Research Paper: Approaches affecting the utilization of agricultural water resources in Central Iran

Vahid Riahi[1*], Hassan Momeni[2]

1. Associate Professor of Geography and rural planning, faculty of geographical science, kharazmi university, Tehran, Iran.
2. PhD Student in rural planning and geography, kharazim university, Tehran, Iran.

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ABSTRACT

Purpose: This study aims to analyze the effective factors in the optimal utilization of agricultural water resources in rural areas of area in central Iran. Therefore, the question is, first, what is the current status of agricultural water resources in Central Iran and what approaches affect the optimal use of these resources?

Methods: The rural farmers of the Buin and Miandasht County, anconstituted the statistical population of the research, which is divided to five districts: Yeylagh, Gorji, North Kerchembo, South Kerchembo and Sardsir and were selected from several villages with pre-determined criteria.

Result: The main indicators of the study were provided from literature reviews and field studies and examined via a survey and interviews. The data were normalized in MATLAB software and analyzed by the COPRAS technique. Research maps were also drawn in ArcMap software. The findings showed that first, the county is at a good level in receiving precipitation compared to other areas of Isfahan Province. Second, Social dimension approaches are more effective in the optimal use of agricultural water resources. Third, the Sardsir district ranks first among other districts.

Conclusions: Therefore, the capacity of agricultural water resources in the northwest of the region is higher and has better conditions. Furthermore, the number of available water resources does not meet the needs of farmers with the current method of cultivation. As a result, the percentage of imported resources exceeds the region's production That It causes expanding dependence, capital loss, jobs and supply of strategic materials.

1. Introduction

Restriction of water resources is consistent with the increasing trend of demand. The rise of water requirements in agricultural and industrial sectors in recent decades has led to managing the utilization of water resources (Mihankhah et al, 2012: 251). The exponential increase of population and the

*** Corresponding Author:**
Vahid Riahi, PhD
Address: *Department of Geography & Rural Planning, Kharazmi University, Tehran, Iran.*
Tel: *+98 (912) 3002385*
E-mail: *riahi@khu.ac.ir*

evolution of human life entails more dependence on land and water. Limited water resources are, specifically, a significant challenge for developing countries. In such circumstances, the optimal use of available agricultural water resources is vital. With the advancement of technology, water extraction, primarily through wells, is increasing steadily (Saboohi and Mojarad, 2010). With an average perception of 252 mm per year, Iran is in the world dry belt. Eighty-six billion cubic meters out of about 93 billion cubic meters of annual water consumption, i.e. 92.5% of water, is used in the agriculture sector (Fal Solaiman and Chakoshi, 2011). The agricultural sector plays an essential role in Iran's economy. It represents about 11 percent of GDP, 23 percent of employment and food supply for more than 80 percent of the population (Durandish and Torabi, 2015). Rural areas and rural people primarily reflect farming (Gorlacha et al, 2008). However, these residents simultaneously contend with environmental risks and uncertainties and increasingly find themselves less able to determine their livelihoods and land use independently. Farmers in these rural regions often diminish natural resource-dependent economics (Malin and DeMaster, 2016).

Currently, of the total 600 plains in the country, more than 300 are facing water scarcity. In addition, in recent decades, the demand trend for crop products, the need for new water resources and the cost of crop production have increased in Iran. Capitalist/industrial farming obtains the means of production (land, labour, machinery and inputs) through the market (Vasconez et al, 2016). Therefore, the country's water plans have emphasized adopting new irrigation methods and managing agricultural water resources. For instance, the government suggested supporting the establishment of pressurized irrigation or drip irrigation in all operating units of the country. The economic environment and R&D (research and development) could affect agricultural activities (Vasconez et al, 2016). The issue of water scarcity is more crucial in the central provinces of Iran, which are considered to be arid regions. According to this, it is offered a productive analytical framework for understanding human-water relationships in a wide range of geographical contexts. (McLean, 2017). The Zagros Mountains in the west of Isfahan Province prevent the penetration of moisture and, consequently, rainfall. It should be noted that the impacts of climate change-induced water scarcity on health and well-being (mentality) are complex (Anwarul Abedin., 2019). Lack of surface water in the agricultural sector has led to the drilling of wells and more exploitation of groundwater resources. Many wells and even unauthorized groundwater levels are severely reduced. Although the county of Buin and Miandasht benefits from an adequate annual precipitation Fig. 1, the water crisis is one of the major problems for rural farming households. There is a substantial scope to connect human-water relations to this literature (McLean, 2017). Preliminary studies (Riahi and Momeni., 2015) showed that low water productivity factors are lack of modern irrigation systems, investment, mechanized agriculture, and proper management of agricultural water resources. The present study emphasizes factors affecting the optimal use of water resources.

2. Literature Review

Since a rural area is a socio-economic resource (Naumann and Rudolph, 2020), there's a series of effective approaches to optimizing water resources. The current research is presented in accordance with both economic and social dimensions. Concerning this, six approaches were identified to have great importance. The three approaches are stability, security and satisfaction of the economic dimension subgroups, and the three approaches of justice, trust and welfare are subgroups of the social dimension. First, three subgroups are described from an economic point of view:

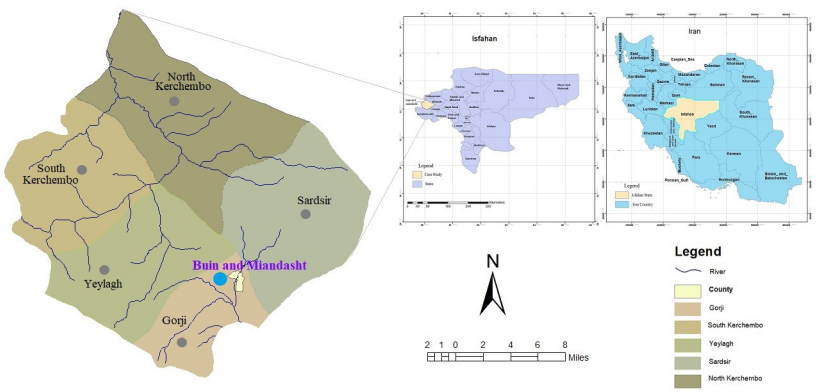

Figure 1. Map of the study area

Effective approaches to optimizing water resources

1) Stability Approach: Economic reliance on agriculture and natural resource extraction increases vulnerability to certain (Prelog and Miller, 2013). Households that relied less on the farm for overall income earning tended to invest little in sustainable practices to enhance farm productivity and resource use efficiency (Mutoko et al, 2014). Resilience can be viewed as a defence mechanism which enables people to thrive against the problems (Mortazavi and Yarolahi, 2015). Making farming an efficient activity would minimize wastage of scarce farm resources and make farming more competitive and remunerative (Mutoko et al, 2014). In this regard, the role of time and information about the issue of optimizing the use of agricultural water resources is relatively broad. In general, the relationship between time and cost is related to the same direction; therefore, the less time consumed, the lower the costs. Sufficient and relevant information is also an important factor in the optimal utilization of agricultural water resources, which is intertwined with the time factor. In the form of time, knowledge and information are created from practical actions.

