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Effect of traditional forest management practices in Havarekhol pattern on forest structure (Case study: Kurdistan province, Northern Zagros forest).

Sorosh Zabiholahii[*1], Maziar Haidari[1], Manocher Namiranian[2] and Naghi Shabanian[3]

[1] *Corresponding author, M.Sc. Graduated of forestry, University of Tehran, Karadj, .R.Iran.*
[2] *Professor of forestry, Faculty of Natural Resources, University of Tehran, I.R.Iran*
[3] *Assistant Prof., Faculty of Natural Resources, University of Kurdistan, Sanandaj, I.R.Iran.*

***Abstract**: To study of forest structure in the Northern Zagros forest, Havarekholforest inBaneeh region, Kurdistan province in west of Iran was selected.60 square sample plots 20×20 meters (400 m^2) were collected by randomized-systematic method in the 200×300 Net. In every plot the position of tree, kind of species, number of trees, and diameter at breast height (cm), height (m), crown height (m) and two diameters of crown were recorded. Vertical and horizontal of this forest showed in the one sample (50×50 m, 0.25 hectare). To analysis of horizontal structure (spatial pattern), used was made of the quadrat method, variance/mean ratio, Green and Morisata index. Data analyzing was done bySPSS16, SVS (Stand Visualization System) and Ecological Methodological software's. Results showed the mean of forest characteristics including DBH, height, crown height, andcrown area, canopy density and density was 8.2 (±1.8), 2.45 (± 0.40), 2.2 (±0.22), 5.6 (±1.01), 35.8 (±4.6) and 640 (±22). Overall results showed Havarekhol forest was two forest story and Quercus libani Oliv and Quercus infectoria Oliv were the most dominant woody plants and located in over story. DBH distribution graphs showed reduced uneven-aged young aged stand and spatial pattern of this forest was uniform to clumped pattern.Overall results showed the Havarekhol Traditional Forest Management Practices lead to increase the young tree and regeneration.*

***Key words**: Havarekhol forest, forest structure, horizontal structure, vertical structure, spatial pattern, Zagros forest.*

I. Introduction

Forests cover about 12 million ha in Iran, including 5 million ha in the mountainous Zagros region [5]. 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 [9 and19]. One of traditional forest management practices in the Kurdistan province are pruning at the ground level to facilitate regeneration of the new saplings (i.e. HavarehKhol pattern, Figure 2). In this method once the trees are taller than livestock threshold (i.e. above 2 m) maintain at a constant height of 12 to 16 meter for 25 years to allow strong trunk development [14]. Stand structure can be defined as the species composition, size and spatial distribution of trees and other vegetation within a forest stand [6]. Vertical structure of a forest includes its differentiation into layers between the ground and the canopy [2]. The horizontal structure of a forest is composed of diameter size distribution of tree species considered individually or as a community [3].This several researches (forest structure) implemented in the Iran and Zagros forest in cloud: Study structure of less degraded Oak forests in Illam province. Results show that, the stands are basically uneven-aged old forests among which *Quercus persica* with its vigorous existence outcrops as pure or original species of forest type [8]. Investigated to determine spatial pattern of tree in the Zagros forests. He concluded that the trees were arranged in a clumped pattern [13]. Investigated on heterogeneity of structure in mixed beech forest of Iran, The results showed that alder and maple combined with beech can indicate the primary stages of succession and in this state; ironwood and persimmon trees are mostly found in the middle story and understory. In this forest, trees diameter distributions are normal based on De Liocourt index [6]. Study on structure of oriental beech (*Fagus orientalis* Lipsky) stand at optimal stage in north of Iran. Results showed that the stand has a closed canopy cover and distribution of stem number per diameter class was more or less homogenous (Bell shape) with a semi even-aged structure. [7]. Study of spatial pattern Manna oak trees (*Quercus brantii* Lindl.) in Bayangan forests of Kermanshah province, zagros forest. All of the applied indicators showed a clumped pattern for *Quercus brantii* [12]. The aim of this research was Study of vertical and horizontal forest structure in Blake forest, Baneeh region, Kurdistan province, in Northern Zagros Forest (west of Iran).The aim of this research was Study of vertical and horizontal forest structure in Havarekholforest, Baneeh region, Kurdistan province, in Northern Zagros Forest (west of Iran).

