International Journal of Economics, Commerce and Management
United Kingdom Vol. II, Issue 9, Sep 2014
http://ijecm.co.uk/ ISSN 2348 0386

MULTI-CRITERIA ANALYSIS FOR MEASURING SUSTAINABILITY OF RURAL AREAS OF ISFAHAN PROVINCE, IRAN

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Abstract

Measuring sustainability of the rural areas of a region to identify their present status and also to recognize the differences between the different areas in terms of sustainability indices is an important issue in the process of making decision for their sustainable development. This concept is adopted in evaluating of the rural areas of Falavarjan County in Isfahan province through assessing the effective dimensions and indices of the region and analyzing the assumption whether there is a significant difference in the level of sustainability in different areas of the region. For sustainability assessment, economic, social, environmental, physical and accessibility dimensions are applied in a descriptive and analytic study method with the assistance of TOPSIS model. The statistical sample consists of 47 villages and 378 households. Results show that there is no uniformity in the level of sustainability in the region, and in each of the dimensions under study there are differences between the areas.

Keywords: Rural development, Sustainability Measurement, Indicators, Multi-criteria, Isfahan province, Iran

INTRODUCTION

Sustainable development, in recent years has become an international issue and many institutions try to adopt it as a strategy in facing challenges like population growth, environmental destruction, restrictions of natural resources, socio-economic inequities, unemployment, poverty and differences in social stratum (Sarafi, 2000). Beginning from the 60s many international conferences and conventions have been organized in this respect, including UNESCO Biosphere conference (Paris, 1968), the Ecological Aspects of International Development Conference (Washington, 1968), the UN conference on Human and Environment in Stockholm (1972) and the Club of Rome's Project, that published a report titled "Limits of Growth" (1972).

In fact the world began to address and emphasize on the issue of sustainability after the Brundtland Report with an emphasis on the issue of sustainability (WCED, 1987). According to this commission sustainable development is defined as: achieving the existing generations' needs without putting the next generations' existence at risk who would want to achieve their needs; sustainability means going through the course of life without exposing the "Capitals" like economy, ecology and society to danger (Barry *et al*., 2007).

The word sustainability is derived from the term "sustenance", meaning keeping alive, that is, going through a course in such a manner where the available desired facilities and resources do not diminish in due course (Gane, 2007). Sustainability in its broad sense refers to the ability of the society, ecosystem or any current system with durability in its unlimited applicability without leaving a negative effect on the whole resource system through overuse (Gilman, 1996).

Accordingly, sustainability is known as a delicate equilibrium among the economic, social, and environmental dimensions at domestic, regional, national and international levels (Fricker, 1998). In this context a nation's sustainable development depends on the balanced development of all regions.

Despite the fact that the rural society in Iran is one of the most important economic segment with significant role in Iran's GNP through its contribution to the food industry, it has not been focused on accordingly in scientific studies (pourtaheri, 2010). At present there exist many rural areas for which achieving a sustainable development is a very difficult task. Issues like lack of employment opportunities and facilities, high under poverty rate, low income in agricultural segment, poor housing and living conditions, lack of social profit sharing, and soil and water resources destruction are among the most important reasons for this issue that cause high migration rate and abandoned villages (Khosrobeigi *et al.,*2011).

With respect to the approach towards sustenance and sustainable development, measuring and assessing the potentials of the rural areas is of major concern. The object of this measuring and assessment on one hand is providing a general picture of the "sustainability" status of that region which can be a spectrum from a "complete sustainability" up to a "complete non-sustainability", that help in recognizing the effective factors which would promote sustainability, and on the other hand is assisting the policy and decision makers in actualizing the sustainability plans (Najam, 1997).

The attempt is made in this article to explain the sustainability status of the study zone, i.e., the rural areas of Falavarjan city, and assess the dimensions of the involved effective indices, and answering to this question that whether there exists any statistically significant difference among the villages under study as far as sustainability is concerned.

For this purpose the multi-criteria decision making model (MCDM model) is adopted , with the general steps of: providing the table of raw data, converting qualitative data into quantitative data, normalizing the values, weighing the indices, and finally ranking the options (Asgharpour, 2013). In this work, for the steps of normalizing, weighing, and ranking, the methods of Fuzzy, Entropy, and TOPSIS are applied, respectively.