2) Security Approach: The factor of preserving and balancing the ecosystem. Farmers deal with essential resources such as water, soil and genetic pools, which have an ecological or environmental function (Collection of articles on agricultural utilization systems, 2003: 4). This factor is based on three basic principles of sustainable development: territorialism, pluralism, and stability. They form the fundamental components of a stable system (Ebrahimpour et al, 2003). In this regard, Shokouei emphasizes providing ecological balances. Similarly, he states that more attention should be paid to population growth, industrial development, technology constraints, and restraining the destruction of vital resources (ecosystem) (Shokouei, 2004: 104). From the perspective of traditional conservatives, the development of private property is the best way to protect the nature and environment, in which excessive destruction and exploitation are prevented. Liberalism proponents argue that if natural resources run out of supply, shortages will increase, and commodity prices will rise, so rising prices will moderate the consumption of these resources. However, in welfare liberalism, policies, law, technology, environmental management (cost-benefit analysis), and tax reform guarantee environmental goals (ibid) and promote sustainability and nature protection.

3) Satisfaction Approach: In geographical studies of the mass production era (Fordism) and flexible accumulation regimes, a stream is created in the process of work, production, labour market and consumption pattern (Shokouei, 2014: 139). A Household's ability to diversify into a high return sector depends on the antecedent level of resources and assets: both tangible and intangible (Gautam and Andersen, 2016). In this stream (approach), some stimuli are significant, such as creating food industries (conversion), mineral resources, and trade. Fulfilling the sub-criteria of the drivers causes an increase in productivity and a favorable situation of competitiveness (Dadashpour and Dadejani, 2015). And this leads to the emergence of local economies, so in the long run, these economic incentives (interest or profits from the promotion of production) cause capital movement and capital markets to be pushed to the region (Nili, 1393: 155). In some cases, power is shared by market actors and the state, while in others, between market actors and the community (Grivins, 2016). This is the emerging use of assemblage thinking in this area (McLean, 2017); market-oriented strategies like neoliberal austerity policy or a Keynesian approach have not yielded the expected positive results (Wirth, 2016). For these reasons, Re-localizing food distribution is expected to geographically concentrate social and economic capital toward beneficial values to both consumers and producers (Brinkley, 2017).

Three social dimension approaches are as follows: 4) Justice Approach: Rural areas are uniquely vulnerable to various hazards given their social and economical combination (Prelog and Miller, 2013). Even in highly developed and densely populated countries, such regions and settlements are scarred by economic decline and demographic shrinking (Wirth, 2016), which is the most important obstacle to the development of land consolidation in the rural areas. However, the lack of support of government agencies and organizations, infrastructural weaknesses, individual factors, lack of creativity, lack of intellectual participation and trust, lack of management and production practices, lack of knowledge and awareness, and lack of access to communication facilities in rural areas are important constraints on land consolidation in the rural areas (Hadipour et al, 2019). In the ideology of the critical science pioneers, science and technology is recognized as a force for social control (Shokouei, 2014: 124). Radical-socialist geographers believed more in the ability of technology and its place in increasing the amount of food. From the perspective of technological determinism in geography, the emphasis is on technology as a determining factor. A technology change creates specific changes in geo-

graphical space. The changes in the geographical area have affected places at local and regional levels, which are the result of innovation, and the power of that (ibid) accelerates social justice.

5) Trust approach: trust is created through participation. So, co-evolution has been introduced as an analytical category for such interconnectivity (Aarset and Jakobsen, 2015). One of the most useful frameworks is the theory of planned behavior (TPB) model, which is being increasingly applied in a broad range of fields (Rezaei et al., 2018). In addition, collaborative approaches to governance that engage diverse mixes of state and non-state actors, including farmers, are increasingly important. Even though participation must be vital, farmers' collaborative action due to the nature of farming is difficult and requires a great deal of consideration. It would be easier for the collaborative water governance process (de Loe et al, 2015). Shokouei mentions Spain, where the agricultural land exploitation in rural areas was a way of self-sufficiency. The exchange of products with the neighboring villages improved the quality of production and distribution. The transportation network changed, and the discrepancies became similar. Small plots of land were merged, and the construction of an irrigation network, the digging of water wells, sending water to arid areas, cultivation of diverse crops, and strong social ties in the sharing of interests gave a whole new face to villages. As a result, the harvest of crops increased five-fold in a short period of time (Shokouei, 2005: 252). Thus, achieving a reasonable understanding of the relationship between individuals and setting boundaries for social communication in rural communities creates trust.

6) Welfare Approach: according to the economic aspect of agriculture, the farmer's family and people working on the farm depend on the production, so it has a social function (Collection of articles on agricultural exploitation systems, 2003: 4). In the welfare approach, David Smith (1977) uses the indicators to realize welfare. David Harvey (1970) also uses the concept of contributing to the common good, the criterion for distributing income in places, the equitable allocation of resources, and meeting the basic needs (Shokouei, 2014: 141), a combined theoretical and interdisciplinary approach, is alternative development theory with an emphasis on the theory of sustainable human development (Ebrahimpour et al, 2003: 482). On the other hand, as mentioned about the effect of technology utility on mass production, the GDP (GDP) has increased. However, has the same GDP growth raised the HDI (human development index)? Therefore, in investigating human welfare and well-being, we should be cautious about using production statistics and improving human welfare should also be the basis for action (Stanford, 2013). The accumulation of human capital is widely recognized as a crucial prerequisite for decreasing the cost (Song et al, 2016). In this context, negative quantitative growth strategies like "Slow City and Life Beyond Growth", which focus on the quality of life, well-being and deceleration, could be a viable alternative (Wirth et al, 2016). In axes of social difference, just like places, some residents will be made poorer and excluded (Wheeler and Loch, 2018). Analyzing the local impacts of mobile populations requires understanding the macro factors (Carson and Carson, 2014). It should be kept in mind that the number of people residing in rural areas has declined, and the urban population has increased (Anderssona et al., 2018). Keeping links with the city is therefore presumably essential for the majority of those who choose to live in the countryside (ibid).

