

# Effects of Beneficiaries' Economic Issues on Rangeland Ecological Sustainability (Case Study: Shahsavan Nomads of Meshginshahr City)

GH. Heidari<sup>1</sup>, A. Hosseinzadeh<sup>2\*</sup>, E. Zandi Esfahan<sup>3</sup>, Hossein Barani<sup>4</sup> and S.H. Zali<sup>1</sup>

<sup>1</sup>Department of Range and Watershed Management, Sari University of Agricultural Sciences and Natural Resources, Sari, Iran; q\_heydari@yahoo.com, hasan.zali@gmail.com

<sup>2</sup>Graduate in Range Management and Instructor of Payam-e-Noor University, Iran; hosseinzadeh2012@yahoo.com

<sup>3</sup>Rangeland Research Division, Research Institute of Forests and Rangelands (RIFR), Agricultural Research Education and Extension Organization (AREEO), Tehran, Iran; zandiesfahan@gmail.com

<sup>4</sup>Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran; baranihossein@yahoo.com

## Abstract

**Background/Objectives:** This research was aimed to investigate the effect of beneficiaries' economic condition on ecological sustainability of allotments, utilized by Shahsavan nomads in summer rangelands of the Sabalan Mountain, Ardabil province.

**Methods/Statistical analysis:** The nomads were sampled by simple random sampling and the number of samples was determined to be 58 beneficiaries using Cochran's formula. The economic indicators examined in this study included the amount of annual income, number of livestock and the share of rangeland area. Ten indicators were chosen to measure and evaluate the ecological sustainability. Data analysis was performed by statistical methods proportional to the level of measured variables using SPSS18 software. **Results:** According to the obtained results, a significant negative relationship was found between the number of livestock and sustainability index ( $r_s = -0.5$  and  $p < 0.01$ ), indicating that the rate of degradation will increase directly by increasing the number of livestock per unit area, resulting in decreased sustainability index. As well, Spearman's correlation test revealed a significant negative correlation between sustainability index and annual income and the share of rangeland area. Based on the amount of beneficiaries', income, the results of variance analysis showed that there were significant differences among the allotments in terms of sustainability ( $F=9.44$ ,  $p \leq 0.01$ ). **Conclusion/Application:** Overall, the results of this study clearly show that the rangeland ecological sustainability will be more important to the beneficiaries, having more livelihood and economic dependence on rangelands in terms of employment.

**Keywords:** Economy, Ecological Sustainability, Rangeland Health, Shahsavan Nomads

## 1. Introduction

Degradation of natural resources is one the crises of the twenty-first century, occurring as a result of human intervention. Natural resources as well as agriculture are considered as important sources of livelihood for rural and nomadic households<sup>1</sup>.

Meanwhile, water scarcity and limited government support policies along with all destructive human

activities have affected agriculture and natural resources including arable lands, forests and rangelands, causing to increased vulnerability of rural and nomadic households by reducing the productivity of ecosystems<sup>2</sup>.

Iranian range lands with 53% of the country's area<sup>3</sup>. Provide the possibility of various appropriate uses for the beneficiaries. However, in the present century, and especially in recent decades, with the increasing population of beneficiaries, increasing livestock and living standards,

\*Author for correspondence

natural ecosystems have been overused, so that the degradation of these resources is obvious to the beneficiaries and researchers<sup>4,5</sup>. Each ecosystem is characterized by its economic, social and ecologic structure. Consequently, the ecosystem's ecological potential is characterized based on the ecological analysis of ecosystems<sup>6</sup>.

Nowadays, with increasing population and the growing need for food, the necessity of sustainable use and management of natural resources, especially range management, is of utmost importance in the process of sustainable development. Undoubtedly, it is necessary to upgrade the productivity and development of natural resources, especially range management, in the development programs<sup>7</sup>.

Factors such as land ownership, livestock, water and means of production are involved in the collaboration between the public and government based on scientific, moral and philosophical phenomena. In other words, people cannot be forced to rational use of natural resources unless these resources meet their needs and the executive operations is in accordance with the socio-economic systems and their activities. These conditions depend on the economic need of beneficiary's household<sup>8</sup>.

Increased flooding, soil erosion, sediment accumulation behind dams and development of arid lands, all represent increasing degradation of the natural resources of the country and the current exploitation conditions, governing natural resources, will continue to intensify this process. That is why socio-economic issues have received particular attention<sup>9</sup>.

