of correlation coefficient were used in this research. The results of this study also showed a strong relationship between some indices of natural environment such as slope, elevation classes, and climate and spatial distribution and number of rural settlements.

In a general summary, it can be said that, the ecological factors affecting the spatial pattern of settlements especially rural settlements according to the conducted studies include climatic factors and variables, height, slope, slope direction, water and soil resources. Land use is mentioned in some studies and it seems that, it is a phenomenon resulted from ecological factors and cannot be considered as an ecological factor.

Some of these factors directly and some indirectly affect the spatial distribution pattern of rural settlements. The effect of these factors and variables is presented in diagram number 1.

The difference between the present study and similar studies mentioned in research literature can be stated as follows:

As observed in research conducted on the subject under study, in most studies spatial pattern of rural settlements has been examined in the form of geographical distribution without considering the population of these settlements. In rare cases, the population factor in this pattern has been examined cross-sectionally and in a specific year, while in the present study population changes in a 10-year periods (40 years) were used to review the spatial changes of rural settlement network.

The second difference between this study and other studies is the factors influencing the formation of rural settlement pattern. In the reviewed studies different factors have been surveyed as affecting factors, while in none of these studies the role of underground waters has been pointed out. While it is one of the most important factors in the formation of spatial pattern and size of rural settlements in semi-arid areas such as Qazvin province. In the present study the impact of this factor on the formation of rural settlements pattern of the province has been examined. Moreover, SKATER method has been used in this study, while it has not been used in any similar research so far (Figure 1).
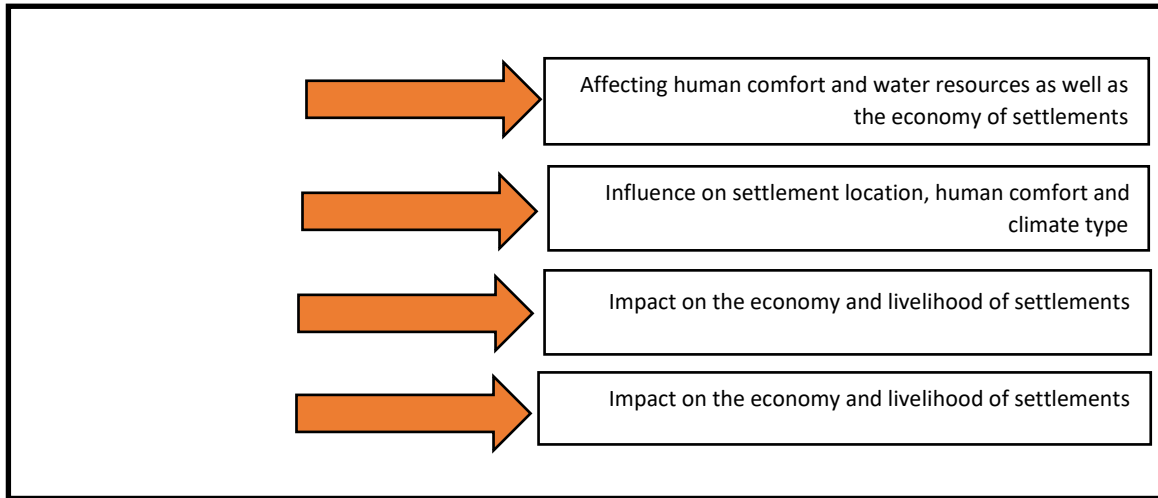
Figure 1. The impact of ecological factors on spatial patterns of rural settlements

3. Research Methodology

The data used in this research are of two categories: the first category is the demographic data of rural areas of Qazvin province which belong to general population and housing census from 1976 to 2016. The second category is the spatial data (map) related to ecological factors of the province that include the following: digital elevation model (DEM) of Qazvin province which is provided by ALOS/ PALSAR sensor and has a spatial resolution of 12.5 meters. shp layer location point of villages of Qazvin province, linear shp layer of rivers and waterways of Qazvin province, polygonal shp layer of soil type of Qazvin province, polygonal shp layer of climate, precipitation and temperature of Qazvin province.

The descriptive-analytical method has been used in this study. First, Getis-Ord Gi* statistic was used to examine the spatial pattern of rural settlements of Qazvin province. The hot spot analysis calculates Getis-Ord Gi* statistic for all features of a layer based on a certain feature. This tool analyzes the characteristic of each feature in ratio with the features of its neighbor. A feature associated with a specific characteristic may have a high value on its own, but it may not be a significant point in terms of hot spot analysis. For a point to be statistically significant, a characteristic must have a high value and be surrounded by other features that also have high value.

The Getis-Ord Gi* statistic is calculated in the following way:

$$G_i^* = \frac{\sum_{j=1}^{n} \omega_{i,j} x_j - \overline{X} \sum_{j=1}^{n} \omega_{i,j}}{S \sqrt{\dfrac{\left[n \sum_{j=1}^{n} \omega_{i,j}^2 - \left(\sum_{j=1}^{n} \omega_{i,j}\right)^2\right]}{n-1}}}$$

In this formula x_j is the value of the characteristic for the feature, $\omega_{i,j}$ which is the spatial weight between features i and j and n is the number of total features. $\overline{X}$ and S are calculated as follows:

$$\overline{X} = \frac{\sum_{j=1}^{n} x_j}{n}$$

$$\overline{X} = \frac{\sum_{j=1}^{n} x_j}{n}$$

Since Gi is a kind of Z in itself, there is no need to calculate it again (Asgari, 2010).

Then in order to examine the relationship between ecological factors and the spatial pattern of rural population of the province, the rural areas were grouped based on the ecological conditions and in the following, the relationship between this grouping and the spatial distribution of the population of rural areas has been investigated using a comparative method analysis.

Spatial 'k'Luster Analysis by tree Edge Removal (SKATER) method was used to group rural areas based on the ecological conditions. SKATER algorithm was presented in 2006 by Assuncao et al. this method is made based on the cutting of tree branches, as a weighted connection graph with edges and nodes, and it clusters (groups) the values

according to their location. In this method clusters with similar values are expected to be next to each other. In this method for each region or area, a list of connected neighbors is presented and the cost for each neighbor is calculated, i.e. the total distance between all variables attached to regions or points is calculated. A two nearest neighbor algorithm (in terms of data) is selected for each region or point, and finally areas are grouped into the most consistent spatial clusters (Assuncao et al., 2006).

To learn more about this method, we must first learn about clustering. Consider *n* as place with *s* as the observed variable in any location. In equation 1, any specific location has different features in which the purpose of spatially constrained clustering is to create k spatially connected regions that are homogeneous with respect to X. in spatial clustering, if the areas are similar in value and close in space, they can be assigned to one cluster.

$$X = \begin{bmatrix} | & | & & | \\ x_1 & x_2 & \dots & x_n \\ | & | & & | \end{bmatrix}$$

Therefore, spatial relations should be considered in every zoning algorithm. In spatial statistics, spatial relations are shown using spatial weight matrices (Aldous, 1990; Assuncao et al. 2006). Spatial weight matrices were given in equation 5.

$$A = \begin{bmatrix} 0 & & a_{1,n} \\ a_{2,1} & \ddots & a_{2,n} \\ a_{n,1} & & 0 \end{bmatrix}$$

In which, ai,j is an index variable for location I and the neighborhood of j with ai,j=ai,j. the neighborhood relations are defined as follows:

$$a_{i,j} = \begin{cases} 1, & d_{euc}(i,j) \leq \epsilon \\ 0, & d_{euc}(i,j) > \epsilon \end{cases}$$

Equation 6 identifies two locations i and j as neighbors, if they are in a specific distance ϵ considering the metric distances such as Euclidean distance deuc. However, there is a conceptualization which is different from spatial relations such as k neighbors and neighborhood proximity-based algorithms (Getis, 2009; Geris and Aldstadt, 2010). Zoning (grouping or clustering) can be stated as a limited optimization

issue to define groups of objects without breaking the spatial proximity according to A:
$\{R1, \dots \text{،} Rk\} \in R.$

$$\arg\min_R = \sum_{i=1}^{k} \sum_{j \in R_i} d(x_j, \mu_{R_i})$$

$$\text{subject to} \sum_{j \in R_q} A[i,j] \geq 1 \qquad \forall i \in R_q, \forall q \in \{1, \dots, k\}$$

In which μRi is the mean for Ri region and d is the distance measurement which is often used as Euclidean distance. The optimization issue in equation 7 requires finding R regions so that the values within a zone are homogeneous and locations of the values are connected. We define a general operator as:

$\mathcal{L}(X.A): \rightarrow R \text{ where } R = [R_1. \dots R_k]$

An efficient $\mathcal{L}(X.A)$, ، $\mathcal{L}(X)$ which is based on spatial constraints of A does not require case setting in spatial clustering (Carlos Duque et al. 2007). One of the efficient zoning approaches is to display A and X jointly and use the efficient clustering algorithm in this new display.

Graph partitioning is an approach for defining an efficient $\mathcal{L}$. In this approach location information has been displayed using a (4) weighted and undirected graph. G (V, E, L). The location of space objects is shown by vertices, $V = V(G) = \{v1 \text{،} \dots vn\}$ in which $|V(G)| = n$ and neighborhood relations between spatial objects have been shown with edges and $|E(G)| = m$ is the number of neighbor pairs. The similarity between observed variables in each node is displayed in the form of paired edge weights (wi,j). Edge weight (wi,j) for edge ei, j∈E(G) is defined by distance function based on the feature vector x_i for object i, $and\ d(x_i. x_j)$.

Displaying the spatial object graph allows partition operators to be used in grouping and meanwhile preserve the constraints of spatial proximity. General zoning operator which works on a G graph, is displayed as follows:

$\mathcal{L}(G) = G^* = \{R1 \dots Rk\}$

The subgraph $G^* \subset G$, where $|V(G*)| = n$, consists of spatially adjacent regions $R = \{R1. \dots Rk\}$. Notably, $G - G^* = E_{cut}$ where E_{cut} is the set of edges removed to divide G into spatially connected regions. In figure 1 a graph-

based approach has been used for spatially constrained clustering.

$\mathcal{L}$ Creation operator defines the spatial adjacent areas for the data of figure 2. The main G graph is depicted on the main set of data and the divided G* graph is located on the zoning output.
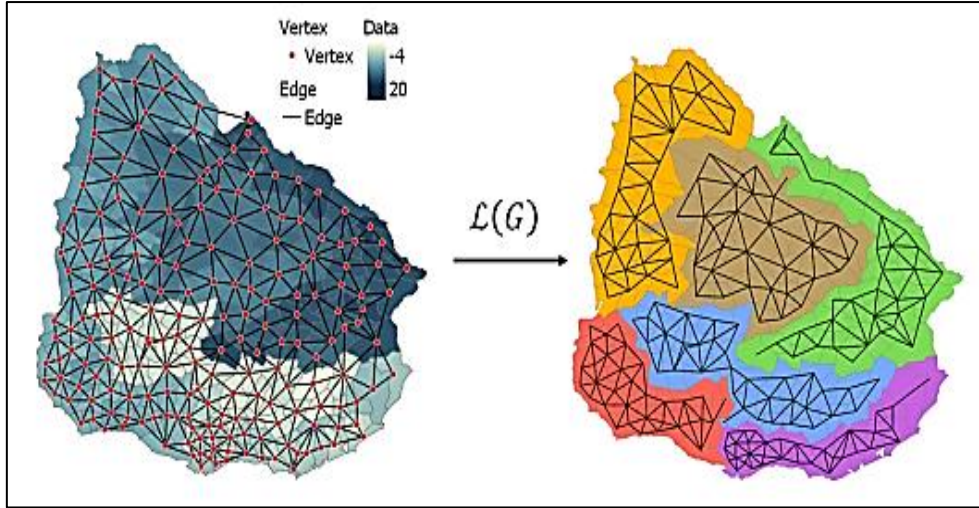

Figure 2. graphic display of spatial data (left side) and the map of the region with spatially constrained clustering (right). The divided subgraph is located on the (right) areas. (Assuncao et al. 2006)

The only difference between G and G* are *Ecut* edges. The edges are omitted to define R. various criteria identify different methods of *Ecut* and the quality of produced zoning is dependent on *Ecut*. The general quality criterion for zoning is the homogeneity of values in each region. The general homogeneity index $f_h(G^*)$ is presented in equation 10:

$$f_h(G^*) = \sum_{i=1}^{k} \sum_{j \in R_i} d(x_j. \mu(R_i))$$

In this equation $d(x_j. \mu(R_i))$ measuring the changes of each region is done considering some central criteria $\mu(R_k)$ related to R_k area such as mean and median.

Finding optimized *Ecut* which maximizes equation 10, is a computationally intensive work, especially for large sets of data (or in other words for large m) that are well connected. A branch of graph-based approaches for zoning (grouping) uses the spanning tree protocol to reduce the number of edges to search from *m* to *n* (Assuncao et al. 2006; Maravalle & Simeone, 1995). Due to the spatial problems of $n \ll m$, the tree-based approaches in the category of graph-based zoning methods have become very popular. To reduce the problem of spatial constrained clustering Assuncao et al. have

suggested tree segmentation method through using spanning tree T (Assuncao et al., 2006). Assuncao's spatial clustering analysis algorithm uses the minimum spanning tree by tree edge removal (SKATER). $T_{MST}(V. E)$ in which $V(T_{MST}) = G$ and $E(T_{MST}) \subset E(G)$ in which $|E(T_{MST})| = n - 1$. SKATER algorithm uses T_{MST} as a route to inspect all spatial locations to define *Ecut*. This approach decreases the number of neighbors from *m* to *n – 1*.

Removing one edge T_{MST} leads to create two subtrees T_{MST}^+ and T_{MST}^- on both sides of the removed edge. These subtrees indicate two zones. SKATER removes T_{MST} from the edges repeatedly and selects an edge that maximizes the equation 10. First, T_{MST} shows a region which is divided to *k* subtrees by SKATER, $T^* = \{T_1 \dots T_k\}$ which covers the regions, $R = \{R_1 \dots R_k\}$. Every time the objective function maximizes (the equation 7), SKATER removes one edge of T^*.
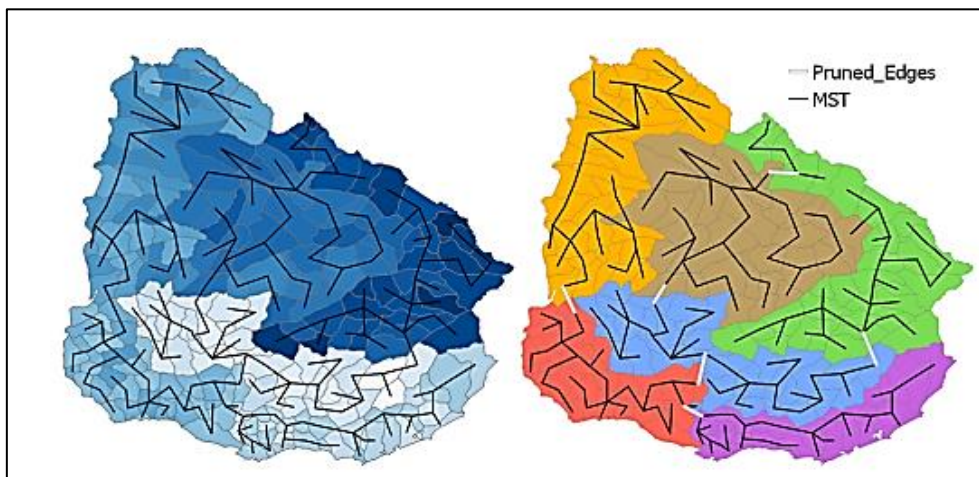
$$f_{obj}(e_{ij}) = f_h(T) - f_h(T^+) - f_h(T^-)$$

Equation 11 quantifies the change in homogeneity by dividing the indicated area T to two zones T^+ and T^-. Assunsao et al. define fh as whithin-

cluster squared deviation (SSD) in which the homogeneity is quantified based on the deviation from regional average, $\mu(R_k)$. The SKATER algorithm is shown in figure 3.


Figure 3. the location data is overlapped with the search path T_{MST}، (left side). The region map by tree edge removal (right side). The removed edges from T_{MST}، have been indicated with white color (Assunsao et al. 2006)

Figure 4 shows the location data and the related minimum spinning tree. The edges of the spinning tree are removed repeatedly (shown with white color) to define the zoning map (right side).

4. Research Findings

In order to identify the demographic changes of Qazvin province, in the first step, the demographic statistics of rural areas of the province were extracted according to census of Statistical Center of Iran during the years 1976-2016 and demographic map of rural settlements network during the census period was prepared, the results of which have been shown in figure 3:
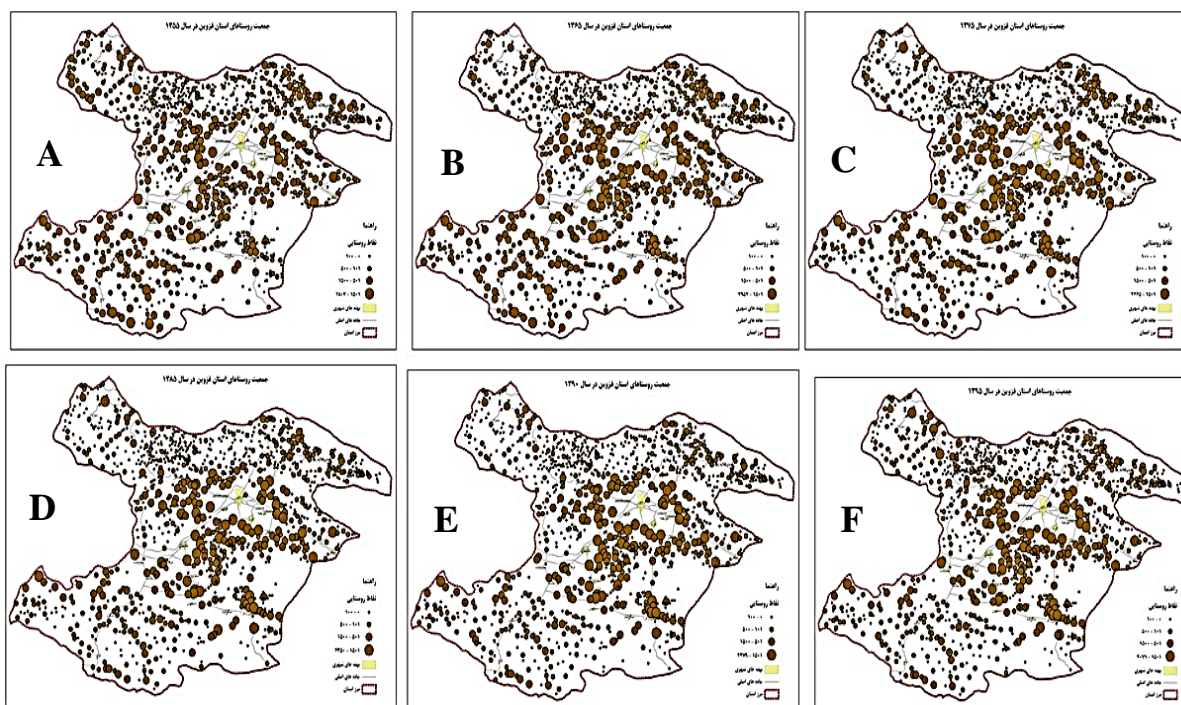

Figure 4. demographic changes of villages in Qazvin province during census A: 1976, B: 1986, C: 1996, D: 2006, E: 2011, and F: 2016

The rural population of Qazvin province was equal to 363911 people in 1976 and it reached 439921 people in 1986, which indicates an increase of 21%. The reason for the population increase during the period 1976-1986 can be related to the incentive policies of the population increase during this period. During the following periods the rural population of the province decreased, so that it reached 415329 people in 1996, 365225 people in 2006, 323324 people in 2011 and finally 321610 people in 2016. The decrease in rural population of the province is due to increased migration from the villages to cities.

Visual interpretation of the spatial distribution of the rural population of the province during the studied periods shows a tendency to concentrate the population in certain areas of the province. In 1976, the spatial distribution of the rural population in the province was almost uniform, while during the following periods, the level of uniformity decreased and density of the spatial distribution of the population occurred, such that it increased in the central and eastern regions of the province and decreased in other areas of the province.

Hotspot analysis method and calculation of Getis-Ord Gi* statistics were applied to review the spatial distribution of the rural population of the province, using ARC GIS software and the results have been indicated in figure 5.
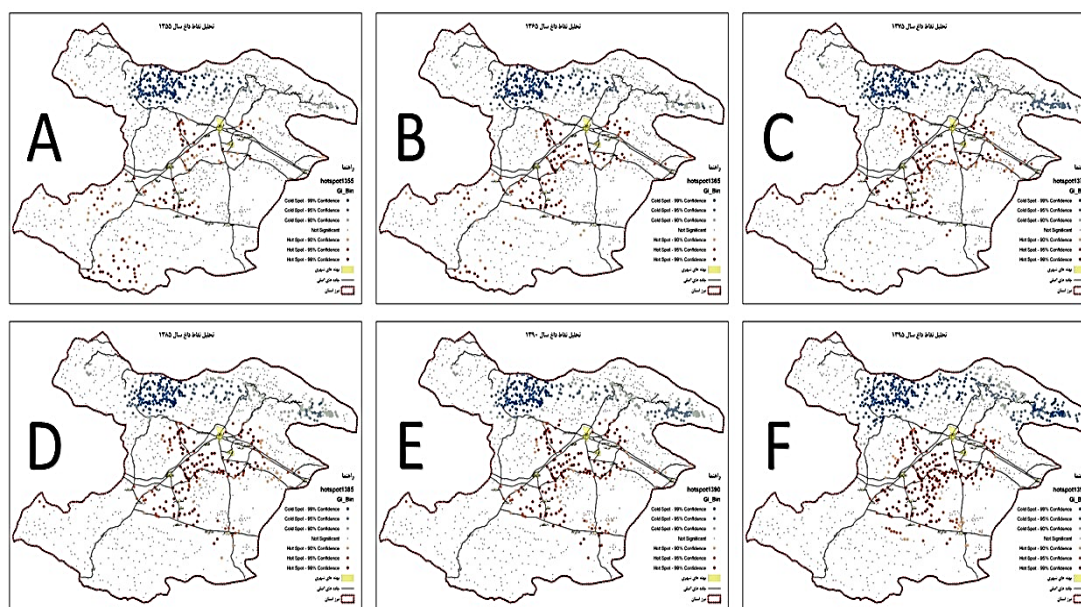
Figure 5. hotspot analysis of rural population of Qazvin province during the census periods A: 1976, B: 1986, C: 1996, D: 2006, E: 2011, and F: 2016

The Z-scores of the values higher than 1.96 are statistically significant with the coefficient of 90-99 and are shown with red color. In this study they indicate the high density of the population which during different periods of population and housing census have formed clusters with hot spots in various parts of the province. The negative value of -1.96 and below are statistically less significant and shown with blue color, form cold spots and indicate the rural areas with low population density.

Figure 3 shows the results obtained from Getis-Ord Gi* statistics during the census period of 1976-2016. According to the results, in 1976, there were the most hot spots with a confidence level of 90%, mostly in central, southwestern, and southern areas of the province, and cold spots were also seen in the northern part of the province. In 1976, almost the same pattern was maintained, although with minor differences, among which we can point out the decrease in the number of hot spots in the southern part of the province and the significant increase in hot spots in the center of the province. In 1996, also the movement of the hot spots towards the center of the province increased. This pattern of increasing the number of spots and their significant increase in the hot spots of province

center continues during the following years and it shows the population concentration in this area during the following years. The northern part of the province which is its mountainous areas, contains the cold spots during the periods under study. These areas have increased during the years 2006-2016 and have advanced to the western parts of the province.

