Int J Biol Med Res. 2013; 4(1): 2720- 2725

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original Article

Study of forest destruction by used the diversity index in the Northern Zagros Forest (Case study: Oak forest)

Maziar Haidari[*a], Mozhgan Bazyar [b], Seyed Anvar Hosseini [c], Reza Hossein Haidari [d], Naghi Shabanian [e]

[a*] *M.Sc. Graduated of forestry, University of Tehran, Karadj, Iran.*
[b] *M.Sc. Graduate of forestry, University of Gilan, Some-sara, Iran.*
[c] *M.Sc. Graduate of forestry, University of Tehran, Karadj, Iran.*
[d] *Assistant Prof., Faculty of Natural Resources, University of Razi, Kermanshah, Iran.*
[e] *Assistant Prof., Faculty of Natural Resources, University of Kurdistan, Sanandaj, Iran.*

ARTICLE INFO

Keywords:
Azarbaijanegharbi province
Distance from village
Shannon index
Tree diversity
Zagros

ABSTRACT

Species diversity is one of the most important indices was used to evaluate the sustainability of forest communities. Aim of this research was study of forest destruction by used the diversity index in the Northern Zagros Forest and four village in Sardasht and Piranshahr region, Western Azarbaijan province, northwest of Iran was selected. For inventory in distance of 100 meter, 121 square sample plots (400m2) 20×20m were selected. Numbers of tree species were recorded. To analyses of biodiversity were applied heterogeneity Indicators of Shannon Wiener (H') and Simpson (1-D) as well as evenness by using Margaleff (R1) indices. For statistical analysis, SPSS and Ecological Methodological software and ANOVA test were used. Results showed that the presence of 12 tree species in the study area and Rosacae family have higher number of species. The results this study showed that the Shannon (H) index had maximum quantity between all indicators. Results of statistical analysis in the study area showed 1000 to 1200 meter classes have maximum tree diversity. Anova test showed the differences between means diversity indexes in the distance classes from village were statistically significant. Duncan test showed that 1200 and 800 m classes have maximum diversity indexes in the study area. In the base of this study suggested the conservation forest planning focused on the nearest of village in the less 1000 meter distance from village.

1. Introduction

With due attention to climate conditions of Iran that 65% area includes arid and semi-aired and degradation rapid of north and west, because of degradation of natural resources will cause to degradation agricultural lands and human environmental [6]. Forests cover about 12 million ha in Iran [10], including 5 million ha in the mountainous Zagros region. This forest extends from Turkey and Iraq into Northeastern and Southeastern Iran (between Azerbaijan and Fars Province). Zagros is typically characterized by a semi-humid climate with extremely cold winters and annual precipitation exceeding 800 mm. The main species in this region are Quercus spp. (oaks), Pistacia mutica (wild pistachio), Crataegus spp. and Pyrus spp [11]. Most of the forests of Iran involve some kind of conventional ownership, either communal (by villages) or among families within villages. In the Zagros Mountains, especially in the northern areas, the territory of Kurdish people, this kind of conventional ownership and relationships between humans and nature are extremely strong. The major element of Zagros forest destruction include: Grazing, farm operation in forest, fuel wood and timber, mining, semi-parasite plant and non-wood forest production [13]. Near than 1.7 million ha of the Zagros forests has been destroyed since 1962 [9]. Increasing population, low level of development and high dependence of local communities on forests for their primary livelihood needs, are the main reasons of this destruction. The lack of regeneration in these forests is a major concern [9 and 13]. Biodiversity is defined as the kinds and numbers of organism and their patterns of distribution [18]. Generally, biodiversity measurement typically focuses on the species level and species diversity is one of the most important indices which are used for the evaluation of ecosystems at different scales [2]. Local diversity can be studied with various indices, such