According to Heidari the factors affecting the participation of executives in range improvement programs could be classified in five key sections including ecological capital, human capital, social capital, economic capital, and organizational capital<sup>10</sup>.

Galvin and et al, in a study conducted in Africa in relation to the protection of natural resources, stated that in consistencies between conservation policies and economic needs of local people are the causes of degradation and range condition decline<sup>11</sup>.

Study on the economic condition of beneficiaries and its impact on the ecological sustainability of rangelands is necessary, and if done carefully, it can help managers and experts in recognition of the problems of a large part of beneficiaries population, dependent on the range land, through which an effective step could be taken to economize the livestock husbandry and pastoralism as well as reducing the pressure on rangelands.

Thus, the purpose of this study was to investigate the impact of beneficiaries' live lihood and economic condition on the ecological sustainability of allotments.

## 2. Concept Headings

### 2.1 Study Area

This research was conducted in the summer rangelands of the Shahsavan tribe, located in the Sabalan Mountain in the southern of Meshginshahr city. The study area is approximately 1875 ha, lying between longitudes 38° 27' and latitudes 47° 26' E with minimum and maximum altitudes of 1700 m and 2400 m, respectively. The residents of the area are engaged in agriculture and animal husbandry. The Sabalan Mountain rangelands are exploited by sheep and goat breeders.

### 2.2 Methodology

The current research is a non-experiment a land descriptive study; however, in terms of data collection, it is a field study and finally it is considered as a survey research due to the ability to generalize the findings. The statistical population of this research included the nomads of Shahsavan tribe in Meshginshahr city, Ardabil province. The sample size was determined using Cochran's formula as follows:

**Equation 1:**

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

Where n is the sample size, q and p are the variance and standard deviation, N is population size, d<sup>2</sup> is potential efficiency, and t is confidence interval. The sample size was calculated to be 58.

$$n = \frac{70 (1.96)^2 (0.5 \cdot 0.5)}{70 (0.05)^2 + (1.96)^2 (0.5 \cdot 0.5)} = 58$$

Sampling was done using stratified random sampling with proportional allocation. As a research-measuring tool, questionnaires were used. The economic indicators examined in this study included number of livestock, the share of rangeland area and amount of annual income. Ten indicators were chosen to measure and evaluate the ecological sustainability.

The process of indicators selection was based on rangeland condition and rangeland health by using the guidance of professors and experts of Meshginshahr Natural Resources Office as well as considering the condition of the study area. The following indicators were selected:

1. Bare soil percentage. 2. Amount of litter. 3. Vigor and vitality of plants. 4. Micro-terraces density and livestock waste on the soil. 5. Slope and erosion. 6. The presence of desirable plants (perennial plants, especially palatable species of grasses and forbs). 7. Canopy cover. 8. Presence and proliferation of annual plants. 9. Forage production and 10. Geographical directions and species frequency. Each indicator was scored from 1 to 20.

Then, each indicator was scored with Likert Scale as 1–4 (very poor), 4–8 (poor), 8–12 (fair), 12–16 (good), and 16–20 (very good)<sup>12</sup>.

Data analysis was performed by statistical methods proportional to the level of measured variables using SPSS18 software. To describe the demographic characteristics of respondents and general conditions of allotments, statistics like frequency, percentage, cumulative percentage, mean and standard deviation were used. Spearman's test was used to assess the correlation between economic indicators and rangeland sustainability and the mean comparison were performed using Duncan's Multiple Range Test.

## 3. Results

### 3.1 Economic Characteristics of the Respondents (Beneficiaries)

#### 3.1.1 Number of Livestock

The results of number of livestock are presented in Table 1. The number of livestock for 62% of beneficiaries was calculated to be 85–115 (highest frequency) and the lowest frequency was obtained for 6.9% of beneficiaries (more than 145 livestock). The average number of livestock was calculated to be 102.

#### 3.1.2 The Share of Rangeland Area

According to the results, the share of rangeland area for 31% of beneficiaries was calculated to be less than 50 ha and 56.9% of beneficiaries had a share of 50–70 ha. Only the share of rangeland area for 12.1% of beneficiaries was more than 70 ha. The average share of rangeland area was calculated to be 55 ha (Table 2).