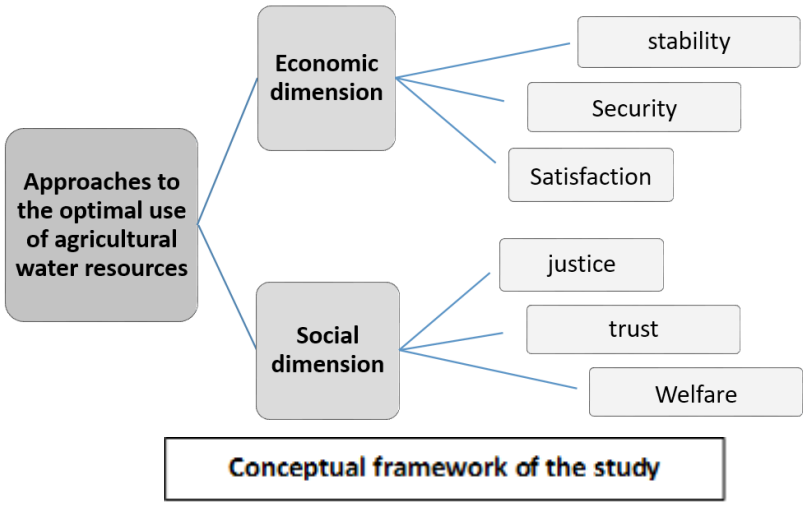

Figure 2. Approaches to the optimal use of agricultural water resources

Area of study

Buin Miandasht County is located in the west of Isfahan Province, 185 km away from the centre of the province. The area of this city is about 1000 square kilometers and its height is 2435 meters above sea level. The county is located at 63.50 degrees east (longitude) and 72.33 degrees north (latitude). The county was identified as a county in political divisions in 2013. It totally comprises 46 villages. (Statistics Center of Iran, 2011). The main occupation of the residents is agriculture, and the amount of inflow of water resources into this county is estimated at 330 million cubic meters per year. Statistics Environmental conditions This geographic zone was separated from Fereydan County of Isfahan province and became a new county not yet Relatively unavailable or does not exist separately. Thus, based on studies conducted on the climatic condition of Isfahan Province, two areas show a more appropriate level of precipitation than other areas of the province. On the other hand, studies of annual precipitation in Isfahan Province show that the western part of Buin and Miandasht county has a privileged position in the amount of yearly precipitation among other areas. The average precipitation is estimated at 350 mm per year Fig. 3, which has a higher amount than the average annual precipitation in the country.

3. Methodology

The present research method is descriptive-analytic and exploratory in terms of nature. In the first step, general research data were collected from various sources in the literature. After forming the theoretical foundations of the research, it became the basis for the field study, which was carried out meticulously in the area. Data collection is divided into four categories: The first is libraries and documents. The second category of official and special data is obtained from decision-making centers such as public organizations and data production centers like the Statistics Center of Iran. The third is the residents of the study area, in which the required data were collected through interviews and questionnaires, and finally, the fourth group of data collection was obtained through objective field observations. The present study examined and compared 28 effective indicators in the optimal utilization of agricultural water resources of the city and finally evaluated them. Among these, nine indicators were prepared through the questionnaire. Recognizing the large population, numerous villages and access limitations, we selected a village in each county as a sample. Five sample villages were selected according to particular characteristics: 1- Proper distribution of sample villages in the city is the most important feature of the criteria for selecting villages in the counties. 2- The population size of the sample villages is about 350 to 550 households for each village.Although there are always exceptions. 3- Selecting sample villages from different zone types of plain, coast, mountain, foothill. Buin and Miandasht County consist of five districts named Yeylagh, Gorji, North Kerchembo, South Kerchembo and Sardsir. Research analysis was done on the county districts, which are shown in Table 1.

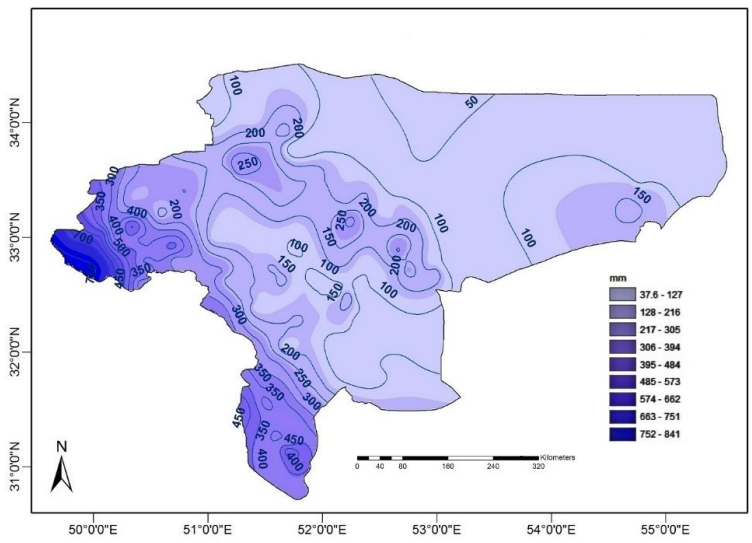

Figure 3. Precipitation map in different areas of Isfahan Province (millimeters). Source: Isfahan Meteorological Department

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Table 1. Rural divisions in Buin and Miandasht

District	Gorji	Yeylagh	Sardsir	South Kerchembo	North Kerchembo
Center section	Afoos	Aznaveleh	Ghareh Boltagh	Boltagh	Karch
County Buin and Miandasht	Buin and Miandasht Afoos Sheshjavan Dashksen	Aznaveleh Ghaem Abad Aghcheh Aghagol Zarneh Hezar jarib Haj Fat hali Tang bid Mahoorestan Sofla Mahoorestan Olya Ghaleh Khajeh Magander	Ghareh Boltagh Mir Abad Marber Masoom Abad Hedan Khalili Deh Rajab Artijan Hossein Abad Jozar Mayandeh Ahmad Abad	Boltagh Ghaleh Ekhlas Dareh Hoz Tirkart Dareh Sari Mahoorak Bagh Madi Khalat Pooshan	Karch Batiljeh Hendookosh Tokhmaloo Dareh Sookhteh Halaghereh Noghan Sofla Noghan Olya Ghaleh Bahman Bastiyan

Source: Ministry of Agriculture-Jahad, 2018.

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Statistical methods

The sample size includes rural residents of Buin and Miandasht county, obtained from 20720 individuals by the modified Cochran method (including 20% of residents), and 35% of the samples were questioned. Finally, 110 questionnaires were used. The characteristics of statistical samples are given in Table 3. The research samples were collected by a random sampling method Table 2.

According to the COPRAS technique (combined relative evaluation), ranking and comparing the level of difference of effective research indicators for each county district was examined. Based on this technique, the required information was first obtained through the opinions of the experts and villagers in the study area, and a decision matrix was prepared. The significance of the criteria should be calculated through value-setting models such as AHP or ANP. Normalization of effective indicators in the research was done with MATLAB application software. There is no need to standardize the indicators with this method. After calculating the total values of each county district, the range of positive and negative values of indicators is obtained. Then, the sum of the alternatives is calculated. Finally, the rank of each indicator was calculated using the following formula (Adopted from Afrakhteh, 2015).

4. Findings

After normalizing the indices and replacing them in the table below, the sum of the rows of indices in all the studied samples has been obtained. Then it is analyzed by the combined relative evaluation technique. Note that the asterisk[*] next to the number of each indicator is considered a negative indicator.

Quantitative results

Indicators used in practical approaches to the exploitation of agricultural water resources in the studied samples from the center of Iran have currents that need to be examined more closely. Based on this, the movement flow of the indicators in Fig. 4 is plotted. According to it, the movement of indicators is variable which has several reasons. Therefore, there are three characteristics with the titles: differences (differentiation), alignment (trend) and focal points (focus) in the chart that can be examined, and all three are mentioned below.

