

## Zoning the Villages of Central District of Dena County in Terms of Sustainability of Livelihood Capitals

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### ABSTRACT

The sustainable livelihood approach was introduced as a sustainable rural development approach in the late 1980s with the aim of poverty alleviation in the rural communities. This approach has offered a broad framework for assessing the various dimensions of sustainability. An important component of this framework is livelihood capitals in a way that it is not possible to achieve sustainable rural livelihood with no regard to the livelihood capitals and assets in rural areas. Thus, the purpose of this descriptive-analytic survey research was zoning the villages of the Central District of Dena County in terms of the sustainability of livelihood capitals. The statistical population of this study was 2500 rural households in the Central District of Dena County, of which 300 households were selected using cluster random sampling method with appropriate allocation based on Krejcie and Morgan's table. The research instrument was a researcher-made questionnaire whose face validity was confirmed by a panel of experts, and its reliability was confirmed in a pre-test and calculating Cronbach's alpha coefficient. Findings of the research showed that, in most studied villages, 3 capitals (social, physical, and human) were above the average and 2 capitals (financial and natural) as well as the total capital was less than average. Additionally, there was a gap and heterogeneity between the villages in terms of social, human, natural capital as well as financial capital, whereas there was a homogeneity in terms of physical and total capital as well. Besides, the most studied villages were potentially unsustainable in terms of financial and natural capital, average level in terms of human and physical capital and total capital, and potentially sustainable in terms of social capital. In addition, cluster analysis to categorize villages indicated that 9, 4, and 7 villages were categorized as non-privileged, semi-privileged, and privileged, respectively. Furthermore, the result of Analysis Of Variance (ANOVA) indicated that there was a significant difference between three categories of villages in terms of social, physical, financial and natural capital, and total capital. Therefore, non-privileged and semi-privileged villages should be given more consideration by planners, who need to pay more attention to regional planning than general planning.

**Keywords:** Regional planning, Rural areas, Semi-privileged villages, Sustainability assessment.

### INTRODUCTION

Development is one of the issues that have always been the mindset of policymakers and planners. Different countries and even their constituent regions want to achieve a level of balanced and sustainable development that can improve the lives of all people, but the key question that might not be given a unanimous

answer is what the development, people, and society's expectation of this process are. Different definitions of development have been proposed but, despite their differences, they all agree on the breadth and multi-dimensionality of development and that its goal is to improve the living conditions or, more precisely, better and superior lives for all generations. (Esmailzadeh *et al.*, 2016). The common conception of development implies that the

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main objective of development is the growth and excellence of all human societies, and hence the recognition and understanding of the conditions and requirements of human societies and their needs and demands in terms of material and spiritual aspects are the basic measures along the improvement and development path. Since the villages and the people settling down there have their own conditions, possibilities and issues, it is justified and necessary to take rural development into consideration (Amanpour *et al.*, 2015).

Based on the steady increase in income, the expansion of productive employment, and the more balanced establishment of the benefits of growth, the vital goals of development in rural areas have failed in practice. The evidence to this is the poor rural economy, the displacement and massive migration of villagers to cities, the spread of poverty and unemployment, food insecurity, the dominant rural population on the margins, and so on (Ghadiri Masoum *et al.*, 2010). In other words, the rural development strategies that have been used so far have failed to provide development goals such as poverty alleviation, employment creation, health, food security and environmental sustainability, and appropriate distribution of benefits in society. As a result, the sustainable livelihood approach was introduced as a new approach to rural development in the 1980s with the aim of reducing and eradicating rural poverty (Jomehpour and Keyoumarse, 2012). In fact, the sustainable livelihood idea was first introduced by the Brundtland Commission on Environment and Development, and the 1992 United Nations Conference on Environment and Development expanded it as a broad goal to eradicate poverty (Krantz, 2001). The concept of sustainable rural livelihoods has a widespread general meaning, including the protection and safeguarding of livelihoods for individuals and society, and the current concerns and policy requirements for sustainable development (Singh and Hiremath, 2010).

The concept of livelihood includes different ways of individual, family living and community needs (Ghadiri Masoum *et al.*, 2015). According to Chambers and Conway (1992), livelihoods include capabilities, assets (stores, resources, and access to resources) and activities required for life. Livelihood is sustainable when it is able to cope

with, and be improved with, the pressures and shocks, and to strengthen or maintain the capabilities and assets in the present and future, while not destroying natural resources. It provides sustainable livelihood opportunities for the next generation and creates net benefits for the livelihoods of others at local or national levels, in the short to long term (Shakoori and Bahrami, 2014).

The sustainable livelihood framework provides an analytical basis for understanding the complexity of rural livelihoods (Tavakoli *et al.*, 2017). This framework consists of five main axes (Tang *et al.*, 2013) including: (1) Vulnerability context, which is identified as insecurity in the individuals', households', and communities' well-being confronting changes in their external environment (Serrat, 2017), (2) Capital or assets, which have five main groups of capitals including social, financial, physical, natural, and human capital (Barrera-Mosquera *et al.*, 2010), (3) Structures and processes, where structures are the public and private part of organizations that set and implement policy and legislation while processes include the laws, regulations, policies, etc. (Serrat, 2017), (4) Livelihood strategies, which are the combination of activities that people choose in order to achieve their livelihood goals (Liu and Xu, 2016), and (5) Outputs or outcomes, which are the achievements of livelihood strategies (Liu and Xu, 2016). This framework plans livelihoods at the individual, household, and village level (Morse and McNamara, 2013). Various sustainable livelihood frameworks recognize that livelihoods are caused by diverse assets and activities. An analysis of livelihood assets and household-level activities could help to understand the dynamics of livelihoods (Horsley *et al.*, 2015).