Reviewing the spatial distribution pattern of rural settlements of Qazvin province based on Getis-Ord statistics indicates a clustering pattern of spatial distribution of rural areas of the province. This pattern has a high density in some areas and low density in other regions. The central areas of the province including Qazvin plain consist of hot spots and northern areas of the province including mountainous areas consist of cold spots (figrue 6).
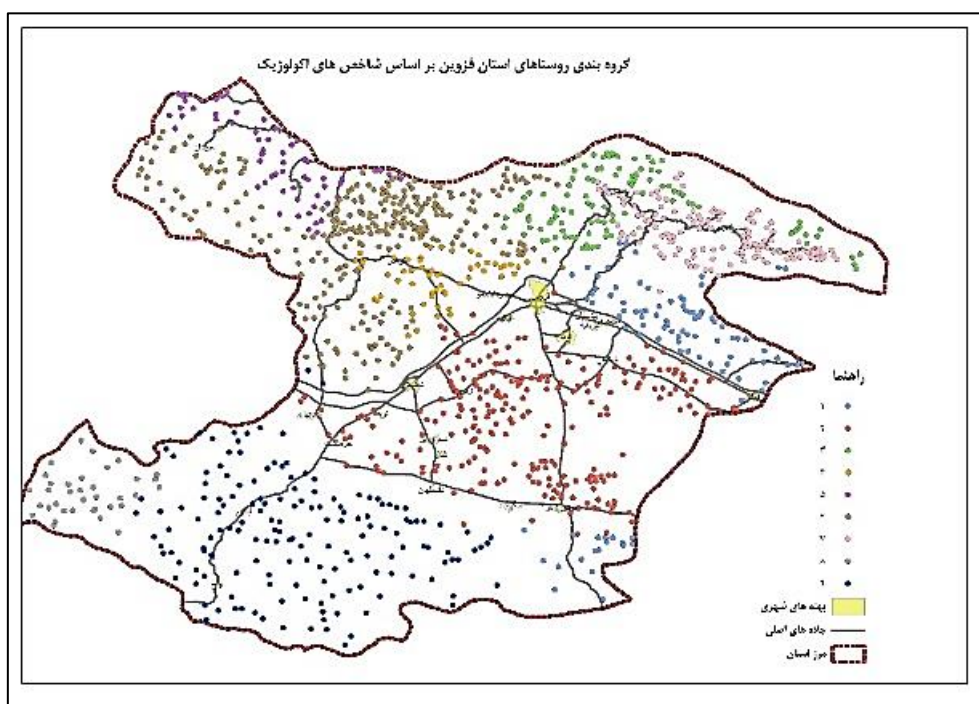

Figure 6. ecological grouping of villages of Qazvin province using SKATER method

Figure 4 indicates the grouping done by SKATER method for rural areas of Qazvin province. The rural areas of Qazvin province have been divided into 9 groups based on ecological conditions. These groups have been defined based on similar ecological conditions such as topography, slope, slope direction, distance from the river, precipitation, temperature, soil type, and access to underground waters. In SKATER method in addition to homogeneity of these conditions, spatial distance is also important in defining groups.

After grouping the rural areas of Qazvin province based on ecological conditions, table 1 and 2 were prepared in order to examine the impact of ecological conditions on the spatial pattern of rural settlements. The percentage of population of each group of rural areas of the province during the population and housing census was identified in table 1. In 1976, the

largest percentage of the rural population of the province (29%) lived in the villages of group 2 and the lowest percentage of it lived in the villages of groups 5 and 8 (4%). The second place in terms of population percentage belongs to the villages of group 9 with 21% of total population in 1976. In other words, it can be mentioned that, 50% of rural population of the province lived in groups 2, 5, and 8 and it shows a high population density in these groups of villages.

We can observe a lot of changes in terms of share amounts in 1986. For example, the increase in shares of the villages of group 2 to 34% indicates an increase of density in this group during this period. The shares of the villages in group 9 have decreased from 21% to 19%. The largest shares in this period are allocated to the villages of group 2 and the smallest shares of the total population belong to the villages of group 5

with 3 percent. In general, during the period 1976-1986 the share of the villages of groups 1, 2, and 4 in the total population have increased and the villages in groups 5, 6, 7, and 9 have faced a decrease in their shares of total population. The shares of the villages in groups 3 and 8 did not show any difference in ratio with previous period.

The largest share of the total population in 1996 is also allocated to the villages of group 2 (39%). Moreover, during this period the shares of the villages of this group from rural population of the province have increased by 5%. The lowest shares of population in this period are also allocated to the villages of groups 5 and 8 with 3 percent. During the period 1986-1996 there was an increase in the shares of groups 2 and 4 and a decrease in the shares of groups 3, 7, 8, and 9. The shares of groups 1, 5, and 6 did not change compared to the previous period.

Like former periods, in 2006, the largest share belongs to the villages of group 2 with 43% of total population. The lowest shares belong to groups 3, 5, and 7 with 3 percent. During the period 1996-2006 the shares of groups 1 and 2 have increased and the shares of groups 3, 6, 7, and 9 have decreased. The rest of the groups did not change compared to previous periods.

Like previous periods, the largest share in 2011 also belongs to group 2 with 45%. However, this is the only group whose share increases in ratio with the former period. Other groups either had a decrease in their shares such as groups 6 and 7 or had no change in their shares compared to previous period.

In 2016, which is the last census period, group 2 took the first place in terms of population share, as in the previous periods, and during 2011-2016, the share of the total rural population of the province increased by 2% and reached 47% in 2016. In addition to group 2, group 4 also had an increase of 1%, while other groups either had no change compared to the previous period or faced a decrease in share.

Table 1. distribution of population in the villages of Qazvin province during census period based on ecological grouping of the villages

Group number	Percentage of the total population (1976 census)	Percentage of the total population (1986 census)	Percentage of the total population (1996 census)	Percentage of the total population ((2006 census)	Percentage of the total population (2011 census)	Percentage of the total population (2016 census)
Group 1	0.10	0.11	0.11	0.12	0.12	0.12
Group 2	0.29	0.34	0.39	0.43	0.45	0.47
Group 3	0.05	0.05	0.04	0.03	0.03	0.03
Group 4	0.06	0.07	0.08	0.08	0.08	0.09
Group 5	0.04	0.03	0.03	0.03	0.03	0.03
Group 6	0.13	0.10	0.10	0.08	0.07	0.06
Group 7	0.08	0.07	0.06	0.05	0.04	0.04
Group 8	0.04	0.04	0.03	0.03	0.03	0.03
Group 9	0.21	0.19	0.16	0.13	0.13	0.13

Table 2 indicates the population growth rate of the villages in various groups during census periods. According to the information given in this table the annual growth rate of rural population of Qazvin province has been positive only during the period 1976-1986 (1.9%) and the annual growth rate in the rest of studied periods was negative.

The growth rate of different groups showed that in the examined periods only group 2 had a positive population growth rate and other groups experienced trends almost similar to the growth of the province. The growth rate of group 2 during 1976-1986 was 3% and during the following periods reached 1, 0.3, 0.7 and 0.3 percent respectively.

The population growth trends in ecological groups indicates different status of group 2 in ratio with other groups.

Table 2. population growth rate in the villages of Qazvin province during census periods based on ecological grouping of villages

Group number	Population growth rate 1976-1986	Population growth rate 1986-1996	Population growth rate 1996-2006	Population growth rate 2006-2011	Population growth rate 2011-2016
Group 1	2.1	-0.3	-0.2	-0.4	0.1
Group 2	3.0	1.0	0.3	0.7	0.3
Group 3	0.6	-2.4	-2.4	-1.4	-0.2
Group 4	1.5	0.9	-0.3	-0.1	0.0
Group 5	-0.7	-0.4	-0.8	-0.5	-0.2
Group 6	-1.3	-0.1	-2.9	-2.9	-0.3
Group 7	0.5	-3.3	-1.7	-3.8	-0.4
Group 8	0.2	-1.5	-1.2	-1.3	-0.1
Group 9	0.4	-1.8	-2.7	-0.4	-0.3
All groups	1.3	-0.6	-1.3	-2.4	-0.1

In order to identify the effect of ecological factors on the spatial distribution of the villages of Qazvin province, the correlation coefficient between the villages' population and quantitative ecological factors during the studied periods were calculated and the output of this coefficient has been shown in table 3.

Table 3. Pearson correlation coefficient between the ecological factors and population of groups according to the years under study

		Access to the aquifer	Average distance to the river	Slope percentage	Height above sea level	Average annual temperature	Average annual precipitation
Population in 1976	correlation coefficient	.753*	-.675*	-0.407*	-0.009	0.063	-0.533
	Sig. (2-tailed)	0.019	0.046	0.027	0.982	0.872	0.140
Population in 1986	correlation coefficient	.851**	-.706*	-0.484*	-0.063	0.117	-0.561
	Sig. (2-tailed)	0.004	0.033	0.018	0.871	0.764	0.116
Population in 1996	correlation coefficient	.905**	-.725*	-0.523	-0.132	0.186	-0.595
	Sig. (2-tailed)	0.001	0.027	0.024*	0.734	0.632	0.091
Population in 2006	correlation coefficient	.937**	-.729*	-0.550*	-0.176	0.229	-0.596
	Sig. (2-tailed)	0.000	0.026	0.041	0.651	0.553	0.090
Population in 2011	correlation coefficient	.945**	-.730*	-0.568*	-0.183	0.238	-0.609
	Sig. (2-tailed)	0.000	0.025	0.031	0.637	0.538	0.082
Population in 2016	correlation coefficient	.951**	-.721*	-0.523*	-0.223	0.273	-0.602
	Sig. (2-tailed)	0.000	0.028	0.049	0.564	0.478	0.086
**The correlation coefficient is significant at the 0.01 level (2-tailed)							
*The correlation coefficient is significant at the 0.01 level. (2-tailed)							

According to the obtained coefficients, the most influential ecological factor on spatial distribution of population of the villages of the province during the studied periods, is access to underground waters (being located on the aquifer). The correlation coefficient of this factor with the population living in villages in 1976, is equal to 0.753 (with a significance level of 0.05). Throughout the following periods the correlation coefficient between this factor and rural population of ecological groups had an increasing trend and reached 0.951 (with significance level of 0.01) in 2016. The second important and effective factor is the distance from surface water resources (distance from rivers).The coefficient of this factor has also increased from -0.675 (with a significance level of 0.05) in 1976 to -0.721 (with a significance level of 0.05) in 2016. According to the regression coefficients outputs it can be said that, there is a very strong positive relationship between the factor of access to underground waters and spatial distribution of the population of the province, whose intensity has increased in the years under review. There is a strong negative relationship between the factor of distance from surface water resources and spatial distribution of the population of the province whose intensity has increased during the studied years. The relationship between the slope percentage and spatial distribution of the population is also strong and negative and its intensity has increased in the years under review. The relationship between other ecological factors and spatial distribution of the population of the province is not significant at the level of 0.01 and 0.05%. For the qualitative factors including geographical direction of the slope and the type of soil, the correlation relations of Fei, Kramer and Landa wer calculated, but no significant relationships were observed between these factors and the spatial distribution of the population.
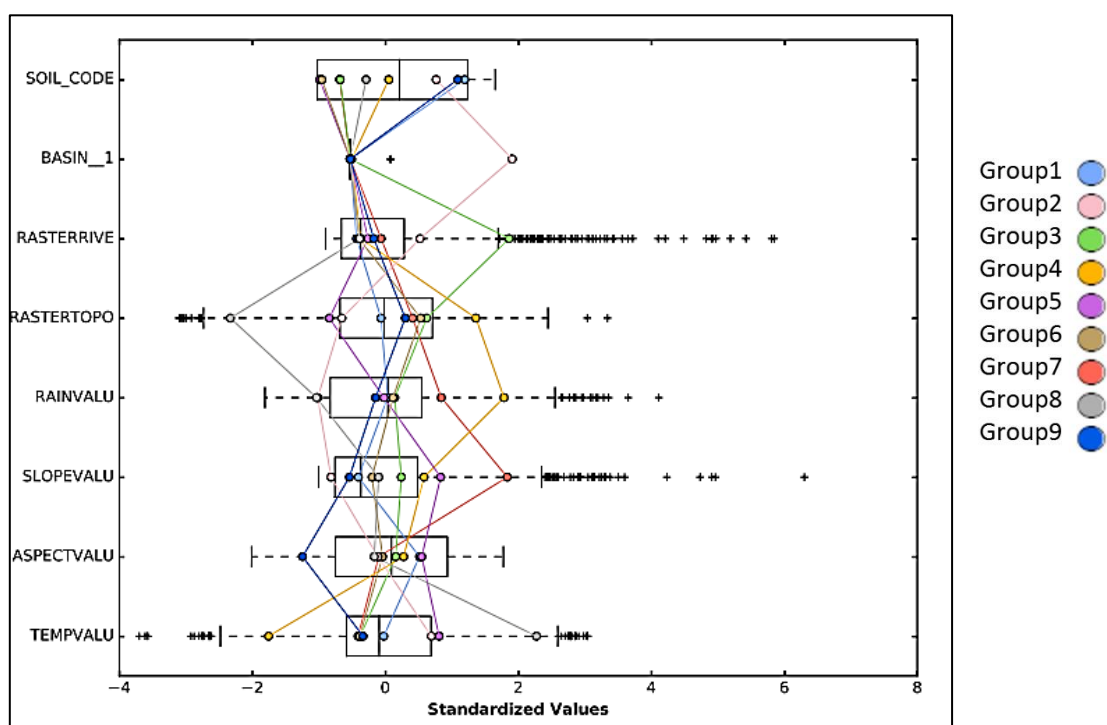

Figure 7. parallel box plot

One of the outputs of the grouping method used is the parallel box plot which can be observed in figure 7. In this diagram each line which has been shown with a different color is related to one of the groups of the villages and its ecological factors. As an example, in group 2 diagram (pink), item (CODE-SOIL) indicates the type of the soil, item (BASIN-1) shows the location of these groups of villages on Aquifer of the plain, (RASTERRIVER) shows the distance from the river (above the mean), item (RASTERTOPO) indicates the height (below the mean), item (RAINVALU) displays the amount of rainfall (below the mean), item (ASPECTVALU) indicates the dominant slope and finally item (TEPVALU) shows the temperature (above the mean). As observed in the diagram, the

main difference between group 2 and other groups which leads to high rate of population in this group and also its high share of population in the reviewed periods in ratio with other groups is related to factors such as being located on aquifer (access to underground waters), suitable slope (maximum 20%), and suitable distance from surface water resources (distance from the river).

5. Discussion and Conclusion

The present study was conducted with the aim of examining the role of ecological variables in the formation of rural settlements pattern in Qazvin province. The results obtained from this research can be reviewed in two parts: the first part has been related to the impact of the role of ecological factors in the formation of the pattern of rural settlements in Qazvin province. According to variance analysis test, the results of this part of the study showed that, the ecological factors are involved in the spatial distribution of rural settlements of the province and formation of the settlement pattern. In the meantime, factors such as access to underground water, distance from the river, and direction of the slope play a more prominent role. In almost all reviewed studies, factors such as distance from the river and the direction of the slope have been considered as important and influential ecological factors in the formation of spatial pattern of rural settlements. Therefore, in terms of the effectiveness of these factors, the findings of the present study are consistent with most previous studies. However, one of the most important findings of this study which has not been mentioned in previous studies, is the high impact of access to underground waters in the formation of spatial pattern and also demographic changes of Qazvin village network during the investigated periods. Water as a vital element has played a great role in accommodation of population in human settlements throughout history. It has a higher influence on rural settlements, since the employment and livelihood of their residents depend on this factor. And

In the meantime, access to underground waters is one of the most important ecological variables which has an undeniable role in the formation of rural settlements pattern of the province and due to droughts in recent years, the role of this factor has become more prominent and has caused the population density in certain groups.

agricultural activities and gardening require access to sustainable resources and water. Since Qazvin is located in a semi-arid area, access to water in the settlements of this province is mainly through underground resources. The Qazvin plain aquifer is one of the most important underground water resources of this province which has a major role in supplying water for rural settlements of Qazvin province. Due to lack of rainfall in recent years, and reduction of surface water resources in the whole country and also Qazvin province, the dependence on underground resources to supply water to rural settlements has been increased. This issue has intensified the role of this factor in the formation of spatial patterns of rural settlements during the studied periods, especially the final courses.

The second part of the results is related to the methods used in this study. The results obtained from the SKATER method in grouping rural areas of Qazvin province according to ecological conditions prove the efficiency of this method in research related to the field of residential pattern studies. The results also show that combining the above method with statistical methods can make an efficient and influential system which brings positive results.

Authors' contributions

The authors equally contributed to the preparation of this article.

Conflict of interest

The author declares no conflict of interest.

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Original Article

واکاوی تغییرات در الگوی فضایی شبکه سکونت‌گاه‌های روستایی استان قزوین با تاکید بر نقش عناصر اکولوژیک طی دوره ۱۳۹۵-۱۳۵۵

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چکیده مبسوط

۱. مقدمه

مکان گزینی و استقرار سکونت‌گاه‌های بشری از ابتدای تاریخ بشر به‌عنوان یکی از مهم‌ترین دغدغه‌های انسان بوده است در ایجاد و مکان گزینی اولین سکونت‌گاه‌های ثابت انسانی نقش عوامل اکولوژیکی خیلی بارز می‌باشد. علی‌رغم پیشرفت‌های فنی صورت گرفته در دوره‌های بعد از باستان هنوز هم نقش عوامل اکولوژیکی پررنگ و غیرقلب‌انکار می‌باشد. البته اثرگذاری عوامل اکولوژیک را بیشتر در سکونت‌گاه‌های روستایی می‌توان مشاهده کرد تا سکونت‌گاه‌های شهری، چون ساختار فعالیت و معیشت در سکونت‌گاه‌های روستایی بیشتر به طبیعت و منابع آن وابسته می‌باشد. بررسی اولیه و مقدماتی توزیع سکونت‌گاه‌های روستایی استان نشانگر یک الگوی خاص (تمرکز روستاهای پرجمعیت در برخی پهنه‌های استان و خالی بودن از جمعیت بودن برخی روستاهای دیگر) در این استان می‌باشد که در طی دوره‌های مختلف سرشماری با تغییراتی همراه بوده است و این سؤال را به ذهن متبادر می‌سازد که چه عواملی باعث ایجاد چنین الگویی گردیده است؟ آیا عوامل اکولوژیک در شکل‌گیری چنین الگویی نقش دارند؟ و اگر نقش دارند میزان اثرگذاری آن‌ها چقدر می‌باشد؟ به همین منظور تحقیق حاضر در جستجوی دستیابی به این سؤالات می‌باشد.

۲. مبانی نظری تحقیق

الگوی اسکان در سکونت‌گاه‌های روستایی هر منطقه بیش از هر چیز انعکاسی از ویژگی‌های محیط طبیعی (آب‌وهوا، پوشش گیاهی، محیط‌زیست، شیوه دسترسی به منابع آب‌وخاک، پراکندگی مکانی شبکه آب‌ها و کیفیت خاک) است. در زمینه تأثیر شرایط اکولوژیک بر الگوی سکونت‌گاه‌ها و به‌ویژه سکونت‌گاه‌های روستایی تحقیقات

زیادی صورت پذیرفته است. در یک جمع‌بندی کلی می‌توان گفت که عوامل اکولوژیکی مؤثر در الگوی فضایی سکونت‌گاه‌ها به‌ویژه سکونت‌گاه‌های روستایی بر اساس مطالعات صورت گرفته شامل عوامل و متغیرهای اقلیمی، ارتفاع، شیب، جهت شیب، منابع آب و نوع خاک می‌باشند. در برخی از مطالعات به کاربری اراضی اشاره گردیده است که به نظر می‌رسد کاربری اراضی به‌عنوان یک پدیده حاصل از عوامل اکولوژیک بوده و نمی‌توان آن را به‌عنوان یک عامل اکولوژیکی به‌حساب آورد.

۳. روش تحقیق

داده‌های مورداستفاده در این تحقیق دودسته می‌باشد: دسته اول داده‌های جمعیتی نقاط روستایی استان قزوین می‌باشد که مربوط به سرشماری‌های عمومی نفوس و مسکن سال‌های ۱۳۵۵ تا ۱۳۹۵ است. دسته دوم داده‌های فضایی (نقشه) مربوط به عوامل اکولوژیک استان می‌باشد. روش مورداستفاده در این تحقیق روش توصیفی-تحلیلی می‌باشد. در ابتدا برای بررسی الگوی فضایی شبکه سکونت‌گاه‌های روستایی استان قزوین از آماره *Getis-Ord Gi و برای گروه‌بندی نقاط روستایی بر اساس شرایط اکولوژیک هم از روش تحلیل خوشه‌بندی فضایی با حذف یال درخت (SKATER) استفاده گردیده است و در ادامه این گروه‌بندی با توزیع فضایی جمعیت نقاط روستایی با روش مقایسه‌ای و استفاده از تحلیل واریانس یک‌طرفه ANOVA بررسی‌شده است.

۴. یافته‌های تحقیق

بررسی الگوی توزیع فضایی سکونت‌گاه‌های روستایی استان قزوین بر اساس آمار گتیس-ارد نشانگر الگوی خوشه‌ای توزیع فضایی جمعیت در نقاط روستایی استان می‌باشد که این الگو در برخی از پهنه‌ها

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روی‌داده در ســال‌های اخیر نقش این عامل پررنگ‌تر گردیده و باعث تمرکز جمعیت روستاها در این گروه خاص گردیده است.

۵. بحث و نتیجه‌گیری

نتایج به‌دست‌آمده از این تحقیق را می‌توان در دو بخش موردبررسی قرارداد: بخش اول مربوط به تأثیرگذاری نقش عوامل اکولوژیک در شکل‌گیری الگوی سکونت‌گاه‌های روستایی استان قزوین بوده است در این بخش نتایج تحقیق با توجه به آزمون تحلیل واریانس نشان داد که عوامل اکولوژیک در توزیع فضایی جمعیت روستایی استان و شــکل‌گیری الگوی ســکونت‌گاهی نقش دارند و در این میان عواملی مثل دسترسی به آب‌های زیرزمینی، فاصله از رودخانه و جهت شیب نقشــشــان بارزتر می‌باشد. بخش دوم نتایج این تحقیق را می‌توان در خصوص روش مورداستفاده در تحقیق بیان نمود. نتایج به‌دست‌آمده از روش SKATER در گروه‌بندی نقاط روستایی استان قزوین بر اســاس شــرایط اکولوژیکی کارآمدی این روش را در تحقیقاتی که مربوط به حوزه مطالعات الگوی ســکونتگاهی می‌باشــد را اثبات می‌نماید

کلیدواژه‌ها: الگوی فضــایی، ســکونت‌گاه‌های روستایی، عوامل اکولوژیک، روش SKATER، استان قزوین.