Table 2. Features of statistical samples

Metrics	Age	Gender	Education	Marital status	Job	Place
Maximum	25- 45	Male	Less than diploma	Married	Agriculture	Village

Source: Research Findings, 2018

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Table 3. Operationalization

Row	Dimension	Approaches	Indicators	Place and method of collection
1	Economic dimension	stability	Average water consumption in agriculture (per capita consumption) *	Ministry of Agriculture-Jahad
2			Average water inflow to the district in comparision with all county	Ministry of Agriculture-Jahad
3			Extraction and operation of water wells	Ministry of Agriculture-Jahad
4			The total number of wells in the district	Ministry of Agriculture-Jahad 2015
5			The amount of users in each district in comparison with all county	Ministry of Agriculture-Jahad
6		Security	The rate of agriculture sector employment or to all economic actors	questionnaire
7			The amount of irrigated cultivation area	Ministry of Agriculture-Jahad
8			The amount of dry farming area	Ministry of Agriculture-Jahad
9			The amount of families owning agricultural land	questionnaire
10			Production rate of organic or natural products	questionnaire
11		satisfaction	Rural migration rate	Interviews and direct observations
12			Percentage of satisfaction with agricultural jobs in the district	questionnaire
13			The amount of satisfaction with long-term contract for crops	questionnaire
14			Income satisfaction rate	questionnaire
15	Social dimension	Justice	The amount of small-scale plots of land m400 ≤	Interviews and direct observations
16			The rate of use of natural water resources	questionnaire
17			The amount of cultivation area in each district	Ministry of Agriculture-Jahad
18			Medium wasted water resources in the district	Interviews and direct observations
19			Ratio of water consumption with or without charge in the district	Interviews and direct observations
20		trust	The number of unauthorized and inactive wells in the district	Ministry of Agriculture-Jahad
21			The number of water-use license in a year	Ministry of Agriculture-Jahad
22			The amount of participation in agricultural activities	Interviews and direct observations
23			The rate of agricultural machinery use	questionnaire
24		Welfare	Distance of water resources to user units (per capita)	Interviews and direct observations
25			The amount of processing and complementary Industries	questionnaire
26			The amount of modern and up-to-date irrigation equipment	Interviews and direct observations
27			Desirability of water transmission canals in the county	Interviews and direct observations
28			The amount of product loss due to traditional operation	Interviews and direct observations

Source: Research Findings, 2018 *(Numbers are in cubic meters)

Table 4. Normalized effective indicators

District Row	Yeylagh	Sardsir	Gorji	North Kerchembo	South Kerchembo	Total
1*	1/0000	0/9375	0/6875	0/8750	0/8750	4/375
2	0/7000	0/7000	0/6000	0/7500	0/8500	3/6
3*	0/8500	0/8000	0/9000	0/7500	0/7000	4
4*	0/5500	0/5000	0/4500	0/3000	0/2500	2/05
5	1/0000	0/7590	0/1407	0/6542	0/5400	3/10
6	1/0000	0/7355	0/1417	0/6550	0/5411	3/6
7	0/8000	8500/0	0/8000	0/8000	0/8500	4/10
8	0/2000	0/1500	0/2000	0/2000	0/1500	0/90
9	0/7000	0/7500	0/8000	0/6500	0/8000	3/6
10	0/3500	0/3500	0/2000	0/6000	0/7000	2/2
11	0/7000	0/8000	0/6000	0/5000	0/5500	3/15
12*	0/5500	0/5500	0/5500	0/5500	0/5500	2/75
13	0/3500	0/3500	0/2000	0/6000	0/7000	2/10
14*	0/2000	0/1500	0/1000	0/0500	0/0200	0/47
15	0/0100	0/0100	0/0000	0/0000	0/0000	0/02
16	0/8000	0/8000	0/8000	0/7000	0/7000	3/7
17	0/8333	0/8333	0/6667	0/8333	1/0000	4/16
18	0/4000	0/3500	0/4000	0/1000	0/1000	1/35
19	0/7500	0/7500	0/7000	0/7000	0/7000	3/60
20	0/6500	0/6500	0/6700	0/6000	0/6000	3/17
21	0/2000	0/2000	0/2000	0/3000	0/3000	1/20
22	0/8000	0/8000	0/6500	0/8500	0/8500	3/90
23	0/3500	0/3500	0/2500	0/3000	0/3500	1/60
24*	0/8000	0/7500	0/8500	0/9000	0/8000	4/10
25	0/6500	0/7000	0/6000	0/6000	0/7000	3/35
26	0/7500	0/7500	0/7500	0/6500	0/7000	3/60
27	0/5500	0/6000	0/5000	0/5000	0/6000	2/65
28	0/6000	0/6000	0/6000	0/6000	0/6000	3

Source: Research Findings, 2018

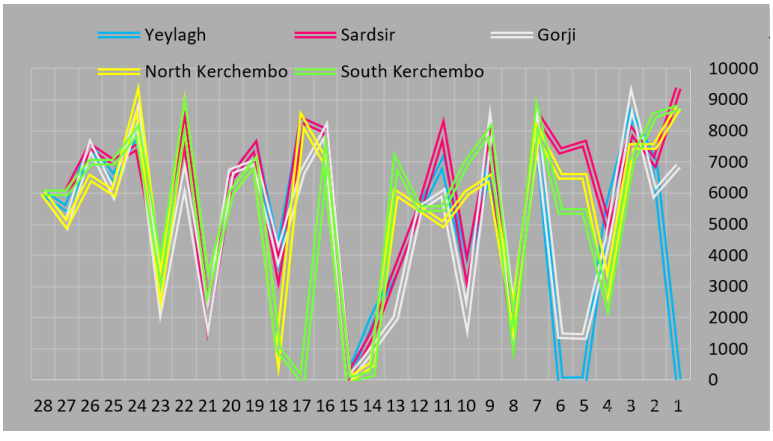

Figure 2. Total maps of the maximum value in each district

Qualitative results

According to the three characteristics of the flow of indicators in the chart, it can be said that in the field of differences (distinction), indicators number: 1, 5, 6 and 17 have this feature. Indicators: 4, 9, 16, 20, 22 and 24 also have the feature of alignment (trend), and also the feature of foci (focus) can be seen in the indicators: 7, 8, 15 and to some extent in 23 and 28. The reasons for this incident stem from the following factors:

1- Indices with differences include: per capita consumption of agricultural water, rate of exploiters, agricultural employment rate and distances of agriculture water resources depending on factors such as agricultural area, geomorphology of the area, resident population, temperature, evaporation and slope. That there is a difference between them makes perfect sense.

2- In examining the characteristics of alignment, there are indicators such as the number of water wells, amount of land plots, utilization of machinery, water transmission lines, landowner families and migration rate. It is effective in all the above indicators. Therefore, the alignment is in accordance with these reasons.

3- Finally, the characteristics of centralized centres such as irrigated cultivation area, rainfed cultivation area, licenses granted, production of organic products and participation rate, even though the data have been obtained from various sources. In this feature, the motion of the flow is completely concentrated on the common points because the unit of measurement is estimated as a percentage. And the residents follow the same approaches. That is, when the amount of rainfall is appropriate in the area, the volume of water entering the area increases. The approach of the villagers is rain-fed cultivation. And when the inflow of water decreases, the use of water resources in the wells increases. On the other hand, the beliefs of the local people in different matters are almost the same, and as a result, their participation is centralized and the same. Also, in granting permits to the villagers to exploit water resources, as stated, a fair approach is established among the people of the whole area.

In Table 5, the sum of negative values and the sum of positive values were extracted and calculated. Then the sum of the values of the negative indicators was divided by each on of them and its sum is obtained.

After calculating the negative and positive values of the items in each of the study areas, ranking was done based on the score in the effective research indicators, which is illustrated in Table 6.