II. Materials and Methods

II.1: Site description

This research was investigated in the Baneeh region, northern Zagros forest, and western Iranian state of Kurdistan (Figure 1). Havare hkhol village (prune at the ground level) and Armardeh or Blake village (prune tree crowns) were selected to this research. Havare hkhol village is located in east of Baneh city and the conventional territory of this village covers 574 ha including 345 ha of forests. The forests are located between 1580 and 2100 m a.s.l [14].

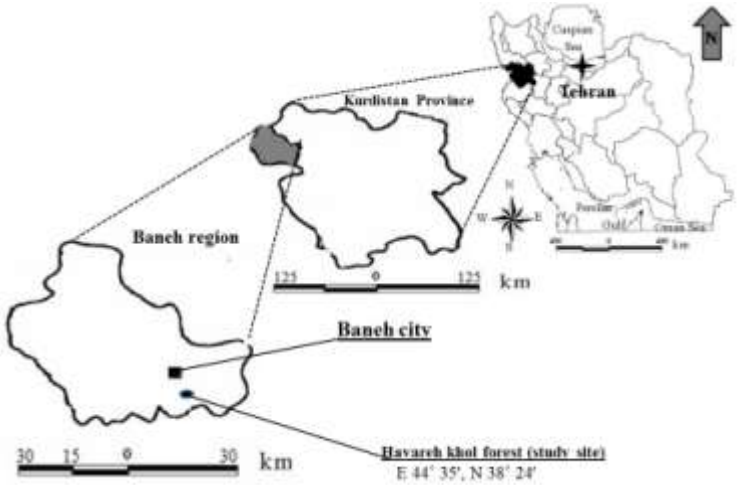

Figure 1. Study site location in the Kurdistan Province, Zagros region, Western Iranian state of Iran.

Figure 2.Havarehkhol traditional forest management practices (Prune at the ground level)

II.2, Analysis

In this study 60 square sample plots (400 m^2) were collected by randomized-systematic method in the 200×300 Net. In every sample plot the position of tree, kind of species, number of trees, origin of trees (i.e. coppice and high tree), and diameter at breast height (cm), height (m), crown height (m) and two diameters of crown were recorded.Vertical and horizontal of this forest showed in the one sample (50×50 m, 0.25 hectare). To study of vertical structure study of distribution of tree and species in the height and diameter classes

(diameter in the 5 cm classes). To analysis of horizontal structure (spatial pattern), used was made of the quadrat method, variance/mean ratio, Green and Morisata index. Data analyzing was done bySPSS16, SVS (Stand Visualization System) and Ecological Methodological software's.

III. Result

The vertical stratification of tree crowns is a forest attribute that influences both trees Growth and understory community structure [10].

Table 1.The mean of forests characteristics in the Havarekholforest.

forests characteristic	means	Standard deviation
Diameter at breast height (cm)	8.2	1.8
Height (m)	2.45	0.40
Crown height (m)	2.2	0.22
Crown area (m^2)	5.6	1.12
Canopy density (%)	35.8	4.6
Density (N/hectare)	640	22

The results showed that the mean of forest characteristics including DBH, height, crown height, andcrown area, canopy density and density, 8.2 (±1.8), 2.45 (± 0.40), 2.2 (±0.22), 5.6 (±1.01), 35.8 (±4.6) and 640 (±22) in Havarekholforest.