LITERATUR REVIEW

Rural sustainable development, as one of the main issues in the subject of development is facing many challenges. To accomplish rural sustainable development, study of the subject areas in terms of sustainability indices is essential; and it is the reason for an increase in studies regarding rural sustainability assessment in the last decades.

Barimani *et al*. (2010) conducted a study on the environmental and residential sustainable conditions in Sistan province rural areas. Their findings indicate a serious non-sustainability in 81.2 percent of the study zone. Yarihesar *et al.* (2011) conducted a study on the sustainable condition of the rural areas in the vicinity of the megacity Tehran. The findings here indicate that the megacity status of Tehran has in no means contributed to the sustainability of its rural regions, but led to its non-sustainability.

Khosrowbeigi (2011) in a study, dealt with the assessment and identification of different models and techniques involved in evaluating the sustainability and selection of proper criteria and indices for measuring sustainability in rural areas. It is concluded that an appropriate approach for such studies is an integrated evaluation and the multi-variable Fuzzy–TOPSIS techniques in decision making methods.

Golusim (2009) conducted a study on the indices applied in measuring sustainability and suggested the four social, economic, environmental and institutional indices in assessing

sustainability. Singh (2008) in his article “A review on the assessing methods of sustainability” has distinguished the effective factors of each one of the reviewed methods, in addition to introduction of indices in sustainability. Wen-Hsien *et al*. (2009) in a research assessed the indices of sustainable development; in this work integrated approach is adopted and different indices are applied in measuring the capacity and resistance of resources and the challenges facing sustainability in rural areas.

METHODOLOGY

This is an applied study and the method used is a combination of analytic and descriptive methods through the use of library and field survey. The theoretical aspects and the studied records on the issue are evaluated and based on that and the available data on the region under study, 87 sustainability assessment indices are determined and categorized in five: economic, social, environmental, physical, and accessibility dimensions. Table-1 shows the indices. The data is obtained through a random sampling questionnaire, and also direct interview with the authorities like village chief, Islamic council members and local sages, and also the sources from National Census Bureau for the year 2011, and the village resume and the village Guiding Plan.

Study Area

The city of Falavarjan covers 310.3 Km³ at 51° 30’ 29”E longitude 32° 33’ 16”N latitude 20 Km S/W of the city of Isfahan. The elevation is 1600 m above MSL. Figure -1 shows the position of the city in relation to its surrounding cities, and also the distributions of the villages. From the total of 247014 population of the city, 93285 live in rural areas that are 27024 households (Provincial Planning Office, Isfahan 2013).

The statistical population consists of 56 villages with households more than 20. Using the Cochran Formula, 378 households are selected from 47 villages to complete the questionnaire. Table-2 shows the political divisions of the city as well as the number of villages under study.