دارای تراکم بالا و در برخی از پهنه‌ها دارای تراکم پایین بوده اســت. پهنه‌های مرکزی اســتان که دربرگیرنده دشت قزوین می‌باشد شامل لکه‌های داغ و پهنه‌های شــمالی اســتان که دربرگیرنده مناطق کوهســتانی اســت شــامل لکه‌های ســرد می‌باشد. گروه‌بندی نقاط روستایی استان قزوین بر اساس شرایط اکولوژیک در ۹ گروه انجام گردیده است. این گروه‌ها بر اساس شــرایط اکولوژیکی مشابه مانند توپوگرافی، شــیب، جهت شــیب، فاصــله از رودخانه، بارش، درجه حرارت، نوع خـاک و دســترســی به ســفره‌های زیرزمینی آب تعریف‌شده‌اند. بررسی شاخص‌های سهم از جمعیت کل روستایی و همچنین نرخ رشــد جمعیت در گروه‌های اکولوژیکی روســتاها تفاوت‌های عمده بین گروه‌ها را نشــان داد که بیانگر اثرگذاری عوامل اکولوژیکی در این تفاوت‌ها می‌باشــد. نتایج به‌دســت‌آمده از آزمون تحلیــل واریــلنس ANOVA هم بیــانگر معنــاداری تفــاوت در میانگین‌های جمعیتی گروه‌های اکولوژیکی است. بر اساس یافته‌های کلی بالاترین میزان تأثیر در گروه‌بندی مربوط به وجود آبخوان بوده و در رتبه‌های بعدی فاصــله از رودخانه و جهت شــیب قرار دارند که نشــانگر تأثیر بالای این متغیرهای اکولوژیکی در توزیع جمعیت روســتایی اســتان در طی دوره‌های مختلف بوده اســت. در این میان نقش دســترســی به آب‌های زیرزمینی یکی از مهم‌ترین متغیرهای اکولوژیکی بوده کـه نقش انکـارنـاپـذیری در شــکــل‌گیری الگوی ســکونتگاه‌های روستایی اســتان داشــته و به دلیل خشک‌سالی‌های

Original Article

Evaluation of Drought Resilience Measures in Reducing the Vulnerability of Rural Households (Case Study: Rostaq Dehestan of Khalilabad County)

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Abstract

Purpose- Village as a residential system has always suffered a lot of damage due to natural hazards such as drought throughout history, and due to the dependence of the rural economy on the agricultural sector, any threat against this sector leads to the weakening of the economic foundations, the village and eventually the economic stagnation of the country. Therefore, the aim of the current research is to evaluate the drought-resilient measures to reduce the vulnerability of rural households located in Rostaq district in Khalil-Abad City, Khorasan-Razavi Province.

Design/methodology/approach- The type of research is applied research, and the data was collected by applying a descriptive-analytical method by using documentary sources and field studies (questionnaire). The statistical population of the research is comprised of the heads of rural households living in the study area. As a result, 337 people were selected using Cochran's method. For ranking and spatial analysis of the village, Copras and Vicor techniques were used, and Shannon technique and SPSS software were used for statistical data analysis.

Findings- The results showed that among the weights obtained from the paired comparison of the dimensions raised in resilience measures with drought in reducing the vulnerability of rural households, modern irrigation measures with a score of (0.290) have the highest score in resilience measures. Avaram took over with the drought. Finally, in the study area, Niqab village performed better than other villages in terms of resilience measures in dealing with drought.

Research limitations/implications- Not having access to statistical information when referring to Jihad Agriculture and Governorship, as well as filling out the questionnaire depending on the topic at the village level and the costs of conducting this research are among the challenges of the present research.

Practical implications- In the end, according to the obtained results, it is considered necessary to provide solutions for the resilience of rural households at the level of the villages of this district and to implement the solutions.

Originality / value- The present research is significant due to its expression and recognition of different issues surrounding the resilience of households in the face of drought. An important step can be taken in the direction of reducing the vulnerability of rural households to deal with drought in the coming years.

Keywords: Resilience measures, Drought, Vulnerability, Rural households, Rostaq Dehestan.

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1. Introduction

A look at the history of life on earth indicates that mankind has always been exposed to various natural disasters (Saemipour et al., 2017). In recent years, as a result of global climate changes, there has been widespread concern about the phenomenon of drought in terms of intensity, repetition, increase and duration throughout the world (Sivakumar, 2012, Peterson et al. al, 2013). This phenomenon has always drawn human attention to itself more than other natural phenomena due to reasons such as its wider spread, the inclusion of more population, the intangible and long-term nature of its effects, and the continuity and amount of damages resulting from it (Rezaei et al., 2010).The occurrence of drought in the regions of the world shows that all nations are vulnerable to weather events (Pourtaheri et al., 2012). Meanwhile, developing countries are more affected by risks compared to developed countries (Xenarios et al., 2016), and Iran is not an exception to this rule and is always exposed to natural disasters such as floods, earthquakes, and droughts. It has been in such a way that out of 40 disasters that have happened in the world, 31 of them happened in Iran. In the meantime, Iran is in the list of the top 10 most impoverished countries in the world (Bozarjmehri & Javanshiri, 2015). During the last 40 years, 27 droughts have occurred in Iran, because most of Iran is located in the dry and semi-arid climate of the world. Iran alone has more extremely dry, dry, and semi-arid areas than the entire European continent (Gholami and Ali Beigi, 2013). The overview of the drought situation in Iran in the next 30 years shows that the drought in the country will increase and in the years 2025, 2030, and 2035, most parts of the country will face severe and very severe drought. In this regard, the drought situation in 2040 will be far more critical than before (Khazanehdari et al., 2008). Therefore, natural hazards and crises have the capacity to become devastating hazards for human communities in the absence of a risk reduction system (Zhou et al., 2010). This is the reason why natural hazards such as drought and its adverse consequences for natural resources, agricultural production and economic and social development are considered as one of the basic challenges of Iran and the other areas prone to drought, and due to the frequency of occurrence and significant scope of this phenomenon, it is necessary to devise mechanisms and directional measures to deal with it (Tavakolinia et al., 2016).In this regard, one of the basic solutions to reduce the vulnerability of rural households against recent droughts is to increase the resilience measures of rural communities against the disruption and chaos created in their lives (Ghorbani et al., 2015). Due to the dynamic nature of society's response to risks and crises, resilient measures are a form of foresight and help to expand policy options to face uncertainty and change (Keck & Sakdapolrak, 2013). In the scientific community, there is a consensus that resilient actions are a multifaceted concept and have social-cultural, human-individual, governance-management, physical-infrastructural, economic-financial and finally natural dimensions. Each of these dimensions has its own indicators and each of the indicators pays attention to details within human systems and plays an essential role in empowering rural communities (Cutter, S., Finch, 2008, Norris et al., 2009). Therefore, due to the close relationship between the village and agriculture, the negative consequences are also more visible on agriculture (Pourtaheri et al., 2012). For this reason, resilient measures against drought for better performance of crops, livestock, meadows and pastures, and other components of the agricultural sector are effective (Habiba, et al., 2012) and lead to an increase in the quality and quantity of production and income, and improve the lives of the rural households, as a result of enhancing their standard of living (De Silva, 2018). Therefore, it is necessary to take resilient measures by rural households in dealing with drought in order to maintain the stable livelihood of households. In Khalil-Abad City of Kashmar and Rostaq District, agriculture is considered as the main activity and livelihood of rural households. The livelihood of most of the rural households in this region is based on the income from agriculture. Agriculture in this region usually depends on the amount and distribution of rainfall and masses prevailing in the district. The seasonal nature of these masses has increased the amount of drought in this region, and drought and the amount of precipitation have been a long-standing challenge in this region. According to the data of the synoptic stations of Rostaq District (2022), although drought has been intermittent in this region since 1380, but frequent droughts have occurred in this district since 2001 to 2022. The occurrence of droughts and lack of rains have resulted in reduction of underground and surface water, reduction of cultivated area and productivity of crops and most importantly, reduction of the income level of rural households. To reduce vulnerability to drought, rural households can withstand drought to some extent through resilience

measures. Therefore, paying attention to the resilient measures can reduce the level of vulnerability of rural households.Therefore, in this research, the evaluation of drought-resilient measures in reducing the vulnerability of rural households in Rostaq District is discussed. In this regard, the present research is designed to answer the following questions:

- Among the resilient measures in dealing with drought, which one is more important?
- What is the difference between the studied villages in terms of resilient measures in dealing with drought?

2. Research Theoretical Literature

The dependence of the rural economy on natural destabilizing factors has created damages in rural settlements (Rahmani & Taghiloo, 2018, Debanli et al., 2017). Among the natural damages, we can take drought as an example, the meaning of which is the access to water resources in lower than average conditions (Melk-Thabet et al., 2014). This phenomenon is one of the natural hazards that are more common in arid and semi-arid regions (Pirmoradian, 2008). Drought is one of the most destructive hazards that is increasing as a slow or creeping event (Pulwarty & Sivakumar, 2014). It leads to imbalance in the hydrological situation of a specific region (Mariano, et al., 2018). In another definition, drought means a deviation from average or normal rainfall conditions and occurs when the amount of rainfall is less than 75% of the rainfall in a certain period of time (25 to 35) in a region (Rezaei et al., 2010). In the practical definition, drought is a continuous period of lack of rainfall (Heidari Sarban & Bakhtar, 2014). To determine the onset of drought, the deviation of the current situation from the average rainfall over a period of time is considered (Basto, et al., 2018). One of the characteristics of drought is the rapid reduction of surface flows and the decline of underground water reservoirs, lakes and rivers (Riahi & Pashazadeh, 2012). In this connection, the role of agriculture in the main livelihood of rural households and its vulnerability to the phenomenon of drought has given importance to the need for operational policies in order to reduce the vulnerability of rural households (Ahmadi & Manouchehri, 2019, Ebrahimi, 2019). Because the most important category and the most uncontrollable variable in the agricultural sector is rainfall, weather and finally drought, it is the dominant force that strongly affects the trend, volume, time table and place of agricultural production, and sometimes it has its own effect that reverses the effect of other

variables and policy instruments. Therefore, considering that the main sources of food supply for rural households are agricultural and horticultural products and animal husbandry, the vulnerability of rural households increases from natural hazards called drought (Sawari & Khosravipour, 2017), which creates local-spatial challenges and the instability of rural settlements (Wilheit et al., 2014, Khalili et al., 2020). On the other hand, the consequences of droughts are not only affected by the severity, continuity and extent of the drought, but also the vulnerability of societies in this field (Wilheit, 2007). In general, vulnerability is a condition that, in relation to geographical and environmental situations, social forces, institutions and cultural values, makes humans sensitive, weak and defenseless against numerous natural hazards (Afrakhteh, 2017). Vulnerability has different concepts among rural households, this is due to the different understanding and perceptions of rural households in each region. Therefore, based on the different dimensions of vulnerability in each region, special policies for that region should be adopted. At the same time, the vulnerability of people is affected by factors such as social class, religion, ethnicity, gender, age, different networks, access to power sources, climate, political structures, diversity of income, infrastructure facilities, technology, access to the market, and the amount of capital (Domeno and Obeng, 2016, Otto et al., 2014, Paavola, 2008). Vulnerability is defined as the conditions of people at risk, their integration in society, and their access to vital services. Vulnerability is part of the generation of inequalities that have affected the sensitivity of different groups and also have determined their ability to respond to them. Vulnerability includes a variety of concepts and elements, including sensitivity to damage and inability to adapt (Oppenheimer et al., 2014). Carter Finch (2008) suggests that vulnerability is a measure of the population's sensitivity to natural hazards and their ability to respond and recover from the effects of hazards. Fussel (2012) defines vulnerability as the lack of ability of individuals, groups or communities to cope with any external stress that affects their livelihood and well-being. However, most of the development theorists have proposed "diversification approach" in the framework of the sustainable rural development model in order to reduce the vulnerability of rural households in the face of drought. In this theory, in order to reduce vulnerability, the existence of "diversity" in economic activities is considered as one of the necessities of rural communities.

Table 1. Review of Literature
Source: Library studies of authors, 2022

Title	Authors	Results
Analysis of the drought risk index and its effect on the location of villages located in Qazvin basin	Fazelnia et al., 2014	The results indicate that the cultivation pattern should be changed in the villages with high risk of drought in order to prevent the instability of the villages in the region.
Analysis of economic, social and environmental dimensions of drought crisis and its effects on rural households of Zarin Dasht City)	Namdar, Bozjamehri, 2015	The results showed that the crisis of successive droughts was associated with significant effects in economic, social and environmental dimensions in the villages of the region, among which the economic effects of this phenomenon were more than other dimensions.
Analyzing the behavior of drought and the factors affecting it in the nomads of Darila Region, Gachsaran City	Rashed Nasab et al., 2017	The results of the research show that the behavior of the studied nomads with drought can be separated into two dimensions of technical and non-technical moderators.
Examining methods of dealing with drought by farmers (case study: Shirvan city)	Abedi Sarostani et al., 2017	The results showed that the first priority of the solutions to deal with drought is related to land reform solutions and the last priority is related to storage solutions.
Analysis of the socio-economic effects of drought on the rural communities of Semnan	Karimi, 2017	The results showed that the four factors of livelihood crisis, stagnation of production and weakening of agriculture, cultural and psychological and social participation explain 55.812 percent of the changes in the socio-economic effects of drought on the rural communities of Semnan.
Measurement and evaluation of effective dimensions on improving the resilience of rural communities in the face of drought (case study: Sabzevar city)	Vazirian et al., 2019	Measuring the dimensions of resilience showed that the most effective and important dimensions in the level of resilience belong to the infrastructural and physical dimension and the natural dimension.
Identification of effective factors on increasing the resilience of Sistan Plain farmers in facing soil drought,	Khaki1firouz et al., 2022	The results showed that the lack of knowledge, literacy, and the low level of understanding of farmers and officials regarding drought and how to deal with it, reducing self-confidence and life expectancy are the most important factors in resilience in the face of drought.
Resilience assessment of Zahedan City against water crisis and drought	Yadgari Far et al., 2023	The results showed that the state of economic, social and institutional resilience in Zahedan City is lower than the optimal average (3) and Zahedan City is not in a good state in terms of resilience against drought and water crisis.
Social and economic effects of drought	Edwards, et al., 2019	The results indicated that policymakers should consider these impacts in designing effective responses to future droughts.
Causes and effects of drought in northern parts of Ethiopia	Mekonnen, Gokcekus, 2020	The results showed that most of the researchers who have paid attention to drought and famine have investigated them through a cause-and-effect relationship.
Effects of Drought, Social Organization and Public Policy in Northeast Brazil: A Case Study of the Upper Paraíba River Basin	Dantas, et al., 2020	The results showed that the use of dams for water management in the semi-arid region was identified as the main factor affecting water security and social organization.
Investigating the economic and social effects of drought on the rural areas of Bijar City (Cheng Almas Region)	Zarei, et al., 2021	The results showed that in the social dimension, there has been an increase in immigration, a decrease in rural participation, an increase in poverty, a decrease in the quality of the environment and the standard of living, an increase in family conflicts, and the spread of disease.
Farmers' perceptions of drought severity and its effects on pre- and post-drought adaptation: evidence from maize farmers in China.	Hou, et al., 2023	These findings highlight the need for policymakers to enhance farmers' understanding and differentiation of adaptation options and consider their interrelationships in resource allocation to maximize effectiveness.
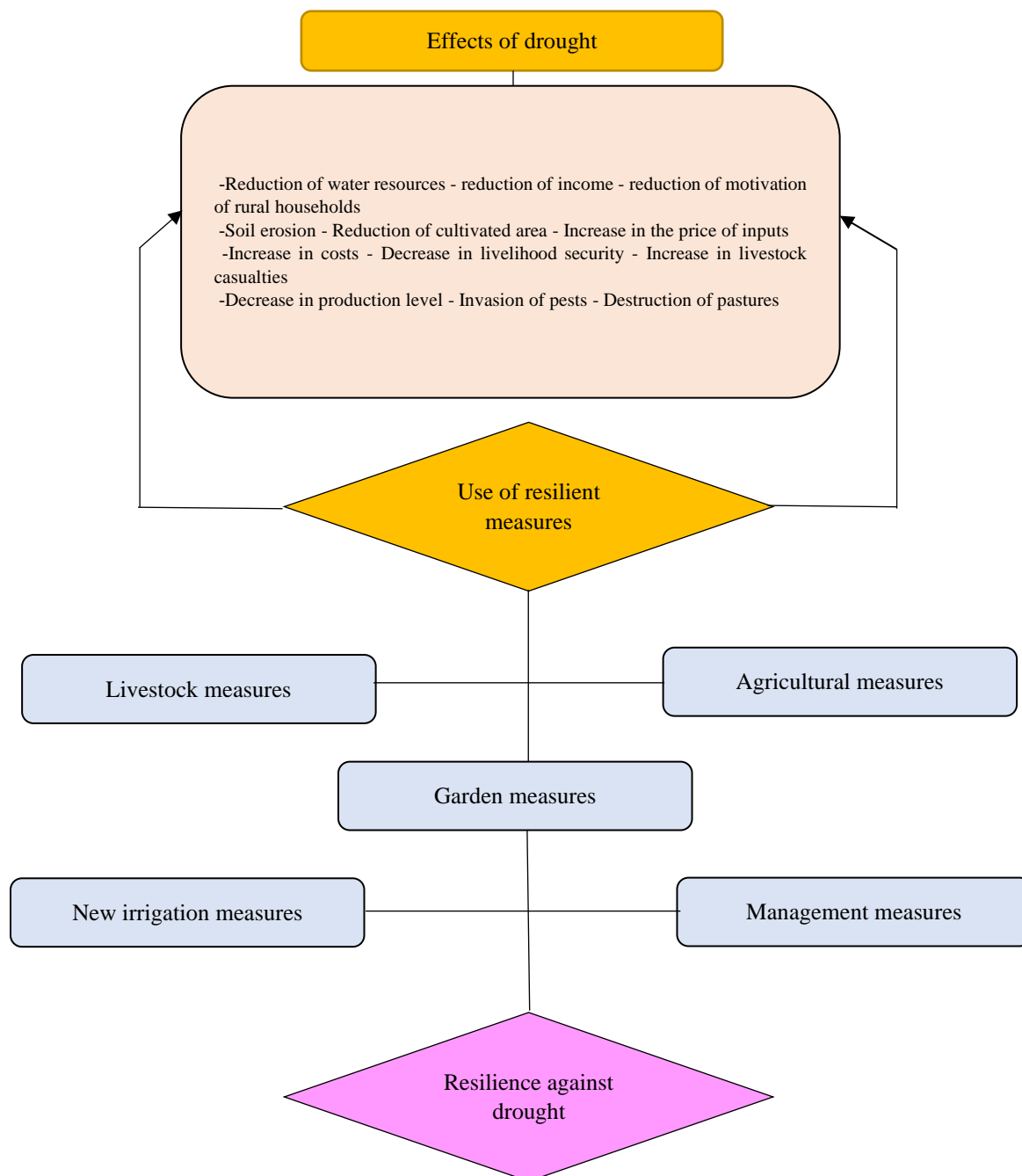
Figure 1- Conceptual model of the research

The application of this approach will facilitate the reduction of the vulnerability of rural households in the face of drought (Alavizadeh, 2009). Based on this, the reduction of the vulnerability of households will appear and finally when the system has many and diverse elements, and the more diverse the system is, the higher the ability to reduce vulnerability and provide conditions for the dynamics of the system, and to preserve it over time in different places not only against internal tensions but also against external tensions (Alavizadeh & Kermani, 2010). In general, the vulnerability caused by drought is classified into four categories: physical, environmental, economic, and social (Nasarnia and Sabeti, 2014); which has direct and indirect effects. The indirect effects of drought on the well-being of other members of the society, due to its effect on product prices and living

costs, are more than the direct effects of drought on production (Dejio, 2017, Badwin et al., 2011).

Due to the fact that drought causes negative consequences on societies in various dimensions, it is of great importance and for this reason, extensive research has been done in this field, and the following can be found from the research conducted in relation to the subject (see Table 1).

However, according to the theoretical background of the research on resilient measures in dealing with drought, it seems that these measures can to some extent curb some of the negative factors affecting the lives of villagers and cause drought to have less impact on the livelihood and life of rural households. On the other hand, not paying attention to drought management and not making people resilient against drought, both in cities and in villages, can lead to negative consequences in the country's villages (Figure 1).

3. Research Methodology
3.1 Geographical Scope of the Research

Khalilabad City with an area of 5.1767 square kilometers is one of the cities of Razavi Khorasan Province. This city is 245 kilometers away from Mashhad, and it is adjacent from the north to the Kohsarakh Region, from the south to Bejestan and Gonabad, from the west to Bardskan City, and from the east to Kashmar. Khalilabad City has a population of 51701 people residing at 27 villages and two parts including the central part with 14 villages and Sheshtaraz District with 13 villages. In the meantime, the central part, its center is Khalil Abad, has smokestacks named Huma and Rostaq. Therefore, Rostaq District was studied from the central part (Figure 2). In the census of 2015, the population of this District was 8441 people and 2748 households, of which, 4328 people, were men and 4113 were women. Agriculture and animal husbandry has been the dominant economy and livelihood at the village level. Therefore, the relevant officials should pay special attention and importance to natural hazards such as drought in this village so that the livelihood of the households is not endangered.
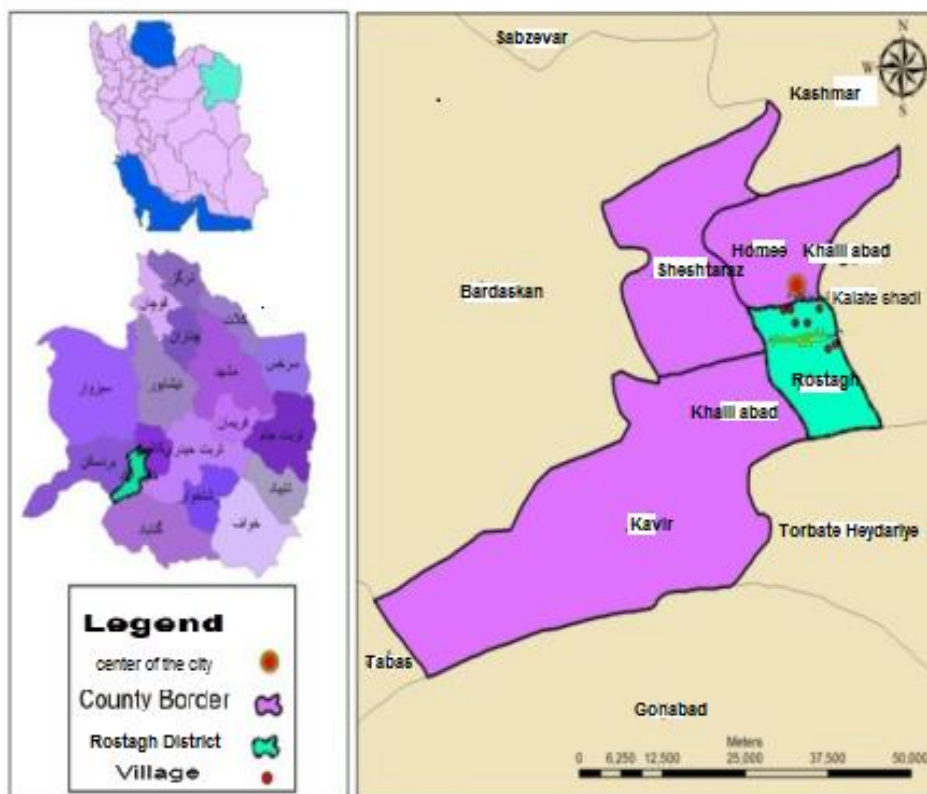

Figure 2. The location of Rostaq Village in Khalilabad City

3.2. Methodology

In order to determine the frequency and severity of climatic drought in the study area, the SPI method was used from the Kashmir synoptic station in the region. The tables are given below. Choosing short-term and long-term scales is because of the effects of drought, which has a short-term effect on soil moisture and agricultural issues, and a long-term effect on water resources. In general, the occurrence of weak type of drought is more frequent than other types of drought in all time scales. In fact, the frequency of drought periods has decreased from the 3-month time scale, but on the other hand, its duration has increased in the studied area in most cases. It is faced with meteorological drought, which is due to the irregularity of rainfall, and also the wet and dry periods have not had much continuity and it is strongly affected by daily rainfall.While in longer time scales, droughts show a slower response to changes in precipitation, the frequency of occurrence of dry periods in long-term time scales is much higher than in short-term periods. According to table (3), there are 31 consecutive droughts in the scale of 3 months, 14 of which are mild droughts and 12 are moderate droughts. In the scale of 3 months (seasonal) in the winter season of 2015, it was -2.28. In the spring season, the most severe drought was in 2018 and 2019, and their severity was -2.40 and -1.9, respectively. There have been 30 droughts in 6 months, 15 of which are weak droughts, 9 moderate droughts, 4 severe droughts, and 2 very severe droughts. According to the table below, 10 cases of drought have occurred in the 9-month scale, 5 of which were mild drought, 4 of which were moderate drought, and 1 was severe drought. The most severe drought was in 2015 with a severity of -2.5. In the 12-month (annual) scale, there have been 12 droughts, 7 of which are mild droughts, 4 of which are moderate droughts, and 1 of which is severe drought

Table 2. Frequency of occurrence of droughts based on SPI index in Kashmer station

Severity of drought perio	SPI–24		SPI–12		SPI–9		SPI–6		SPI–3	
	Percent	Abundance	Percent	Abundance	Percent	Abundance	Percent	Abundance	Percent	Abundance
Weak drought	384	5	59/4	7	48/9	5	58	18	47/1	10
Moderate drought	0	0	33/5	4	47/6	4	27	10	36/7	8
severe drought	0	0	7/1	1	3/5	1	11/6	2	16/2	3
Veryseveredrought	15/7	1	0	0	0	0	3/4	1	0	0
Total	100	6	100	12	100	10	100	31	100	21

The upcoming research is of descriptive-analytical type, which has two major parts in order to investigate the related parameters. The first part was devoted to documentary, library studies and the use of internet facilities to examine issues such as the subject literature, research background, concepts, etc. and the second part was conducted in the form of field research to collect statistical data and complete the questionnaire. For this purpose, according to the basic questions of the research, indexing has been done in two sections: drought resilience measures (Table 3) and vulnerability of rural households in the face of drought (Table 4) in the studied households and finally a questionnaire has been prepared. It should be noted that the studied indicators are selected according to the conditions of the region and from a wide range of indicators related to each sector.