* Corresponding Author : **Maziar Haidari,**
M.Sc. Graduated of forestry, University of Tehran, Karadj, Iran.
Postal Code: 6734157169.
Phone: +98-9382713648,
E-mail: Maziarheidari1364@gmail.com

as number of species per unit area (species richness) or the Shannon index, amongst other. These are used as indicators of the degree of complexity of the under study communities and provide information on the homeostatic capacity of the system to unforeseen environmental changes (Magurran, 1988). Investigation the traditional forest management and its Application to encourage public participation for sustainable forest management in the northern Zagros Mountains of Kurdistan province and results showed that traditional forest management can offer sustained yield and can be prescribed for sustainable forest management in northern Zagros[11]. Comparison of plant diversity, richness and evenness indices around protected area of the Bazangan Lake in Khorasan province, northeast of Iran indicated that the highest value in Shannon-Wiener index in the protected area [12]. The Comparison of tree species diversity in two protected and non-protected area in protected regions of Oshtorankooh in Lorestan province, west of Iran. Indicated that trees and shrubs living in the protected regions species have significantly higher diversity, richness, evenness and better living condition than they living in non-protected region [1]. This study was carried out to determine the effect of distance from village on the tree diversity in the northern Zagros forest, Azarbaijane-Gharbi (western Azarbaijan) Province and indicating the suitable management solution for this forest

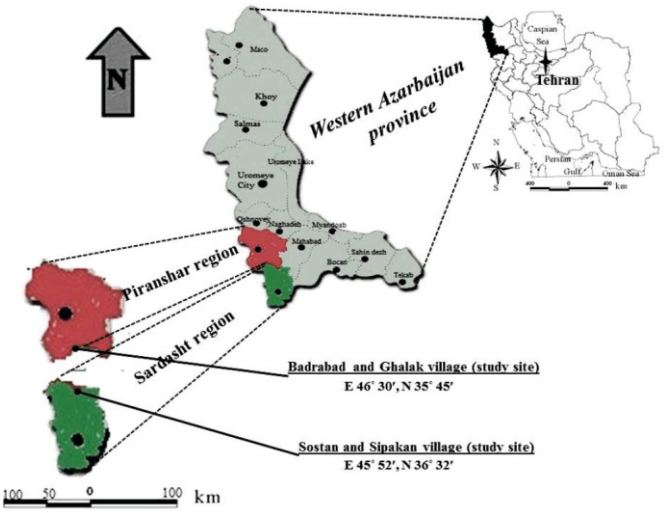
2. Material and method

2.1. Site description

Iranian habitats support about 8000 species of flowering plants (i.e. belonging to 167 families and 1200 genera), of which almost 1700 are endemic [7]. This plant species are growing on four ecological zones (Figure 1). The Zagros Mountains are Zagros forests are the second natural forest ecosystem that their area has been reduced because of impolitic exploitation. In order to investigate this research was accomplished in four villages of West Azerbaijan province in two regions of Sardasht and Piranshahr (figure 2). Minimum temperature in divided into two parts of northern and southern of Zagros. The northern Zagros is consisted of the growing site of Quercus infectoria Oliv and somewhat Q.libani Oliv and Q.persica J. & Sp. (Q.brantii Lindl.) can be observed. The northern Zagros is wetter and cooler than the southern one [13]. February (-9.1˚C) and the highest temperature in August (12.1 ˚C) are recorded. Mean annual precipitation of the study area were from 834.8 mm at the Sardasht city metrological station which 14 km far from the study area. Climate of the region is semi-humid [5].

Figure 1. Distribution of four ecological zones of Iran

Figure 2. Location of study area, Sardasht and Piranshar region, Western Azarbaijan Province, Northwest of Iran

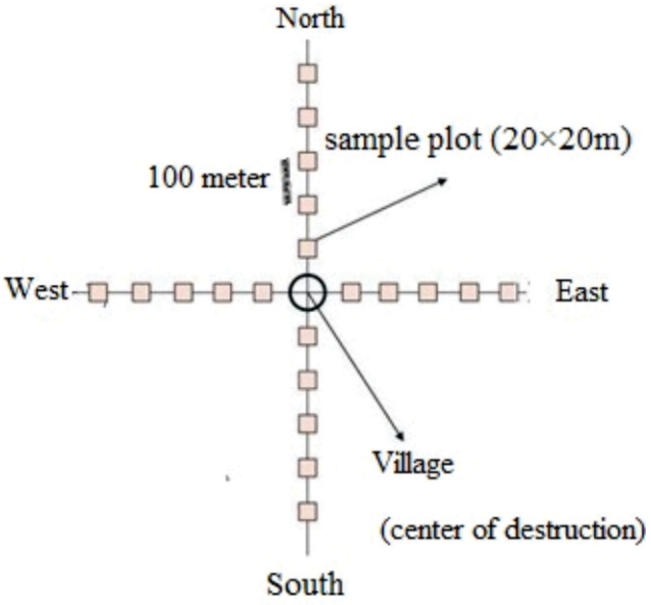


The main woody species in Baghe-Shadi are Quercus libani Oliv, Q. infectoria Oliv. And Acer monspessulanum L. The dominant species in our research area is Quercus. spp.