The higher the score of each county district, the higher its ranking ratio will be. Since social factors have a high rate in Sardsir District of Buin and Miandasht county, the social dimension plays an effective role in the score and not natural factors. Therefore, according to the results of the COPRAS technique, Sardsir District has the highest score in the optimal utilization of agricultural water resources in Buin and Miandasht County, and Yeylagh, North Kerchenbo, South Kerchembo and finally Gorji Districts are in the order of rankings, respectively. A noticeable point is the Gorgi District score regarding the fact that the county's center is located in this district. The reason can be: 1. The small number of villages in this district 2. Employment in other sectors such as employment in services and industry. 3- Low use of surface water resources, especially permanent rivers, etc.

Table 5. Calculate the value of the items in each place

Total	Yeylagh	Sardsir	Gorji	N.Kerchembo	S.Kerchembo	Places Metrics
58/24	12/31	12/80	8/38	12/05	12/25	Sj+
17/81	3/95	3/70	3/53	3/43	3/20	Sj-
-	4/508	4/813	5/042	5/192	5/562	N/Sj-

Source: Research Findings, 2018

Table 6. Ranking based on the score in effective indicators

Places	Yeylagh	Sardsir	Gorji	N.Kerchembo	S.Kerchembo
Score	16/26	16/50	11/91	15/48	15/42
Rating	2	1	5	3	4

Source: Research Findings, 2018

5. Discussion

A mean comparison is taken from the economic and social dimensions of the study to determine the score of each district in these dimensions and for all indicators. In the social dimension, Sardsir District has the highest score because the criteria have a high degree in the proportions and relations of the residents of the district. Furthermore, the interactions among the people and even the officials show a good amount of participation and cooperation. In the economic dimension, South Kerchembo has acceptable conditions in supplying agricultural water resources with a suitable natural situation. Therefore, this district has the highest degree in the economic dimension. Evaluation of the water-resources potential for agriculture in rural areas of the county: Drawing the possibility of water resources according to the amount of input of agricultural water resources in different districts of Buin and Miandasht County and the distribution of rural areas is checked out. The area is divided into four equal parts, and each geographical direction into three parts, which is twelve parts in the county. Then, each part was evaluated based on the potential of agricultural water resources. Water resource potential is capable and present in all parts of the county. However, they have a different amounts. Based on natural and environmental conditions, it has additional capabilities. Depending on the amount of rainfall, the formation of watersheds, and the storage and conservation of surface and underground water, the county has a special place. In this regard, the northwest has the highest volume of water inflow. There are 46 villages in the county, which have a great density in both Yeylagh and Sardsir. Also, none of the districts is entirely in one geographical direction. According to the division of the region into four geographical directions, each district is divided into two or three geographical directions. Some rural areas are also located on the county borderline. And the northwestern side of Buin and Miandasht County, which had the most significant potential for agricultural water resources, has environmental phenomena. Therefore, it benefits from attracting tourists, most of whom are from large cities such as Aligudarz.The current level of farm use does not bring the desired profitability for farmers. Despite the relative use of water resources in the area, the villagers still complain about the water shortage problem. The amount of water resources is different among the different placements of rural settlements in the study area. There are abundant water resources in the mountain area, but plain and rangeland areas use underground water resources (wells) in agriculture, and now permissions for good construction are not given to any actual or legal applicants. According to the people's opinion, granting well licenses belongs to the agricultural sector. Therefore, the construction of illegal wells is almost zero. It can be said that management and planning have not been effective in the economic development of the residents because the lack of job dissatisfaction and youth migration is very high, and household income per capita does not fit for savings. The best solution in this watershed is to diversify its economy. The environmental capacity and potential of the area are high, so the same amount of water resources can accelerate the development process. The analysis of the combination of indicators shows a significant relationship between water resources and environmental benefits (space economy).

The type of cultivation should be changed according to the region's conditions. According to the regional conditions, a new cultivation pattern is possible by building a new culture. Suppose 10 hectares were cultivated in the past and today 100 hectares are cultivated. In that case, it will probably not be possible to cultivate even 1 hectare in the future due to eroding resources and reducing water. The appropriate use is the optimal and continuous use of resources. In recent years, the area under cultivation of the entire province has decreased (with a decrease in water resources), which results in poor livelihoods, reduced soil protection, agricultural and food dependence, etc. 25% decrease in the total cultivated area of the province (about 100,000 hectares out of 400,000 hectares of cultivated area are generally not cultivated) the quality has also decreased in some areas (water salinization). The depth of reaching the aquifer has increased, for example, a 7000-hectare area of rice cultivation in the Zayandehrud River basin. According to the officials, it is not adequate to continue at all. Moreover, it should be replaced with developmental and incentive strategies.

If the cultivation pattern of the area does not change, it will have some consequences because the pace of resource use is generally much faster than population growth. Furthermore, the number of available water resources does not meet the needs of farmers with the current method of cultivation. As a result, the percentage of imported resources exceeds the region's production. It causes expanding dependence, capital loss, jobs and supply of strategic materials. The cultivation of fruits such as cucumbers, melons, and watermelons needs water. They are exported to countries, especially those around the Persian Gulf, which export water at a low price.

On the other hand, strategic products like wheat, soybeans and oilseeds are imported. In this case, the country will probably need to import water in the future. The

country is located in the world's low rainfall regions, and the necessary measures should be taken to prevent water wastage. One of these solutions is to prevent the evaporation of water resources by different methods, such as the type of irrigation, the timing of crop irrigation, the kind of water canals, the covering of stagnant water levels, etc. Estimating the growing population's needs for agricultural land and the provision of food for this ever-increasing population are probably the greatest struggles of the present century. The agricultural sector plays a vital role in the county's economy, about 11 percent of GDP, 23 percent of employment and food for more than 80 percent of the population. Water has a decisive role as the most important factor in production. Due to the importance of groundwater resources, the preservation and reconstruction of groundwater aquifers and increasing farmers' awareness about the importance of groundwater are suggested.

Additionally, in plans and projects, the region's high potential to attract tourists should be considered. An appropriate pattern of the results for farmers is to increase environmental interest and efficiency of agricultural products. This will lead to maintenance of the sustainability and its continuity in the future, especially for rural settlements. As a result, the relative welfare of the villagers and the country's security by relying on domestic products and self-sufficiency will be achieved.

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Conflict of Interest

The authors declared no conflicts of interest.

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Research Paper: Prospects of critical impacts of sustainable employment on rural sustainability (Case study: Dibaj Rural District - Dargaz county)

Reihaneh Soltani Moqadas[1*], Fazlolah Esmaeili[2]

1. Associate Professor, Department of Geography, Payam Noor University, Tehran, Iran.
2. Assistant Professor, Department of Geography, Payam Noor University, Tehran, Iran.

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ABSTRACT

Purpose: In recent years, economic hardships and the migration of rural youth have focused on sustainable employment. In this regard, sustainable employment can play an important role in stabilizing and sustaining the rural population because entrepreneurship and job creation of young people strengthen the sense of spatial belonging and rural sustainability. The present study investigates the role of sustainable employment in rural sustainability in the villages of Dibaj rural district of Dargaz city.

Methods: According to the studies and research literature and considerin environmental conditions of the study area, the indicators of the effects of sustainable employment in social, economic and spatial dimensions have been studied, and Entropy and MABAK methods have been used to analyze the research data.