Table 1- The sustainability assessment indices, categorized in 5 dimensions

	Index
Economic	1- Occupational variety 2- Cultivated and cultivable land ratio 3- Employees rate 4- Male Female occupational ratio 5- *Participant rate* 6- Job satisfaction level near rural population 7- Income stability 8- Income satisfaction 9- Rate of uneven income among households 10- Ability to save 11- Investment level in rural areas 12- The need to construct new housing 13- Variety in farm products 14- Self efficiency of the village 15- Advantages of social insurance
Social	1- Population level 2- Population growth rate 3- Number of households 4 household size 5- Residential units to household ratio 6- 15-65 years percentage 7- Literacy percentage 8- Female literary ration to Male 9- Membership ratio in social institutions 10- Inter family marriage rate 11- Extra family marriage rate 12- Participating ratio in social ceremonies in the village 13- Cooperation rate among villagers 14- Violence rate in groups or individuals in the village 15- Rural-Urban interconnection rate 16- Medical services satisfaction rate 17- Educational services satisfaction rate 18- Agricultural services satisfaction rate 19- Level of satisfaction regarding innovation in agriculture 20- Level of satisfaction from rural council- population cooperation 21- Level of participation in elections
Environmental	1- Topography 2- Elevation from MSL 3- Variety of irrigation water 4- Water salinity problem 5- Water efficiency for agriculture 6- Training new irrigation techniques and soil protection (preservation) 7- Drinking water quality 8- Sustainable water supply9- Roads flooding in winter 10- The village cleanliness: swage, garbage pickup, animal waste, landscape etc. 11- Solid waste disposal manners 12- Flooding hazard 13- Draught hazard 14- Freezing hazard 15- Earthquake hazard 18- Agricultural pesticide usage level
Physical	1- Geographical position of the village 2- Distance from city 3- Access roads status 4- Material quality used in residential buildings 5- Utilities consumption level 6- New to old buildings ratio 7- Modernity of the residential buildings 8- Residential building ratio to households 9- Rain water removal from pedestrian routes
Accessibility	1- Average in primary school distance 2- Average in secondary and high school distance 3- Average in medical faculties distance 4- Telecommunications use rate 5- Banking services 6- Emergency services 7-Veteranian services 8- Taxi services 9- Police station and safety services 10- Mosque distances 11- Fuel station service 12- Mechanic shops services 13- Athletic centers service 14- *rural guiding plan* 15- Recreational and pilgrimage centers 16- Historical monuments 17- Cemetery 18-Water purification center 19-Cooperatives 20-Islamic council and village chief 21- Agricultural development office 22- Public library 23- State and NGO centers 24- Parks and play grounds

Fig.1. Study area location

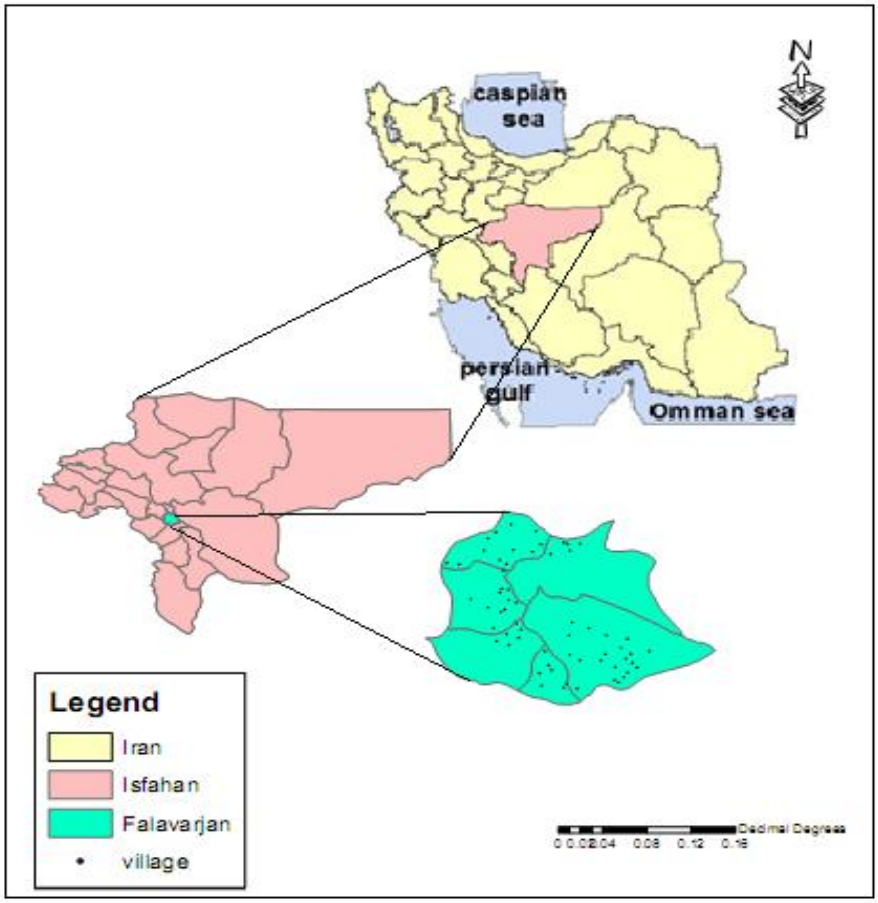

Table 2- The political divisions of the city of Falavarjan

County	Section	Rural district	Number of villages
Falavarjan	Central	Abrisham	4
		Zazeran	7
		Golestan	9
		Oshtorjan	7
	Pearbakran	Garkan shomali	19
		Sohr-O-Firozan	10
Total	2	6	56