Table 3. Resilient measures in the face of drought
Source: library studies and field observations of the authors, 2022

Row	Dimension	Indicators
1	Agricultural and garden measures	The use of nursery crops, the use of improved seeds, protective plowing, the cultivation of drought-resistant plants (saffron and pistachio), increasing the variety of crops, the use of more resistant vegetative bases, preparing and interpreting the soil profile, reducing the diversity of trees. fighting pests, changing the cultivation pattern, leaving the land fallow,

2	New irrigation measures	Optimal irrigation methods, optimal methods of water transfer, use of covered canals, use of new irrigation technologies, control of floods with the help of earth dams, dredging of canals, irrigation during low evaporation time (night and sunset), waste water control
3	Livestock measures	Use of optimized livestock, compliance with health principles in keeping livestock, reducing the number of livestock, grazing under grass and under trees, manual feeding of livestock, protection of pastures.
4	Management measures	Financial management, local cooperative companies, education and promotion, strengthening local management

Table 4. Significant indicators in the vulnerability of rural households from drought (Source: library studies and field observations of the authors, 2022)

Row	Dimension	Components	Indicators
1	Economic	Employment and income	Employment status, income, banking facilities, property and assets
		The amount of production	The production efficiency, the area under crop cultivation, the number of livestock in the village, the price of agricultural inputs and materials, plant and livestock pests and diseases.
		Investment	The amount of investment in the village, the amount of savings of the villagers
2	social	Migration	The amount of migration of villagers, the interest of young people to continue living in the village environment, job motivations in the migration of villagers
		Participation	The amount of participation of villagers, the escalation of conflicts, the level of interest of farmers in the activity, the level of access to services and facilities in the village.
		Satisfaction	Level of satisfaction with income, level of satisfaction with access to banking facilities
3	environmental	Destruction of the environment	The extent of the destruction of the environment, the loss of plant and animal species, the loss of the natural beauty of the environment (wetlands, etc.), the abandonment and destruction of villages, the change of use of farms and gardens. loss of pastures
		Pollution of the environment	pollution and salinization of water and soil sources, destruction and drying of wells and canals

The number of households in Rostaq District was 2748 in 2015 and according to the latest political divisions of the country, it includes 7 villages. In this research, random sampling was used and the sample size was determined by Cochran's formula.

The statistical volume is estimated to be 2748. N = the number of sample size n = 337. Based on the proportional allocation formula, the number of samples in each village was determined (Table 5).

Table 5. Estimated sample size by villages (Source: Population and housing census, 2015)

Row	Village	Number of households	number of samples
1	Bezanjard	402	49
2	Mirabad	268	33
3	Neghab	780	95
4	Hosianabad	183	23
5	Kalate shadi	281	34
6	Ebrahimabad	681	84
7	Haftkhaneh	183	19
8	total	2748	337

In the next step, to increase the validity of the research, the content and form validity technique was used, and validity of the research was confirmed by the judgment of the experts (experts of the responsible departments) about the research questions. Its value was 0.87 for resilience measures in the face of drought and 0.81 for the vulnerability of rural households to drought (Table 6).

Table 6. Cronbach's alpha of the studied subjects of the research (Source: Research findings, 2022)

Row	Topic	Question number	Cronbach's alpha
1	Resilient measures	30	0/87
2	Vulnerability of rural households	30	0/81

The value of alpha in the variables is higher than 0.70. Therefore, it can be said that the research tools have very good reliability and the research items (questionnaires) have a high internal correlation. Finally, to analyze the data, statistical and spatial analyses such as Shannon's entropy model, Koperas and Vicor models and SPSS software were used

4. Research Findings

According to the supplementary questionnaires, 76.9% of the respondents are men and 23.1% are women, and the highest age frequency is related to the age group of 45 to 60 years (equivalent to 46.5%). Also, the highest frequency of respondents in terms of education level is middle school (equivalent to 38.3 percent). The findings of the research confirm that the annual income from the agricultural sector in 45.2% of the studied households is more than other household incomes and in 4.6% of the studied households, more than 70% of the annual household income was related to the agricultural sector (Table 7).

Table 7. Frequency of studied households by share of agricultural sector income from the total annual household income

Row	The percentage of income of the agricultural sector	Frequency	Percentage
1	10 Less than	22	4/6
2	10- 20	25	6/7
3	21 - 30	43	10
4	31 -40	45	12/5
5	41 -50	48	13/3
6	51 - 60	74	28/1
7	61 -70	60	19/4
8	70 More than	20	5/4
9	sum total	337	100

Also, out of all 337 surveyed households, in 89.6% of the households, the level of carrying out resilience measures has increased compared to the last 5 years, in 6.5% of the households living in the studied villages, the level of carrying out resilient measures has also decreased in this time range (Figure 3).
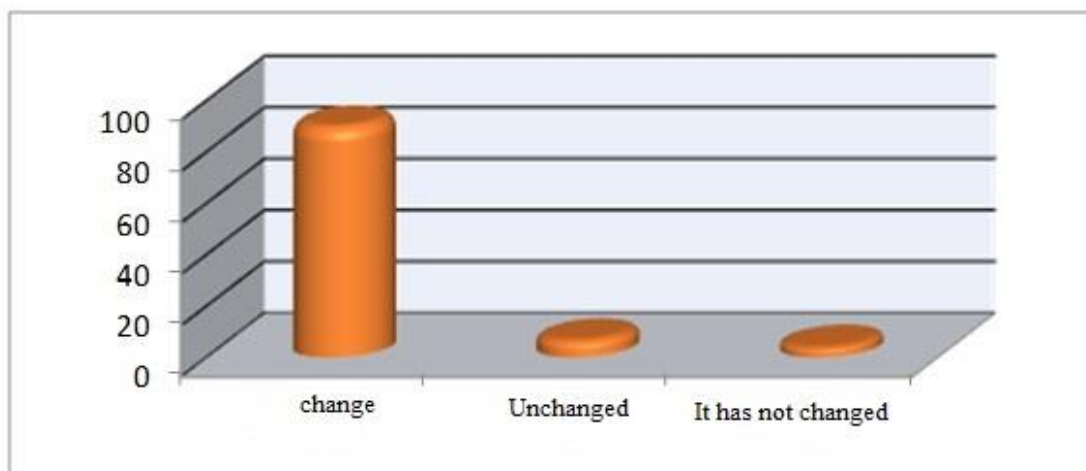
Figure 3. Frequency of resilience of studied rural households compared to the last five years

Summarizing the information obtained from the questionnaires related to the studied households and the statistical analysis of the relevant factors confirm that optimal irrigation methods, optimal water transfer methods, changing the cultivation pattern, leaving land fallow, education and promotion, and strengthening local management have been effective in increasing the level of resilience measures of the studied households.

Regional macro surveys indicate a decrease in the area under cultivation of agricultural crops after the occurrence of drought. In such a situation, it is expected that the cultivated area will become smaller. In other words, the farmers who had a higher cultivated area of the fields, in order to cope with drought conditions, have inevitably reduced the cultivated area. An overview of the findings in table (8) shows that in 2015, 10.2 percent of the cultivated fields were between 2.5 and 5 hectares, while in 1400, this amount reached zero. It is obvious that during the drought period, farms that had enough water were able to continue their activities. Therefore, two hypotheses can be presented regarding the small size of farms during drought. The first hypothesis is that these farms are the previous small farms that have continued to operate due to having enough water, and the second hypothesis is that the remaining farms were part of larger farms that are now limited due to drought. Examining the evidence shows that the second hypothesis is stronger. Therefore, it can be claimed that one of the adjustment mechanisms used by rural households, most of whom are agricultural, to deal with drought is to reduce the area under cultivation.

Table 8. Frequency distribution of agricultural lands and their cultivated area (2016 and 2021)

Area under cultivation	Year 2016		Year2021	
	Percent	Frequency	Percent	Frequency
Less than 0.5 hectares	5/4	15	23/9	55
0.5-1 hectare	55/6	130	62/4	130
1-5/1 hectare	11/2	60	13/7	60
2-5/1 hectare	10/4	50	0	50
2-5/2 hectares	5/8	20	0	20
5-5/2 hectares	10/8	55	0	55
Bay of 5 hectares	0/8	7	0	7
Total	100	337	100	337

Shannon's entropy model was used to determine the relative importance of effective factors in the resilience measures of rural households in the face of drought. Shannon's entropy method is one of the multi-indicator decision-making methods for calculating the weights of criteria. The results of this survey show that the dimensions of management measures with a coefficient of 0.320 and modern irrigation measures with a coefficient of 0.290 have the highest scores, and agricultural

and garden measures with a coefficient of 0.257, and livestock measures with the coefficient of 0.133 has the lowest score (Table 9).

Table 9. Weights obtained from the dimensions mentioned in the resilience actions of rural households in facing drought with the Shannon entropy model (source: research findings, 2022)

Row	Dimensions	Amounts
1	Agricultural and garden measures	0/257
2	New irrigation measures	0/290
3	Livestock measures	0/133
4	Management measures	0/320

On the other hand, the examination of the dimensions related to the resilience measures of rural households in the face of drought in 337 sample households also confirms that management measures with a value of 15.147 have the highest t value at the level of the studied households. Considering that the average of all indicators was evaluated above the average and, with a confidence level of 99% and a significance level of less than 0.01, significant effect of the indicators of resilience measures of rural households in the face of drought was confirmed in the study area (Table 10).

Table 10. The status of significant indicators in the resilience measures of rural households in the face of drought

Row	Indicators	t amount	Sig (2- tailed)	Std. Deviation
1	Agricultural and garden measures	10/136	0/000	0/420
2	New irrigation measures	13/129	0/000	0/659
3	Livestock measures	8/092	0/000	0/375
4	Management measures	15/147	0/000	0/781

Also, based on the degree of importance of the dimensions related to the resilience measures of rural households in the face of drought (Shannon's entropy model) and their situation in the studied households, the level of resilience measures of rural households in the face of drought was calculated at the level of 337 households, and finally, the rank of resilience measures of rural households in facing drought was determined at the level of each of the studied villages.

In the meantime, among the studied villages, villages such as Niqab due to access to the use of modern irrigation technology, diversification of livelihoods, preparedness in life for harsh conditions (drought), cultivation of resistant and low-water crops, spatial continuity of land parcels and .... performed the most resilient actions at the level of the villages of this district (Table 11).

Table 11. Evaluation results of Copperas model (source: research findings, 2022)

Village	Sj⁺	Sj⁻	Oⱼ	Nⱼ	Rank
Hosianabad	0/3114	0/1725	0/4189	4419/0	7
Neghab	0/9856	0/2792	0/8532	100	1
Mirabad	0/6744	0/2410	0/7128	0/7034	4
Ebrahimabad	0/9437	0/2635	0/8201	0/6971	2
Kalate shadi	0/5247	0/2279	0/6591	0/6246	5
bezanjard	0/9542	0/2782	0/8316	0/9787	3
Haftkhaneh	0/4265	0/1932	0/5470	0/5621	6

The decrease in the price of meat and the increase in the cost of feeding livestock make rural households turn to selling livestock in drought conditions. The results of table (12) show that the number of households with livestock decreased from 337 households in 2020 to 147 households in 202

Table 12. Frequency distribution of households in relation to the number of livestock (years 2016 and 2021)

Area under cultivation	Year 2016		Year2021	
	Percent	Frequency	Percent	Frequency

Less than 10 heads	25	87	0	0
10-20 heads	0	0	147	147
20-30 heads	34	11/6	0	0
30-40 heads	48	14/7	0	0
50-40 heads	147	42/2	0	0
More than 50 heads	83	23/7	0	0
Total	337	100	147	100

On the other hand, the results of comparing different dimensions related to the level of vulnerability of rural households in facing drought in the studied villages show that the economic dimension has the highest degree of importance with a score of 0.425 (Table 13).

Table 13. Weights obtained from the mentioned dimensions in thedegree of vulnerability of rural households in facing drought with the Shannon entropy model (source: research findings, 2022)

Row	Dimensions	Amounts
1	Economic	0/425
2	social	0/205
3	environmental	0/370

On the other hand, the investigation of the dimensions related to the level of vulnerability of rural households in the face of drought in 337 sample households also confirms that economic dimensions with a value of 17.230 have the highest t value in the studied households. Considering that the average of all indicators were evaluated above the average, with a confidence level of 99% and a significance level of less than 0.01, significance of the indicators of the vulnerability of rural households in facing drought in the region was confirmed (Table 14).

Table 14. Status of significant indicators in the degree of vulnerability of rural households in the face of drought

Row	Dimensions	Amount t	Sig (۲- tailed)	Std. Deviation
1	Economic	17/230	0/000	0/890
2	Social	12/534	0/000	0/637
3	Environmental	14/110	0/000	0/760

Also, based on the importance of the dimensions related to the level of vulnerability of rural households in facing drought (Shannon's entropy model) and their situation in the studied households, the level of vulnerability of rural households in facing drought was calculated at the level of 337 sample households and finally, vulnerability rating of rural households in facing drought at the level of each of the studied villages was determined based on Vicor method. In the meantime, among the studied villages, villages such as Haft Khaneh and Hossein Abad were among the most vulnerable at the level of the villages due to the presence of factors such as employment status, income, production efficiency, the area under cultivation, the number of livestock in the village, the migration rate of villagers, the interest of young people to continue living in the village environment, the level of participation of villagers, the escalation of conflicts, the abandonment and destruction of villages, the change of use of fields and gardens, the loss of pastures, and the loss and drying up of wells and aqueducts (Table 15).

Table 15. Evaluation results of Vicor model

Row	village	Q
1	bezanjard	0/123
2	Mirabad	0/147
3	Neghab	0/070
4	Hosianabad	0/230
5	Kalate shadi	0/152
6	Ebrahimabad	0/098

7	Haftkhaneh	0/180

Statistical analysis has been used to investigate the relationship between "resilience measures" and "level of vulnerability in households living in the studied villages". There is no doubt that the existence of distance variable, homogeneity of variances and normal distribution of the used data are necessary conditions in using parametric tests. In this research, due to the existence of the necessary conditions for the use of parametric test, Kendall's correlation test was used to investigate the relationship between resilience measures and the level of vulnerability in households living in the studied villages. The research results confirm that there is a significant relationship between these two variables. The correlation coefficient between resilience measures and the level of vulnerability in households is -0.597, which according to the resulting values, with a confidence level of 99%, it can be said that there is an inverse and significant relationship between these two variables with moderate correlation (Table 16). Based on this, the increase of resilience measures, with a confidence level of 99 percent, has caused a decrease in the level of vulnerability in the households living in the studied villages in the face of drought.

Table 16. The result of Kendall's correlation test in examining the relationship between resilience measures and level of vulnerability of rural households in facing drought

Items	Amounts
The correlation coefficient	-0/597
Significance level	0/000
number of samples	337

In order to provide better results of the contribution of determining indicators of drought resilience measures in reducing the vulnerability of rural households, we used step-by-step regression. (Kalantari, 1385: 173). The results of the step-by-step regression show that in the evaluation of drought resilience measures, among the 4 variables of resilience measures that were included in this model, the management index with a determination coefficient of 0.288 has the largest share in the evaluation of the measures. Resilience with drought has reduced the vulnerability of rural households. (Table 17).

Table 17. Entered indicators and the contribution of each variable in the step-by-step regression model in the evaluation of resilience measures with drought in reducing the vulnerability of rural households

Levels	The variable entered into the model at each step	Coefficients of determination (R_2)	The contribution of each variable in determining the dependent variable (percentage)
step one	Agricultural and garden measures	0/570	20/6
The second step	New irrigation measures	0/397	28/4
The third step	Livestock measures	0/648	19/7
The fourth step	Management measures	0/288	31/3

According to table (18), the beta value obtained for each variable indicates that a change of one unit in the standard deviation of the variables is equal to the beta value of the same variable on the standard deviation of the assessment of drought resilience measures in reducing the vulnerability of rural households and it affects the villages. The beta value of management measures with (0.597) percent is the most important in evaluating drought resilience measures in reducing the vulnerability of rural households.

Table 18. step-by-step regression coefficients for examining independent variables on the evaluation of drought resilience measures in reducing the vulnerability of rural households

variable entered into the model	Regression (B)coefficients	Standard regression (B)coefficients	Standard error	The significance level
Fixed coefficient	–	–	–	–

Agricultural and garden measures	1/059	0/910	0/45	0/000
New irrigation measures	0/760	0/850	0/38	0/000
Livestock measures	1/120	0/935	0/66	0/000
Management measures	0/597	0/943	0/32	0/000

5. Discussion and Conclusion

The vast country of Iran is located in the arid and semi-arid region, and according to the topographical conditions, it has a diverse climate. In the meantime, the increase in population puts a lot of pressure on the excessive and undesirable use of natural water and soil resources to increase agricultural products. The production of agricultural products, especially rainfed cultivation, has a high correlation with the amount of precipitation and some climatic factors. In the meantime, drought is one of the most costly events that has irreparable effects on economic sectors. In this regard, the livelihood of rural households is threatened by drought because the close relationship between the village and agriculture has led to the vulnerability of households and disrupted their economy, and its continuation increases the vulnerability of rural households. Hence, taking resilient measures can be a salve for rural households and to some extent reduces the severity of this vulnerability on the economy of households and villages. Therefore, the aim of the current research was to evaluate drought resilience measures in reducing the vulnerability of rural households (case study: Rostaq District), which in its own way is compared to similar studies related to the resilience measures of rural households. It is significant in the face of drought. From the results of the statistical analysis of the research, it can be concluded that the level of vulnerability in the households living in the villages of Rostaq District will be reduced by taking more resilient measures. In fact, the results of this research are in line with the research findings of Soltani Moghadas (2019) who believes that taking resilient measures has played an effective role in reducing the vulnerability of rural households in the face of drought in al-Qurat Village of Birjand City. In 2015, 10.2 percent of the cultivated fields were between 2.5 and 5 hectares, while in 1400, this amount reached zero. It is obvious that during the drought period, farms that had enough water were able to continue their activities. The results of the research show that it can be claimed that one of the adjustment mechanisms used by rural households, whose occupation is agriculture, to deal with drought, is to reduce the area under cultivation. This part of the findings is consistent with the results of Kanti's (1998) study in Bangladesh. The results of the step-by-step regression show that in the evaluation of drought resilience measures, among the 4 variables of resilience measures that were included in this model, the management index with a determination coefficient of 0.288 has the largest share in the evaluation of the measures. Resilience with drought has reduced the vulnerability of rural households. Anyway, based on summarizing the results of the household questionnaires (opinions of the heads of the studied households or their spouses), it is necessary to pay attention to the following points in order to promote the implementation of resilient measures in dealing with drought in reducing the vulnerability of rural households in the face of drought. Due to the lack of water, some households living in the villages of Rostaq District choose low-water crops such as saffron for cultivation, because the extremely high price of saffron will bring them significant annual income. Therefore, in order to prevent the departure of human capital from the village to the city, it is suggested to cultivate these income-generating crops with the encouragement and support of the relevant executive bodies.

- The villages of Rostaq District suffer from the presence of irregular and little rains. Therefore, in relation to improving the optimal use of water in the agricultural sector, one of the basic solutions can be the development of new irrigation methods in this sector, and the implementation of operations. Construction projects in the water and soil sector of agriculture is another solution.
- The lack of proper efficiency of agricultural activities of rural households, together with the migration of young and skilled manpower from the production cycle, has caused the environmental destruction to reach its highest level and also the development in the agricultural sector has been damaged. In this regard, the necessary infrastructure should be considered for the adaptation of rural households in the conditions of drought, as well as the preservation and sustainability of experienced and skilled workforce in the rural system. Therefore, it is suggested that educational and promotion systems take an effective and continuous step in line with the mentioned cases.
- Planning and action in order to increase the awareness of rural households regarding the upcoming crises.
- In order to preserve vegetation and prevent wind and water erosion and the loss of animal habitats, increasing the government's supervision over the use of pastures

through conservation units, reviving pastures through weeding, and fodder distribution are necessary. Subsidies among farmers in order to raise livestock and reduce pressure on pastures, construction, restoration and reconstruction of livestock watering holes, establishment of mobile sources of water supply, and fuel supply in rural areas are among the suggestions that can reduce the adverse effects.

Authors' contributions

The authors equally contributed to the preparation of this article**.**

Conflict of interest

The author declares no conflict of interest.

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Original Article

ارزیابی اقدام‌های تاب آورانه با خشکسالی در کاهش آسیب‌پذیری خانوارهای روستایی (مطالعه موردی: دهستان رستاق شهرستان خلیل‌آباد)

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چکیده مبسوط

پژوهش به ارزیابی اقداماهای تاب آورانه با خشکســالی در کاهش آسیب‌پذیری خانوارهای روستایی در دهستان رستاق پرداخته می‌شود.