Results: The study of analytical models shows that entrepreneurship and economic diversification are the most prominent effects of creating sustainable employment in this rural area.

Conclusion: Sustainable employment is considered a tool to reinforce rural sustainability. So, encouragement of rural investments inevitably affects the rural economy and population stability.

1. Introduction

Efficient use of rural space is one of the goals of sustainable rural development. In a way, the multi-functionality of the rural economy and the creation of new job opportunities in rural settlements can create a new spatial identity for rural areas and lead to the evolution of rural space (Duan et al.,2021).On the other hand, creating new markets and businesses and new economic structures leads to the reconstruction and production of rural space, which is one of the requirements of rural sustainability (Rosenqvist,2021). Thus, the production of space is affected by the dynamics of

*** Corresponding Author:**
Reihaneh Soltani Moqadas, PhD
Address: *Department of Geography,Payam Noor University,Tehran,Iran.*
Tel: *+98 (939) 5118405*
E-mail: *r.soltani@pnu.ac.ir*

power and economic structures(Panzer-Krause,2021).A village is always a place of production, and the economy based on the production is a prominent feature of the village. Various occupations, including animal husbandry, cause people to stay in the village (Pourghayumi, Eftekhari & Taheri, 2021). In this regard, the production space effectively explains the reciprocal relations in rural areas and can determine the totality and sustainability of the village (Hu et al., 2021). On the other hand, Helfkari (2006) in the reconstruction of rural space emphasizes on strengthening the location of the village, the physical-spatial manifestation of the village and rural livelihood, which rural livelihood is closely related to creating sustainable employment. In the late 1980s, a booming market economy boosted rural economic productivity and increased farmers' incomes (Tao,2021). Thus, the boom in the employment market plays a role in positive change in rural settlements. On the other hand, rural areas due to having various functions such as providing food and raw materials, protecting resources and natural landscapes,

Creating productive job opportunities and realizing an oil-independent economy play an important role in the prosperity of the economy (Keshavarz, 2017). In this regard, rural entrepreneurial currents, the formation of micro-enterprises, and entrepreneurs' roles can cause spatial-spatial changes (Moradi et al., 2019).

On the other hand, employment expansion has an influential role in stabilizing rural areas. Sustainable employment is one of the principles of a resistance economy. One of the very helpful issues in the direction of a resistance economy is a stable job in the community. The endurance of households is directly related to their income from their work and occupation (Jamali and Jaberi,2015). Also, sustainable employment in many villages is vital to increasing the viability of rural settlements (Khorasani and Rezvani, 2013). Because job creation effectively reduces rural poverty (Alafar,1996), creating sustainable employment can reduce various social and economic inequalities. In this regard, border areas are among the regions where unemployment rises at some local levels, leading to migration to large cities. Therefore, the rural population of this region has decreased about 3.3%; from 21.700.000 in 2010 to 20466000 in 2016. In addition, a study of migration flows during the years 1390-1396 shows that 78% of migration was from villages and small towns to large cities. One of the main reasons for this migration pattern is the lack of employment opportunities in rural areas and the rising youth unemployment rate in rural areas; the lack of attention to local levels in planning and ignoring the capabilities of the regions has caused the gap and imbalance to increase (Taqvaei & Salehi, 2013).

On the other hand, the youth unemployment rate has increased from 18.8% in 2011 to 22% in 2016 (Statistics Center of Iran, 2016). Therefore, sustainable rural employment to solve rural problems has been the focus of decision-makers. Accordingly, the Cabinet of Ministers, in the meeting of 2017 at the proposal of the Program and Budget Organization and cooperation with the Ministry of Cooperatives, Labor and Social Welfare and the Deputy Minister of Rural Development and Deprived Areas of the country, approved a law. Thereby supporting the development and creation of sustainable employment in rural and nomadic areas using the resources of the National Development Fund was intended (www.daraian.com). Because paying attention to local capabilities and sustainable employment is an undeniable necessity (Ghadermazi, 2015).

This study aimed to investigate the situation of sustainable employment in the Lotfabad sector of Dargaz county in three social, economic and spatial fields.

2. Literature Review

Many studies on creating sustainable employment in rural areas indicate the impact of sustainable employment on population stabilization and retention of the active rural population. According to the studies of Meng & Zhao (2019), in the rural area of Zhejiang city, the lack of job opportunities in rural areas has been the cause of the formation of a permanent population flow to the city. Accordingly, in his study, Chen (2018) concluded that the expansion of job opportunities in rural areas had reduced the gap between towns and villages in large Chinese cities. Because according to comprehensive studies (2017), employment has a key role in attracting immigrants and expanding the rural population. Based on Islam (2011), countries can develop sustainable employment if they generate more sustainable investment sources. The research of Heydari Mokarrar, Nadrianfar, Nadrianfar & Shahraki (2012) is in line with these results. They have considered self-sufficiency and job creation projects to improve rural life. They can generate more sustainable sources of investment. In confirmation of these studies, Ghanbari, Nouri & Ghafourzadeh (2016) have also pointed to the effective role of the Committee of Emdad in developing sustainable employment in rural areas.

On the other hand, according to the study by Ebrahimi et al. (2014), creating rural employment can cause urban and rural population balance; because employment

is one of the main factors in the stability and order of the villages. Further, it creates new opportunities for the villagers to increase their income and capital. Also, it improves the living standards of rural communities by creating new institutions and small and medium-sized businesses. In this regard, sustainable employment means that a person has job security and works continuously. According to Ghadermazi studies(2015), sustainable employment provides opportunities for further development and income in rural areas and stabilizes the population.

Capacity building for sustainable employment is one of the policies of sustainable development. Because employment and unemployment are among the most critical issues, they should be considered the first condition for achieving economic growth and development (Sepehrdoost & Barouti, 2017). Unemployment is one of the biggest problems that upset the financial balance of society and causes various crises in the social, economic, cultural and political spheres of society (Jamshidi et al.,2017).In the book entitled:" Wealth of Nations", Adam Smith states that every nation wants to specialize in a type of production that is naturally more talented by implementing the basic principle of division of labour (Jafari, Samimi &Taghavi,2008). Therefore, if the factors affecting the economic growth of the regions are identified, it is possible to improve the level of policies related to the areas and make the right and informed decision-making for national and local policymakers (Sadeghi Shahdani & Ghaffari-Fard, 2009). Economic development requires paying attention to local needs, recognizing the strengths and weaknesses of regions, invigorating rural economic potential, and eliminating investment challenges and constraints at the regional level (Todaro,1999). Also, the solution to the problem of urban unemployment is to improve employment in rural areas (Alizadeh,1999). Then, Promoting resilience and adaptation to changes and environmental crises and reducing the risk level among local communities enable community development to continue in the face of environmental threats constantly and sustainably(Azimi et al.,2020). One of the most important policy tools is employment-oriented industrial development, which provides the need for people's participation in production and the economy (Rabiee & Mansouri, 2016). So, sustainable employment emphasizes equitable growth, employment, and poverty reduction, which are approved as a critical component of policy-making and even the goal of socio-economic programs. In this regard, models such as micro-finance, local economic development, and business cluster development are mentioned due to locally designed and implemented methods. One of the common problems of these models is their focus on the geographical, local and social characteristics of the target socio-economic systems, independent of macroeconomic and political currents. The Millennium Development Goals were based on developing employment and employment programs based on their indigenous capacities and led to a more flexible approach to economic policy-making (Rabiee& Mansouri, 2017). According to De Rosa et al.(2019), economic diversification in various agricultural activities increases job opportunities and sustainable employment in rural areas and prevents rural migration.