Source: Dept. of Planning, Isfahan, 2013

RESULTS AND DISCUSSION

With respect to each one of the 5 dimensions, first the raw data matrices are prepared and qualitative data (of the indices) are converted into quantities data. In the next step these data are normalized and harmonized through the Fuzzy method. Then through the Entropy method the weight of each one of the indices are calculated. By multiplying the values of every normalized matrix column in the obtained weight of that column the matrices of the weighed data is obtained and by adding the values of every row in this matrices (which indicates a given village), the sustainability values related to different villages are obtained. The above calculations are made separately for each dimension resulting in a matrix with 47 lines and 5 columns (Table 3). This matrix is considered as the decision making matrix in measuring sustainability and ranking of the villages.

In order to rank the under study villages, according to the 5 dimensions the TOPSIS method is applied. In this method the selection is based on both having the shortest distance to the ideal positive solution (the best condition possible) and longest distance to the negative solution (the worst condition possible). This model includes the main steps of, forming the decision making matrices and its normalization, multiplication of the normalized elements by the related indices' weighs', determining the ideal solution (positive or negative), using Oghlidous Norm to measure distance by calculating the proportional closeness of the ideal selected solution in ranking the options based on the obtained values. The implementation of steps 1, 2 and 3 is similar to the previous method. Here the initial applied matrix replaces the raw data matrices of decision making matrices introduced in Table 3. The normalized decision making matrix is presented in Table 4 after normalization.

The weight of every index is calculated based on Entropy method and the values are presented in Table 5. Multiplication of the normalized values and the weights is done through following expression:

$$V = Z \times W \qquad (1)$$

in which Z is the matrix of normalized values as shown in table 4, and W is a diagonal matrix in which the values on its main diagonal are equal to the values of weights shown in table 5 . The resulting V matrix is illustrated in Table 6.

Table-3 The Decision Making Matrix

Village	Economic	Social	Environmental	Physical	accessibility	Village	Economic	Social	Environmental	Physical	accessibility
Golgon	0.424	0.565	0.612	0.701	0.398	Khonsarak	0.216	0.319	0.667	0.734	0.650
Polartgan	0.204	0.146	0.441	0.475	0.290	SiahAfshar	0.177	0.155	0.465	0.585	0.660
RahimAbad	0.147	0.201	0.385	0.529	0.121	Ali Shahedan	0.134	0.391	0.545	0.658	0.669
SadeghAbad	0.089	0.248	0.351	0.489	0.281	Mosian	0.377	0.449	0.747	0.832	0.802
VazirAbad	0.102	0.196	0.404	0.382	0.268	Mohammadieh	0.354	0.341	0.496	0.868	0.328
MehernJan	0.313	0.281	0.426	0.554	0.385	MehrenjanAtrak	0.180	0.339	0.426	0.447	0.548
Chamrood	0.108	0.240	0.472	0.679	0.617	DashtChi	0.175	0.309	0.566	0.667	0.522
Filergan	0.159	0.259	0.410	0.826	0.394	GhalehAmir	0.144	0.214	0.252	0.587	0.338
Dastna	0.161	0.217	0.391	0.424	0.325	Rara	0.300	0.404	0.469	0.319	0.433
Semsan	0.119	0.325	0.397	0.705	0.374	HoseinAbad	0.300	0.258	0.775	0.812	0.541
Ghalehsorkh	0.210	0.343	0.409	0.803	0.197	Kafeshan	0.164	0.361	0.523	0.697	0.553
NodarAmad	0.189	0.311	0.339	0.567	0.220	Karooj	0.154	0.207	0.453	0.754	0.441
Jilab	0.161	0.234	0.500	0.866	0.327	Daregan	0.231	0.517	0.535	0.562	0.671
Ardal-va-SafiAbad	0.150	0.218	0.570	0.714	0.495	Jolerestan	0.231	0.318	0.675	0.819	0.455
Tamandgan	0.293	0.299	0.305	0.357	0.546	Hovieh	0.185	0.248	0.592	0.775	0.655
KhirAbad	0.237	0.322	0.722	0.641	0.484	Shervedan	0.228	0.323	0.493	0.741	0.833
Dashtloo	0.272	0.358	0.456	0.812	0.296	Sohr-O-Firozan	0.216	0.205	0.471	0.736	0.723
VanHar	0.222	0.211	0.347	0.534	0.489	Taad	0.191	0.373	0.267	0.667	0.563
Polart	0.235	0.341	0.535	0.679	0.589	Karaskan	0.215	0.280	0.577	0.868	0.787
Mehrgan	0.136	0.280	0.502	0.621	0.620	Boostan	0.282	0.321	0.582	0.846	0.379
Esfehran	0.253	0.301	0.467	0.768	0.515	Zofreh	0.217	0.255	0.398	0.783	0.425
Bendart	0.191	0.432	0.678	0.803	0.586	Jojil	0.188	0.417	0.586	0.440	0.608
DarAfshan	0.223	0.346	0.641	0.725	0.570	Zazeran	0.224	0.416	0.417	0.915	0.555
Karoyeh	0.166	0.296	0.482	0.732	0.665						

