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Research Article

Study of most element of forest destruction by used the IRS-1Cand LANDSAT image in the southern zagros forest (Case study: Kohkeloeye and Boveirahmad province)

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Abstract

The Zagros forests (west of Iran) have been highly exploited in recent decades by human impacts. Easy access, abundance and variety of valuable forest yields have led to population growth, density, creation of new residential areas and deforestation activities. In order to determinate the distribution and rate of deforestation from 1995 to 2006 by using the satellite imagery (IRS-1Cand LANDSAT image) and possibility of modeling the changes extent and its relation to physiographic and some human factors by using multiple regression in the Kohkeloeye and Boveirahmad province, Golestan province. Southern Zagros forest, west of Iran. Classification was performed using maximum likelihood classifiers and forest divided two classes (forest and non – forest). Results showed that the maximum likelihood classifiers exhibited the highest results with 96% overall accuracy and 74% kappa coefficient. The results showed that about 462.5 ha from forest areas were deforested in the 12 years. To determination of major element of forest destruction used the multiple regression methods.According to results distance from the road and village variables were in contrary of deforestation expanding. Forest destruction was increased with increasing around populated villages and near to this village.

Key words: Iran, Deforestation, IRS-1C, Kohkeloeye and Boveirahmad province.

Introduction

Forests cover about 12 million ha in Iran (Forest and Rangeland Organization of Iran, 2002 and Haidari *et al*, 2012). The Zagros forests cover a vast area of the Zagros mountain ranges stretching from Piranshahr (Western Azerbaijan Province) in the northwest of the Iran to the vicinity of Firooz-Abad (Fars Province), having an average length and width of 1300 km and 200 km, respectively (Fattahi, 1994 and Haidari *et al*, 2013). These forests cover approximately an area of 5 million ha, and because of dominancy of species of oak genus, these forests are called as western oak forests (Marvi-Mohajer, 2005 and Haidari *et al*, 2013). Zagros is typically characterized by a semi-humid climate with extremely cold winters and annual precipitation exceeding 800 mm. Increasing populations, low level of development and high dependence of local communities on forests for their primary livelihood needs, are the main reasons of this destruction (Fattahi, 1994 and Jazirehi and Rostaghi, 2003). In order to investigate on deforestation modeling and correlation between deforestation and physiographic parameters, man-made settlements and roads parameters in Zagros forests is using remote sensing and GIS (Amini *et al*, 2009). The several studies on the forest

destruction and deforestation include: The researched on the satellite images to determine rates of deforestation over the past 35 years and to identify current deforestation "hotspots" in the eastern rainforests and in the dry endemic forests of southern Madagascar. The analysis of population trends, topography, and coincident ethnographic research points to a number of different factors influencing deforestation in these regions. Each of these factors generates different problems for conservation and development, most of which are not being dealt with adequately (Sussman*et al*, 1994).The researched on the deforestation by determining areas of pasture, secondary growth, and forest in aerial photographs taken in the 1930s, 1950s, 1960s, 1970s, and 1980s and results showed the mean annual deforestation rate for the 1938–1988 period was 1.5 percent, and ranged from <0.1 percent (1938–1955) to 4.4 percent (1970s–1980s). Between the 1930s and the 1980s, areas covered by pasture and young secondary forest increased from 26–53 percent and from 2–14 percent, respectively [4]. The researched on theSatellite Change Detection Analysis of Deforestation Rates and Patterns along the Colombia – Ecuador Border and Satellite change detection analysis showed that the annual rates of deforestation were considerably higher for the Colombian side of the border. In addition, loss of forest cover on the Colombian side for the study period was almost 43%, while only 22% on the Ecuadorian side. The study found that there is no single factor driving deforestation on either side of the border, but concluded that the higher rates on the Colombian side may be due to higher colonization pressures and intensification of illegal coca cultivation. On the Ecuador side of the border the satellite images documented patterns of deforestation that reflected road networks associated with oil exploration and development (Andrés et *a*l, 2004). The researched used land-cover maps and active fire detection based on satellite imagery to evaluate the rates and spatial distribution of peatland deforestation in Southeast Asia from 1990 to 2010. Over this time period, the proportion of forest cover in the peatlands of Peninsular Malaysia, Sumatra, and Borneo fell from 77% to 36%. After two decades of extensive deforestation (31 000 km2; 4.9% yr−1) strongly associated with fire activity, Sumatra has been left with just 28% of its historical forested peatlands. If peatland deforestation is allowed to continue at current rates, the Southeast Asian peat swamp forests will disappear by around 2030 (Miettinen *et al*, 2011). The researcher studied of used Forest Extend Changes Using AerialPhotos and ASTER Imagery in hyrcanian forest and results showed that severe changes were occurred in forest extent during the 41 years. Around 1250.8 ha of the extent of natural forests have been reduced, but 246.29 ha were just increased in this time duration. Hence, net forest extent reduction was 1004.5 hectare (Rafyayan *et al*, 2006). Theresearcher study of deforestation modeling on related physiographic and human factors using satellite images and GIS in zagros forest and change detection using forest maps of 1955 and 2002 showed that 4853 ha of the forest area have been reduced and 953 ha increased in this period. The result showed that there is inverse relationship between deforestation and distance from roads. Minimum and maximum deforestation were happened at north and east aspects, respectively. The result of applying logistic regression model indicated that distance from road is more effective than other parameters on deforestation in the study area (Amini *et al*, 2009). The researcher studied the forest extend changes using aerial photos and ASTER Imagery in hyrcanian forest and results showed that severe changes were occurred in forest extent during the 41 years. Around 1250.8 ha of the extent of natural forests have been reduced, but 246.29 ha were just increased in this time duration. Hence, net forest extent reduction was 1004.5 hectare (Ghanbari and Shataee, 2011). The aim of this study was evaluation of forest destruction in the southern zagros forest in the 1995 to 2006 periods by used the IRS-1Cand LANDSAT image.