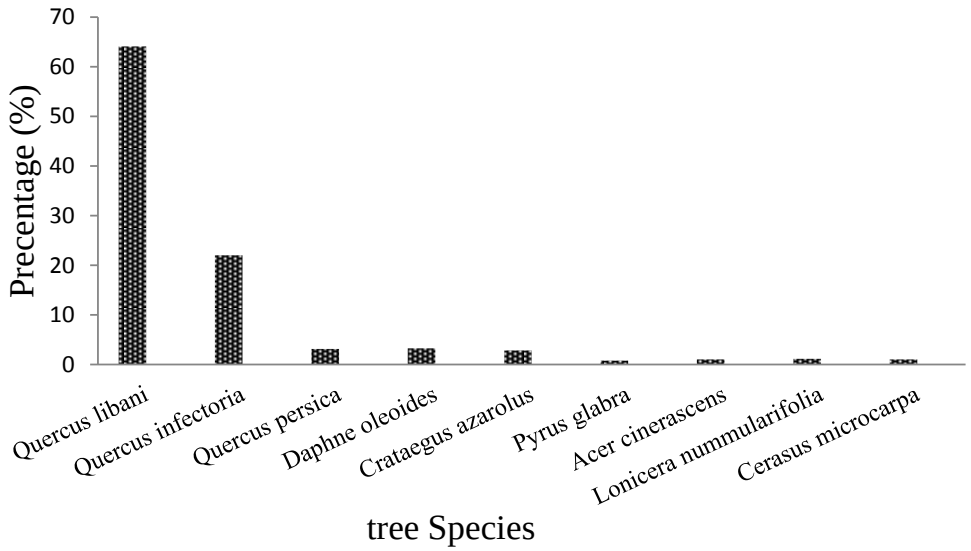

Figure 3: frequency percentage of tree species in Havarekholforest.

Figure 3 showed thatnine tree species were found in the Havarekholforest. And *Quercus libani* Oliv and *Quercus infectoria Oliv* were the most dominant woody plants in this area.

Table 2: the mean of species height and forest story in Havarekholforest.

	HavarehKhol forest	
Main species	Tree height (m)	vertical structure
Quercus libani Oliv.	5.5±0.98	over story[1*]
Quercus infectoria Oliv.	4.2±.65	understory[2*]
Quercus persica	4±0.55	understory[2*]
Crataegus azarolus	2.5±0.40	understory[2*]
Acer Monspessulanum L	3.05±0.58	understory[2*]
Pyrus glabra	3.2±0.51	understory[2*]

1* over story: tree height 5 to 9 meter 2* understory: tree height less 5 meter.

Results showed that HavarehKhol forest has two story and *Quercus libani Oliv* located in the over story

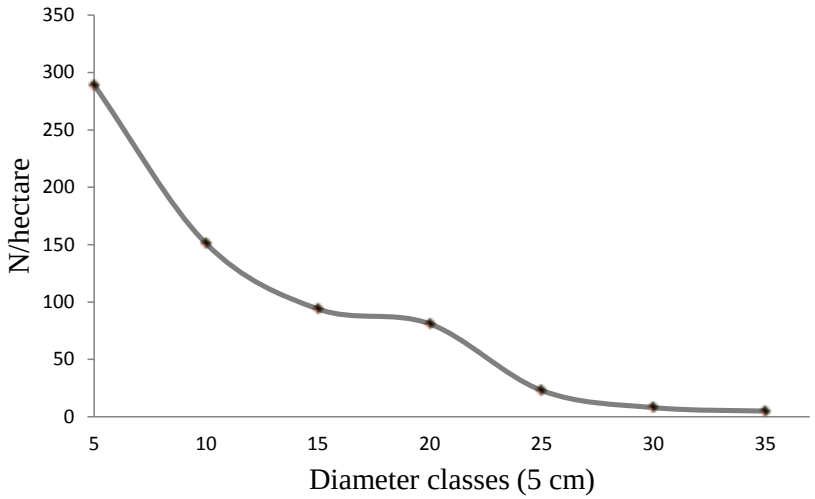

Figure 4.The number of trees in diameter classes in the Havarekholforest.

The diameters of the trees in the study site were measured at the breast height and recorded in classes of 5 cm. We measured DBH of trees ranging from 2.5 to 37 cm in Havarekholforest.
, respectively.The DBH distribution graphs in the stands indicate reduce uneven, aged young stand.