۱.مقدمه

دور نمای وضعیت خشکسالی ایران طی ۳۰ سال آینده نشان می‌دهد که خشکســالی در کشــور رو به افزایش خواهد بود و در ســال‌های ۲۰۲۵، ۲۰۳۰، ۲۰۳۵ بیشتر نقاط کشور با خشکسالی شدید و بسیار شــدید روبه رو خواهد بود. در این راستا، وضعیت خشکســالی در سال‌های ۲۰۴۰ به مراتب بحرانی‌تر از قبل خواهد بود. در این راستا، یکی از راهکارهای اساسی کاهش آسیب‌پذیری خانوارهای روستایی در برابر خشکســالی‌های اخیر، افزایش اقدام‌های تاب اورانه جوامع روستایی در برابر اختلال و آشفتگی ایجاد شده در زندگی آنان است. از این رو، ارتباط تنگاتنگ روستا و کشاورزی، پیامدهای منفی آن نیز بر کشاورزی بیشتر نمایان می‌شود. به همین خاطر اقدامات تاب آورانه در مقابل خشکســالی برای بهتر عملکرد محصــولات، دام‌ها، مراتع و چراگاه‌ها و دیگر اجزای بخش کشــاورزی تاثیرگذار بوده و منجر به کاهش کیفیت و کمیت تولیدات و درآمد خانوارهای روستایی، در نتیجه کاهش سطح استاندارد زندگی آنان را به دنبال داشــته اســت. لذا، انجام اقدام‌های تاب آورانه توسـط خانوارهای روستایی در مقابله با خشکسالی برای حفظ معیشت پایدار خانوارها ضروری می‌باشد.

خلیل‌آباد کاشمر و دهستان رستاق نیز کشاورزی به عنوان فعالیت اصلی و ارتزاق خانوارهای روستایی محسوب می‌شود. تامین معیشت اکثر خانوارهای روستایی این منطقه بر پایه درآمد حاصـل از کشــاورزی اسـت. کشاورزی در این منطقه معمولا به میزان و توزیع بارش‌ها و توده‌های حاکم در سطح دهستان بستگی دارد. فصلی بودن این توده‌ها بر میزان خشکسالی در این منطقه افزوده است و خشکسالی و مقدار بارش، به عنوان چالشـی دیرین در این منطقه بوده است. بنابراین، توجه به این اقدام‌های تاب آورانه می‌تواند سطح آسـیب‌پذیری را بر خانوارهای روسـتایی کاهش دهد. لذا در این

۲. مبانی نظری تحقیق

وابستگی اقتصاد روستایی به عوامل ناپایدار ساز طبیعی آسیب‌هایی را در سکونتگاه‌های روستایی پدید آورده است. از جمله آسیب‌های طبیعی، می‌توان خشکسالی را مثال زد که مفهوم آن دسترسی به منابع اب از شــرایط متوسـط پایین‌تر اسـت. این پدیده یکی از مخاطره‌های طبیعی اسـت که فروانی آن در مناطق خشـک و نیمه خشک زیاد می‌باشد. خشکسالی یکی از مخرب‌ترین مخاطرات است که به عنوان یک رویداد آهسته و یا خزنده در حال افزایش است. خشکسـالی را معلول یک دوره شـرایط خشـک غیرعادی در نظر می‌گیرند که به اندازه کافی دوام داشـته و منجر به ایجاد عدم تعادل در وضعیت هیدرولوژی یک منطقه خاص گردد. در این ارتباط، نقش کشاورزی در معیشت اصلی خانوارهای روستایی و آسیب‌پذیری آن از پدیده خشکسالی، لزوم سیاست‌گذاری‌های عملیاتی را دراستای کاهش آسیب‌پذیری خانوارهای روستایی اهمیت بخشیده است. زیرا، مهم‌ترین مقولـه و متغیر غیرکنترلی در بخش کشــاورزی، بارندگی، آب و هوا و در نهایت خشکسـالی اسـت که نیروی غالب به شــدت تاثیرگذار بر روند، حجم و جدول زمانی و مکانی تولیدات بخش کشاورزی است و گاهی چنان اثر خود را می‌گذارد که اثر سایر متغیرها و ابزارهای سـیاسـت‌گذاری را معکوس می‌کند. بنابراین، باتوجه به اینکه، منابع اصلی تامین مواد غذایی خانوارهای روستایی، تولیدات زراعی و باغی و دامداری اسـت. آسـیب‌پذیری خانوارهای روستایی از مخاطره طبیعی به نام خشکسالی افزایش می‌دهد که زمینه ساز چالش‌های محلی- فضایی و ناپایداری سکونتگاه‌های روستایی می‌شود. از طرفی، پیامدهای ناشی از خشکسالی‌ها نه تنها از شــدت، استمرار و گسـتره خشکسالی تاثیر می‌پذیرد، بلکه میزان آسـیب‌پذیری جوامع نیز دراین زمینه تاثیر گذار است

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۳. روش تحقیق

پژوهش پیش رو از نوع توصیفی – تحلیلی است که جهت بررسی پارامترهای مورد بررسی سود جسته، دارای دو بخش عمده بوده است. بخش اول را مطالعات اسنادی، کتابخانه‌ای و استفاده از امکانات اینترنتی جهت بررسی مواردی چون ادبیات موضوع، پیشینه تحقیق، مفاهیم و غیره به خود اختصاص داده و بخش دوم در قالب پژوهش‌های میدانی جهت جمع‌آوری آماری اطلاعات و تکمیل پرسشنامه انجام گردیده است. بدین منظور با توجه به سؤالات اساسی تحقیق اقدام به شاخص‌سازی در دو بخش اقدامات تاب آورانه با خشکسالی و آسیب‌پذیری خانوارهای روستایی در مواجهه با خشکسالی در خانوارهای مورد مطالعه و نهایتاً تهیه پرسشنامه شده است. تعداد خانوار دهستان رستاق ۲۷۴۸ خانوار در سال ۱۳۹۵ بوده و بر اساس آخرین تقسیمات سیاسی کشوری شامل ۷ روستا می‌باشد. در این پژوهش از نمونه گیری تصادفی استفاده شده است و با فرمول کوکران حجم نمونه تعیین گردید است. حجم آماری N=۲۷۴۸ تعداد حجم نمونه n=337 برآورد شده است. براساس فرمول تخصیص متناسب تعداد حجم نمونه در هر روستا مشخص شد. در نهایت برای تجزیه و تحلیل داده‌ها از تحلیل‌های آماری و فضایی مثل مدل آنتروپی شانون ، مدل کوپراس و ویکور و نرم‌افزار SPSS, استفاده گردیده است.

۴. یافته‌های تحقیق

مروری بر یافته‌های، نشان می‌دهد در سال ۱۳۹۵، ۱۰/۲ درصد مزارع سطح زیرکشت بین ۲/۵ تا ۵ هکتار بوده‌اند، این در حالی است که در سال ۱۴۰۰ این میزان به صفر رسیده است. بدیهی است که در طول دوران خشکسالی، مزارعی توانسته‌اند به فعالیت خود ادامه دهند که از آب کافی برخوردار بوده‌اند. نتایج این بررسی نشان می‌دهد که ابعاد اقدام‌های مدیریتی با ضریب ۰/۳۲۰ و اقدام‌های آبیاری نوین با ضریب ۰/۲۹۰، دارای بیشترین امتیاز و اقدام‌های زراعی و باغی با ضریب ۰/۲۵۷ و اقدام‌های دامی با ضریب ۰/۱۳۳، کمترین امتیاز برخوردار هستند. در این میان، از بین روستاهای مورد مطالعه، روستاهایی همچون نقاب به دلیل دسترسی به استفاده از تکنولوژی آبیاری نوین، متنوع نمودن معیشت، امادگی داشتن در زندگی برای شرایط سخت(خشکسالی)، کشت محصولات مقاوم و

کم آب بر، پیوستگی مکانی قطعات اراضی و ...،، بیشترین اقدام‌های تاب‌آورانه در سطح روستاهای این دهستان را انجام دادند. نتایج تحقیق مؤید آن است که بین این دو متغیر رابطه معناداری وجود دارد. ضریب همبستگی بین اقدام‌های تاب‌آورانه و سطح آسیب‌پذیری در خانوارها ۰/۵۹۷- می‌باشد که با توجه به مقادیر حاصل، با سطح اطمینان ۹۹ درصد می‌توان گفت که بین این دو متغیر، ارتباط معکوس و معنادار با همبستگی متوسط برقرار می‌باشد

۵.بحث و نتیجه گیری

کشور پهناور ایران در منطقه خشک و نیمه خشک قرار گرفته و با توجه به شرایط توپوگرافی، دارای اقلیمی متنوع می‌باشد. در این بین افزایش جمعیت، فشار بسیاری را بر استفاده بی‌رویه و نا مطلوب از منابع طبیعی آب و خاک برای افزایش محصولات کشاورزی وارد می‌سازد. تولید محصولات کشاورزی به ویژه کشت دیم، همبستگی بالایی با مقدار نزولات جوی و برخی از عوامل اقلیمی دارد. در این میان، خشکسالی از جمله پرهزینه‌ترین حوادثی است که اثرات جبران‌ناپذیری را بر بخش‌های اقتصادی وارد می‌سازد. در این راستا، معیشت خانوارهای روستایی را خشکسالی به مخاطره می‌اندازد چرا که ارتباط تنگاتنگ روستا و کشاورزی، آسیب‌پذیری خانوارها را در پی داشته است و اقتصاد آن‌ها مختل کرده است و تداوم آن، شدت آسیب‌پذیری بر خانوارهای روستایی را دو چندان کرده است. از این رو انجام اقدام‌های تاب‌آورانه می‌تواند مرهمی بر دل خانوارهای روستایی باشد و تا حدودی از شدت این آسیب‌پذیری بر اقتصاد خانوارها و روستاها بکاهد. لذا، هدف پژوهش حاضر، ارزیابی اقدام‌های تاب آورانه با خشکسالی در کاهش آسیب پذیری خانوارهای روستایی(مطالعه موردی: دهستان رستاق) می‌باشد که در نوع خودش در مقایسه با مطالعات مشابه در ارتباط با اقدام‌های تاب‌آورانه خانوارهای روستایی در مواجهه با خشکسالی قابل توجه می‌باشد.

کلیدواژه‌ها: اقدامات تاب آورانه، خشکسالی، آسیب‌پذیری، خانوارهای روستایی، دهستان رستاق.

Original Article

The Impact of Rural Information and Communication Technology on Indicators of Development of Creative Villages in Iran
(Case Study: Mashhad Suburban Settlements)

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Abstract

Purpose- The use of Information and Communication Technology (ICT) has an effect on development of Creative Villages as a new approach in using the existing rural capabilities and capacities to revive the rural areas. This study seeks to analyze the impact of RICT on the indicators of development of Creative Villages in suburban settlements in Mashhad County.

Design/methodology/approach- A descriptive-analytical research method was employed in this fundamental study, and documentary and survey methods have been used for collecting the data. The study population included households in 8 villages around Mashhad (N = 20813). These villages had a rural ICT office and a population of over 1,000 households. The sample was estimated using Cochran's formula; accordingly, 194 households were selected by systematic random sampling.

Finding- Spatial analysis of the main variables was performed using Combined Compromise Solution and fuzzy gray analysis. The result showed that the villages of Gorji Sofla, Hosseinabad Gharghi, Dostabad and Dehroud have the highest, and the villages of Kal Zarkash and Chahar Borj have the lowest level of use of RICT services and the indicator of the Creative Village. Using the partial least squares (PLS) technique, among the research indicators, "promoting and training" with the coefficient of 0.591 had the most direct effect on the dependent variable. Also, variable dimension of "awareness of RICT services", considering the direct and indirect effects, with a coefficient of 0.816, has had a greater impact on the indicators of development of Creative Villages in rural settlements. Given the value of R^2 (0.998), we concluded that RICT has a high-level impact on the indicators of development of Creative Villages.

Keywords- Information and Communication Technology (ICT), Rural settlements, Creative Village Indicators, Rural development, Iran.

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1. **Introduction**

For centuries, rural areas have been critical centers of habitation and production. However, in today's conditions and due to events and government interventions and lifestyle changes, in the transition period from productivism, many villages, instead of enjoying the benefits of sustainable development, have faced retrogression and while losing their population in the migration process, are dealing with population evacuation and physical destruction (Rastghalam et al., 2016). To address spatial imbalances, some approaches are presented including economic approaches (agricultural development, green revolution, land reform, industrialization), social approaches (meeting basic needs, participation in rural development, development of local communities), physical-spatial approaches (planning for rural centers, rural-urban development, urban functions in rural development) and comprehensive approaches (comprehensive and integrated rural development, sustainable development) (Estalaji & Jafari, 2014). However, most of the past development strategies such as industrialization and agricultural development have failed to provide the necessary conditions for economic and social sustainability of rural areas. Today, many developing countries still face numerous challenges in the rural development process, which unfortunately have been exacerbated by the immature requirements and approaches of the industrial period in these countries. Therefore, most countries sought to identify or create new ways and means to achieve rural development, and the development of creative activities was proposed as one of the influential factors in rural development (Einali et al., 2019).

The concept of "creative city" was founded almost two decades ago by Richard Florida's theories (Landry & Bianchini, 1995). The concept of Creative City provided the basis for the development and progress of some capable cities. In this regard, reviving the process of development, and recalling the flow of life and production in new structures into the rural environment also requires the definition of a new efficient approach adapted to rural context and environments (Rastghalam et al., 2016). Although the concept of creativity has been studied mainly in urban areas rather than rural ones, the Creative Village as a new concept can be considered in the postmodern context against the urban demands in areas such as ICT, handicrafts, tourism and music. Creative Village is a sustainable living space that relies on ecological processes of lifestyle, clean environment and desirable facilities, to attract the creative classes in low-tech industries, especially in the fields of culture and arts and provide a platform for creativity, and a win-win situation for the rural communities, the creative classes and the consumers of rural creative products (Rastghalam et al., 2016). The concept of creative village has a cultural dimension and a set of possibilities and opportunities. The creative village is an intercultural place where the focus is on combining different cultures and experiences and exchanging ideas and programs with each other (Mitchell & Waal, 2009).

Generally speaking, the creative village approach, by utilizing the talents, natural resources, lifestyle and experience of the village and fostering creativity in the resident and rural community, will provide the ground for the revitalization of rural settlements. The establishment of creative villages leads to more employment, economic wealth, favorable population birth rate, and the prosperity of rural life based on the cultural industries of the host ecosystem (handicrafts, tourism, traditions, music, visual arts, etc.). The growth of communication technologies and high demand for various forms of information, have made way for a new period in which the life of human societies is highly dependent on the circulation of information and timely information. The most important feature of this period is higher speed and reliance on information, as a raw material needed for agriculture, industry and development. In this period, a kind of holistic view gradually dominates every aspect (Ghazavi, 2003). Therefore, in many ways, Information and Communication Technology (ICT) is viewed as an important factor of sustainable development and plays a key role in public services, rural and urban development, transportation and road communications, healthcare, special needs of human populations, education, environment and agriculture (Borhani & Mirzaee Fashalami, 2015); Even the knowledge of using ICT is now considered as one of the criteria for assessing the literacy of the population to use ICT services and search, organize, evaluate and communicate

information (Hollifield & Donnermeyer, 2008). The most important functions of Rural ICT that can play an effective role in the development process are: social development, higher decision-making power of villagers, higher rural extension, promoting products, expansion of local and rural markets, expansion of e-commerce activities in rural areas, development of e-learning activities for rural residents, promotion of rural tourist attractions, transfer of knowledge from urban to rural areas and vice versa, making contacts, receiving government services (to pay taxes, banking matters, etc.), GIS for the management of natural resources in rural areas (Akca et al, 2007), mitigating the effects of natural disasters and plant pests, preserving the environment, empowering the rural poor, increasing the quality of life, decentralization and the possibility of working remotely.

Nevertheless, the benefits of this technology can be reaped only if this technology spreads across all sections of the society. We live in a digitally fragmented world where half the world's population is deprived of access to telephone calls. However, the agreed argument is that the decade of globalization improves the ability of rural people to use this technology, and the capabilities of developing countries. Therefore, in intellectual paradigms and new approaches to rural development, the use of knowledge and information, together with tools and technologies of its transfer and exchange, are important and have a special place (Fathi and Motlagh, 2010); And IT centers are believed to be a new concept in rural development that help villagers access social, economic, educational and training opportunities through the use of information and remote information technology (Suzuki and Shankariah, 1998). In fact, by providing such services, these centers provide low-cost opportunities for local communities (Falch and Anyimadu, 2003). In this regard, a new and wide wave of information technology development has been formed in the third world countries, especially in their rural areas. Currently, there are few countries in the world that do not have experience in the development of information technology in their rural areas (Shakeel, 2000). In Iran, providing services using ICT to the villagers is one of the strategies on the agenda of rural development authorities that help to narrow

information gaps and remove barriers caused by 'geographical isolation' (Motiee Langroudi, 2010); The predominant form of access to information technology in rural areas is the establishment of a telecommunications center, which in Iran is known as the Information and Communication Technology Center or 'Rural ICT'. There is no doubt that if ICT is used effectively in rural areas, these technologies can act as a driving force for development and fill some gaps in rural development.

In this study, rural ICT offices in Mashhad have been studied. The rural areas of this city, like other rural areas of Iran, are facing the same issues we enumerated and the results of the 2006, 2011 and 2016 censuses verify this fact. One of the solutions is to use ICT services and move towards a creative village. Given the wide impact of this technology in different societies and its novelty in our country, applied and field studies about its effects on rural development and development of creative villages, could be useful for the proper use of this technology in rural areas of Iran. Therefore, the present study seeks to answer the question to what extent the development of information technology through rural information and communication technology (RICT) has affected the indicators of development of creative villages in the study area?

2. Research Theoretical Literature

Richard Florida introduced the concept of 'creative city' almost two decades ago. Landry and Bianchini in 'The Creative Cities' also propose this concept in response to urban issues in the face of the urban crisis that has occurred in the transition to post-industrial culture and global economy (Landry & Bianchini, 1995). Although there are many differences between urban and rural areas; using and citing the literature of the creative city, we made attempts to lay the right foundation for explaining the concepts and theories of the creative villages. With an overview of the concepts of the creative cities, assuming the common aspect of urban and rural residential performance, the theoretical foundation of creative villages is explained. Many settlements around the world are currently facing difficult transition periods. The process of transformation from old to modern industries is taking place based on earning added values (Kuhmonen & Kuhmonen, 2015).

Exploring the literature on creativity shows that 'creative village' is a new concept that has been created in contrast to the concept of 'creative city', and no internationally unified definition has been made. However, a brief definition of this concept is given. A creative village is a space that relies on ecological processes of lifestyle, clean environment and desirable facilities to attract the creative class in low-tech industries, especially in the fields of culture and arts, and provide a win-win platform for the rural community, creative class and audiences and consumers of the creative products outside the countryside. The production of wealth in this village is due to the payment of ownership interest of rural space to the villagers and the production of economic added values resulted from the creativity of the creative class, which complements the intrinsic activities of the village in production, especially in agriculture (Rastghalam, Seidaee and Nouri, 2016). Meanwhile, the creative class, which is seen as part of social capital in rural areas, is an essential resource in rural areas, as it affects their actions and improves the quality of life of rural communities in every way. Evidently, the villagers who have higher social capital can easily access the source of knowledge and awareness to improve production and have access to added values, create new economic activities and also protect and even improve their existing economic activities (Batjargal, 2007). The members of a creative class also tend to have differing views on the quality of a particular place, and they are not always concentrated in cities (McGranahan and Wojan, 2007; Noack & Federwisch, 2020), as they believe that the creative class also accumulates in rural areas, and in such cases, they will be the driving force of the economic development. They support this theory with many arguments. They believe that one of the main reasons for attracting the creative class to rural areas of Iran is the wealth of the country, low population

density and a special relationship with Dehyars (rural administrators) (Stolarick et al, 2011). Nevertheless, in the meantime, rural areas face many issues in losing human capital (young people migrating to cities, students going to university, graduates going to cities to find work); A good alternative to solve these problems is to attracts people who are interested in living in rural areas (Jarábková & Hamada, 2012). However, the creative rural class are not the only immigrants to rural areas, and the main inhabitants of the rural areas are also creative and part of the creative class. In general, the creative rural class consists of two groups: the first group includes creative rural residents (creative villagers) and the second group includes creative people who, according to the characteristics of a creative village, have chosen it for living and have migrated to it. The members of a creative class tend to gather in creative communities and form a network for themselves. The creative class of a village does not necessarily include only the educated or experts with high-level knowledge, as is often observed in cities. The creative class of rural communities add new elements to the economic, social, cultural and managerial aspects of a village and provide new opportunities for the development of the village at national and transnational levels (Rastghalam et al., 2016).

In the period of transition from liberal to neoliberal school, the rural areas have also moved from productivism to post-productivism. In fact, with the collapse of micro and traditional agricultural structures, some opportunities have arisen to meet new urban demands for the new nature of the rural areas, such as tourist resorts and the supply of organic food and handicrafts (Bell & Jayne, 2010). Table 1 summarizes the studies that have the highest relevance to our research topic.

Table 1. Studies with the highest relevance to the research topic

Researcher (year)	Research results
Kalami & Hosseini (2017)	The results show that the states can encourage creative industries with the participation of the inhabitants, and creative industries should be considered in all areas including culture, religion, arts, agriculture and industries.
Rastghalam et al. (2016)	Theoretical structure derived from the first part consisted of 15 items and 49 indicators. The highest score belonged to the creative class 'Immigrants to rural areas' with 0.087452 percent and the lowest score (0.035478) belonged to 'communication with relatives.
Einali et al. (2019)	According to regression fitting, about 0.83 percent of the positive impact of tourism on sustainable rural development has been made by creativity in tourism.
Kamarudin et al. (2018)	The results show that the creative villages of the study, using new advertisements tools such as Facebook, YouTube and Bazar, have played an important role in the development of

Researcher (year)	Research results
	entrepreneurship.
Can & Ngo (2017)	The results indicate that Dong Lam village has the potential necessary for creative tourism. Therefore, a variety of tourism packs including tourism, eco-tourism, and rural tourism should be available in this area.
Citarella and Maglio(2014)	The results showed that the foundations of the creative tourism success lie in strengthening the local economy based on creativity in a logical system.
Doncean (2013)	To achieve creative rural tourism, it is necessary to pay careful attention to the combinations of color, harmony and order in the arrangement between residence and health management and quality.
Lee & Wall (2012)	The results show the making use of the advantage of rural areas to make local cuisine can help achieve creative economy of the rural tourism.
European Union (UN) (2011)	In the framework of the General Studies of Agricultural Policy Outlook in Europe, it examines the role of rural creativity in public agricultural development policies, the issues facing rural areas in agricultural development, and responsive policies and innovations in rural development. How to improve agricultural production in rural areas, how to prioritize policies and how to allocate funds for rural development are reviewed and comprehensive policies for sustainable development are listed for all regions of Europe.
Stolarick et al. (2011)	In this study, tourism and economic development have been introduced as areas of creativity in rural communities, and visual arts, culture and historical heritage have been mentioned as tools for generating wealth and reviving traditional economic processes.
Brüntrup & Messner (2007)	The results show that creative industries in areas such as music, literature, tourism and arts have a strategic position to intelligently promote sustainability, and raise local, regional and national growth in Europe. Having a continuous research approach and process in the distribution of innovative activities such as festivals, music concerts, rural eco-museums and rural theaters is a useful step in local and rural development.