Table 4. Normalized matrix(z)

Village	Normalized matrix					Village	Normalized matrix				
	Economic	Social	Environmental	Physical	accessibility		Economic	Social	Environmental	Physical	accessibility
Golgon	0.043	0.039	0.026	0.022	0.017	Khonsarak	0.022	0.022	0.029	0.023	0.028
Polartgan	0.021	0.010	0.019	0.015	0.013	SiahAfshar	0.018	0.011	0.020	0.019	0.028
RahimAbad	0.015	0.014	0.017	0.017	0.005	Ali Shahedan	0.014	0.027	0.023	0.021	0.029
SadeghAbad	0.009	0.017	0.015	0.016	0.012	Mosian	0.038	0.031	0.032	0.026	0.035
VazirAbad	0.010	0.014	0.017	0.012	0.012	Mohammadieh	0.036	0.024	0.021	0.028	0.014
MehernJan	0.032	0.020	0.018	0.018	0.017	MehrenjanAtrak	0.018	0.024	0.018	0.014	0.024
Chamrood	0.011	0.017	0.020	0.022	0.027	DashtChi	0.018	0.21	0.024	0.021	0.023
Filergan	0.016	0.018	0.018	0.026	0.017	GhalehAmir	0.015	0.015	0.011	0.019	0.015
Dastna	0.016	0.015	0.017	0.013	0.014	Rara	0.030	0.028	0.020	0.010	0.019
Semsan	0.012	0.023	0.017	0.022	0.016	HoseinAbad	0.030	0.018	0.033	0.026	0.023
Ghalehsorkh	0.021	0.024	0.018	0.025	0.008	Kafeshan	0.017	0.025	0.023	0.022	0.024
NodarAmad	0.019	0.022	0.015	0.018	0.009	Karooj	0.016	0.014	0.020	0.024	0.019
Jilab	0.016	0.016	0.022	0.027	0.014	Daregan	0.023	0.036	0.023	0.018	0.029
Ardal-va-SafiAbad	0.015	0.015	0.025	0.023	0.021	Jolerestan	0.023	0.022	0.029	0.026	0.020
Tamandgan	0.030	0.021	0.013	0.011	0.024	Hovieh	0.019	0.017	0.025	0.025	0.028
KhirAbad	0.024	0.022	0.031	0.020	0.021	Shervedan	0.023	0.022	0.021	0.024	0.036
Dashtloo	0.028	0.025	0.020	0.026	0.013	Sohr-O-Firozan	0.022	0.014	0.020	0.023	0.031
VanHar	0.022	0.022	0.015	0.017	0.021	Taad	0.019	0.026	0.012	0.021	0.024
Polart	0.024	0.024	0.023	0.022	0.025	Karaskan	0.025	0.019	0.025	0.028	0.034
Mehrgan	0.014	0.019	0.022	0.020	0.026	Boostan	0.029	0.022	0.025	0.027	0.016
Esfehran	0.026	0.022	0.020	0.024	0.022	Zofreh	0.022	0.018	0.017	0.025	0.018
Bendart	0.019	0.030	0.029	0.025	0.025	Jojil	0.019	0.029	0.025	0.014	0.026
DarAfshan	0.023	0.024	0.028	0.023	0.025	Zazeran	0.023	0.029	0.018	0.029	0.024
Karoyeh	0.017	0.021	0.021	0.023	0.029						