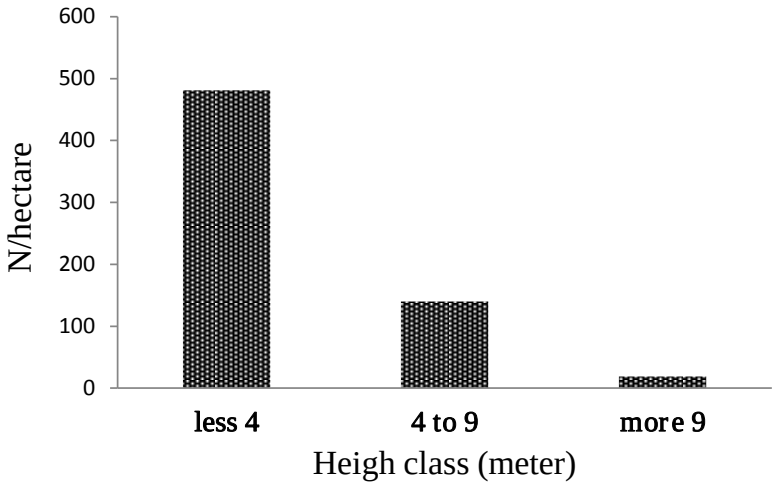

Figure 5. The number of trees in diameter classes in the Havarekhol forest s.

Figure 6 showed that the less 4 meter height class has a maximum N/hectare and this forest has a two layer story.

Table 3. The means of regeneration (N/hectare) in Havareh kohl forest

	seed regeneration	Coppice regeneration
N/hectare	130.6±17	6214±354
total	6344.6±331	

The results of table 3 showed that the estimated number of regeneration is as follows: mean seed regeneration equal to 130.6 and for Coppice regeneration equal to6214 (N/Hectare) in the HavarehKhol forest, respectively.

Table 4.The spatial pattern index of tree in HavarehKhol forest.

Spatial pattern index	Spatial pattern	Quantity of $\square^2$	Quantity index
variance /mean Ratio	Clumped pattern	240.1	4.069
Green	Clumped pattern	-	0.0019
Morisata	Clumped pattern	238.712	1.117
Spatial pattern	Clumped pattern		

The table 4 showed all of the applied indicators have a clumped pattern for Havareh kohl forest.

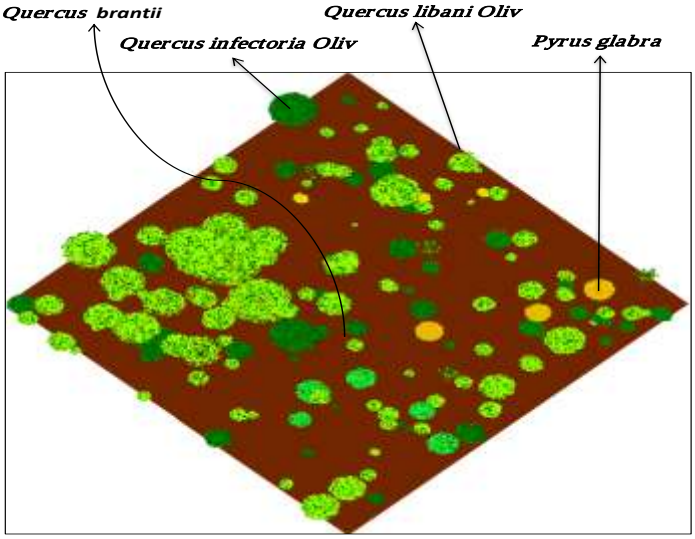

Figure 6. Stand visualization simulation of Havarekholforest(horizontal structure)

Figure 6 indicate spatial pattern (horizontal structure) of Havare khol forest was Clumped pattern.

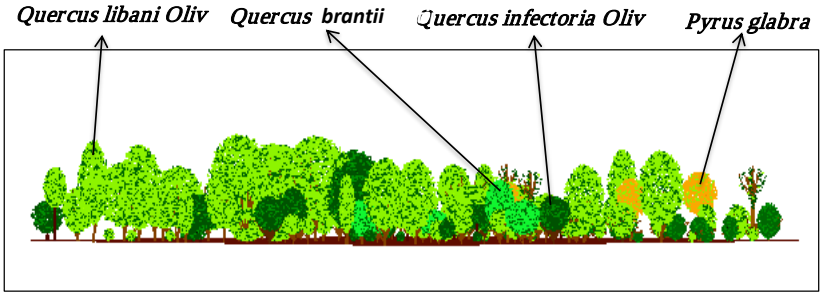

Figure 7. Stand visualization simulation of Havarekholforest(vertical structure).