2.2. Data collection and analysis:

The inventory operations were fulfilled in 4 directions that two directions were parallel to measure lines and two other directions were perpendicular to measure lines (Figure 3). For inventory in distance of 100 meter, 121 square sample plots with the area of 400m2 and dimensions of 20×20m were sampled. Numbers of tree species were recorded. For statistical analysis, SPSS and Ecological Methodological software and Anova test were used.

Figure 3: inventory plan in this study



In order to analyses of biodiversity were applied heterogeneity Indicators of Shannon Wiener (H′) and Simpson (1-D) as well as evenness by using Margaleff (R1) indices (Table 1).

Table 1: Biodiversity Indices used in this paper

Indices	References	Equation*
Shannon′s (H′)	[17]	$H=\sum_{t=1}^{3} pi \ln(pi)$
Simpson (1-D)	[17]	$1\text{-}D=(\sum pi)^2$
Margaleff (R1)	[8]	$\frac{R=s-1}{Ln(N)}$

*S and pi refer to total number of species in the sample and proportion of individuals in the species, respectively.

3. Results

Calculation and comparison of different indices of diversity, as a favorite method is considered for study on biodiversity [4]. The assessment of biodiversity in forest has become an important issue for studying ecosystems and their conservation [3]. All three calculated indices in this study have been mentioned as the most applicable indices [4 and 16]

Table 2. List of Scientific name and Family name of tree species in the studied areas

Scientific name	Family name
Quercus libani Oliv	fagaceae
Quercus infectoria Oliv.	fagaceae
Amygdalus communis L.	Rosacae
Acer monspessulanum L.	Aceraceae
Crataegus aronia (L.) Bosc.	Rosacae
Lonicera nummularifolia Jaub.& spach	Caprifoliaceae
Rosa canina L	Rosacae
Daphne mucronata Royle	Thymelaceae
Prunus divaricate Ledeb.	Rosacae
PyrUs communis L.	Rosacae
Cotoneaster morulus pojark.	Rosacae
Rosa canina L.	Rosacae

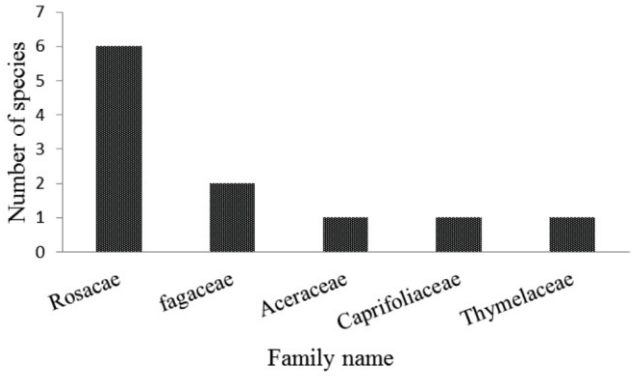


Figure 4. Family name of tree in the study area

Results Figure 4 showed in this study area Rosacae family have higher number of species