Table-5 Weights of indices

Dimension	Economic	Social	Environmental	Physica	accessibility
(W_i) weight	0.281	0.191	0.142	0.128	0.257

Table-6 The Matrix of Multiplication of the normalized values and the weights (*V-matrix)*

Village	*Value * Weight*					Village	*Value * Weight*				
	Economic	Social	Environmental	Physical l	accessibility		Economic	Social	Environmental	Physical l	accessibility
Golgon	0.109	0.0108	0.087	0.090	0.112	Khonsarak	0.056	0.061	0.095	0.094	0.183
Polartgan	0.052	0.028	0.063	0.061	0.082	SiahAfshar	0.046	0.030	0.066	0.075	0.185
RahimAbad	0.038	0.038	0.055	0.068	0.034	Ali Shahedan	0.034	0.075	0.078	0.084	0.188
SadeghAbad	0.023	0.047	0.050	0.063	0.079	Mosian	0.097	0.086	0.106	0.107	0.226
VazirAbad	0.026	0.037	0.057	0.049	0.075	Mohammadieh	0.091	0.065	0.071	0.111	0.092
MehernJan	0.080	0.054	0.061	0.071	0.108	MehrenjanAtrak	0.046	0.065	0.061	0.057	0.154
Chamrood	0.028	0.046	0.067	0.087	0.174	DashtChi	0.045	0.059	0.081	0.086	0.147
Filergan	0.041	0.049	0.058	0.106	0.111	GhalehAmir	0.037	0.041	0.036	0.075	0.095
Dastna	0.041	0.042	0.056	0.054	0.091	Rara	0.077	0.077	0.067	0.041	0.122
Semsan	0.031	0.062	0.056	0.090	0.105	Hosein Abad	0.077	0.049	0.110	0.0104	0.152
Ghalehsorkh	0.054	0.066	0.058	0.103	0.055	Kafeshan	0.042	0.069	0.075	0.090	0.155
NodarAmad	0.048	0.059	0.048	0.073	0.062	Karooj	0.040	0.039	0.065	0.097	0.124
Jilab	0.041	0.045	0.071	0.011	0.092	Daregan	0.059	0.099	0.076	0.072	0.189
Ardal-va-safiAbad	0.039	0.042	0.081	0.092	0.139	Jolerestan	0.059	0.061	0.096	0.105	0.128
Tamandgan	0.075	0.057	0.043	0.046	0.153	Hovieh	0.048	0.047	0.084	0.100	0.184
KhirAbad	0.061	0.062	0.103	0.082	0.136	Shervedan	0.059	0.062	0.070	0.095	0.234
Dashtloo	0.070	0.069	0.065	0.104	0.083	Sohr-O-Firozan	0.055	0.039	0.067	0.094	0.203
VanHar	0.057	0.040	0.049	0.069	0.137	Taad	0.049	0.071	0.038	0.086	0.158
Polart	0.060	0.065	0.076	0.087	0.166	Karaskan	0.065	0.054	0.082	0.111	0.221
Mehrgan	0.035	0.054	0.071	0.080	0.169	Boostan	0.072	0.061	0.083	0.109	0.106
Esfehran	0.065	0.058	0.066	0.099	0.145	Zofreh	0.056	0.049	0.057	0.100	0.120
Bendart	0.049	0.083	0.097	0.103	0.165	Jojil	0.048	0.080	0.083	0.057	0.171
DarAfshan	0.057	0.066	0.091	0.093	0.160	Zazeran	0.057	0.080	0.059	0.117	0.156

Using matrix *V* the positive solution vectors (v+) and negative solution vectors (v-) are obtained as follows:

$$\underline{v}^{+} = \left(v_j^{+} = Max\left[v_{ij}\right]_{i=1}^{m}\right)$$
$$\underline{v}^{-} = \left(v_j^{-} = Min\left[v_{ij}\right]_{i=1}^{m}\right) \qquad (2)$$

The values of these two vectors, that obtained based on the maximum and minimum values of each column of indices of Table 6, are presented in Table 7.