In the field of rural livelihood, research has been carried out, some of which are mentioned in the following. Dehghani Pour *et al.* (2018) investigated the impact of livelihood assets on choosing livelihood strategies in the Hara Biosphere Reserve. The results of the study indicated that financial, social, and human assets had a significant positive impact on choosing commercial and mixed livelihood strategies, whereas physical assets positively influenced a propensity towards the fishery/livestock

livelihood strategy. Kibria *et al.* (2018) studied the interactions between livelihood capitals and access of local communities to the forest provisioning services of the Sundarbans Mangrove Forest in Bangladesh. Their study suggested that improving the human capital and social capital would be vital in changing the access to the provisioning services and thereby ensure better conservation. Forouzani *et al.* (2017) used sustainable livelihood framework in a study conducted among Karun farmers. The results showed that the farmers' social capital was above average, their natural capital was moderate, and farmers' human, physical and financial capital as well as the total assets index were lower than average. In addition, farmers' social capital had the highest average while their physical capital had the lowest average. Ibrahim *et al.* (2017) investigated the relationship between livelihood assets and sustainable livelihoods. The results indicated that physical asset, natural asset, and social asset were significantly related to achieving sustainable livelihood. You and Zhang (2017) investigated the sustainable livelihoods and rural sustainability in China. The results showed that the sustainable livelihood security index and its components varied between provincial regions, with the western provinces being most adversely affected, sustainable livelihood, economic efficiency, and social equity being the least secure (or relatively insecure) in the western provinces. In contrast, economic efficiency was most secure (or relatively secure) in the eastern and middle provinces, and social equity was most secure in the eastern provinces. Finally, they suggested that policies be designed to improve the sustainable livelihood security of farmers according to local and regional circumstances. Udoh *et al.* (2017) assessed the sustainable livelihood assets of farming households in Southern region of Nigeria. The finding indicated that farming households had considerable piles of physical, social and natural assets, whereas they had a huge deficiency in financial and human assets. AliBeygi and Mahdizadeh (2017) examined the role of small industries in improving the livelihoods of rural households in Sirvan and Chardavol Counties in Ilam Province. The results showed that, apart from the natural capital, the increase in human, financial, social, physical, and total capitals of employed households after employment in small industries was higher than

pre-employment. Also, the establishment of small industries in the studied villages of the counties had a positive impact on the capitals, except for natural capital, including human, financial, social, physical, and total capital of employed households compared to non-employed ones. Khosrozadyan *et al.* (2016) investigated the priority of agricultural exploitation systems in Behbahan Township based on the model of sustainable livelihood. The results showed that human, financial, social, physical and natural capital, with the weights of 0.360, 0.354, 0.106, 0.099 and 0.081, respectively, played the most important role in determining the sustainability of an exploitation system. Sadeghzadeh *et al.* (2015) analyzed paddy farms sustainability in Rasht Township using a sustainable livelihood approach. The results showed that each of the six districts of Rasht Township (Central, Kucheshfahan, Lasht-e-Nesha, Sangar, Khoshkebijar and Khomam) did not have a favorable status in five capitals including physical, human, social, financial, and natural capital. However, human capital had a more favorable status than the other capitals in these six districts. Sangar had the highest level of natural and physical capital. The central district had the best status in the financial and human capital, and Khomam had the best status in the social capital. Sarrafi and Shamsaei (2014) investigated the sustainable livelihoods framework in their study to achieve a strategy for survival and promotion of households in the informal settlements in Islamabad neighborhood in Tehran. The results showed that the natural assets were the highest asset of the residents in terms of geographical location and gardens and green space around them. However, the amount of natural capital of the neighborhood had been reduced due to human factors. Also, the physical, human, and social assets of Islamabad neighborhoods were moderate and the political and financial assets were lower than the average. Furthermore, the physical, financial, human, and social capital of the neighborhood households had been decreased. Wang *et al.* (2016) investigated the sustainable livelihoods of different farmers in the hilly red soil erosion areas of southern China. The results showed that there were significant differences in the level of livelihood sustainability among rural households, such that specialized agricultural households had the highest livelihood



sustainability index (0.29), while households with more than 90% pure farm households had the lowest livelihood sustainability (0.116). Chen *et al.* (2013) measured their livelihood assets in sustainable forest commons governance in northwest China. The findings showed that the total value of livelihood assets was 0.56 in 2006 and increased to 0.71 in 2010. Indeed, in the process of sustainable forest governance, livelihoods had changed significantly. Su and Shang (2012), in a study on the relationship between livelihood assets and livelihood strategies in the Heihe river basin, concluded that physical capital had the maximum value (0.609) and human capital had a relatively high value (0.516) for farmers, followed by social capital (0.354). In addition, financial (0.286) and natural assets (0.241) had relatively low value and were positioned in the following rankings.

Barrera-Mosquera *et al.* (2010) analyzed the available capitals in agricultural systems in rural communities of Saraguro in Ecuador. In this area, which includes 19 communities, in some communities a project for the development of the region was implemented. The results of the comparison of capitals among these communities showed that financial capital and human capital grew 231 and 173%, respectively. Physical capital increased by 105 percent due to investment in technology, equipment, tools and services, and social capital had the highest growth (255 percent).