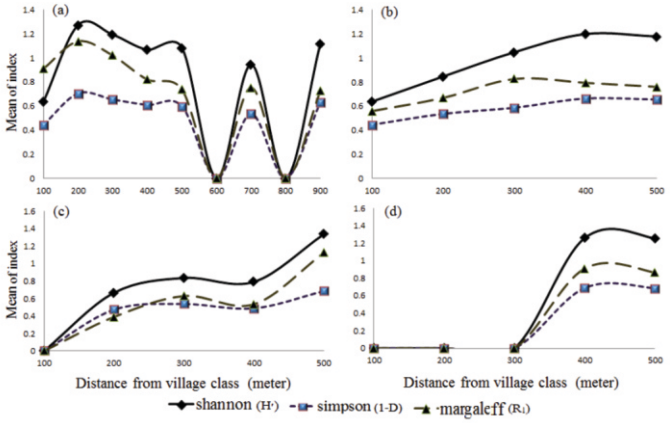
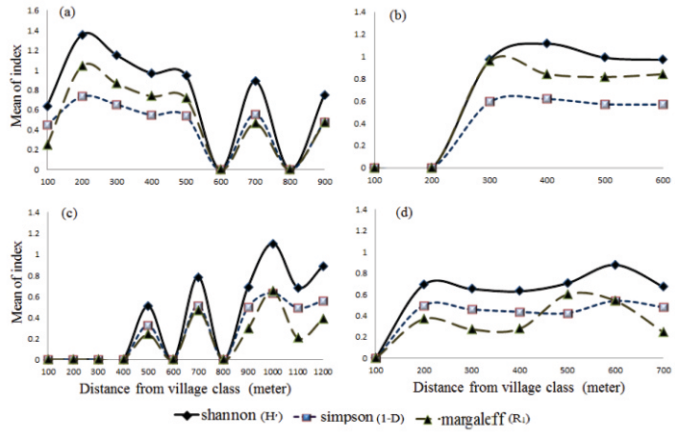


Figure 5. Mean diversity index in the: (a) North (b) East (c) South and (d) West of Sostan village.

Results Figure 5 showed in the north of village 200 meter classes have maximum tree diversity and in the East, South and West of village 400, 500 and 400 m classes have maximum tree

Figure 6. Mean diversity index in the: (a) North (b) East (c) South and (d) West of Sipakan village.



Results Figure 6 showed in the north of village 200 meter classes have maximum tree diversity and in the East, South and West of village 400, 1000 and 600 m classes have maximum tree diversity.

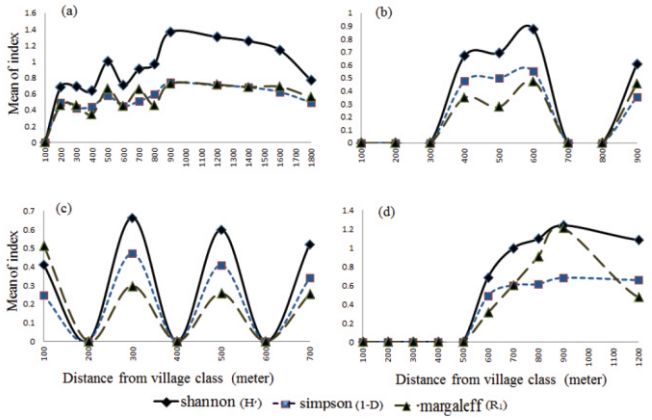


Figure 7. Mean diversity index in the: (a) North (b) East (c) South and (d) West of Gholak village.

Results Figure 7 showed in the north of village 900 meter classes have maximum tree diversity and in the East, South and West of village 600, 500 and 900 m classes have maximum tree diversity.

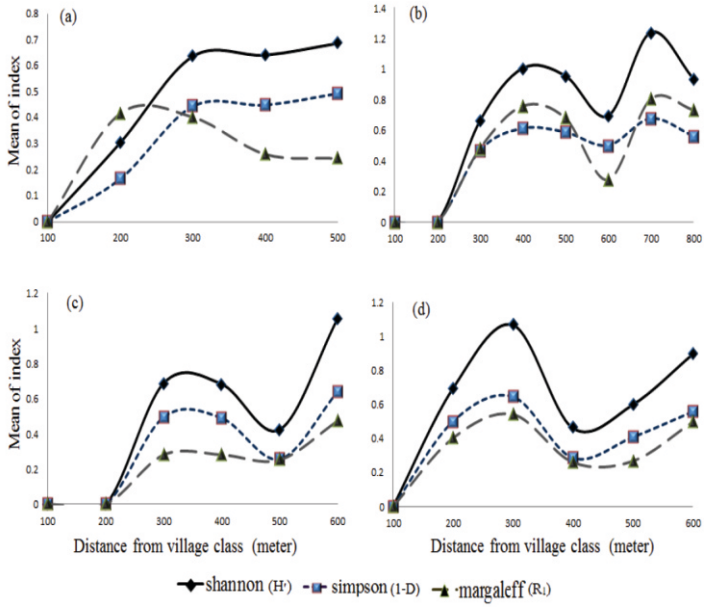


Figure 8. Mean diversity index in the: (a) North (b) East (c) South and (d) West of Badrabad village.