A review of the experiences of the developed and developing countries in employing IT in rural and agricultural development shows that in proportion to the capabilities of these countries, in almost all of them, the use of IT has received significant attention. In this regard, there are many examples of macro-measures and policies, such as strategies for the development of this technology. At the same time, innovations, initiatives and specific programs have been realized as a subset of macro-policies (Riahi Vafa and Hedayati, 2006). In Iran, more than any other countries, the use of RICT in various fields is inevitable, as the young population of the country imposes very high costs on the government. Due to the fact that a large part of the Iranian population are villagers, not paying attention to this group will cause irreparable damage to the country (Suzangar, 2003). In general, ICT is the result of the interaction of three distinct areas: computers, information and telecommunications (Alexandru et al, 2007). In rural areas, ICT seeks to provide rural residents with central government and non-government agency services (Rao, 2004).

Over the past few decades, with the emergence of ICT as an important tool and its positive effects on various activities, many studies have been conducted in Iran and abroad on ICT and its effects. Nevertheless, a main part of these topics has been in the form of theoretical discussions about the concepts and necessities of the subject. Among these studies are: Rezaee (2006), Motiee Langroudi et al. (2010), Barghi and Ghanbari (2010), Azizi et al. (2009), Sarami and Bahari (2010), Anabestani and Vaziri (2011), Mohammadi and Pirkhazraeian (2012) and Molaei Hashtjin et al. (2012) on the socio-economic effects of ICT and rural development in Iran; The studies of Khajeh Shahkoohi (2013) and Rostami Ghobadi et al. (2014) on the quality of life and social capital showed that ICT can empower the villagers as they can have a conscious impact (as the founding sources of production and growth of the national economy). Although the use of ICT as one of the technological advances of the modern age cannot be seen as a miracle to solve the fundamental problems of rural areas, making use of its tools namely e-government, e-commerce, e-learning, marketing, tourism, etc., along with proper management of its use, can accelerate rural development and provide significant assistance in providing public welfare in these areas, and in various dimensions it can be

effective in rural development. However, studies have shown that the effect of ICT offices on various aspects in rural areas has not been comprehensive and there is a significant relationship between the background variables of education, income, occupation, marital status and gender with the ICT indicator. A significant difference was also observed between the amount of social capital of users and non-users of rural ICT offices. Access to the services of rural ICT offices, including Internet access, has led to better acceptance of differences among individuals, and these individuals are more involved in the local community. According to Ceylan et al. (2009), ICT contributes to social development by bridging the gap between urban and rural areas, households, occupations, and geographical areas, and reducing the economic and social differences between regions. Chen (2006) argues that ICT development in rural and urban areas creates new opportunities for economic, social and political empowerment and improves the quality of life indicators in rural areas (Chen, 2006).

Evidence from the literature shows that so far, few studies have been conducted on creative villages and due to the diversity, complexity, breadth and novelty of the subject, few attempts have been made to formulate a theory that can explain the whole phenomenon. A review of relevant papers showed that each of the theories and papers have examined only parts of the subject from certain angles. What has been widely covered so far is the 'creative city' and the factors associated with it. In the meantime, some Iranian and foreign experts have paid attention to creative villages and its relevant factors and have studied issues related to entrepreneurship, creative villages and creative rural tourism. As a result, we can argue that so far, no study has been conducted on the effectivity and spatial analysis of the indicators of creative villages. Therefore, given the importance of ICT in rural areas of Iran, this study seeks to analyze the impact of information technology on the indicators of development of Creative Villages in Mashhad County. In fact, the importance and value of this research lies in opening a theoretical framework based on defining the complementary approaches to development which can be implemented in rural areas. Accordingly, the indicators of development of creative villages can include participation, leadership, risk-taking, promotion and education, innovation and flexibility.

3. Research Methodology
3.1. Geographical Scope of the Research
The metropolis of Mashhad with a population of 3,001,184 people is located in northeastern Iran and with a Periphery (Harim) of 867 km has 132 rural settlements with a population of 185,000 people (Anabestani and Kharazmi, 2018).
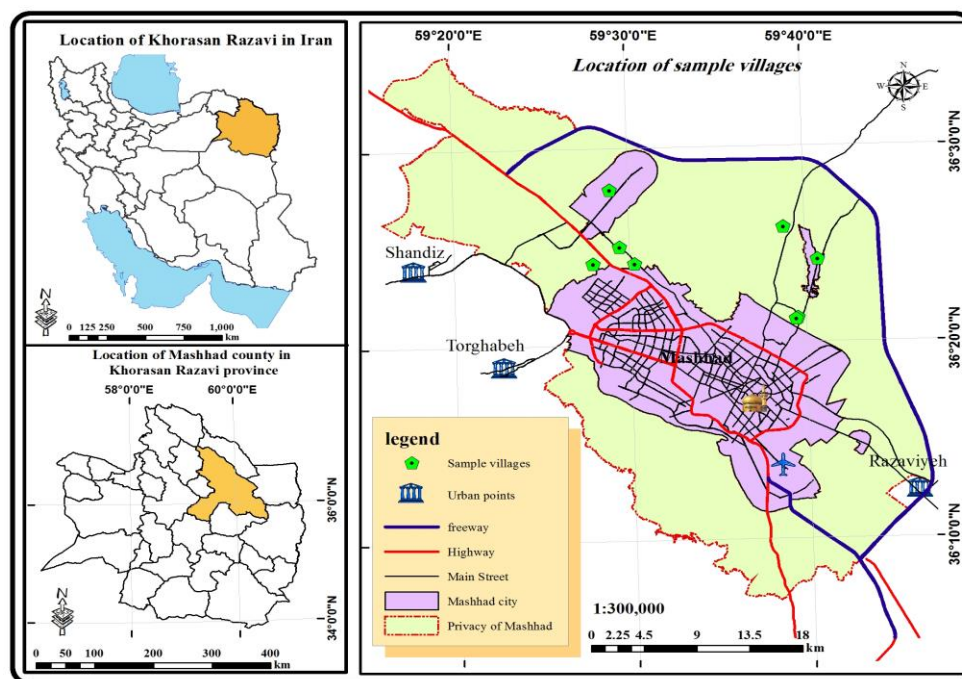

Figure 1. Geographical location of the study area

Accordingly, for better evaluation of the indicators, in villages with more population and closer to the city, the statistical population of the study includes villages that have a RICT office, a population of over 1000 households and are located near Mashhad. With this conditions, 8 villages of Gorji Sofla, Dehroud, Doostabad, Hosseinabad Gharghi, Manzalabad, Kal Zarkesh, Farokhad and Chahar Borj in the central district of Mashhad were selected as the population of the study. Then, given the total number of households in the sample population (N = 20813 households), the sample size of 194 households was estimated with the Cochran's formula (with an error rate of 0.07%). The samples were selected in a systematic random sampling method (Table 4).

3.2. Methodology

The research was conducted in a descriptive-analytical method with a geographical approach and is based on quantitative and qualitative techniques. The assessment tool is a researcher-made questionnaire. To verify the validity of the questionnaire, several copies were given to a group of experts, including university professors and relevant experts, and the necessary corrections were made according to their suggestions. Using the KMO test, the validity of the items explaining the use of information technology with the score of 0.762 and the indicators of development of creative villages with the score of 0.835 were confirmed. In addition, based on the results of Cronbach's alpha coefficient for the use of information technology which is 0.856, the indicators of development of creative villages is 0.781. To select the research indicators, at first, drawing on the critical analysis of the literature the indicators were listed and in the second step, the initial indicators were screened to identify the items related to the effects of information technology and the indicators of development of the creative villages and they were limited to the main indicators. After finalizing the indicators and items, the questionnaire was completed by the villagers in the form of 5-point Likert scale (very low, low, medium, high and very high) and the results were extracted (Tables 2 and 3).

Table 2. Monitoring the dimensions and indicators of RICT use and their Cronbach's alpha coefficients

(Sources: Akbari et al., 2016: Khajeh Shahkouhi, 2013; Rostami Qobadi et al., 2014; Motiee Langroudi et al., 2010; Azizi et al., 2009; Sarami & Bahari, 2010; Anabestani & Vaziri, 2011; Mohamadi & Pirkhazraiean, 2012; Barghi & Ghanbari, 2010; Sourani et al., 2014; Fathi & Motlagh, 2010; Falch & Anyimadu, 2003; Suzuki & Shankariah, 1998)

Dimensions	Item descriptions	Cronbach's alpha coefficients
Level of awareness of RICT services (12 questions)	Familiarity with RICT offices; Familiarity with telecommunication services in RICT offices; Familiarity with Post Bank services; Familiarity with various types of services provided by RICT offices; Familiarity with postal services; people's attitudes towards establishing RICT offices in their villages; Awareness of the benefits of using RICT office services; Satisfaction with the services provided in RICT offices; Awareness of the facilities and equipment available in rural RICT offices; Skills in using a computer; Familiarity with various Internet services; Awareness of the Pishkhan government services	0.898
Level of using RICT services (12 questions)	To pay service bills (water, electricity, gas); telecommunication and telephone services; Post Bank services; computer and office services (copy, print, etc.); various Internet services of RICT offices; postal services; services provided in the framework of e-government; e-health services; services provided for e-business and e-commerce; high speed internet access for home users; use of home internet for any of the above services	0.887

Table 3. Monitoring the indicators of development of creative villages and their Cronbach's alpha coefficients

(Source: Rastghalam et al., 2016; Kalami & Hosieni, 2017; Zarrabi et al., 2014; Mohammadi & Majidfar, 2010; Zarrabi et al., 2012; Maleki et al., 2015; Baeker & Murray, 2008; Khaleefa, 1996; Robinson, 2001; Pinto-Correia et al, 2006; Dos Santos & Laurencin, 2006; Dissart & Marcouiller, 2012; Mitchell, 2013; Bell and Jayne, 2010; McGranahan et al., 2011)

Indicators	Item descriptions	Cronbach's alpha coefficients
Flexibility (6 questions)	Flexibility in different dimensions of the organization, ways of thinking, trading; Innovation in turning a cost into a revenue; to turn government employment costs into proceeds of privatization; Ability to adapt to the environment and people; Tendency to accept new ideas and values (less clinging to the past); (Age, gender, education, needs and financial abilities)	0.814
Innovation (4 questions)	The level of innovation and doing tasks in an innovative way among the villagers; Ability to apply innovative solutions to rural issues and achieve goals (modernity, courage) among villagers;	0.864

Indicators	Item descriptions	Cronbach's alpha coefficients
	Innovation of villagers in economic activities (new marketing methods, etc.); Innovation in the design of rural housing and accommodations (with emphasis on sustainability and eco-friendly materials, etc.)	
Promotion & education (6 questions)	Promotional and training activities for acquiring various skills in rural areas; Status of public education (education and culture) in the village; To teach and transfer the old rural arts and skills to new generations in the village; To organize training workshops for villagers and entrepreneurs; To motivate villagers by introducing top rural entrepreneurs in various fields; Distribution of publications (daily, weekly and special issues) in rural areas.	0.832
Risk-taking (5 questions)	Appropriate financial capacity and risk-taking ability of the villagers; Education level of villagers and their risk-taking ability; Meeting the needs of villagers and residents' risk-taking ability; Age and gender of rural people and increasing the ability to accept the consequences of a failure; The rate of using product insurance plans.	0.743
Leadership (6 questions)	The need for leadership and decision-makers in rural areas; Success of rural managers in coordinating relevant centers and authorities; Identification and selection of graduates and human resources for job plans; Age and education appropriate for rural management; Appropriate management personality traits; The performance of rural managers in using the communication process in a specific situation to influence people and direct them to specific goals	0.876
Participation (6 questions)	To involve villagers in social, economic, cultural and political affairs in order to increase social harmony; Social participation; To increase rural participation rate (both men and women); Self-sufficiency and cooperation in supplying products; The level of public participation in environmental issues; The effect of individual characteristics of rural people (age, gender, education) on participation; teamwork among the villagers	0.887

After collecting and clustering the data, descriptive and inferential statistics including Pearson correlation and one-sample T tests in SPSS were used. Smart PLS was used to extract the structural equation model and determine the effects of villagers' use of RICT on the indicators of development of creative villages. Among weighting methods, Fuzzy Delphi Analytical Hierarchy Process (FDAHP), Combined Compromise Solution (CoCoSo) and Fuzzy Gray Analysis (FGRA) were used for spatial analysis and ranking of the sample villages.

Gray planning is one of the methods of analyzing gray systems for decision making under uncertainty. A number whose true value cannot be stated with certainty, but it is known by an interval is a gray number. One solution to present the uncertainty is to combine the two methods of fuzzy programming and interval parametric programming. This method takes into account the uncertainty of the right and left sides of the model at the same time. The combination of fuzzy programming and gray programming has led to gray fuzzy programming solution (Anabestani & Javanshiri, 2018) and has increased the efficiency of both models.

As mentioned earlier, the Combined Compromise Solution (CoCoSo) method has been used to rank the villages in terms of indicators of development of creative villages. The proposed combined approach is based on an integrated model of simple weight addition method and weight multiplication model. This model can be a set of compromise solutions. The

CoCoSo model has 5 main steps to solve a decision problem which are (Yazdani, 2019):

1- The initial decision-making matrix is determined:

2- Normalization of indicators is accomplished based on the following equations. The first relation is used for indicators with positive direction and the second relation is used for indicators with negative direction. Based on this normalization, all indicators are placed between 0 and 1.

$$r_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}; \quad \text{for benefit criterion,}$$

$$r_{ij} = \frac{\max_i x_{ij} - x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}, \quad \text{for cost criterion.}$$

3- The total of the weighted comparability sequence (**Si**) and the whole of the power weight of comparability sequences for each alternative as **Pi** and **Si** is achieved based on grey relational generation approach:

$$S_i = \sum_{j=1}^{n} (w_j r_{ij}),$$

In this model, the weight is calculated using the fuzzy Delphi hierarchical analysis method.

Pi is also obtained according to the multiplication mode of WASPAS:

$$P_i = \sum_{j=1}^{n} (r_{ij})^{w_j},$$

4- Relative weights of the indicators using the following aggregation strategies are

$$k_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m}(P_i + S_i)}, \quad k_{ib} = \frac{S_i}{\min_i S_i} + \frac{P_i}{\min_i P_i}, \quad k_{ic} = \frac{\lambda(S_i) + (1-\lambda)(P_i)}{\left(\lambda \max_i S_i + (1-\lambda)\max_i P_i\right)}; \quad 0 \leqslant \lambda \leqslant 1.$$

Equation (Ria) expresses the arithmetic mean of sums of WSM and WPM scores, while Equation (Rib) expresses a sum of relative scores of WSM and WPM compared to the best. Equation (Ric) releases the balanced compromise of WSM and WPM models scores. In Equation (Ric), λ (usually λ=0.5) is chosen

computed. In this step, three appraisal score strategies are used to generate relative weights of indicators, which are derived using formulas (R_{ia}, R_{ib}, R_{ic}):

by decision-makers. However, the flexibility and stability of the proposed CoCoSo can rely on other values.

5- The final ranking of the alternatives is determined based on Ri, values, as more significant as better:

$$k_i = (k_{ia}k_{ib}k_{ic})^{\frac{1}{3}} + \frac{1}{3}(k_{ia} + k_{ib} + k_{ic}).$$

Table 4. Characteristics of the study villages and the number of samples in each village

Row	Village	Dehestan	Population	Household	Sample
1	Gorji Sofla	Tabadkan	15163	4321	34
2	Dehroud	Tabadkan	11869	3317	28
3	Doostabad	Toos	8969	2576	24
4	Hosseinabad Gharghi	Tabadkan	13644	3759	31
5	Manzalabad	Toos	8520	2494	23
6	Kal Zarkesh	Toos	6134	1836	20
7	Farakhad	Tabadkan	3977	1203	17
8	Chahar Borj	Toos	4524	1307	17
	Total		72800	20813	194

4. Research Findings

According to the results, about 34.5% of the respondents are between 20 and 30 years old and 31.6% are between 41 and 50 years old; In terms of gender, 68.2% were male and 70.3% were married. In terms of education level, 5.3% of the respondents are illiterate, 18.6% have primary education and 61.3% have a high school diploma, bachelor's degree or higher. Examining the job status of the respondents, revealed that out of 377 people who answered the question related to their occupation, 21.2% are farmers, 10.9% are stockbreeders, 31.8% are engaged in service activities (grocery stores, etc.).

4.1. Monitoring the use of RICT in rural settlements

The use of RICT services in rural settlements in the study area was assessed from two dimensions of the 'level awareness of RICT services' (with 12 items) and the Level of using RICT services (with 12 items) in a 5-point Likert scale. These services include four categories: 'Computer and e-government services', 'Communication services', 'Banking and e-commerce services' and 'Home

Internet'. The results show that, according to the villagers, the level of villagers' awareness of RICT services with 3.55 in general was higher than the theoretical median of the research (i.e., 3); However, their level of using RICT services with 2.76 is less than main. These results were confirmed by the one-sample t-test with a theoretical median of 3, while ensuring the normal distribution of data using Kolmogorov-Smirnov test. Considering the value of t-statistic and the value of significance level of 0.000, with 95% confidence, we conclude that the villagers equate the whole level of RICT with a value of t equal to 7.64 which is above the theoretical median (Table 5).

As Table 5 shows, although villagers have a high level of awareness of RICT services, the level of using RICT services has been lower than median in the sample villages. This could be due to lack of access to full services or the low quality of services in rural areas, as the short distance of these villages to the metropolis of Mashhad, encourage the villagers to go to downtown to access high quality services. Clearly, providing

appropriate services in the villages, especially in higher rural areas, can make way for more use of RICT services and development of indicators and infrastructure of creative villages.

Table 5. An assessment of the importance of the dimensions of RICT from the villagers' view (test standard = 3)

Dimension	Indicators	Main	*T value*	Sig	Mean difference	95% difference in confidence interval	
						Lower	Upper
Level of awareness of RICT services	Communication services and e-government	3.608	19.036	0.000	0.608	0.545	0.671
	Banking and e-commerce services	3.245	8.442	0.000	0.245	0.188	0.302
	Home Internet	3.851	28.601	0.000	0.851	0.792	0.909
	Awareness of services	3.548	23.496	0.000	0.548	0.502	0.594
Level of using RICT services	Computer services and e-government	2.846	-6.095	0.000	-0.154	-0.203	-0.104
	Communication services	3.286	9.582	0.000	0.286	0.227	0.345
	Banking and e-commerce services	2.529	-14.04	0.000	-0.471	-0.537	-0.405
	Home Internet	2.379	-13.49	0.000	-0.621	-0.712	-0.530
	Awareness of services	2.762	-9.674	0.000	-0.238	-0.286	-0.189
Rural digital technology		3.155	7.638	0.000	0.155	0.115	0.195

Fuzzy gray analysis (FGRA) was used for spatial analysis and determining the level of ICT in rural areas. After determining the status quo matrix (fuzzy mean of awareness and the level of using RICT services in the sample villages), first the indicators were weighted by Shannon entropy method. In the next step, to standardize the state quo matrix, given the direction of the indicators (positive or negative), the norm normalization was used. Then the variance of the initial normalized values is estimated; In the next step, the positive and negative fuzzy ideal solution is determined and the degree of fuzzy gray relationship of each alternative is obtained according to the importance determined by the decision makers; Eventually, the ratio of positive and negative ideal

fuzzy solution is calculated and finally the relative fuzzy relation of the positive solution was identified. After defuzzification of fuzzy numbers, the sample villages were arranged in a descending order of priority. According to the results of the model, the villages of Gorji Sofla, Hosseinabad Gharghi and Dehroud had the highest, and the villages of Kal Zarkesh and Chahar Borj had the lowest level of using RICT services (Table 6). The indicators such as distance from the metropolis of Mashhad and the main roads in the villages have a significant effect on access of rural areas to RICT services; and the villages closer to Mashhad, thanks to more access to services and facilities, are at a higher level than the more distant villages.

Table 6. Initial fuzzy matrix and fuzzy balanced normalized matrix at the sample villages

Village	Initial fuzzy matrix						Fuzzy balanced normalized matrix (Y)					
	Level of awareness of RICT services			Level of using RICT services			Level of awareness of RICT services			Level of using RICT services		
Chahar Borj	4.0	3.4	2.8	3.1	2.3	1.9	0.241	0.205	0.169	0.669	0.509	0.416
Hosienabad	4.3	3.7	3.3	3.3	2.9	2.7	0.259	0.223	0.199	0.723	0.638	0.578
Doostabad	4.0	3.5	3.0	3.3	2.8	2.3	0.241	0.211	0.181	0.705	0.612	0.506
Dehroud	4.3	3.6	3.3	3.3	2.9	2.4	0.259	0.217	0.199	0.705	0.621	0.524
Farokhad	4.00	3.32	2.75	3.08	2.58	2.08	0.241	0.200	0.166	0.669	0.559	0.452
Kal Zarkesh	3.67	3.25	2.83	3.08	2.45	1.92	0.221	0.196	0.170	0.669	0.531	0.416
Gorji Sofla	4.25	3.78	3.42	3.42	2.95	2.67	0.256	0.228	0.206	0.741	0.640	0.578
Manzelabad	4.00	3.45	2.83	3.25	2.77	2.25	0.241	0.208	0.170	0.705	0.601	0.488
Cj (max)	4/3			3/42			Y^+ 0.221	0.196	0.166	0.669	0.509	0.416
Shannon Weight	0/259			0/741			Y^- 0.259	0.228	0.206	0.741	0.640	0.578

Table 7. Degree of fuzzy gray relation of each alternative and relative fuzzy relation by positive fuzzy ideal and De-fuzzified values

Village	E_i^+			E_i^-			Γ (Fuzzy positive ideal)			Defuzzied	Rank
Chahar Borj	0.042	0.037	0.034	0.074	0.082	0.094	0.362	0.312	0.268	0.314	7
Hosienabad	0.083	0.087	0.087	0.037	0.035	0.036	0.694	0.710	0.709	0.706	2
Doostabad	0.051	0.059	0.049	0.049	0.045	0.052	0.506	0.568	0.482	0.531	4
Dehroud	0.075	0.068	0.067	0.042	0.040	0.040	0.643	0.631	0.623	0.632	3
Farokhad	0.042	0.041	0.036	0.074	0.068	0.085	0.362	0.374	0.300	0.353	6
Kal Zarkesh	0.033	0.035	0.035	0.100	0.087	0.090	0.250	0.289	0.278	0.276	8
Gorji Sofla	0.093	0.100	0.100	0.034	0.033	0.033	0.731	0.750	0.750	0.745	1
Manzelabad	0.051	0.054	0.042	0.049	0.049	0.067	0.506	0.521	0.385	0.483	5

4.2. An evaluation of the indicators of development of creative villages from the villagers' perspective

To assess the development of creative villages in the study area, the indicators of "flexibility", "innovation", "promotion and education", "risk-taking", "leadership" and "participation" were used. Based on the results, from the villagers' perspective, the mean of development of creative villages is 3.77 which indicates a high level of development of creative villages in the study villages. The indicator of risk taking with a mean of 4.13 had the highest and the indicator of leadership with a mean of 3.1 had the lowest values in the sample villages (Table 8). Using one-sample t-test and the theoretical median of 3,

while ensuring the normal distribution of data by Kolmogorov-Smirnov test, villagers' opinions about the indicators of development of creative villages were examined. The results show that villagers' risk taking with a T-statistic of 39.99 has the highest value and the value of the T-statistic for the variable of development of creative villages is higher than the theoretical median and equals 31.72. Therefore, from the villagers' perspective, the status of indicators of development of creative villages in the sample villages has been evaluated as appropriate and the mean of the respondents' opinions in the T test have been higher than the theoretical median.