Generally, sustainable livelihood capitals are the pre-existing physical, natural, financial, social, and human resources that belongs to a community or a community has access to it (Cherni and Hill, 2009). Therefore, a society that is unable to fulfill the basic needs of livelihood capital (natural, financial, physical, human, and social capital) is not sustainable (Pandey *et al.*, 2017). The issue of sustainable livelihoods and livelihood capitals should be given more attention in less developed regions such as Kohgiluyeh and Boyerahmad Province in Iran. On the other hand, rural areas of Dena County rank the last in terms of development among the rural areas of this province (Karami and Abdshahi, 2011). Furthermore, in rural areas of Dena County, social, human and physical capitals are at average sustainability. However, financial and natural capitals are at poor sustainability (Sharafi *et al.*, 2018). Previous studies have investigated

livelihood capitals. However, none of them focused on the zoning the rural areas based on the sustainability of livelihood capitals. Therefore, this research aimed at zoning the villages of the Central District of Dena County, which includes two townships called Tootnade and Dena, in terms of the sustainability of livelihood capitals. Accordingly, the research objectives included measuring the livelihood capitals, determining whether the livelihood capitals are statistically different from average value or not, determining the sustainability of livelihood capitals in the villages of the Central District of Dena County, categorizing the villages based on the level of five livelihood capitals and finally determining whether there is a significant difference between the villages in terms of the five livelihood capitals or not. The conceptual framework of the research is illustrated in the Figure 1.

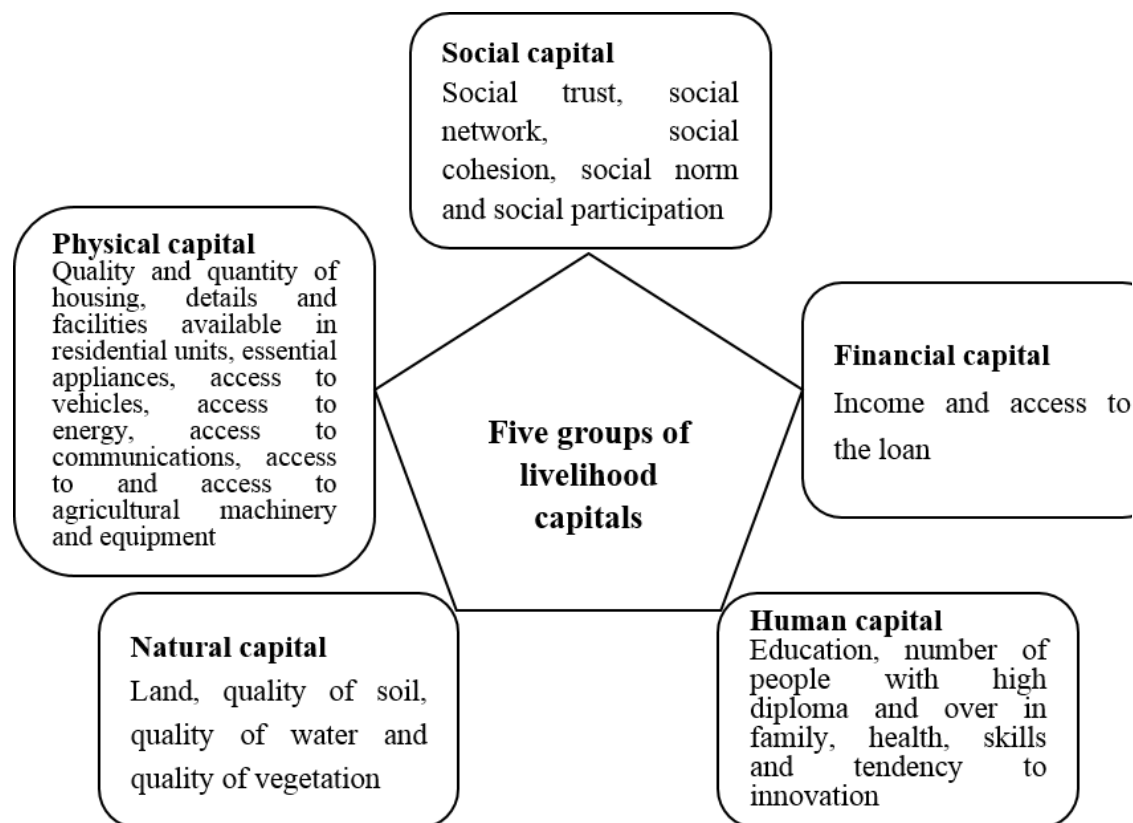
## MATERIALS AND METHODS

The present descriptive-analytic study was carried out through a survey method. The statistical population and the unit of analysis were 2,500 rural households in the central district of Dena County, of which 300 households were sampled based on Krejcie and Morgan's (1970) table. Samples were selected through cluster random sampling. First, two townships of this district were assumed as clusters. Then, 12 villages of Dena Township and 8 villages of Tootnadeh Township were selected randomly, and the sample size in each village was allocated proportionally to the number of households. Finally, respondents for a questionnaire were randomly selected in the chosen villages. The statistical population and sample size are shown in Table 1.

The data-gathering tool in this research was a structured and researcher-made questionnaire, whose face validity was confirmed using a panel of experts (Faculty Members of Rural Development Management Department of Yasouj University) and the reliability of different sections of the questionnaire was confirmed by carrying out a pre-test outside the study area and calculating the Cronbach's Alpha. Livelihood capitals and their components used in the questionnaire are listed in Table 2.

**Table 1.** Statistical population and sample size.

Township	Village	Number of household	Sample size
Dena	Kareyak	215	32
	Darshahi	237	35
	Iqbal Abad-e Si-Sakht	16	3
	Kookhdan	215	12
	Biyare	104	15
	Hassan Abad-e Kareyak	15	3
	Talega	30	5
	Amir Abad-e Si-Sakht	64	10
	Ali Abad-e Kookhdan	24	4
	Dehno Kookhdan	24	4
	Sarmoor Kookhdan	28	4
	Masumabad va Aliabad-e Kareyak	258	38
Tootnadeh	Gandhi Khoury Sofla	109	16
	Tootnadeh	489	73
	Sar Tang Tootnadeh	55	8
	Gor Ganjo	96	14
	Ahmad abad-e Gor Ganjo	22	4
	Nade	37	5
	Kare Karami	79	10
	Sar Asiyab Kare	29	5

**Figure 1.** The conceptual framework of the research.



Measuring the sustainability of rural livelihoods was carried out in 3 steps as follows:

**Step 1:** Considering the different ways of measuring the components of the five livelihood capitals, first, the standardization of each section of the above mentioned capitals was carried out using Equation (1), such that the standardized indicators ranged in the interval zero and one (Shahrokhi Sardoo, 2013).

$$\text{Standardization } r_{ij} = \frac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}} \quad (1)$$

$x_{ij}$ : The value of the  $i$  index;

$x_j^{\min}$ : The minimum  $i$ ,

$x_j^{\max}$ : The maximum  $i$ .