It is worth noting that employment is the last link in production. If investment and output are not made, employment will not be created. It is necessary to develop employment and remove barriers and challenges facing production and investment, including lack of financial resources, infrastructure facilities, and socio-cultural barriers (Ziaee & Bigdeli, 2003; Karimi, 2014). Therefore, in employment development, it is necessary to develop jobs while increasing the level of employment in communities, are compatible with geographical features and strengthen the sense of spatial belonging.

3. Methodology

The research method used in this research is descriptive-analytical research. The data collection tool is a questionnaire, and the scale for measuring the indicators used is sequential. Cronbach Alpha has been adopted to measure reliability, estimated at 0.77, which is appropriate. Entropy and MABAC methods have been used to analyze the data. The entropy method has been used to weight items and indicators. Entropy expresses the amount of uncertainty in a continuous probability distribution. The basic idea of this method is that the higher the scatter in the values of an index, the more important that index is. In a matrix, decisions are made with m options and n criteria for weighting the variables. The MABAC method has also been used to rank items and villages. It is one of the multi-criteria decision-making methods presented by Pakumar and Sirovik.

This method aims to rank the options in a multi-criteria decision model. The steps of this method are given below. Step 1: Form the initial decision matrix (X) Step 2: Normalize the initial decision matrix elements (N). Because the type of each of the criteria may be different, in the second step, the decision matrix is normalized to neutralize the effect of the different scales of the criteria. In order to do this and according to the gender of each criterion, Equation 4 is used to normalize the positive

criteria, and Equation 5 is used to normalize the negative criteria. The normal decision matrix is denoted by N.

$$N = \begin{bmatrix} n_{11} & \cdots & n_{1n} \\ \vdots & \ddots & \vdots \\ n_{m1} & \cdots & n_{mn} \end{bmatrix}$$

The values of the normalized matrix N are calculated using the following equations:

$$n_{ij} = \frac{x_{ij} - x_i^-}{x_i^+ - x_i^-}$$

$$w_j = \frac{x_{ij} - x_i^+}{x_i^- - x_i^+}$$

Step 3: Formation of a normal rhythmic matrix (V); Step 4: Specify the area estimate boundary matrix (G) ; Step 5: Calculate the distance of the options from the area estimation boundary (Q). The distance of the options from the area estimation boundary is determined according to the relationship equal to 8 times the difference between the weighted matrix elements (V) and the value of the area estimation boundary

$$Q = V - G = \begin{bmatrix} v_{11} & \cdots & v_{1n} \\ \vdots & \ddots & \vdots \\ v_{m1} & \cdots & v_{mn} \end{bmatrix} - \begin{bmatrix} g_{11} & \cdots & g_{1n} \\ \vdots & \ddots & \vdots \\ g_{m1} & \cdots & g_{mn} \end{bmatrix} \quad \text{(G)}.$$

$$g_j \in \begin{cases} G^+ & q_{ij} > 0 \\ G & q_{ij} = 0 \\ G^- & q_{ij} < 0 \end{cases}$$

Based on the logic of the Mabak method, for Ai to be the best option in the set of options, It needs to be closer to the upper limit of the (G +) region than other options. Step 6: Rank the options, which are calculated by the following formula (Pamučar & Ćirović,2015):

$$S_i = \sum_{j=1}^{n} q_{ij}$$

According to the previous studies, reviewing the research literature, and considering the environmental conditions of the study area, indicators of employment stability have been studied in terms of three of social, economic-spatial dimensions. The indicators and variables used in this research are listed in Table (1).

Table 1. The indicators of the research

Index	indicators	Variations
Social index	Population stabilization	The residence of children
		The residence population
		Immigrants return to the village
	Social justice	Increase revenue
		Loan & credit access
		The invigoration of rural cohesion
Economic index	Economic diversification	the number of jobs Increase
		Diversification of occupations
		Increase in employees
	Economic efficiency	Diversity of rural income sources
		Revenue increase
		Family purchasing power Increase
		Saving Increase
Spatial index	Reinforcement of the sense of spatial identity	Continuity of rural livelihood
		Strengthen the sense of spatial belonging
		Participation in rural development
	Rural sustainability	Entrepreneurship
		Creation of sustainable jobs
		Increase in rural participation

Source: HeyuanYou & Zhang, 2017; Afshari Azad et al., 2016; Ghanbari et al., 2016; Plummer et al., 2018; Mani et al., 2018; Sari & Akkaya, 2016.

Study area

Dibaj village is located in the Lotfabad section of Dargaz city in Khorasan Razavi province of Iran. This village is located near the border of Turkmenistan with Iran (Fig 1.). Shilgan village has the highest population. The total population of the studied rural settlements in 1976 was equal to 2165 people, which in 2016 has decreased to 1406 people. Also, in these villages, of the population over ten years old, 650 are employed, and 42 are unemployed, which indicates the high employment capacity of these villages (Statistics Center of Iran, 2016). According to the Cochran formula,216 people were adopted as the sample size (Table 2).

The most important effect of sustainable employment on sustainable rural development is that the population has been stable. In Shilgan village, due to its abundant water resources and Imamzadeh, the lands under cotton, grape and plum cultivation, and its extensive livestock, it has significantly impacted job opportunities. In Shilgan village, a ranch with 500 head of cattle was established and created many jobs. Also, tourist attractions have left a positive impact on Shilgan village. Hesar village is one of the border villages of Turkmenistan, which is important in terms of population. The village cultivates wheat, and barley and produces many livestock products. Also, beekeeping activities have recently been launched in Safar Qaleh rural settlement.

4. Findings

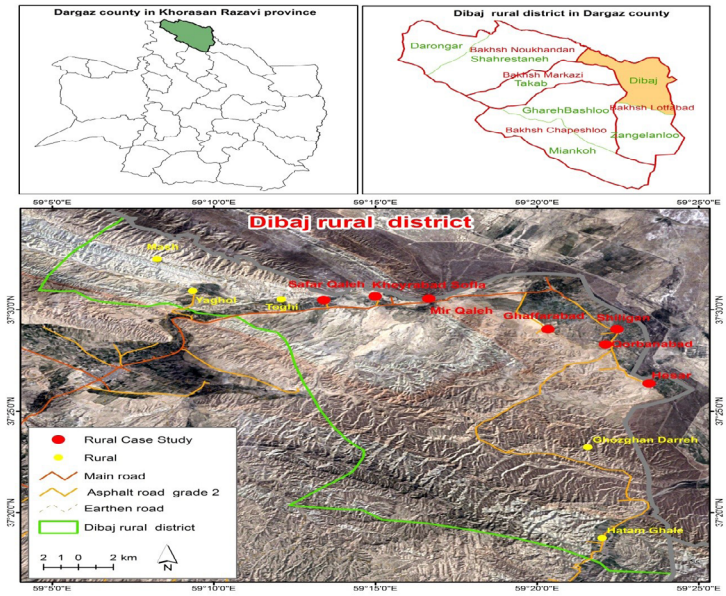

Figure 1. Geographical map of Dibaj rural district

JSRD

Table 2. Rural case studies & sample size

Rural settlement	population	household	sample
Hesar	224	78	34
Shilgan	639	230	100
Kheirabad	87	33	14
Safar Qaleh	64	21	9
Ghaffarabad	116	44	19
Ghorbanabad	92	30	13
Mir Qaleh	184	59	26
Total	1406	495	216

Statistics Center of Iran, 2016

JSRD

Ghorbanabad village is a single-sector village that is engaged in animal husbandry. Most of their residents are involved in semi-nomadic and nomadic livestock farming, whose livestock is sold as fattening in Dargaz and Mashhad markets. In this way, they earn a good profit and added value to many young people in this activity. They are also employed. Also, one of the main products of this village, which is sold in the surrounding villages and the Dargaz city, is the production of various livestock products, which are famous for this product. In the village of Safar Qala, Limited livestock facilities, agriculture and distance from the main road have been effective factors in job diversity in 1400 residents due to adaptation to climate change and entrepreneurship to raise bees.