Table-7 The values of Victors $\underline{v}^{-}$ & $\underline{v}^{+}$

	Economic	social	environmental	physical	Accessibility
$\underline{v}^{+}$	0.034	0.041	0.036	0.028	0.023
$\underline{v}^{-}$	0.234	0.117	0.110	0.108	0.109

The distance of every choice (village) from the above mentioned vectors are obtained through the following equations:

$$d_i^{+} = \sqrt{\sum_{j=1}^{k}\left(v_{ij} - v_j^{+}\right)^2}, \quad i = 1,\ldots,m$$
$$d_i^{-} = \sqrt{\sum_{j=1}^{k}\left(v_{ij} - v_j^{-}\right)^2}, \quad i = 1,\ldots,m \qquad (3)$$

where, *m* is the number of the villages and *K* is the number of dimensions under study. By using di values, Cli values are calculated as following:

$$CL_i = \frac{d_i^{-}}{d_i^{+} + d_i^{-}} \qquad (4)$$

These values, which are between 0 and 1, indicate the distance of the choices from the negative solution and their closeness to the positive solution. These values are used for ranking the understudied villages based on their sustainability condition in 5 understudied dimensions. Table 8 shows the ranking results. As the results show Moosian and Karsangan villages with sustainability values of, respectively, 0.890 and 0.732 are ranked the highest, and Vazir Abad and RahimAbad villages with sustainability values of, respectively, 0.187 and 0.138, are ranked the lowest. The sustainability level among the villages under study is not uniform and in each of the dimensions a high difference exists between the villages.

Table-8 Ranking of villages based on CI values

Village	*CL*	Ranking	Village	*CL*	Ranking	Village	*CL*	Ranking
Mosian	0.890	1	Golgon	0.554	17	Zofreh	0.429	33
Karaskan	0.732	2	Kafeshan	0.547	18	Karooj	0.418	34
Shervedan	0.724	3	Mehrgan	0.543	19	MehernJan	0.403	35
Daregan	0.672	4	Chamrood	0.538	20	Filergan	0.399	36
Khonsarak	0.655	5	Esfehran	0.533	21	Dashtloo	0.386	37
Sohr-O-Firozan	0.637	6	KhirAbad	0.528	22	Jilab	0.366	38
Bendart	0.633	7	Taad	0.521	23	Semsan	0.362	39
Ali Shahedan	0.622	8	Jolerestan	0.518	24	Ghalehsorkh	0.299	40
Hovieh	0.620	9	DashtChi	0.516	25	GhalehAmir	0.276	41
Karoyeh	0.611	10	MehrenjanAtrak	0.492	26	Dastna	0.258	42
Hosein Abad	0.606	11	Tamandgan	0.488	27	Polartgan	0.250	43
DarAfshan	0.600	12	Ardal-va-safiAbad	0.474	28	NodarAmad	0.227	44
Polart	0.596	13	Boostan	0.465	29	SadeghAbad	0.214	45
Zazeran	0.590	14	Mohammadieh	0.447	30	VazirAbad	0.187	46
Jojil	0.580	15	Rara	0.442	31	RahimAbad	0.138	47
SiahAfshar	0.556	16	VanHar	0.430	32			