**Table 1.** The frequency distribution of respondents based on the number of livestock

Number of livestock	Number of beneficiaries	Relative frequency (%)	Cumulative relative frequency (%)
Less than 85	11	19	19
85 – 115	36	62.1	81
116 – 145	7	12.1	93.1
More than 145	4	6.9	100
Sum	58	100	-

Average number of livestock: 102 standard deviation: 25.18

**Table 2.** The frequency distribution of beneficiaries based on the share of rangeland area

The share of rangeland area (ha)	Number of beneficiaries	Relative frequency (%)	Cumulative relative frequency (%)
Less than 50	18	31	31
50 – 70	33	56.9	87.9
More than 70	7	12.1	100
Sum	58	100	-

Average Share: 55, Standard deviation: 13/76

#### 3.1.3 The Amount of Annual Income

According to the results of questionnaires, the annual income of 13.8% of beneficiaries was less than 15 million Tomans, 67.2% of beneficiaries 15–20 million Tomans and 19% of beneficiaries more than 20 million Tomans (Table 3).

The average annual income in this region was calculated to be 19 million Tomans. It was based on the statements of beneficiaries in the questionnaires as well as the information of neighborhoods in order to increase the accuracy of total income obtained from animal husbandry, agriculture and secondary jobs.

#### 3.1.4 Ecological Sustainability

According to the obtained results, the sustainability index of 5.2% of allotments was very low and it was high for 34.5% of allotments. In general, the sustainability index of 50% of total area was above average (Table 4).

#### 3.1.5 Ordinal Average of Indicators

The results of ordinal average of indicators showed that the highest average was related to soil (40.2), canopy cover (3.93) and production (3.66) and the lowest was obtained

**Table 3.** The frequency distribution of beneficiaries based on the amount of annual income

Annual income (million Tomans)	Number of beneficiaries	Relative frequency (%)	Cumulative relative frequency (%)
Less than 15	8	13.8	13.8
15 – 20	39	67.2	81
More than 15	11	19	100
Sum	58	100	-

Average income: 19, Standard deviation: 5/21

**Table 4.** The frequency distribution of vegetation types based on the sustainability index

Sustainability index	Intensity	Allotment	Relative frequency (%)	Cumulative relative frequency (%)
10 – 18	very poor	3	5.2	5.2
18.1 – 26	Poor	16	27.6	32.8
26.1 – 34	Fair	10	17.2	50
34.1 – 42	Good	20	34.5	84.5
42.1 – 50	very good	9	15.5	100
SUM	58	100	-	

Average: 32.84, Standard deviation: 9.07

for litter (2.4), micro-terraces density and livestock waste on the soil (2.88) and erosion (2.88), (Table 5).

### 3.1.6 Relationship between the Number of Livestock and Sustainability Index

The results of Spearman test revealed a significant negative correlation between the number of livestock and sustainability index ( $p \leq 0.01$  and  $r_s = -0.5$ ). In other words, degradation rate will be increased by increasing the number of livestock, resulting in reduced sustainability index.

### 3.1.7 Relationship between Annual Income and Sustainability Index

According to the results of Spearman test, a significant negative correlation was found between the annual income and sustainability index ( $p \leq 0.01$  and  $r_s = -0.462$ ). This means that trying to earn more income could result in reduced sustainability index.

Mean comparisons for the sustainability of allotments based on beneficiaries' annual income. According to the results of variance analysis, significant differences were found for the sustainability of allotments based on the beneficiaries' annual income ( $p \leq 0.01$  and  $F = 9.44$ ). Our results

**Table 5.** Relative frequency and ordinal average of indicators

sustainability index	Frequency					Ordinal average
	very poor	Poor	Fair	Good	very good	
Bare soil percentage	0	3.5	22.4	43.7	31	4.02
Canopy cover	1	10.3	27.6	20.7	41.4	3.93
Forage production	1.7	12.1	31	29.3	25.9	3.66
Geographical directions and species frequency	3.4	10.3	27.6	41.4	17.2	3.59
Presence and proliferation of annual plants,	1.7	27.6	19	37.9	13.8	3.34
Vigor and vitality of plants	6.9	22.4	25.9	41.4	3.4	3.12
The presence of desirable plants	8.6	31	19	37.9	3.4	2.97
Slope and erosion	13.8	27.6	19	36.2	3.4	2.88
Micro-terraces density and livestock waste on the soil	19	31	15.5	32.8	1.7	2.57
Amount of litter	1.3	34.5	37.9	12.1	5.2	2.4

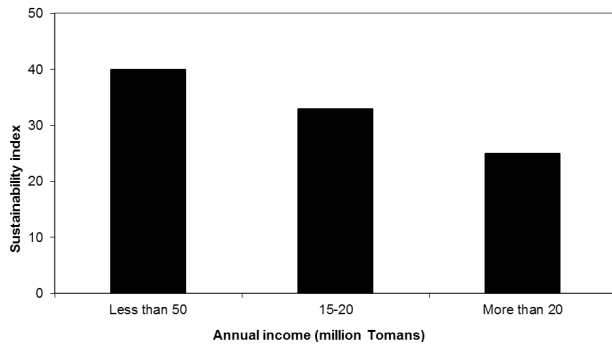
clearly showed that the sustainability of allotments was decreased by increasing the annual income (Figure 1).