Results showed that Havareh Kohl forest have to story and *Quercus libani* Oliv located in over story layer (5.5 m height average) and other species located in understory.

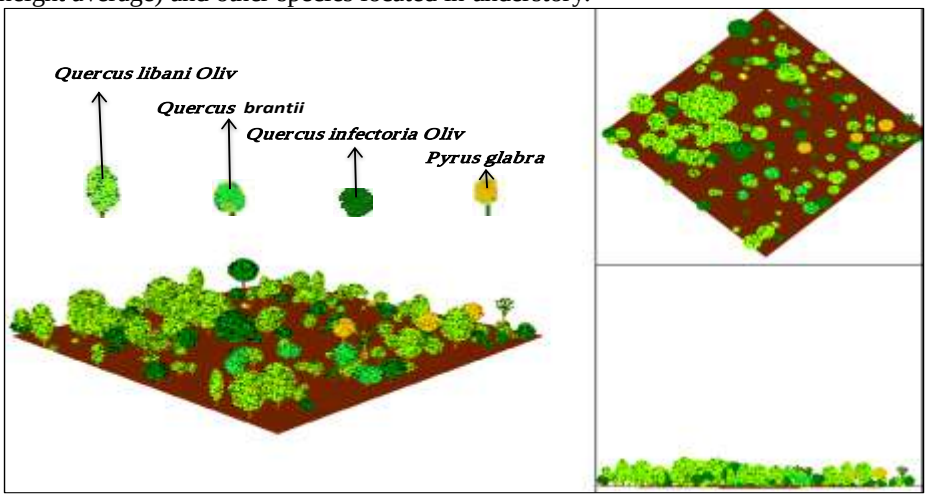

Figure 8. Stand visualization simulation of Havarekholforest(vertical and horizontal structure)

Figure 8 showed Havare khol forest have two story layers.

IV. Conclusion

IV.1, DISSCUSION

Structural changes that result in differences in the amount and distribution of leaf area and cover in stands affect stand functions such as tree growth [1] and understory plant diversity [9].In this forest nine tree species were found and *Quercus libani* Oliv and *Quercus infectoria Oliv* were the most dominant woody plants in this area (Figure 3). To study of vertical structure use the height species and SVS output. Study of vertical structure showed Havare khol forest less 4 meter height class has a maximum N/hectare, in Havareh Kohl forest more trees has more 9 meter height and *Quercus libani* Oliv (5.5 m height average) located in over story and has

major effect in this forest and other species are in understory layer (Figure 7 and table 2).the overall results showed that Havarekholforest have two story layers. The mean of diameter at the breath high ranging from 2.5 to 37 cm in Havarekholforest, respectively. The DBH distribution graphs in the stands indicate reducedunevenaged young stands (Figure 4). Hosseinzadeh et al, 2004 [8]indicated that DBH distribution graphs was unevenaged old stand (destruction forest) and our study showed different results, Havarekhol forest has young forest.On the other hand, traditional forest management of Havarekholforest increases the frequency of young trees and regeneration. These data showed that traditional forest management practiced in Havarekholforest can regulate diameter distributions as uneven-aged young stands system and lead to support forest regeneration. The major problem in Havarekholforest is lack of large (i.e. 30 50 cm) and very large (50 cm) diameter classes as well as dead trees have decreased habitat for wild animal. This study showed Havarekhol forest has negative effect on the old tree and degradation of this forest. Results showed that the estimated number of regeneration is as follows: mean seed regeneration equal to 130.6 and for Coppice regeneration equal to6214 (N/Hectare) in the HavarehKhol forest. This results emphasis that Havarekhol forest has sufficient regeneration and traditional forest management practice by Havarekhol pattern supported the forest regeneration (table 3). Spatial pattern information for individual trees is increasingly sought by forest managers and modelers as means to improve the spatial resolution and accuracy of forest models and management scenarios (Wulder*et al*, 2004 [13]). There are three basic spatial patterns as following: clumped, random and uniform [11].Results showed that spatial pattern (horizontal structure) of Havarekhol forest was clumped pattern (table 4 and figure 6). Safari *et al*, 2010 [12] showed a clumped pattern for oak forest and our study in the Havarekhol forest has a Clumped pattern. Results of this study showed Havarekhol (Havarekhol Pattern) have negative effect on the forest and degradation of this forest. Overall results showed the Havare khol Traditional Forest Management Practices lead to increase the young tree and regeneration. Traditional forest management may be considered a short-or medium-term approach for regional forest management to meet the basic local community needs for fuel wood and livestock fodder as long as people in this region are dependent on these resources for their livelihoods.