Results Figure 8 showed in the north of village 300 meter classes have maximum tree diversity and in the East, South and West of village 700, 600 and 300 m classes have maximum tree diversity.

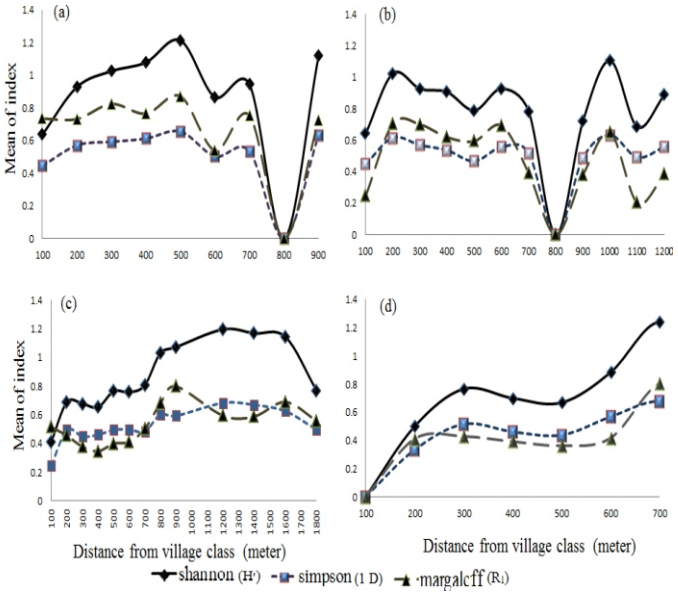


Figure 9. Mean diversity index in the: (a) Sostan (b) Sipakan (c) Gholak and (d) Badrabad of village

Results Figure 9 showed in the sostan village 500 meter classes have maximum tree diversity and in the Sipakan, Gholak and Badrabad village 1000, 1200 and 700 m classes have maximum tree diversity.

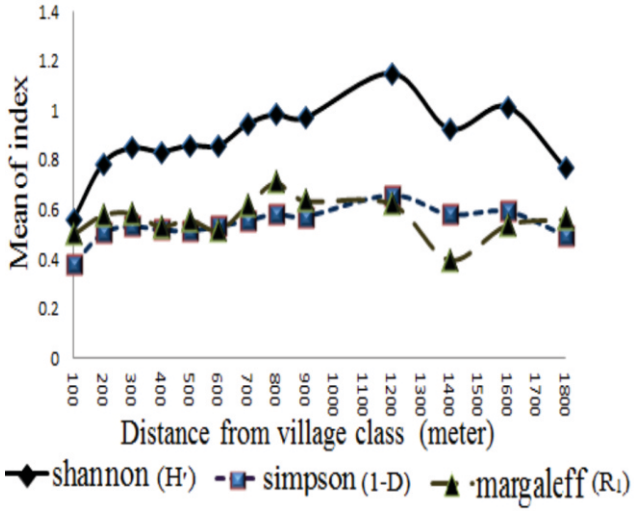


Figure 10. Mean diversity index in the four villages (study area)

Results Figure 10 showed in the study area 1000 to 1200 meter classes have maximum tree diversity.

Table 3.The results Anova analysis to compere the means diversity index in distance

Diversity index	Diversity index	DF	Sum of Squares	Mean Square	F	Sig.
Shannon′s (H′)	Between Groups	15	4.142	.276	2.578	0.002
	Within Groups	113	12.102	.107		
	Total	128	16.244	077		
Simpson (1-D)	Between Groups	15	1.162	033	2.340	0.006
	Within Groups	113	3.741	.192		
	Total	128	4.904	.056		
Margaleff (R_1)	Between Groups	15	2.885	.276	3.412	0.000
	Within Groups	113	6.371	.107		
	Total	128	9.256	.077		

Result table 3 indicated the differences between means diversity indexes in the distance classes from village were statistically significant

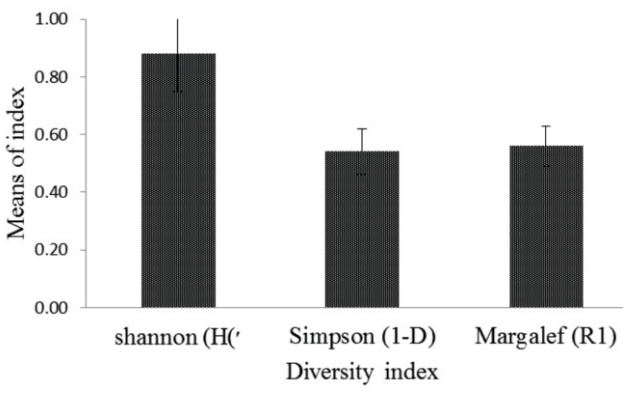
Table 4.The results of Duncan test to analysis to compere the means diversity index in distance classes.