### 3.1.8 The Relationship between the Share of Rangeland Area and Sustainability Index

The results of Spearman test revealed a significant negative correlation between the share of rangeland area and sustainability index ( $p \leq 0.001$  and  $r_s = -0.357$ ). In other words, the sustainability indices decrease by increasing the share of rangeland area and vice versa.

### 3.1.9 Mean Comparison of Sustainability of Allotments based on the Share of Rangeland Area

According to the results of variance analysis, significant differences were found for the sustainability of allotments



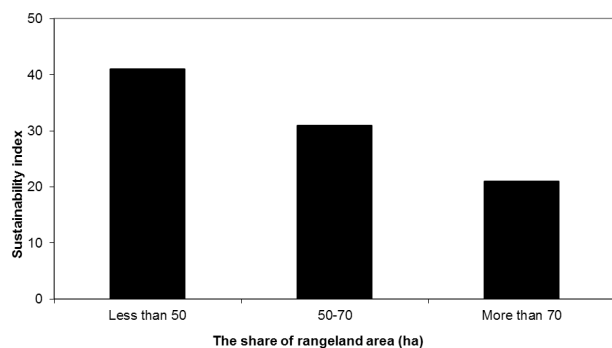
**Figure 1.** Mean comparisons for the sustainability of allotments based on beneficiaries' annual income.

based on the share of rangeland area ( $p \leq 0.001$  and  $F=23.57$ ).

The results of mean comparisons showed significant differences among the three groups so that higher sustainability was recorded for the allotment in which beneficiaries had smaller share of rangeland area (Figure 2).

## 4. Discussion

According to the results of Spearman test, a significant negative correlation was found between the annual income and sustainability index. It would be more tangible when the beneficiaries with large numbers of livestock compete with each other to achieve more forage resources and income. In such circumstances, even if the amount of rainfall and climatic conditions are suitable, the growth rates and revitalization of vegetation will be slower in comparison with rangeland ecological sustainability. The social structure stability of tribes to achieve a higher income level could be improved through



**Figure 2.** Comparison of the sustainability of allotments based on the share of rangeland area.

buying small ranchers' rights that are reluctant to animal husbandry or have died and also by creating jobs, relevant to rangelands, for other beneficiaries in various sectors.

The average number of livestock in four allotments was calculated to be 102 heads. However, the experts of range management plans calculated an allowable stocking rate of 90 heads. According to field studies and the results of this research, it was found that the beneficiaries had more livestock in the allotments whose ecological sustainability was low. It seems that the number of livestock and rangeland ecological sustainability are intimately related to each other.

In the allotments that the number of livestock was less than, or close to the allowable stocking rate, rangelands showed a better sustainability. In other words, the grazing intensity will increase when nomads, for the sustainability of social and economic life, increase the number of livestock, leading to the indirect degradation of rangelands. Overgrazing may be due to the poor range management. In addition, in summer rangelands, group exploitation (utilization) causes that the beneficiaries, while competing together, tend to increase the number of available livestock. Nowadays, by implementing the new targeted subsidies plan in Iran and increased price of livestock products and forage, this issue could impose more challenges against rangelands and its management.

In addition, results clearly showed that the increased share of rangeland area caused that the beneficiaries entered more livestock to the rangeland to achieve higher income. In such circumstances, the sustainability of rangelands will face more damage if the exploitation continues.

The following recommendations could be taken into account based on the results of this study:

- It seems that the cultivation of medicinal, industrial, and ornamental plants besides animal husbandry could improve the ecological sustainability of rangelands as well as increasing the income of beneficiaries.
- Monitoring and management programs as well as correct implementation of range improvement projects would enhance the economic situation of beneficiaries; meanwhile reducing the number of livestock and beneficiaries would result in maintaining the ecological sustainability of the region.
- It is recommended to establish range management cooperatives in each region in which range managers are using several common allotments.



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