$i$ : The index,

$j$ : The location

**Step 2:** The obtained standardized data for each section was averaged for each of the five capitals and the resulting score was considered as the sustainability index for each capital.

**Step 3:** To convert quantitative calculations into qualitative values, the Prescott-Allen five categories were used (Roknodin Eftekhari et al., 2011). In these categories, if the calculated

score is between 0 and 0.2, that capital is in an unsustainable state; if the score is between 0.2 and 0.4, that capital is in a potentially unsustainable (weak) state and the score obtained in the range from 0.4 to 0.6 is indicative of a moderate sustainability condition. If the calculated score is between 0.6 and 0.8, that capital will be in a potentially sustainable state and, finally, if the calculated score ranges from 0.8 to 1, it indicates that the capital is in sustainable state. The mentioned classification is shown in Table 3. Data were analyzed using descriptive (frequency, mean, and standard deviation), analytical statistics (One-Sample t Test, analysis of variance, and cluster analysis) and SPSS19 software. Cluster analysis is one of the most widely used methods for finding homogeneous regions and leveling up the regions and villages. In this method, places located at one level are very similar to each other, but have a significant difference with the locations of other levels (Ziaiean Firozabadi et al., 2016).

**Table 2.** Five groups of livelihood capitals and their components, which are used in the questionnaire (Source: Authors' research).

Capital	Components
Social capital	Social trust (7 items), social network (8 items), social cohesion (5 items), social norm (3 items) and social participation (7 items) in three-point Likert scale (low, medium, high)
Financial capital	Income (open question) and access to the loan (3 items) in three-point Likert scale (low, medium, high)
Human capital	Education (open question), number of people with high diploma and over in family (open question), health (standardized SF-36 questionnaire), skills (4 items) and tendency to innovation (4 items) in three-point Likert scale (low, medium, high)
Natural capital	land (the ownership of farmland and garden in open question), quality of soil (8 items), quality of water (3 items) and quality of vegetation (4 items) in three-point Likert scale (low, medium, high)
Physical capital	Quality and quantity of housing (5 items), details and facilities available in residential units (4 items), essential appliances (4 items), access to vehicles (5 items), access to energy (3 items), access to communications (3 items), and access to agricultural machinery and equipment (4 items) in nominal scale

**Table 3.** Prescott-Allen five categories for classification of sustainability levels.

Sustainability levels (State)	Score
Unsustainable	0-0.2
Potentially unsustainable (Weak)	0.2-0.4
Moderate	0.4-0.6
Potentially sustainable (Strong)	0.6-0.8
Sustainable	0.8-1

Source: Rezvani et al. 2015.

## RESULTS

## Demographic Characteristics

The demographic characteristics of the respondents are presented in Table 4. According to the findings of this study, 97.0% of the respondents were male and only 3.0% were female. The mean score of the respondents' age was 44.16 years and the standard deviation was 13.39. In other words, most respondents were middle-aged. In addition, the mean score of the respondents' education was 8.28 years with a standard deviation of 5.01. Therefore, it could be concluded that the education level of most respondents was at guidance school level. The mean score of the respondents' household size was 5.08, with a standard deviation of 2.14.

## The Status of Livelihood Capitals

The status of livelihood capitals in the studied villages is shown in Table 5. According to the mentioned table, out of 20 studied villages, only the social capital of two villages in Gandhi Khoury Sofla and SarTang Tootnadeh was slightly less than 0.5 (average). In general, it could be stated that the social capital of the studied villages was moderately above average. This finding was consistent with the results of the research by Forouzani *et al.* (2017) and Sarrafi and Shamsaei (2014), while it was contrary to the findings of Sadeghzadeh *et al.* (2015). The standardized scores of financial capital showed that, in all studied villages, the financial capital score was less than 0.5. Therefore, the financial capital of these villages was less than average, which was similar to the findings of Forouzani

Sadeghzadeh *et al.* (2015). In addition, the human capital scores of the studied villages indicated that out of the 20 studied villages, only the human capital of 6 villages including Kareyak, Hassan Abad-e Kareyak, Talega, Dehno Kookhdan, Sarmoor Kookhdan and Tootnadeh was slightly less than 0.5 (average). Generally, the human capital of most studied villages was higher than average. This result was in agreement with the findings of Sarrafi and Shamsaei (2014), while not consistent with the results of Forouzani *et al.* (2017) and Sadeghzadeh *et al.* (2015). The natural capital of the studied villages indicated that only the natural capital of the village of Ali Abad-e Kookhdan was higher than 0.5 (average). It is worth considering that one item of natural capital is water, which is of importance and great value because of its impact on ecological functions, programs of socio-economic development, cultural and religious values and so on (Valizadeh, *et al.*, 2018). Overall, the results indicated that the natural capital of most villages was less than average, which was in accordance with Sadeghzadeh *et al.* (2015), but contradicted the findings of Forouzani *et al.* (2017) and Sarrafi and Shamsaei (2014). The status of physical capital also showed that the physical capital score of two villages including Gandhi Khoury Sofla and Sar Asiyab Kare was less than 0.5 (average). It could be stated that the physical capital of most studied villages was above average, which was consistent with the findings of Sarrafi and Shamsaei (2014), while inconsistent with the results of Forouzani *et al.* (2017) and Sadeghzadeh *et al.* (2015). The total capital also showed that out of the 20 villages, the total capital of 7 villages was higher than 0.5 (average). This finding was different from the results of Forouzani *et al.* (2017). Therefore, it could generally be concluded that social capital, physical capital, and human capital of the studied villages were above average, while the