Shannon (H′) index			Simpson (1-D) index			Margaleff (R1) index		
Distance class (m)	Means index	Duncan test	Distance class (m)	Means index	Duncan test	Distance class (m)	Means index	Duncan test
100	0.56	F	100	0.38	D	1400	0.40	E
1800	0.77	E	1800	0.50	C	100	0.50	D
200	0.78	E	200	0.50	C	600	0.51	CD
400	0.83	D	500	0.51	C	400	0.53	C
300	0.85	D	400	0.52	C	1600	0.54	C
600	0.86	D	600	0.53	C	500	0.56	C
500	0.86	D	300	0.53	C	1800	0.56	C
1400	0.92	C	700	0.55	C	200	0.57	C
700	0.94	C	900	0.57	BC	300	0.58	C
900	0.97	BC	1400	0.58	B	700	0.61	B
800	0.98	B	800	0.58	B	1200	0.62	B
1600	1.01	B	1600	0.59	B	900	0.63	B
1200	**1.15**	**A**	**1200**	**0.66**	**A**	**800**	**0.71**	**A**

The results Duncan test showed that 1200 and 800 m classes have maximum diversity indexes in the study area.

Figure 11. The means of diversity indices in the study area

The results of Figure 11showed that the computed tree species diversity index is as follows as: mean species Shannon index: 0.88, Simpson index: 0.54 and Margaleff index: 0.56.



4. Discussion

Biodiversity measurement is recognized as guidance for conservation plans in local scale. Species biodiversity is used greatly in vegetation studies, and environmental evaluation is one of the main criteria to determine ecosystems condition [15]. The zagros forest where enough rain falls to support habitation, humans have degraded the landscape because the zagros forest where enough rain falls to support habitation. Agriculture, pastoralism, and woodcutting have caused the loss of natural vegetation. One of the serious threats to most of the Iranian ecosystems is drought, because much of Iran lies in the arid or semi-arid regions. The other threats for plants are: overgrazing, fuel wood extraction, conversion of forest and other wild lands for agriculture, road construction, overexploitation, and unscientific extraction of plant resources for medicine and food. The presence of 12 tree species in the area

indicates considerable plant diversity in the study area (table 2). Results showed in this study area Rosacae family have higher number of species (figure 4). In the north of Sostan village 200 meter classes have maximum tree diversity and in the East, South and West of village 400, 500 and 400 m classes have maximum tree diversity (figure 5). In other to in the sostan village 500 m classes have maximum tree diversity (figure 9). In the north of Sipakan village 200 meter classes have maximum tree diversity and in the East, South and West of village 400, 1000 and 600 m classes have maximum tree diversity (figure 6). In other to in the sostan village 900 m classes have maximum tree diversity (figure 9). In the north of Gholak village 900 meter classes have maximum tree diversity and in the East, South and West of village 600, 500 and 900 m classes have maximum tree diversity (figure 7). In other to in the sostan village 1200 m classes have maximum tree diversity (figure 9). In the north of Bard Abad village 300 meter classes have maximum tree diversity and in the East, South and West of village 700, 600 and 300 m classes have maximum tree diversity (figure 8). In other to in the sostan village 600 m classes have maximum tree diversity (figure 9). Results statistical analysis in the study area showed 1000 to 1200 meter classes have maximum tree diversity because in the nearest of village humans have degraded the landscape include: Agriculture, grazing and woodcutting have caused the loss of natural vegetation. ANOVA test showed the differences between means diversity indicators in the distance classes from village were statistically significant (table 3). The Duncan test showed that 1200 and 800 m classes have maximum diversity

5.Conclusion

Results showed the human utilization and grazing have negative effect on the tree diversity and lead to forest destruction. Maximum of tree diversity observed in the 1000 to 1200 m distance classes from village and minimum of tree diversity observed in the nearest of village in the northern zagros forest. In the base of this study suggested the conservation forest planning focused on the nearest of village and less of 1000 meter distance from village. Therefore, prevention of livestock grazing and irregular tree cutting in the degraded forest stands can be suggested as a suitable approach for natural restoration and increasing plant diversity.