Table 8. An evaluation of the indicators of development of creative villages from the villagers' perspective (Test standard = 3)

Indicators	Main	T value	Sig	Mean difference	95% difference in confidence interval	
					Lower	Upper
Flexibility	3.570	24.066	0.000	0.570	0.524	0.617
Innovation	3.968	29.251	0.000	0.968	0.903	1.033
Promotion & education	4.033	29.582	0.000	1.033	0.964	1.101
Risk-taking	4.133	39.994	0.000	1.133	1.077	1.189
Leadership	3.102	2.706	0.007	0.102	0.028	0.177
Participation	3.822	24.291	0.000	0.822	0.755	0.889
Creative village	3.771	31.719	0.000	0.771	0.723	0.819

Concerning the spatial distribution, the indicators of development of creative villages in the sample villages, Hosseinabad Gharghi, Gorji Sofla and Dostabad villages with 3.98, 3.97 and 3.92, had the highest means respectively, and Chaharborj village had the lowest mean. Then, Combined Compromise Solution (CoCoSo) was used to rank the study villages in terms of the indicators of development of creative villages. In this model, the weight of research indicators has been calculated using fuzzy Delphi hierarchical

analysis method. The highest weight obtained, according to the experts, belongs to two indicators of participation (0.265) and innovation (0.210). After performing the 5 main steps of the CoCoSo method, the Ri value for each of the study villages was obtained in indicators of flexibility, innovation, promotion, risk-taking, leadership and participation. According to what can be seen in Table (9), the highest rank belongs to the villages of Hosseinabad Gharghi, Gorji Sofla and Dostabad.

Table 9. Spatial analysis of the development of creative village indicators in the study villages based on CoCoSo method

Village	Former Matrix						si	pi	Ri	Rank
	Flexibility	Innovation	Promotion & education	Risk-taking	Leadership	Participation				
Chahar Borj	3.56	3.87	4.03	3.92	2.78	3.34	0.30	3.60	3.47	6
Hosienabad	3.67	4.18	4.19	4.43	3.30	4.09	0.98	5.98	9.31	1
Doostabad	3.68	4.18	4.21	4.22	3.24	3.99	0.89	5.88	8.62	3
Dehroud	3.49	3.78	3.96	3.89	3.01	3.72	0.44	5.17	5.03	5
Farokhad	3.31	3.51	3.54	3.87	2.88	3.39	0.07	2.54	1.37	7
Kal Zarkesh	3.33	3.46	3.60	3.82	2.81	3.42	0.05	2.60	1.19	8
Gorji Sofla	3.65	4.17	4.17	4.42	3.28	4.14	0.97	5.97	9.28	2
Manzelabad	3.67	4.16	4.21	4.07	3.15	3.92	0.80	5.75	7.89	4
Wi	0.065	0.210	0.165	0.128	0.167	0.265				

4.3. The effects of RICT on indicators of development of creative villages

The results of Pearson correlation test (ensuring the normal distribution of data) show that there is a positive and significant correlation between the dimensions of RICT and the indicators of development of creative villages at a significance level of less than 0.01. Therefore, with the increasing use of RICT and its dimensions, the indicators of development of creative villages have also improved. In addition, the correlation coefficient in the dimension of the level of using RICT services and the indicators of development of creative villages with a coefficient of 0.641 at the confidence level of 99% is higher than the dimension of awareness of RICT services (Table 10).

Table 10. The relationship between RICT, its dimensions and the indicators of development of creative villages

Dependent / Independent	Indicators of development of creative villages		
	Person value	Sig	Result
Level of awareness of RICT services	0.625**	0.000	There is a significant relationship
Level of using RICT services	0.641**	0.000	There is a significant relationship
Rural digital technology	0.746**	0.000	There is a significant relationship

Structural equation modeling (SEM) and Smart PLS were used to test the conceptual model of the study and the effects of RICT on the indicators of development of creative villages. Structural equation modeling consists of two parts: measurement model and structural model; its variables are divided into two categories of implicit and explicit variables; implicit variables are used in different levels (Amaro & Duarte, 2016). In the present study, RICT variables and the indicators of development of creative villages are the main structures (and implicit variables). Based on the research conceptual model, each of these structures is composed of different dimensions and each dimension is assessed by a number of items or questions. The external model examines the relationship between the items or questions of the questionnaire and the structures. In fact, the relationships cannot be tested until the items (questions) of the questionnaire have proven that the implicit variables are well measured. An external model was used to show that the implicit variables were measured appropriately.

In order to investigate this, the construct validity of the model is examined, which is measured by Convergent Validity and Discriminant Validity. Convergent validity refers to the ability of the indicators of a dimension to explain that dimension, and discriminant validity implies that the constructs of a research model should be more correlated with their questions than with other constructs (Hulland, 1999). In convergent validity, each of the factor loads (regression coefficients) must be significant and greater than or equal to 0.4. Otherwise, the optimal and acceptable limit of combined reliability (CR) and Average Variance Extracted (AVE) should be considered. In this study, some items were excluded from further analysis due to low factor loading or

unfavorable characteristics of the constructs. After excluding the items and examining the desirability of the structures in terms of CR and AVE indicators, the results are presented in Table 11.

Table 11. Indicators for evaluating the validity and reliability of the RICT concept and the indicators of development of creative villages

Component	Convergent validity	Point validity			Reliability	
	AVE	Fornel & Larker	Cross-factor loads	HTMT	Cronbach Alpha>0/7	Combined reliability CR>0/7
Level of awareness of RICT services	0.557	Confirmed	Confirmed	Confirmed	0.838	0.881
Level of using RICT services	0.630	Confirmed	Confirmed	Confirmed	0.788	0.794
Flexibility	0.783	Confirmed	Confirmed	Confirmed	0.816	0.716
Innovation	0.668	Confirmed	Confirmed	Confirmed	0.739	0.861
Promotion & education	0.758	Confirmed	Confirmed	Confirmed	0.838	0.833
Risk-taking	0.649	Confirmed	Confirmed	Confirmed	0.866	0.732
Leadership	0.568	Confirmed	Confirmed	Confirmed	0.753	0.821
Participation	0.668	Confirmed	Confirmed	Confirmed	0.881	0.814
Creative village	0.675	Confirmed	Confirmed	Confirmed	0.886	0.907
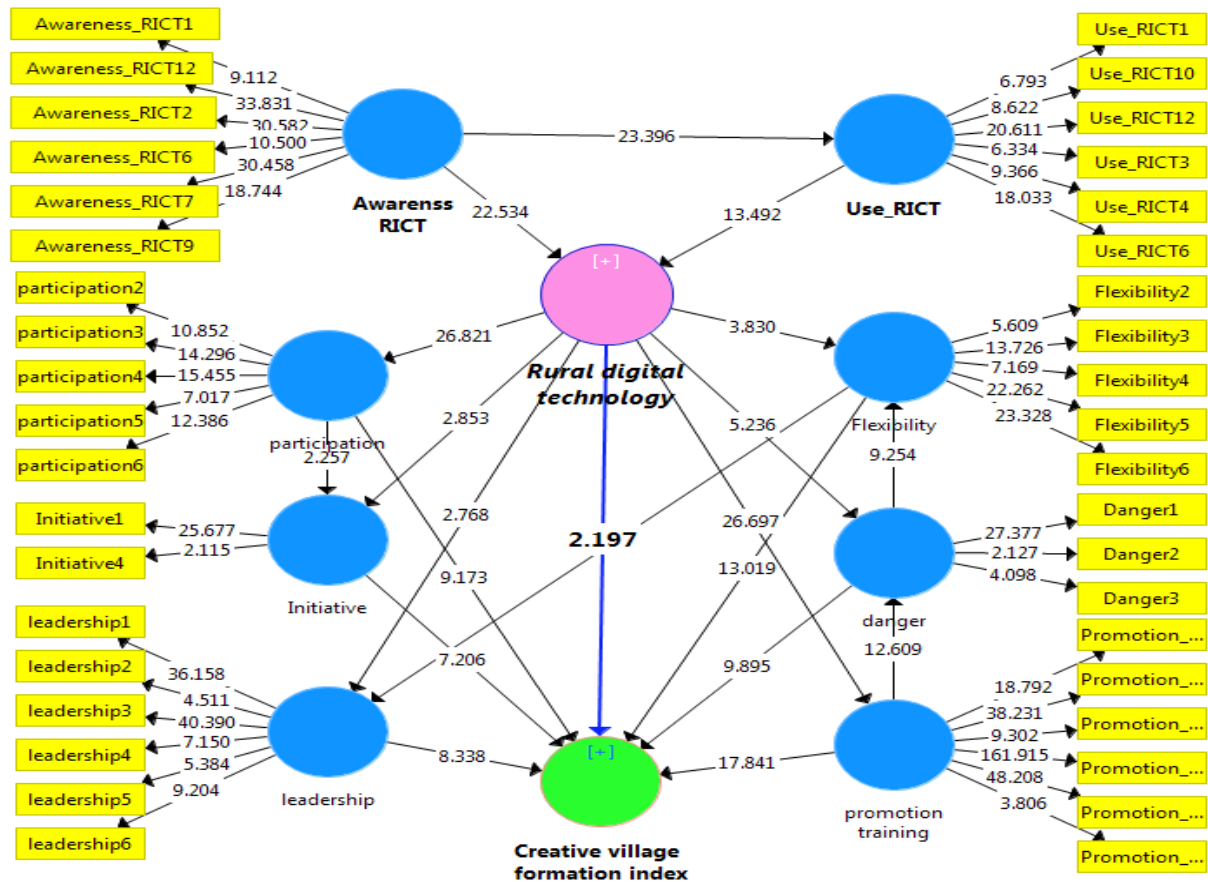
Figure 2. Structural model of the relationship between RICT and the indicators of development of creative villages

The value of the criterion for the acceptance level of AVE is 0.5, which means that the implicit variable explains at least 50% of its observable variance. In the present study, all AVE values related to structures were greater than 0.5 and this confirms that the convergent validity of the present questionnaire is acceptable.

Composite reliability and Cronbach's alpha are used to measure the reliability of the model. The Cronbach's alpha coefficient verifies the ability of the questions to properly explain their dimensions. The composite reliability coefficient also determines the degree of correlation between the questions of a dimension with each other for a sufficient fit of the measurement models. Given that the appropriate value for Cronbach's alpha and composite reliability is 0.7 (George & Mallery, 2003) and based on the research findings, these criteria have adopted a

suitable value for latent variables, one can confirm that the research has an appropriate reliability.

After testing the external model, it is essential to examine the internal model, which shows the relationship between the latent variables of the research. In order to investigate the effects of RICT on the indicators of development of creative villages using the variance-based structural equation modeling approach, independent and dependent variables of the research were entered into the structural equation model as latent variables in the form of first-order factor models. In Figure 2, the numbers on the lines are the T values of the Bootstrap test and are interpreted as the T test; That is, if T values are more than 1.96, they are significant at the level of 0.05, and if values are more than 2.58, they are significant at the level of 0.01 (Vinzi et al, 2010).
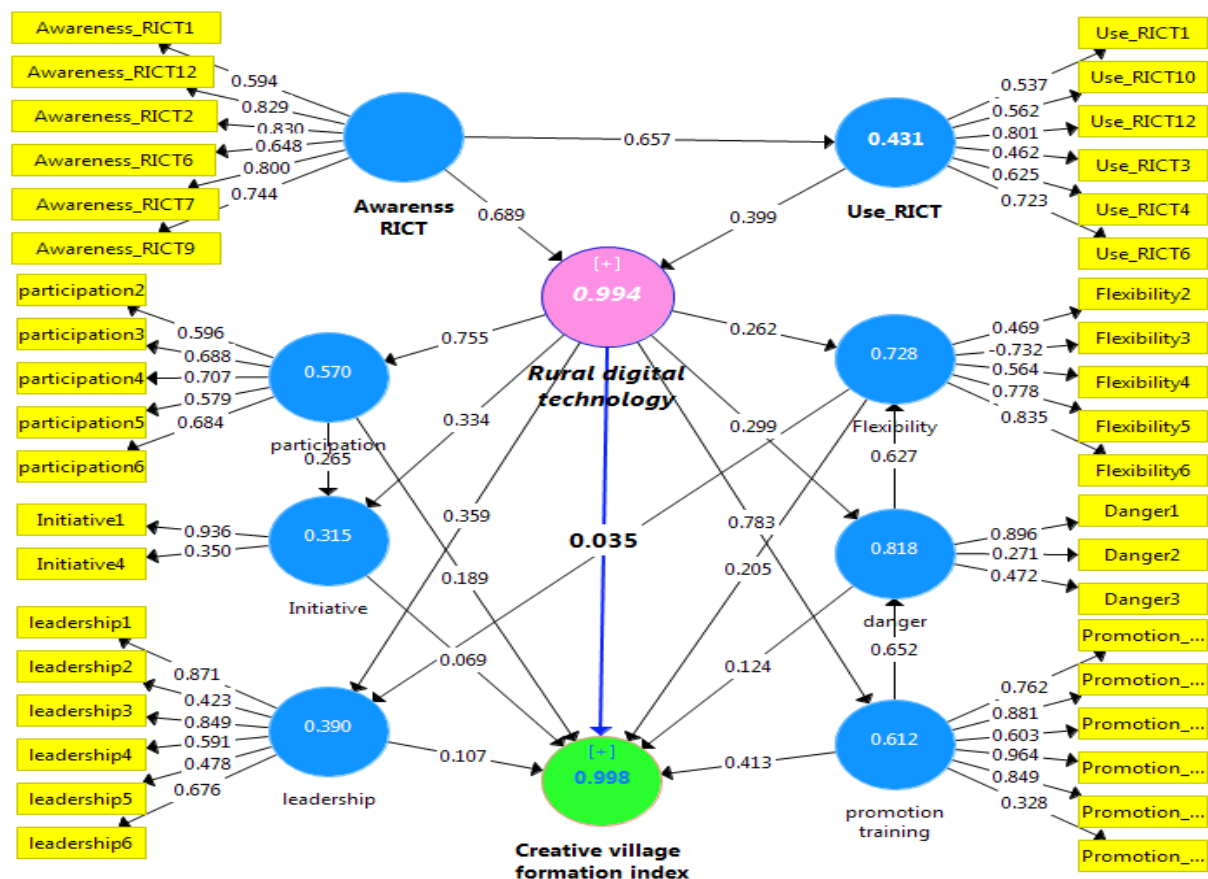
Figure 3. An evaluation of the structural model of the impact of RICT on the indicators of development of creative villages

As shown in Figure 2, the T-coefficients between RICT and the indicators of development of creative villages are greater than 2.58, that is, the relationship

between the variables in the sample population is confirmed at the confidence level of 99%. Given the results of T and P of the path coefficient and

confirmation of the direct relationship between the variables, we also investigated the coefficient of direct and indirect impact of RICT on the indicators of development of creative villages. The cause-and-effect relationship between latent variables and the indicators of development of creative villages has been measured in the form of a structural model. The acceptable factor load for each variable is 0.4 and the significance level is 0.1. All indicators of the present study have a factor load of more than 0.4 and have a high validity and reliability for measuring variables and there is an acceptable correlation between the indicators (Figure 3).

The relationship between the indicators of "flexibility", "innovation", "promotion and education", "risk-taking", "leadership" and "participation" and the variable of the "indicators of development of creative villages" is significant and direct, as 41.3% of the varations in the level of indicators of development of creative villages are directly predicted by the indicators of **promotion and education** (Figure 3). Based on the results, the high mean of 'promotion and education' in rural areas, and the positive effects of 'level of awareness of RITC services' and 'the level of using RICT services' on the promotion and education and thus the development of creative villages and rural development are quite evident. Besides, the indicators of "flexibility" and "participation" with a coefficient of impact of 0.237 and 0.207, respectively, have had a significant effect on improving the indicators of

development of creative villages. Therefore, promotion and education, flexibility and participation can be introduced as the main indicators of development of creative villages.

As mentioned earlier, the RICT variable directly and indirectly affects the variable of "indicators of development of creative villages" through the mediation of research indicators ($p > 0.05$). Based to Table 12, "level of awareness of RICT services" with direct and indirect effects, and a coefficient of 0.816, had a greater impact on "indicators of development of creative villages". This relationship between the main constructs of the research at the 95% confidence level is also statistically significant ($p > 0.05$). 'Level of using RICT services' with a coefficient of 0.342 has had a significant effect on the indicators of development of creative villages. The variable of RICT, directly and indirectly affects the variable of 'indicators of development of creative villages. According to the standard coefficients, 85.9% of the changes in the level of indicators of creative villages are predicted by RICT variable. The results show that although 'the level of awareness of RICT services' does not directly affect the indicators of development of creative villages, it has an indirect significant effect on the dependent variable. Therefore, increasing the awareness of villagers about RICT services will help a lot in development of creative village indicators in the sample villages.

Table 12. An estimation of total, direct and indirect effects of research components on the indicators of development of creative villages

Independent variable		Dependent variable	R	Direct		Indirect		Total	
				Effect	P	Effect	p	Effect	p
Indicators	Flexibility	indicators of development of creative villages	0.998	0.205	0.000	0.033	0.000	0.237	0.000
	Innovation			0.069	0.000	–	–	0.069	0.000
	Promotion & education			**0.413**	0.000	0.178	0.000	**0.591**	0.000
	Risk-taking			0.124	0.000	0.149	0.000	0.273	0.000
	Leadership			0.107	0.000	–	0.000	0.107	0.000
	Participation			0.189	0.000	0.018	0.000	0.207	0.000
Dimension	Level of awareness of RICT services			–	–	0.816	0.000	**0.816**	0.000
	Level of using RICT services			–	–	0.342	0.000	0.342	0.000
Variable	Rural digital technology			0.035	0.000	0.190	0.000	**0.859**	0.000

The effect size of the endogenous (dependent) latent variables of the model is determined by a coefficient of R^2. According to Figure 3, the value of R^2 for the variable of 'the indicators of

development of creative villages' is 0.998; that is, the effect of independent variables on "indicators of development of creative villages" is significant and at a strong level, and 99.8% of the changes in

"indicators of development of creative villages" in the study area is predicted by the level of using RICT services. That is, as level of using RICT services increase in rural areas, the level of 'indicators of development of creative villages' has also increased significantly. The evaluation criteria of the structural equation model as a whole also confirm the results. The value of Q^2 indicates the very good predictive power of the model regarding the endogenous constructs of the research, and given the value of GOF (0.877), the fit of the general model is confirmed as very good and shows that all indicators verify the desirability of the structural equation model (Table 13).

Table 13. Indicators for evaluating the totality of the structural equation model

GOF[4]	R[2]	Communality	NFI[3]	SRMR[2]	Q[2] (=1-SSE/SSO)[1]	Indicators
0.877	0.898	0.771	0.937	0.098	0.613	value

1. The value of Q^2: the predictive power of the model shows how capable the model is in predicting the dependent variable. The closer the value of indicator to 1, the more predictive the model is. Three values of 0.02, 0.15, and 0.35 have been introduced as weak, medium, and strong values for predictability.

2. The values of this indicator in the optimal state, should be less than 0.10.

3. The optimal values for this indicator are values greater than 0.90.

4. As of the GOF indicator, values less than 0.10 shows a weak fit, 0.25 is a moderate fit and above 0.36 is a good fit. This criterion is calculated using the following formula:

Relation 1

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

5. Discussion and Conclusion

According to the research findings, from the villagers' perspective, the villagers' awareness of RICT services was higher than the theoretical median of the research; however, the level of using RICT services is less than theoretical median. Bavle & Shekar Research (2020); Leng et al. (2020); Min et al. (2020); Rashid & Rashid (2020); Stillman et al. (2020) have shown that the level of villagers' awareness of RITC and its services plays an important role in rural development. As it makes way for the entry of small businesses, increases the retention of young people in rural areas and increases the creative class in rural areas.

According to the villagers, the indicators of development of creative villages in rural settlements have been at a relatively high level. However, there have been different results in various studies. In some studies, the indicators of development of creative villages are at a strong level (Anderson et al., 2016; Akgün et al., 2016; Horiuchi; 2017; Strasiulis, 2017; Herslund, 2019; Xiong et al., 2020), and in some studies, these indicators have been at a weak level (Rastghalam et al., 2017). Therefore, depending on the society, culture, development status, etc., they may have an effect on indicators of development of creative villages.

The results showed that the dimension of "awareness of RICT services" had a greater impact on the indicators of development of the creative villages. Among the research indicators, "promotion and education", "risk-taking" and "flexibility" are the most influential one in development of creative villages. Studies such as Wojan & Nichols, (2018); Rastghalam et al. (2017); have examined the characteristics of creative villages and concluded that a variety of constructs may have an effect on developing a creative village, one of which is RICT. They also argued that practical training and design flexibility accelerate the process of developing creative villages.

The realization of sustainable rural development is directly related to the movement of that village towards creative villages. 'Creative and innovative villages' is one of the new topics in the field of rural studies emphasized by geographers, economists and sociologists who try to realize a Knowledge Community and knowledge-based development. Therefore, rural areas are seen as a place for development of creativity, knowledge, creative industries and knowledge economy in a composite approach. Moving towards the realization and creation of creative villages is the basic solution to solve the crises of rural settlements. In this theory, it is believed that rural areas can encourage economic growth by attracting people to creative professions. It can be concluded that the creative village approach is a facilitator for the growth and development of creativity and dynamism in the rural environment.

The realization of the creative villages is effective in creating a balance in the rapid changes of the settlements, and the creative villages can provide the ground for attracting the creative class in contrast with the creative cities and strike a balance between these two settlements. Therefore, it is essential to make way for the revitalization of rural life through endearing proper rural life among the creative class and providing them with the facilities of sustainable life. The creative rural class is able to add new sectors to the economic, social, cultural and managerial dimensions of rural areas and create new opportunities for their development on a national and transnational scale. Therefore, it is necessary to examine the indicators of development of creative villages in rural areas. The present study analyzed the impact of RICT on the indicators of development of creative villages in rural settlements.

Eventually, given the significance of RICT and its impact on the indicators of development of creative villages in suburban settlements, the following suggestions are presented:

- To establish Internet service centers for large villages and those near cities (if it is not possible to set up such centers for all villages). This would be possible with the planning and assistance of the Telecommunication Company of Iran and the cooperation of relevant officials.
- To make the latest information available to the villagers and receive their feedbacks, prepare and broadcast TV and radio educational programs in the fields of agriculture and animal husbandry in accordance with the products of each region and take measures to increase information sharing and promote the use of the services. The measures may include holding English language classes for rural youth, raising awareness about the benefits and services of RICT, and providing free training courses on the use of the Internet and computer in agriculture and animal husbandry, whose implementation require more attentive attention of the planners, which can be possible through promotional programs.
- To localize global experiences, especially those of the countries with more cultural and infrastructural similarities in upgrading and developing the services of RICT centers and improving the indicators of development of creative villages.
- To improve the level of information literacy of the villagers in order to get them acquainted with the services of RICT center and teach them how to do various tasks such as e-banking services, and so on.
- To provide high speed Internet services in rural areas; to reduce the cost of Internet access and mobile calls for the villagers; to donate computers to RICT centers to encourage villagers' use of RICT services. For creating proper institutional environment, rural development planners should design web sites to provide the villagers with up-to-date and essential information, and encourage governmental and non-governmental organizations to provide services through the Internet, establish coordination between local and national organizations to develop RICT services and provide appropriate conditions necessary for the development of creative villages.
- In terms of indicators of development of creative villages, the sample villages do not have many active workforces. To attract young people, government incentives, such as tax cuts and housing and employment facilities can be used to motivate young people to start their businesses. Therefore, the first step is to attract and prepare human resources to adopt new roles and create a suitable platform for producing creative ideas.
- To take communication and development plans into account in rural development plans and tourism boom, for example by creating a communication network between rural areas, common tourism markets (which connect several villages).
- To take into account creative industries in all fields such as cultural, ritual, artistic, agricultural and industrial ones. Programs such as ritual celebrations, branding and eco-tourism can be a way to attract tourists to rural areas. In addition, natural and geographical features can underlie some industries, such as pisciculture, ecotourism programs and natural tourism hubs.
- To explain the villagers, local and regional officials the proposed indicators through holding appropriate training workshops. It should be noted that after all these steps, government support must continue until the rural economy becomes dynamic and self-sufficient.