IV.2, **CONCLUSION**

Overall results showed Havarekholforest was two forest story and *Quercus libani* Oliv and *Quercus infectoria Oliv* were the most dominant woody plants and located in over story. DBH distribution graphs showed reduced uneven-aged young aged stand and spatial pattern of this forest was uniform to clumped pattern.Overall results showed the Havarekhol Traditional Forest Management Practices lead to increase the young tree and regeneration.

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References

[1] M.J, Arbaugh. D.L, Peterson, Stem wood production patterns in ponderosa pine: effects of stand dynamics and other factors. USDA Forest Service Research Paper, PSW-RP-217.Pacific Southwest Research Station, Albany, 1993, 11pp.
[2] P.S. Bourgeron, Spatial aspects of vegetation structure. In: Golley, F.B. (Ed), Tropical Rainforest Ecosystems: Structure and Function. Elsevier, Amsterdam 1983, 29–48.
[3] L.S. Davis, K.N. Johnson, Forest Management, third ed. McGraw-Hill, New York, 1987.
[4] A. Daneshvar, R. Rahmani, H. Habashi, The heterogeneity of structure in mixed beech forest (case study shastkalateh, Gorgan), J. Agric. Sci. Natur. Resour 14, 2007, 1-12.
[5] Forest and Rangeland Organization, Strategies for sustainable forest management in Zagros forests. Technical Report.Forest and Rangeland Organization.Tehran, 2002.
[6] R.J.Harrod, B.H. McRae, W.E. Hart, Historical stand reconstruction in ponderosa pine forests to guide silvicultural prescriptions. For. Ecol. Manage 114, 1999, 433–446.
[7] M. Hassani, M. Amani, Investigation on structure of oriental beech (FagusorientalisLipsky) stand at optimal stage in Sangdeh forest. Iranian Journal of Forest and Poplar Research 18, 2010, 163-176.
[8] J. Hosseinzadeh, M. Namiranian, M. MarviMohajer, GH. ZahediAmiri, Structure of Less Degraded Oak Forests in Illam Province (Southwest Iran). Iranian J.Natural Res57, 2004, 74-90.
[9] P.A. Latham, A process-related quantification of forest structure and understory diversity in inland northwest forests: from stands to landscapes. PhD dissertation.University of Montana, Missoula, 1996, 245pp.
[10] P. Latham, R. Zuuring, D. Coble, A method for quantifying vertical forest structure. Forest Ecology and Management 104, 1998, 157–170.
[11] A. Mitchell,the ESRI Guide to GIS Analysis.Vol. 2, ESRI Press, 2005, USA.
[12] A. Safari, N.Shabanian, R.H. Heidari, S.Y. Erfanifard and M. Pourreza, Spatial pattern of Manna Oak trees (QuercusbrantiiLindl.) in Bayangan forests of Kermanshah. Iranian Journal of Forest and Poplar Research18 (4), 2011, 596-608.
[13] M.A. Wulder, K.O. Niemann and T. Nelson, Comparsion of airborne and satellite high resolution data for the identification of individual trees with local maxima filtering. Int. J. Remote Sensing 25 (11), 2004, 2225-2232.
[14] S.Jamshidiyan, Report of conventional ownerships. In Project of traditional forest management in Havare hkhol. Joint project of Daumoon (local NGO) with UNDPGEF/ SGP. Project No, IRA-2002-018 (IRA98G52), 2003.