Acknowledgments:

The authors would like to thanks Mr. Afshin Maleki and Sorosh Zabiholahii for their help in the field and also I would like to have a special thanks to Mr. Nasrolah Moradi Kor for criticism reading and editing of the manuscript

6. Reference

[1] Abasi S, Hosseini SM, Pilehvar B, Zare H. Effects of Conservation on Woody Species Diversity in Oshtorankooh region, Lorestan. Iranian J Forest, 2009; 1: 1-10.

[2] Ardakani MR. Ecology. Tehran University Press, 2004; 340.

[3] Aubert M, Alard D, Bureau F. Diversity of plant Assemblages in managed temperate forests: a case study in Normandy (France). Forest Ecol Manag, 2003; 175: 321-337.

[4] Baev P. V, Penev L.D. BIODIV. Program for calculating biological diversity parameters, similarity, niche overlap, and cluster analysis. Version 5.1. Pensoft, 1995; 57p.

[5] Baneje-shafie A, Eshaghie-rad J, Alijanpour A, Pato M. Effect of Tortrix viridana L. on the Oak forest in the Piranshar and Sardasht forest. Journal of plant Protection, 2011; 25: 178-18.

[6] Dastmalchi M. Investigation compatibility experimental of tree species Ardabil province. Jangal and Senoubar J. Inst. For. Ranglands Res, 1998; 203: 168 p.

[7] Eftekhari T, Ramezani M. Introduction to Plant Biodiversity in Iran. In: Biodiversity and Medicinal Plant Wealth of South Asian Countries. (eds). P. Pushpangadan, K.N. Nair and M.R. Ahmad P.39-40. National Botanical Research Institute, Lucknow, 2004; 226001, In dia.

[8] Ejtehadi H, Sepehry A, Akkafi HR. Method of measuring biodiversity. Ferdowsi University of Mashhad Publication No. 2009; 530p. Mashhad, IR Iran.

[9] Fattahi M . Study on Zagros oak forests and the most important their destruction causes. Institute of Forests and Rangelands Research press. 1994; Sanandaj.

[10] Forest and Rangeland Organization. Strategies for sustainable forest management in Zagros forests. Technical Report. Forest and Rangeland Organization, . 2002; Teheran.Iran.

[11] Ghazanfari H, Namiranian M, Sobhani H, Marvi Mohajer M.R. Traditional forest management and its application to encourage public participation for sustainable forest management in the northern Zagros mountain of Kurdistan province, Iran. Scandinavian Journal of forest science, 2004; 19: 65-71.

[12] Gholami A, Ejtehadi H, Ghassemzadeh F, Ghorashi-Al-Hosseini J. Study of Plant Biodiversity around Protected Area of the Bazangan Lake. Iranian J Biol, 2007;19: 398-407.

[13] Jazirehi M.H, Ebrahimi M. Silviculture in Zagros. University of Tehran Press, Tehran (in Persian).

[14] Magurran A. E. Ecological diversity and measurment. Princeton University Press, Princeton, 1988; 354.

[15] Mirdavoodi HR, Zahedi Pour H. Determination of suitable species diversity model for Meghan playa plant association and effect of some ecological factors on diversity change. Pajuhesh & Sazandegi 2005; 68: 56-65.

[16] Neufeldt V, Guralink D.B, Websters M. New World dictionary, Third College Edition, Simon and Schuster. New York, in: Barnes, B.V., Zak, D.R., Denton, S.R. and Spurr, S.H., (Eds.). Forest Ecology (4th edition). John Wiley and Sons Inc, 1988; 774P.

[17] Peet R.K. The measurement of species diversity. Ann. Rev. Ecol, Systematics 5. 1974; 285-307.

[18] Schuler A. Sustainability and biodiversity – forest historical notes on two main concerns of environmental utilization. Assessment of Biodiversity for Improved Forest Planning. Kluwer Academic Publishers, Dordrecht, 1998; 353-360.