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Authors' contributions

The authors equally contributed to the preparation of this article.

Conflict of interest

The author declares no conflict of interest.

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Original Article

تحلیل اثرگذاری فناوری دیجیتالی بر شاخص‌های شکل‌گیری روستای خلاق در ایران

(مطالعه موردی: سکونتگاههای پیراشهری کلانشهر مشهد)

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چکیده مبسوط

۱.مقدمه

در جهان حاضر، باتوجه به تغییرات سریع تکنولوژی و رقابت بین‌المللی، توجه به نیروی انسانی خلاق در روستاها از اهمیت ویژه‌ای برخوردار است، استفاده از فناوری دیجیتالی نیز بر شکل‌گیری روستای خلاق به‌عنوان رویکردی نو در استفاده از قابلیت‌ها و ظرفیت‌های موجود روستا جهت احیای آن، تأثیرگذار است. در ایران ارائه خدمات با استفاده از فناوری‌های اطلاعاتی و ارتباطی به روستاییان یکی از راهبردهایی است که در راستای کاهش و حذف شکاف دیجیتالی و رفع موانع ناشی از «انزوای جغرافیایی» در دستور کار متولیان توسعه‌ی روستایی قرارگرفته است. با توجه به تأثیرات گسترده این تکنولوژی در جوامع مختلف و نوپا بودن این موضوع در کشور ما، مطالعات کاربردی و میدانی درزمینه آثار آن در توسعه روستاها و شکل‌گیری روستای خلاق، می‌تواند در جهت به‌کارگیری صحیح این فناوری در روستاهای ایران، مفید واقع شود. ازاین‌رو تحقیق حاضر در پی پاسخ به سؤال زیر است: توسعه فناوری دیجیتالی از طریق فناوری اطلاعات و ارتباطات روستایی (RICT) به چه میزان بر شاخص‌های شکل‌گیری روستای خلّاق در منطقه موردمطالعه تأثیر داشته است؟

۲. مبانی نظری تحقیق

کنکاش در بین متون و پژوهش‌های مختلف در زمینۀ خلاقیت نشان می‌دهد که روستای خلاق مفهوم جدیدی است که در مقابل مفهوم شهر خلاق و به تبعیت از آن ایجاد شده و تعریف واحد و بین‌المللی در این باره تا به حال صورت نگرفته است. با این حال به تعریفی مختصر از این مفهوم اشاره می‌شود. روستای خلاق فضایی است که با اتکا بر فرآیندهای بوم‌مدارانه سبک زندگی، محیط زیست پاک و امکانات مطلوب زمینۀ جذب طبقه خلاق در صنایع با فناوری غیر سطح بالا، به‌ویژه در بخش فرهنگ و هنر را مهیا و بستر انتفاع برد -

برد جامعه روستایی و طبقه خلاق و همچنین مخاطبان و مصرف‌کنندگان محصولات خلاقانه در بیرون از محیط روستا را فراهم می‌آورد.

مروری بر تجارب کشورهای توسعه یافته و درحال‌توسعه در به کار گیری فناوری اطلاعات در توسعه روستایی و کشاورزی، نیز نشان می دهد که به تناسب توانایی این کشورها، تقریباً در همه آنها استفاده از فناوری اطلاعاتی مورد توجه است. در این زمینه، نمونه های بسیاری از اقدامات و سیاست‌های کلان مانند راهبردهای توسعه این فناوری وجود دارند و در عین حال، نوآوری ها، ابتکارات و برنامه های خاص نیز به صورت زیرمجموعه سیاست گذاری کلان تحقق یافته است. در ایران بیش از سایر کشورها به کارگیری ICT روستایی را درزمینه های مختلف اجتناب ناپذیر میباشد، زیرا جوان بودن بافت جمعیت کشور هزینه های بسیار بالایی را بر دولت تحمیل می‌کند؛ با توجه به اینکه بخش عظیمی از جمعیت کشور ما را روستاییان تشکیل می دهند، عدم توجه به این قشر صدمات جبران ناپذیری به کشور وارد خواهد کرد.

۳. روش تحقیق

روش تحقیق در پژوهش حاضر با رویکرد جغرافیایی، روش‌شناسی توصیفی- تحلیلی و مبتنی بر شیوه‌های کمّی و کیفی است. ابزار سنجش را پرسشنامه محقق ساخته، تشکیل می‌دهد. میزان روایی گویه‌های تبیین‌کننده پرسشنامه با استفاده از آزمون KMO در میزان استفاده از فناوری دیجیتالی با مقدار ۰/۷۶۲ و شاخص‌های شکل‌گیری روستای خلاق با مقدار ۰/۸۳۵ مورد تائید قرار گرفت. همچنین پایایی پرسشنامه برای میزان استفاده از فناوری دیجیتالی برابر ۰/۸۵۶ و شاخص‌های شکل‌گیری روستای خلاق برابر ۰/۷۸۱ مورد تایید قرار گرفته است. پس از جمع‌آوری و دسته‌بندی داده‌ها، از روش آمار توصیفی و استنباطی (آزمون‌های همبستگی پیرسون و T تک نمونه‌ای) در محیط نرم‌افزار SPSS و همچنین برای استخراج

*. نویسندۀ مسئول:

دکتر علی‌اکبر عنابستانی

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مدل معادلات ساختاری و تعیین میزان اثر استفاده روستاییان از فناوری (دیجیتالی) بر شاخص‌های شکل‌گیری روستای خلاق از نرم‌افزار Smart PLS استفاده گردید. همچنین از روش‌های وزن دهی روش تحلیل سلسله مراتبی دلفی فازی (COCOSO) و تحلیل خاکستری فازی (FGRA) جهت تحلیل فضایی و رتبه‌بندی روستاهای نمونه استفاده گردید.

۴. یافته‌های تحقیق

بر اساس یافته‌های پژوهش حاضر باید عنوان کرد ازنظر روستاییان میزان آگاهی روستاییان از خدمات فناوری دیجیتالی در کل با میانگین ۳/۵۵ بالاتر از میانه نظری تحقیق (یعنی ۳) بوده است؛ ولی میزان استفاده از خدمات با میانگین ۲/۷۶ کمتر از میانه نظری است. نتایج تحلیل فضایی سطح فناوری دیجیتالی نشان داد که روستاهای گرجی سفلی، حسین‌آباد قرقی و دهرود دارای بالاترین، و روستاهای کال زرکش و چهار برج دارای پایین‌ترین سطح استفاده از خدمات فناوری دیجیتالی (RICT) بوده است. همچنین شاخص‌های شکل‌گیری روستای خلاق در سکونتگاه‌های پیراشهری برابر با میانگین ۳/۷۷ و نشان‌دهنده سطح نسبتاً بالای شاخص‌های شکل‌گیری روستای خلاق در روستاهای موردمطالعه است. نتایج آزمون T تک نمونه‌ای نیز مشخص کرد که شاخص "خطرپذیری" با آماره T برابر ۳۹/۹۹ بالاترین مقدار را به خود اختصاص داده است و مقدار آماره T برای متغیر شاخص‌های شکل‌گیری روستای خلاق نیز بالاتر از میانه نظری و معادل ۳۱/۷۲ است. نتایج رتبه‌بندی روش راه حل ترکیبی سازشی (COCOSO) نشان داد که روستاهای حسن آباد قرقی، گرجی سفلی و دوست‌آباد در رتبه اول تا سوم و روستای چهاربرج در رتبه آخر قرارگرفته است.

۵. بحث و نتیجه گیری

نتایج به‌دست‌آمده از نرم‌افزار Smart PLS نیز ضمن تائید آزمون بیرونی مدل (مقدار روایی واگرا و همگرا و آلفای کرونباخ و پایایی

ترکیبی) نشان داد که ضرایب T بین دو سازۀ اصلی پژوهش، بالای ۲/۵۸ بوده و رابطه معنادار و مستقیم بین دو متغیر برقرار است؛ بُعد "آگاهی از خدمات RICT" با ضریب ۰/۸۱۶، تأثیر بیشتری بر شاخص‌های شکل‌گیری روستای خلاق در سکونتگاه‌های نمونه داشته است. در بین شاخص‌های پژوهش نیز "ترویج و آموزش" با ضریب ۰/۵۹۱، "خطرپذیری" با ضریب ۰/۲۷۳ و "انعطاف پذیری" با ضریب ۰/۲۳۷ بیشترین تأثیرگذاری را در شاخص‌های شکل‌گیری روستای خلاق می‌باشد. در کل با توجه به مقدار ضریب تعیین (R2) برای متغیر شاخص‌های شکل‌گیری روستای خلاق (۰/۹۹۸) مشخص گردید تأثیرگذاری فناوری دیجیتال روستایی (RICT) بر شاخص‌های شکل‌گیری روستای خلاق در سطح قوی است؛ بنابراین فرضیه تحقیق مبنی بر اینکه، توسعه فناوری دیجیتالی از طریق فناوری اطلاعات و ارتباطات روستایی (RICT) تأثیر زیادی بر شاخص‌های شکل‌گیری روستای خلاق در منطقه موردمطالعه داشته است، تائید می‌شود؛ و ۹۹/۸ درصد تغییرات شاخص‌های شکل‌گیری روستای خلاق در منطقه موردمطالعه به‌وسیله استفاده از فناوری دیجیتال روستایی پیش‌بینی‌شده است. در انتها این نکته ذکر ضروری است که به دلیل نبود مطالعاتی در رابطه با تأثیر فناوری دیجیتالی (RICT) بر شاخص‌های شکل‌گیری روستای خلاق، امکان مقایسه نتیجه تحقیق با تحقیقات قبلی وجود نداشته و این مطالعه، یک پژوهش اکتشافی به شمار می‌رود.

کلیدواژه‌ها: فناوری دیجیتالی، سکونتگاه‌های روستایی، شاخص روستای خلاق، توسعه روستایی، کلان‌شهر مشهد.

تشکر و قدردانی

فهرست مندرجات

داوران این شماره به ترتیب حروف الفبا

دکتر فرحناز اکبراقلی (استادیار جغرافیا و برنامه‌ریزی روستایی دانشگاه پیام نور)

دکتر علی باقرزاده (دانشیار اقتصاد دانشگاه آزاد اسلامی واحد خوی)

دکتر حمیده بیگی (استادیار جغرافیا و برنامه‌ریزی شهری دانشگاه گیلان)

دکترعیسی پوررمضان (استادیار جغرافیا و برنامه ریزی روستایی دانشگاه آزاد اسلامی واحد رشت)

دکتر حمید جلالیان (دانشیارجغرافیا و برنامه‌ریزی روستایی دانشگاه خوارزمی)

دکتر علی حاجی نژاد (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه گیلان)

دکتر ساره حسینی (استادیار منابع طبیعی دانشگاه علوم کشاورزی و منابع طبیعی ساری)

دکتر سید امیرمحمد علویزاده (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه پیام نور)

دکتر زهرا عنابستانی (استادیار جغرافیا و برنامه‌ریزی شهری دانشگاه آزاد اسلامی مشهد)

دکتر علی‌اکبر عنابستانی (استاد جغرافیای انسانی و آمایش دانشگاه شهید بهشتی)

دکتردوچول کیم (استاد مدیریت محیط زیست روستایی دانشگاه اوکایاما)

دکتر علی گلی (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه شیراز)

دکتر ولی‌الله نظری (استادیار جغرافیا و برنامه‌ریزی روستایی دانشگاه فرهنگیان)

۹.۳. انواع نقل قول‌ها (مستقیم و غیر مستقیم)، نقل به مضمون و مطالب به دست آمده از منابع و مآخذ، با حروف نازک و استفاده از نشانه‌گذاری‌های مرسوم، مشخص شود و نام صاحبان آثار، تاریخ و شماره صفحات منابع و مآخذ، بلافاصله در میان پرانتز نوشته شود.

۱۰. مقالات برگرفته از رساله و پایان‌نامه دانشجویان با نام استاد راهنما، مشاوران و دانشجو به صورت توأمان و با مسؤولیت استاد راهنما منتشر می‌شود.

۱۱ . چنانچه مخارج تحقیق یا تهیه مقاله توسط مؤسسه‌ای تأمین مالی شده باشد، باید در بخش تشکر و قدردانی مشخص گردد.

۱۲ . شیوه ارزیابی مقالات: مقالات ارسالی که شرایط پذیرش را احراز کنند، برای داوران خبره در آن موضوع ارسال می‌شوند. داوران محترم، جـدای از ارزشـیابی کیفـی مقالات، راهبردهای سازنده‌ای پیشنهاد می‌کنند. پیشنهادهای داوران محترم به طور کامل، اما بدون نام و نشان داور، برای نویسنده مقاله ارسال خواهد شد.

۱۳ . مجله حق رد یا قبول و نیز ویراستاری مقالات را برای خود محفوظ می‌دارد و مقالات مسترد نمی‌گردد. اصل مقالات رد یـا انصـراف داده شـده پـس از سـه مـاه از مجموعه آرشیو مجله خارج خواهد شد و مجله پژوهش و برنامه‌ریزی روستایی هیچ مسئولیتی در این ارتباط نخواهد داشت.

۱۴ . مسؤولیت ارائه صحیح مطالب مقاله بر عهده‌ی نویسندگان مقاله است. از این‌رو، نسخه‌ای از مقاله آماده چاپ برای انجـام آخـرین تصـحیحات احتمـالی بـه نشـانی الکترونیکی نویسنده ارسال خواهد شد. چنانچه ظرف مدت یک هفته پاسخی از سوی نویسندگان واصل نگردید به معنای موافقت آنها با اصلاحات انجـام شـده تلقـی و نسبت به چاپ آن اقدام می‌شود.

۱۵. دریافت مقاله صرفاً از طریق سامانه مجله (http://jrrp.um.ac.ir) خواهد بود و مجله از پذیرش مقالات دستی یا پستی معذور خواهد بود.

۱۶. نویسندگان گرامی، مقالاتی که مطابق فرمت مجله تهیه نشده باشند به نویسنده بازگردانده شده و در فرآیند ارزیابی قرار نخواهد گرفت.

۱۷. فایل های ضروری برای ارسال از طریق سامانه عبارتند از:

الف) فایل مشخصات نویسندگان: در محیط word شامل اسامی و مشخصات نویسندگان به فارسی و انگلیسی.

ب) فایل اصلی مقاله بدون مشخصات: در محیط word شامل متن اصلی مقاله بدون اسامی و مشخصات نویسندگان.

ج) فایل چکیده مبسوط (مکمل) مقاله: شامل چکیده مبسوط فارسی در قالب یک فایل در محیط Word.

۱۸. شرایط جزئی تر و دقیق تر نیز در فایل راهنمای نگارش و ارسال مقاله توسط نویسندگان ارائه شده است.

۱۹. مقاله پس از ارزیابی علمی به زبان انگلیسی برگردانده شده و نویسنده(گان) موظف به ترجمه آن در مراکز ویراستاری معتبر خواهند بود و تا قبـل از انجـام ترجمـه، امکان ارسال گواهی پذیرش مقدور نمی‌باشد. لذا پیشنهاد می‌شود فارسی زبانان مقاله خود را به زبان فارسی تهیه و ارسال نموده و پس از طی فراینـد ارزیـابی علمـی و پذیرش نسبت به ترجمه آن اقدام شود.

فرم اشتراک (یک ساله/ دوشماره) **مجلهٔ پژوهش و برنامه‌ریزی روستایی**

این جانب .... شغل .... با ارسال فیش بانکی به مبلغ.......... ریال به حساب جاری شماره ۴۲۵۲۹۹۶۳۸ بانک تجارت شعبه دانشگاه مشهد کد ۴۲۵۰ به نام عواید اختصاصی دانشکده ادبیات و علوم انسانی، متقاضی اشتراک فصلنامه از شماره ....هستم. چنانچه صاحبان مقالات منتشر شده متقاضی دریافت مجلّه و تیراژه‌ی آن از طریق پست پیشتاز باشند، باید هزینه‌ی آن را به شماره حساب مذکور واریز و اصل فیش پرداختی را به نشانی دفتر مجلّه ارسال کنند.

نشانی: ....   کدپستی: ....

شرایط پذیرش مقاله

برای سرعت بخشیدن به امر داوری و چاپ مقالات، از همهٔ پژوهشگرانی که مایل به چاپ مقالات علمی خود در این نشریه هستند، درخواست می‌شود به نکات زیر توجه کافی داشته باشند:

۱ . مقالهٔ ارسال شده نباید قبلاً در هیچ نشریهٔ داخلی یا خارجی چاپ شده باشد. هیئت تحریریه انتظار دارد نویسندگان محترم تا هنگامی‌کـه جـواب پـذیرش از نشـریه نرسیده است، مقالهٔ خود را به مجلهٔ دیگری برای چاپ ارسال نفرمایند.

۲ . مقالات انگلیسی با قلم نازک Times New Roman11 با نرم افزار Word تهیه شود. مقالات، روی کاغذ A4 (با حاشیه از بالا ۳ و پایین ۲ و راسـت ۲ و چـپ ۲ سانتی‌متر) تایپ شود. متن به صورت دو ستونی با رعایت فاصله ۱ سانتی‌متر بین دو ستون و فواصل بین خطوط به صورت single باشد. ۳ . حجم مقاله نبایـد از حـدود ۹۵۰۰ کلمه و یا حداکثر ۱۵ صفحهٔ چاپی به قطع نشریه بیشتر باشد (با در نظر گرفتن محل جداول، اشکال، خلاصه فارسی و فهرست منابع).

۴ . عنوان مقاله با در نظر گرفتن فواصل بین کلمات نباید از ۶۰ حرف تجاوز کند و با قلم Times New Roman14 سیاه تایپ شود.

۵ . نام نویسندهٔ مقاله با قلم سیاه Times New Roman10 عنوان علمی یا شغلی او با قلم Times New Roman10 در زیر عنـوان مقالـه ذکر شـود. ضـمناً آدرس الکترونیکی و شماره تلفن نویسندهٔ مسؤول در پاورقی آورده شود.

۶ . چکیدهٔ مقاله ساختاریافته با قلم نازک Times New Roman 11 به صورت تک ستونی باشد.

۷ . شکل‌ها و نمودارهای مقاله حتماً اصل و دارای کیفیت مطلوب باشد. فایل اصلی اشکال (تحت PDF، Word،Excel) و با دقت ۳۰۰ dpi ارائه شـود. انـدازهٔ قلم‌هـا خصوصاً در مورد منحنی‌ها (legend) به گونه‌ای انتخاب شوند که پس از کوچک‌شدن مقیاس شکل برای چاپ نیز خوانا باشند.

۸ . ساختار مقاله شامل عناصر زیر است:

۸ . ۱ در صفحهٔ شناسنامه باید عنوان مقاله، نام و نام خانوادگی نویسنده (نویسندگان)، درجهٔ علمـی، نشـانی دقیـق (کـد پسـتی، تلفـن، دورنگـار و پسـت الکترونیکی)، محل انجام پژوهش، مسؤول مقاله و تاریخ ارسال) درج شود. عهده‌دار مکاتبات باید با علامت ستاره مشخص شود.

۸ . ۲ چکیده: شامل چکیده‌های فارسی ساختار یافته (شامل هدف، روش؛ یافته‌ها؛ محدودیت‌ها؛ راهکارهای عملی؛ اصالت و ارزش و واژگان کلیدی (۳ تا ۶ کلمه) است. تا حد امکان چکیدهٔ مقاله از ۳۰۰ کلمه تجاوز نکند . علاوه بر چکیده ساختار یافته، لازم است چکیدهٔ مبسوط فارسی بین ۷۵۰ تا ۱۰۰۰ کلمه نیز حـاوی مقدمـه، مبـانی نظری، روش، نتایج و بحث، نتیجه‌گیری و کلیدواژه‌های مقاله تهیه شود، به طوری که حاوی اطلاعاتی از کل مقاله باشد و بتوان جداگانه آن را چاپ کرد. با توجه به این که مقاله بعدا به صورت کامل به انگلیسی برگردانده خواهد شد، نیازی به ترجمه چکیده مبسوط به انگلیسی نیست.

۸ . ۳ مقدمه: شامل ۱–طرح مسئله؛ ۲–اهمیت و ضرورت؛ ۳–اهداف و سوالات اصلی تحقیق.

۸ . ۴ ادبیات نظری تحقیق: شامل ۱– تعاریف و مفاهیم؛ ۲–دیدگاه‌ها و مبانی نظری؛ ۳– پیشینه نظری تحقیق و ... .

۸ . ۵ روش‌شناسی تحقیق: در برگیرندهٔ ۱–محدوده و قلمرو پژوهش؛ ۲– روش تحقیق و مراحل آن (روش تحقیق، جامعهٔ آماری، روش نمونه‌گیری، حجم نمونه و روش تعیین آن، ابزار گردآوری داده‌ها و اعتبارسنجی آن‌ها)؛ ۳–سؤال‌ها و فرضیه‌ها؛ ۴– معرفی متغیرها و شاخص‌ها؛ ۵–کاربرد روش‌ها و فنون.

۸ . ۶ یافته‌های تحقیق: ارائهٔ نتایج دقیق یافته‌های مهم با رعایت اصول علمی و با استفاده از جداول و نمودارهای لازم.

۸ . ۷ بحث و نتیجه‌گیری: شامل آثار و اهمیت یافته‌های پژوهش و یافته‌های پژوهش‌های مشابه دیگر با تأکید بر مغایرت‌ها و علل آن، توضیح قابلیت تعمیم‌پذیری و کاربرد علمی یافته‌ها و ارائهٔ رهنمودهای لازم برای ادامهٔ پژوهش در ارتباط با موضوع، نتیجه‌گیری و توصیه‌ها و پیشنهادهای احتمالی.

۸ . ۸ تشکر و قدردانی: قبل از منابع مورد استفاده ارائه شود و از ذکر عناوین دکتر و مهندس خودداری شود.

۹ . نحوهٔ ارجاعات: منابع و مآخذ باید به صورت درون‌متنی و همچنین در پایان مقاله ذکر شود.

۹ . ۱ ارجاعات در متن مقاله باید به شیوهٔ داخل پرانتز (APA) نسخه ۶ باشد؛ به گونه‌ای که ابتدا نام مؤلف یا مؤلفان، سال انتشار و صفحه ذکر شود. شایان ذکر است کـه ارجاع به کارهای چاپ شده به زبان فارسی بوده و در اسامی لاتین معادل آن در زیر نویس همان صفحه ارائه شود. به عنوان نمونـه: (شـکوئی، ۱۳۸۷، ص. ۵۰) یـا (وودز، ۲۰۰۵، ص. ۲۷).

۹ . ۲ در پایان مقاله، منابع مورد استفاده در متن مقاله، به ترتیب الفبایی نام خانوادگی نویسنده بر اساس الگوی فهرست نویسی APA تنظیم گردد.

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مقالات نمودار آرای نویسندگان است و به ترتیب وصول و تصویب درج می‌شود.