**Table 4.** Demographic characteristics of the respondents.

Variable	Frequency	Percent	Mean	Standard deviation
Gender Male	291	97.0	-	-
Female	9	3.0	-	-
Age (Year)	-	-	44.16	13.39
Level of education (Years)	-	-	8.82	5.01
Household size	-	-	5.08	2.14

*et al.* (2017), Sarrafi and Shamsaei (2014), and

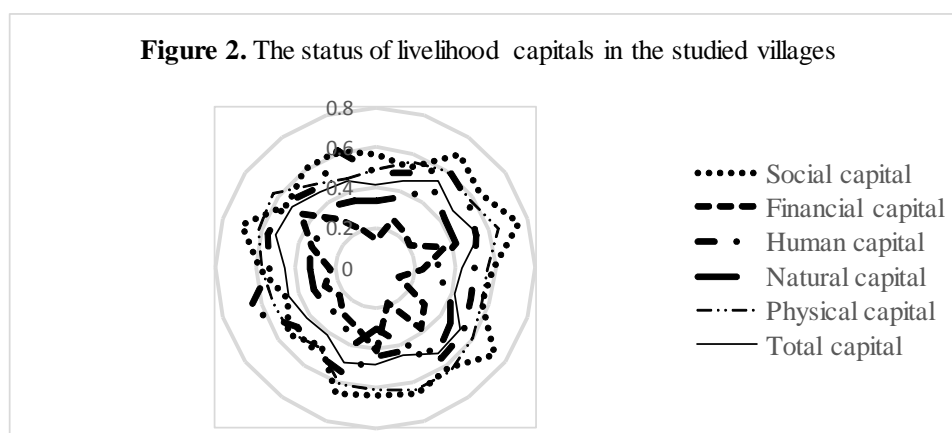
**Table 5.** The scores of livelihood capitals in the studied villages.

Village	Social capital	Financial capital	Human capital	Natural capital	Physical capital	Total capital
Kareyak	0.57	0.15	0.48	0.34	0.50	0.41
Darshahi	0.53	0.26	0.50	0.38	0.56	0.45
Iqbal Abad-e Si-Sakht	0.71	0.23	0.61	0.49	0.60	0.53
Kookhdan	0.64	0.20	0.57	0.42	0.58	0.48
Biyare	0.75	0.36	0.52	0.42	0.64	0.54
Hassan Abad-e Kareyak	0.58	0.23	0.49	0.29	0.55	0.43
Talega	0.55	0.12	0.49	0.39	0.55	0.42
Amir Abad-e Si-Sakht	0.73	0.30	0.54	0.46	0.59	0.52
Ali Abad-e Kookhdan	0.61	0.37	0.55	0.51	0.63	0.53
Dehno Kookhdan	0.65	0.18	0.43	0.39	0.63	0.46
Sarmoor Kookhdan	0.63	0.41	0.44	0.30	0.60	0.48
Masumabad va Aliabad-e Kareyak	0.65	0.31	0.55	0.40	0.60	0.50
Gandhi Khoury Sofla	0.47	0.28	0.52	0.30	0.48	0.41
Tootnadeh	0.55	0.23	0.49	0.31	0.54	0.42
Sar Tang Tootnadeh	0.47	0.27	0.67	0.33	0.54	0.46
Gor Ganjo	0.58	0.23	0.54	0.33	0.57	0.45
Ahmad Abad-e Gor Ganjo	0.71	0.34	0.57	0.35	0.62	0.52
Nade	0.55	0.47	0.56	0.33	0.64	0.51
Kare Karami	0.61	0.31	0.50	0.39	0.52	0.47
Sar Asiyab Kare	0.62	0.20	0.62	0.36	0.47	0.45

financial and natural capital as well as the total capital of these villages was less than average.

Figure 2 depicts the status of livelihood capitals in the studied villages. The closer the diagram is to the circle, the lower is the gap between the studied villages. According to Figure 2, social capital in the majority of villages was more than the other capitals of these villages. The finding of Choobchian *et al.* (2015) also showed that social sustainability in Beach Seine cooperatives had the best situation. The result of the current study could be because

of the fact that the people in the studied area were tribal. Therefore, they had high level of social trust, social cohesion, social participation and other components of social capital. However, the presence of sharp angles in the figure of social capital indicated the existence of a gap between the studied villages in terms of social capital. After social capital, the physical capital of the villages was higher than the other capitals, and the presence of fewer angles in the figure of physical capital indicates that there was less gap between the villages in

**Figure 2.** The status of livelihood capitals in the studied villages



terms of physical capital; in other words, the villages were relatively homogeneous in terms of physical capital. After physical capital, the human capital of villages was more than the two other capitals (natural and financial capital). However, the sharp angles in the figure of human capital showed that there was a gap between the studied villages in terms of human capital and the villages were somewhat heterogeneous in terms of human capital.

The figure also showed that, after financial capital, the natural capital of most villages was less than the rest of the capitals. Furthermore, the angularity of the above figure indicated that the studied villages were not homogeneous in terms of natural capital. Finally, the financial capital in most villages was less than other capitals. In addition, the existence of a large number of sharp angles in the figure of financial capital indicated that the villages were very heterogeneous in terms of financial capital. Nevertheless, the figure of total capital showed that the villages were somewhat homogeneous in terms of total capital.