CONCLUSION

Measuring sustainability level of rural areas of a region, to recognize their present status and realize their differences in terms of sustainability indices are of great importance. Providing a general perspective on the sustainability condition of a region and recognizing the effective factors on its sustainability condition can assist decision and policy makers to provide effective development programs to accomplish sustainable development goals. In this type of measurements the indices are among the most important elements. In the present work different indices and criteria in five economic, social, environmental, physical and accessibility dimensions are employed to assess the sustainability condition of rural areas of Falavarjan city in Isfahan province. To combine the indices and obtain the final results a Multi-criteria model in decision making was employed. Based on the theoretical concept of the study in each one of the above dimensions a subset of indices was considered. The relative importance of each

index was calculated through Entropy procedure, and at the end the relative weights of every dimension was calculated. The sustainability rank was determined by applying Topsis method. The results showed in terms of sustainability, Moosian and Karsangan villages are ranked the highest, and Vazir Abad and RahimAbad villages are ranked the lowest. Also the results showed sustainability in general, and also in each of the dimensions, is not uniform among the villages.

LIMITATIONS & FUTURE RESEARCH

Limitations of current research include absence of standard indicators and tools for sustainability assessment, and absence of some up-to-date census data. Regarding future related researches following subjects are recommended:

- Due to frequent droughts in the region it is needed to manage water resources more efficiently to decrease its negative impact on the sustainable development of the rural areas.
- Empowering local economy and create various employment opportunities to reduce reliance on mere agricultural activities can improve sustainability indicators in the region.
- Development is a dynamic process affected by many factors. Achieving sustainable development requires continuous assessment of its indicators so that be able to monitor current state, and based on that, take necessary steps to preserve development pace.

REFERENCES

Asgharpour, M. (2013). Multi criteria decision making (10th ed.). Tehran,Tehran University Press.

Barry, N. (2007). Categorizing tools for sustainability assessment. Ecological Economics (60), 498–508

Barimani, F.(2010). Determining the intensity of environmental instability in rural settlements of Sistan by Multi Criteria evaluation model. Journal Geography and Development, 19(3), 127-144.

Bryden, J. (2002). Rural development indicators and diversity in the European Union, EU.

Fricker, A. (1998). Measuring up to Sustainability. Futures Journal, 30(4), 367–375.

Gane, M. (2010). Forest Strategic Management and Sustainable Development for Forest Sector. Netherlands, Springer.

Gilman, R. (1996). Sustainability. http://www.context.org/ICLIB/DEFS/AIADef.htm.

Golusim, M. (2009). Definition characteristics and state of the indicators of sustainable development in countries of Southeastern Europe. Agriculture, Ecosystems and Environment, 130 (1-2), 67-74.

Khosrobeigi, R., Shayan H., Sajasi H., and Sadeghloo T. (2011). Assessment and Evaluation of Sustainability in Rural Areas using TOPSIS- FUZZY Multi-criteria Decision Making Technique. Journal of Rural Research, 1, 151-160.

Najam, A. (1997). Assessing progress Toward Sustainability in Developing countries; In Assessing Sustainable Development, principles in practice; peter, H. , Terrence, Z., International Institute for Sustainable Development(IISD), Canada, 21.

Singh, R. K., Murty, H.R.,Gupta S.K., and Dikshit A.K. (2009). An overview of sustainability assessment methodologies. Ecological Indicators, 9, 189-212.

Saffari M. (2000). Fundamentals of Regional Development Planning (2nd ed.). Publication of Management and Planning Organization.

Provincial Government of Isfahan (2012). *Statistical Yearbook* of 2012 of Falavajan County., Bureau of statistics, Information, and GIS.

Pourtaheri, M., Sajasi Hamdollah and Sadeghloo Tahereh, 2010. Measurement and packing of social Sustainability in Rural Areas BY using FUZZY Technique. Journal of Rural Research, No. 1, Tehran. p.2.

Tsai, W.H. and Chou W,C. (2009). Selecting management systems for sustainable Development in SME, A novel hybrid model based on Dematel , ANP, ZOGP, Expert systems with Application, 36, 1444-1458.

WCED, 1987. Our Common Future. Oxford University Press, Oxford.

Yari hesar, A., Badri, S.A., Pourtaheri, M., and Faraji, H. (2011). Sustainability measuring and assessment of Tehran metropolitan rural area, Journal of Rural Research, 2(4), 89-122.