In the villages of Safar Qaleh, Mir Qaleh and Kheirabad, the collection of medicinal plants is common, and these plants are sold in the Dargaz city. Based on the results of table 3., the creation of sustainable jobs, entrepreneurship and diversity of employment is the efficient factors in rural sustainability, which is evident in Shilgan village. Also, increasing employment and diversity of income sources are the economic effects of sustainable employment. On the other hand, rural residency and population stabilization are also important and prominent effects of sustainable employment in the social impact of sustainable employment.

Also, to rank the villages, the Mabak method has been used for ranking in Table 4. The matrix is normalized using steps 4 and 5. Then multiplied by Equation 6 by the weight of the criteria obtained from the Savara method to obtain the weighted matrix, then by step 7, the area estimation boundary (G) is calculated for each criterion. By step 8, the distance of the options from the estimated limit of the area (Q) determined at the end is calculated and ranked by the final score relation of the options.

According to the results of MABAK method in order to explain the effectiveness of sustainable employment, Shilgan village is ranked first in terms of the effects of sustainable employment among the villages. The Hesar village in terms of rainfed agriculture and livestock, Mir Qaleh village due to its proximity to Lotfabad city and benefiting from economic-occupational benefits of this city have the highest rank in creating sustainable employment that have the greatest impact on the stability of rural settlements (Table 5).

Table 3. The weighting of research items

Variations	Ej	dj	weight	rank
Rural residency of children	0.9816	0.0184	0.0296	11
Rural residency of population	0.9816	0.0184	0.0296	11
Return of immigrants	0.9839	0.0161	0.0260	12
Increase revenue	0.9724	0.0276	0.0445	10
loans and credits access	0.9718	0.0282	0.0455	9
Strengthen of rural cohesion	0.9867	0.0133	0.0214	14
Increasing the number of jobs	0.9883	0.0117	0.0189	15
Diversification of occupation	0.9508	0.0492	0.0794	3
Employees increase	0.9554	0.0446	0.0720	4
Diversity of income sources	0.9554	0.0446	0.0720	4
Income increase	0.9658	0.0342	0.0552	7
Purchasing power increase	0.9664	0.0336	0.0542	8
Savings increase	0.9664	0.0336	0.0542	8
Sustainable livelihood	0.9664	0.0336	0.0542	8
Strengthen the sense of locational belonging	0.9867	0.0133	0.0215	13
Participation in rural growth	0.9884	0.0116	0.0187	16
Rural stabilization	0.9611	0.0389	0.0628	5
Entrepreneurship	0.9437	0.0563	0.0908	2
Creation of sustainable jobs	0.9431	0.0569	0.0918	1
Enhancement of social cohesion	0.9644	0.0356	0.0574	6

Table 4. MABAK weight matrix and boundary of the estimation area

Index	Mir Qaleh	Qurbanabad	Ghafarabad	Safar Qaleh	Shilgan	Kheirabad	Hesar	G
Rural residency	0.041	0.047	0.047	0.030	0.059	0.041	0.053	0.045
Population residency	0.041	0.047	0.047	0.030	0.059	0.041	0.053	0.045
Return of immigrants	0.042	0.031	0.036	0.026	0.052	0.031	0.042	0.036
Increase revenue	0.045	0.074	0.059	0.052	0.089	0.067	0.059	0.062
loans and credits access	0.076	0.068	0.076	0.045	0.091	0.068	0.076	0.070
Strengthen of rural cohesion	0.034	0.026	0.034	0.021	0.043	0.026	0.039	0.031
Increasing the number of jobs	0.026	0.023	0.026	0.019	0.038	0.023	0.023	0.025
Diversification of occupation	0.119	0.109	0.099	0.079	0.159	0.099	0.129	0.111
Employees increase	0.103	0.093	0.072	0.072	0.144	0.082	0.113	0.094
Diversity of income sources	0.103	0.093	0.072	0.072	0.144	0.082	0.113	0.094
Income increase	0.074	0.092	0.074	0.055	0.110	0.083	0.092	0.081
Purchasing power increase	0.081	0.072	0.072	0.054	0.108	0.081	0.090	0.078
Savings increase	0.081	0.072	0.072	0.054	0.108	0.081	0.090	0.078
Sustainable livelihood	0.081	0.072	0.072	0.054	0.108	0.081	0.090	0.078
Strengthen the sense of locational belonging	0.034	0.026	0.030	0.022	0.043	0.026	0.039	0.031
Participation in rural growth	0.026	0.022	0.026	0.019	0.037	0.022	0.030	0.026
Rural stabilization	0.102	0.094	0.094	0.063	0.126	0.086	0.110	0.095
Entrepreneurship	0.151	0.161	0.141	0.091	0.182	0.131	0.151	0.141
Creation of sustainable jobs	0.153	0.163	0.143	0.092	0.184	0.133	0.163	0.144
Enhancement of social cohesion	0.093	0.086	0.093	0.057	0.115	0.086	0.101	0.089

JSRD

Table 5. Score and final rank of rural settlements

Rural settlement	Q	Rank
Mir Qaleh	0.053	3
Qurbanabad	0.018	4
Ghafarabad	-0.067	5
Safar Qaleh	-0.448	7
Shilgan	0.545	1
Kheirabad	-0.083	6
Hesar	0.201	2

JSRD

5. Discussion

The present study aimed to evaluate the effects of sustainable employment. Based on this, three dimensions of economic, social -spatial effects of sustainable employment and its impact on rural sustainability in Dibaj rural area of Dargaz city have been studied. Analysis and evaluation of research items indicate that creating sustain-

able employment and job security have comprehensive effects on the growth and sustainability of rural settlements. Job diversity in the villages of the study area, access to credit and loans, entrepreneurship and investment strengthen the effects of sustainable employment in the study villages. In general, according to the analytical model results, it can be mentioned that creating sustainable jobs, entrepreneurship, and job diversity have the most role in sustainable rural employment.

A comparison of the obtained findings with other research results shows that the combination of employment opportunities with spatial-spatial capabilities has improved spatial-spatial belonging, stability of rural settlements (Ghadermazi, 2015), and improved the quality of rural life (Heidari et al., 2011).

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Conflict of Interest

The authors declared no conflicts of interest.

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