Table 6 shows the result of One-Sample t Test of livelihood capitals, which was applied to determine whether the mean score of livelihood capitals is statistically different from average value (0.5) or not. According to the mean score and significant level, it is indicated that all five livelihood capitals as well as total capital were statistically different from average value (0.5) in the studied villages. Indeed, social capital and physical capital were significantly above average at 99% confidence level, and human capital was significantly above average at 95% confidence level, whereas financial capital, natural capital, and total capital were

significantly below average at 99% confidence level.

### Sustainability Status of Livelihood Capitals

The sustainability of livelihood capitals in the studied villages is shown in Table 7. In order to examine the sustainability of capital, the Prescott-Allen five categories (Table 3) were used. The results of Table 7 showed that, out of the 20 studied villages, the social capital of 9 villages including Kareyak, Darshahi, Hassan Abad-e Kareyak, Talega, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, Nade, was moderate in terms of sustainability. In addition, 11 villages including Iqbal Abad Si-Sakht, Kokhdan, Biyare, Amir Abad-e Si-Sakht, Ali Abad-e Kookhdan, Dehno Kookhdan, Sarmoor Kookhdan, Masumabad va Aliabad-e Kareyak, Ahmad abad-e Gor Ganjo, Kare Karami, Sar Asiyab Kare were potentially sustainable (strong). Therefore, most of the studied villages were in the state of strong in terms of the sustainability of social capital. As mentioned before, it might be because of tribal structure in the studied region that they had high levels of social capital and as a result, the villages were potentially sustainable in terms of the social capital.

Out of the 20 studied villages, the financial capital of 3 villages, including Kareyak, Talega and Dehno Kookhdan, was unsustainable. Fifteen villages including Darshahi, Iqbal Abad Si-Sakht, Kookhdan, Biyare, Hassan Abad-e Kareyak, Amir Abad-e Si-Sakht, Ali Abad-e

**Table 6.** The result of one-sample t test of livelihood capitals (Test value= 0.5).

Livelihood capital	Mean	<i>t</i>	<i>Sig</i> <sup>a</sup>	Mean difference	95% Confidence Interval of the difference	
					Lower	Upper
Social capital	0.6080	6.120	0.001	0.10800	0.0711	0.1449
Financial capital	0.2725	-11.529	0.001	-0.22750	-0.2688	-0.1862
Human capital	0.5320	2.419	0.026	0.03200	0.0043	0.0597
Natural capital	0.3745	-8.939	0.001	-0.12550	-0.1549	-0.0961
Physical capital	0.5705	6.092	0.001	0.07050	0.0463	0.0947
Total capital	0.4720	-2.921	0.009	-0.02800	-0.0481	-0.0079

<sup>a</sup> Significance level

**Table 7.** Sustainability of livelihood capitals in the studied villages.

village	Social capital	Financial capital	Human capital	Natural capital	Physical capital	Total capital
Kareyak	Moderate	Unsustainable	Moderate	Weak	Moderate	Moderate
Darshahi	Moderate	Weak	Moderate	weak	Moderate	Moderate
Iqbal Abad-e Si-Sakht	Strong	Weak	Strong	Moderate	strong	Moderate
Kookhdan	Strong	Weak	Moderate	Moderate	Moderate	Moderate
Biyare	Strong	Weak	Moderate	Moderate	Strong	Moderate
Hassan Abad-e Kareyak	Moderate	Weak	Moderate	Weak	Moderate	Moderate
Talega	Moderate	Unsustainable	Moderate	Weak	Moderate	Moderate
Amir Abad-e Si-Sakht	Strong	Weak	Moderate	Moderate	Moderate	Moderate
Ali Abad-e Kookhdan	Strong	Weak	Moderate	Moderate	Strong	Moderate
Dehno Kookhdan	Strong	Unsustainable	Moderate	Weak	Strong	Moderate
Sarmoor Kookhdan	Strong	Moderate	Moderate	Weak	Strong	Moderate
Masumabad va Aliabad-e Kareyak	Strong	Weak	Moderate	Moderate	Strong	Moderate
Gandhi Khoury Sofla	Moderate	Weak	Moderate	Weak	Moderate	Moderate
Tootnadeh	Moderate	Weak	Moderate	Weak	Moderate	Moderate
Sar Tang Tootnadeh	Moderate	Weak	strong	Weak	Moderate	Moderate
Gor Ganjo	Moderate	Weak	Moderate	Weak	Moderate	Moderate
Ahmad abad-e Gor Ganjo	Strong	Weak	Moderate	Weak	Strong	Moderate
Nade	Moderate	Moderate	Moderate	Weak	Strong	Moderate
Kare Karami	Strong	Weak	Moderate	Weak	Moderate	Moderate
Sar Asiyab Kare	Strong	Weak	Strong	Weak	Moderate	Moderate

Kookhdan, Masumabad va Aliabad-e Kareyak, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, Ahmad abad-e Gor Ganjo, Kare Karami, and Sar Asiyab Kare were in a potentially unsustainable (weak) state, and only 2 villages of Sarmoor Kookhdan and Nade were moderate. In other words, the majority of studied villages were in a potentially unsustainable (weak) state in terms of financial capital. It might be due to the fact that most of the villagers in the studied area were small farmers, freelancers, or workers who suffered from the lack of sustainable income sources.

In addition, the results of Table 7 show that, out of 20 studied villages, the human capital of 17 villages including Kareyak, Darshahi, Kookhdan, Biyare, Hassan Abad-e Kareyak, Talega, Amir Abad-e Si-Sakht, Ali Abad-e Kookhdan, Dehno Kookhdan, Sarmoor

Kookhdan, Masumabad va Aliabad-e Kareyak, Gandhi Khoury Sofla, Tootnadeh, Gor Ganjo, Ahmad abad-e Gor Ganjo, Nade, and Kare Karami were moderate in terms of sustainability. Also, 3 villages including Iqbal Abad Si-Sakht, Sar Tang Tootnadeh, and Sar Asiyab Kare were potentially sustainable (strong). Therefore, most of the studied villages were in a moderate state in terms of the sustainability of human capital. The level of the villagers' education, their status of health, as well as their tendency to innovation were moderate. In addition, the level of the villagers' skills were moderate, which is worth mentioning that professional and experienced labor forces are one of the most fundamental factors for development (Shiri *et al.*, 2011). Taken together, these results suggested that the studied villages were moderately sustainable in terms of human capital.

Furthermore, Table 7 shows that among 20 studied villages, the natural capital of 14 villages including Kareyak, Darshahi, Hassan Abad-e Kareyak, Talega, Dehno Kookhdan, Sarmoor Kookhdan, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, Ahmad abad-e Gor Ganjo, Nade, Kare Karami, and Sar Asiyab Kare were potentially unsustainable (weak). Moreover, 6 villages including Iqbal Abad-e Si-Sakht, Kookhdan, Biyare, Amir Abad-e Si-Sakht, Ali Abad-e Kookhdan, Masumabad va Aliabad-e Kareyak were moderate. Therefore, most of the studied villages have been potentially unsustainable (weak) in terms of the sustainability of natural capital. Most of the studied villagers did not own considerable amount of land. As a result, the studied villages were potentially unsustainable in terms of the natural capital.

In addition, the segregation of villages based on the sustainability of physical capital in Table 7 indicated that out of 20 studied villages, the physical capital of 12 villages including Kareyak, Darshahi, Kookhdan, Hasan Abad-e Kareyak, Talega, Amir Abad-e Si-Sakht, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, Kare Karami, and Sar Asiyab Kare were moderate in terms of sustainability. Also, 8 villages including Iqbal Abad-e Si-Sakht, Biyare, Ali Abad-e Kookhdan, Dehno Kookhdan, Sarmoor Kookhdan, Masumabad va Aliabad-e Kareyak, Ahmad abad-e Gor Ganjo, and Nade were potentially sustainable (strong). Therefore, most of the studied villages were in the moderate state in terms of the sustainability of physical capital. Since most of the studied villagers had access to energy, communication, and so on, the studied villages were moderately sustainable in terms of the physical capital.

Finally, Table 7 shows that the total capital in all 20 studied villages was in the moderate state of sustainability.

### **Categorizing the Villages Based on the Level of Livelihood Capitals**

K mean cluster analysis was used to categorize villages into three categories based on the level of five livelihood capitals. A cluster analysis is a technique for grouping individuals or topics

so that they are similar within groups, but they have a significant difference with other groups (Kalantari, 2003). Based on K mean cluster analysis, villages were divided into three categories: non-privileged, semi-privileged, and privileged. According to Table 8, 9 villages were non-privileged including Kareyak, Darshahi, Hassan Abad-e Kareyak, Talega, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, and Sar Asiyab Kare. Furthermore, 4 villages including Sarmoor Kookhdan, Ahmad abad-e Gor Ganjo, Nade, and Kare Karami were semi-privileged. Finally, 7 villages were privileged including Iqbal Abad-e Si-Sakht, Kookhdan, Biyare, Amir Abad-e Si-Sakht, Ali Abad-e Kookhdan, Dehno Kookhdan, and Masumabad va Aliabad-e Kareyak.

### **Comparison of Villages Based on Their Livelihood Capitals**

Analysis of variance (ANOVA) was used in order to define whether there is a significant difference between the three categories of villages in terms of five livelihood capitals or not. The result showed that apart from human capital, the other four livelihood capitals as well as total capital were significantly different between the three categories of villages. Duncan was used as a post hoc test to determine where the differences occurred between groups. According to Table 9, semi-privileged and privileged villages were significantly different from non-privileged villages in terms of social capital, physical capital, and total capital. In addition, semi-privileged villages were significantly different from both non-privileged and privileged villages in terms of financial capital. On the other hand, there was a significant difference between privileged villages and both non-privileged and semi-privileged villages in terms of natural capital.

### **CONCLUSIONS**

The present study was carried out with the aim of zoning the villages of Central District of Dena County in terms of the sustainability of livelihood capitals. The survey of the status of

**Table 8.** The result of K mean cluster analysis for categorizing villages based on the level of five livelihood capitals.

Level of five livelihood capitals	Number of villages	Villages
Non-privileged	9	Kareyak, Darshahi, Hassan Abad-e Kareyak, Talega, Gandhi Khoury Sofla, Tootnadeh, Sar Tang Tootnadeh, Gor Ganjo, Sar Asiyab Kare
Semi-privileged	4	Sarmoor Kookhdan, Ahmad abad-e Gor Ganjo, Nade and Kare Karami
Privileged	7	Iqbal Abad-e Si-Sakht, Kookhdan, Biyare, Amir Abad-e Si-Sakht, Ali Abad-e Kookhdan, Dehno Kookhdan and Masumabad va Aliabad-e Kareyak

**Table 9.** The result of ANOVA between the three categories of villages.

Livelihood capital	Mean			F	Sig
	Non-privileged	Semi-privileged	Privileged		
Social capital	0.546 <sup>a</sup>	0.625 <sup>b</sup>	0.677 <sup>b</sup>	11.678	0.001
Financial capital	0.218 <sup>a</sup>	0.382 <sup>b</sup>	0.278 <sup>a</sup>	8.624	0.003
Human capital	0.533	0.517	0.538	0.151	0.861
Natural capital	0.336 <sup>a</sup>	0.342 <sup>a</sup>	0.441 <sup>b</sup>	15.468	0.001
Physical capital	0.528 <sup>a</sup>	0.595 <sup>b</sup>	0.610 <sup>b</sup>	11.174	0.001
Total capital	0.433 <sup>a</sup>	0.495 <sup>b</sup>	0.508 <sup>b</sup>	21.224	0.001

the five livelihood capitals in the studied villages indicated that, in most studied villages, among 5 livelihood capitals, 3 capitals (social, physical, and human capitals) were above average, while 2 capitals (financial and natural capitals), as well as the total capital of the villages were less than average. Therefore, it seems essential for policy makers, planners, and authorities to make an effort in order to promote financial and natural capitals in the studied area.

Furthermore, the figure that illustrated the status of livelihood capitals in the studied villages showed that, in most studied villages, social capital was more than other capitals. Then, physical capital, human capital, and natural capital were placed, respectively. Finally, most villages had the least privilege of financial capital. In addition, there was a gap and heterogeneity between the villages in terms of social capital, human capital, natural capital, as well as financial capital. On the contrary, there was a homogeneity between the studied villages in terms of physical capital and total capital. Hence, regional, not general, planning needs to be taken into consideration in order to improve the status of social capital, human capital, natural capital, and financial capital in the studied villages.

The findings of One-Sample t Test of livelihood capitals indicated that social capital,

physical capital, and human capital were significantly above average at 99% and 95% confidence level, respectively, while financial capital, natural capital, and total capital were significantly below average at 99% confidence level.

The study of the sustainability of livelihood capitals indicated that sustainability of most studied villages was strong in terms of social capital. In addition, the sustainability of most studied villages was in a moderate state in terms of human capital, physical capital, as well as total capital. Nevertheless, the majority of the studied villages were weak in terms of the sustainability of financial capital and natural capital. Therefore, in order to achieve sustainable livelihood in the studied villages, financial capital and natural capital seem more necessary to receive attention by planners and policy makers than other capitals. Additionally, it is recommended that low-interest loans and bank credits with long-term installments without collateral should be easily provided through creation of loan funds for villagers to create a business.

Furthermore, the result of cluster analysis to categorize villages showed that 9, 4, and 7 villages were categorized as non-privileged, semi-privileged, and privileged, respectively. In addition, the result of Analysis Of Variance

(ANOVA) indicated that, except human capital, other four livelihood capitals as well as total capital were statistically different between the three categories of villages. Hence, non-privileged and semi-privileged villages should receive more consideration by planners.

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### پهنه بندی روستاهای بخش مرکزی شهرستان دنا به لحاظ پایداری سرمایه‌های معیشت

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#### چکیده

رویکرد معیشت پایدار به عنوان یکی از رویکردهای توسعه پایدار روستایی در اواخر دهه ۱۹۸۰ با هدف فقرزدایی اجتماعات روستایی به وجود آمد. این رویکرد یک چارچوب وسیعی برای ارزیابی ابعاد مختلف پایداری پیشنهاد نموده است. یک جز مهم در این چارچوب سرمایه‌های معیشت است به طوری که دستیابی به معیشت پایدار روستایی، بدون توجه به دارایی‌ها و سرمایه‌های معیشتی در روستاها امکان پذیر نیست. از این رو، هدف این پژوهش توصیفی-تحلیلی از نوع پیمایش، پهنه بندی روستاهای بخش مرکزی شهرستان دنا به لحاظ پایداری سرمایه‌های معیشت بوده است. جامعه آماری تحقیق ۲۵۰۰ خانوار روستایی بخش مرکزی شهرستان دنا بودند که براساس جدول کرجسی و مورگان ۳۰۰ خانوار از طریق روش نمونه‌گیری تصادفی خوشه‌ای با انتساب متناسب انتخاب شدند. ابزار تحقیق پرسشنامه‌ی محقق ساخته بود که روایی صوری آن با استفاده از پانل متخصصان و پایایی آن نیز با انجام مطالعه پیش‌آزمون و سنجش آلفای کرونباخ تأیید شد. یافته‌های تحقیق نشان داد در اغلب روستاهای مورد مطالعه، مقدار ۳ سرمایه (اجتماعی، فیزیکی و انسانی) بالاتر از حد متوسط و ۲ سرمایه (مالی و طبیعی) و همچنین سرمایه کل کمتر از حد متوسط بوده است. افزون بر این، بین روستاها از لحاظ سرمایه اجتماعی، انسانی، طبیعی و همچنین سرمایه مالی شکاف و ناهمگونی وجود داشت در حالی که از نظر سرمایه فیزیکی و نیز سرمایه کل همگن بودند. همچنین عمده روستاهای مورد مطالعه از لحاظ سرمایه مالی و طبیعی در وضعیت ناپایداری بالقوه، از لحاظ سرمایه انسانی و فیزیکی و نیز سرمایه کل در وضعیت پایداری متوسط و از لحاظ سرمایه اجتماعی در وضعیت پایداری بالقوه قرار داشتند. افزون بر این، تجزیه و تحلیل خوشه‌ای برای طبقه بندی روستاها نشان داد که ۹، ۴ و ۷ روستا به ترتیب به عنوان غیر برخوردار، نیمه برخوردار و



برخوردار طبقه بندی شده اند. علاوه بر این، نتیجه تجزیه و تحلیل واریانس (ANOVA) نشان داد بین سه دسته از روستاها به لحاظ سرمایه های اجتماعی، فیزیکی، مالی و طبیعی، و سرمایه کل تفاوت معنی داری وجود داشت. بنابراین، روستاهای غیر برخوردار و نیمه برخوردار باید مورد دقت و توجه بیشتر برنامه ریزان قرار گیرد و لازم است برنامه ریزی منطقه ای بیش از برنامه ریزی کلی مورد توجه آنان واقع گردد.