Materials and Method

Site description

The Zagros Mountains are divided into two parts of northern and southern. 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 (Jazirehi and Rostaghi, 2003). This research was investigated in the Tange-ta moradi region, southern Zagros forest, and southwestern Iranian state of Kohkeloeye and Boveirahmad province (Figure 1). Tange-ta moradi forest was located in south of Yasouje city and 6704 hectare of this forest was selected. The Blake forests are located between 1060 and 2633 m a.s.l.

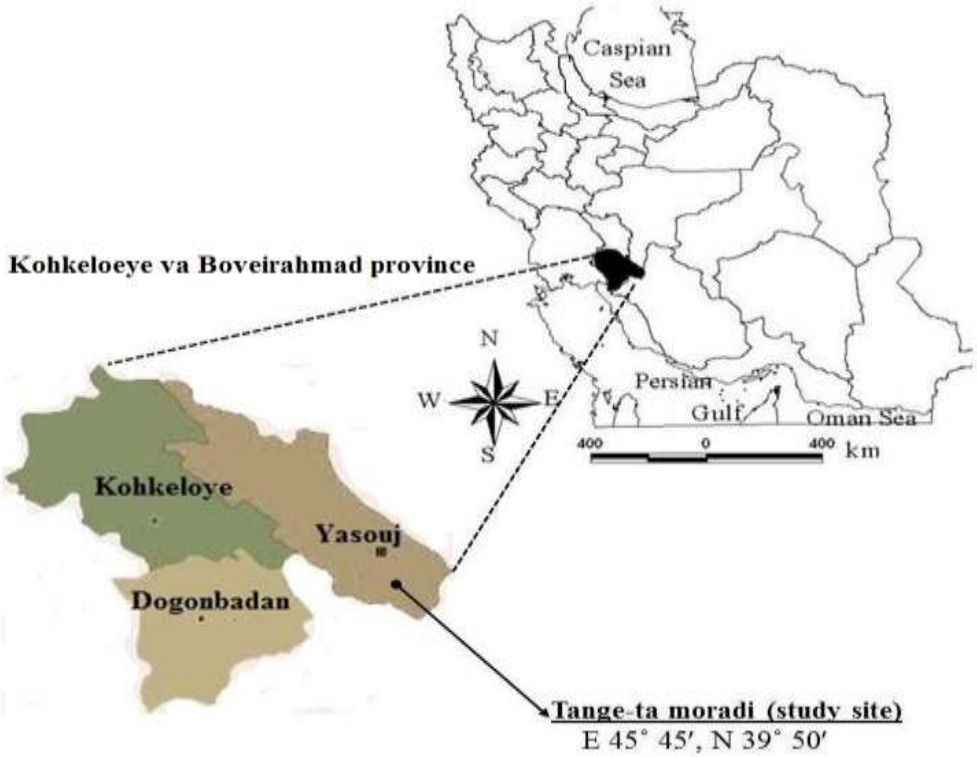

Figure 1: Study site location in the Kohkeloeye and Boveirahmad province, southern Zagros forest, and southwestern Iranian state of Iran.

Satellite images

In this researches used the +ETM (Landsat Satellite image) in 1995 and *LISSIII* (*IRS-1C* Satellite image) in 2006 and deforestation in the period (1995 to 2006) detected.

Forest land information

In south and north of land slid inventory designed by randomized-systematic method by square sample plot (60 m* 60m) in a net of 450 m × 200 m were collected. To data analyzing, used of the Microstation 8.1, ARCGIS 9.2, IDRISI Kilimanjaroand SPSS18 software. The images were geo referenced using GCPs and digital elevation model. Radiometric and geometric quality of images was investigated. The images were classified with supervised

classification to forest and non-forest classes by maximum likelihood classification algorithmsand study area divided two classes (forest and non – forest).

Change forest area maps

To study of forest areas change in the begging and end of period (1995 to 2006) the supply of forest cover maps in the two non-forest and forest classes. Two maps extract in the ARCGIS 9.2 and change maps in the three classes (forest increases, forest decrease and non-changing). To study of major element of deforestation in by used e ARCGIS 9.2 software created the road and village maps. To detection major element of forest destruction used the spirmans regression analysis in the SPSS16 software. To study of major element of forest destruction slope, altitude, aspect, distance from village, distance from roads divided to 9,9,9,8 and 6 classes and deforestation in the physiographical and human element calculated.

Result and Discussion

Knowledge of forest extent during past decades is necessary for future planning. Deforestation has resulted in the reduction of indigenous forests to four-fifths of their pre-agricultural area. Indigenous forests now cover 21% of the earth's land surface (Tree Society, 2000).

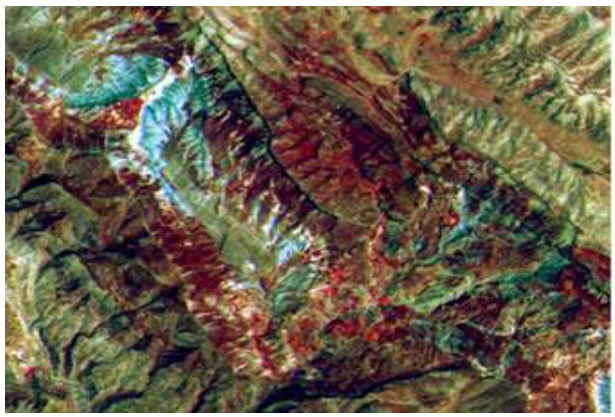

Figure 2: Satellite images of study area

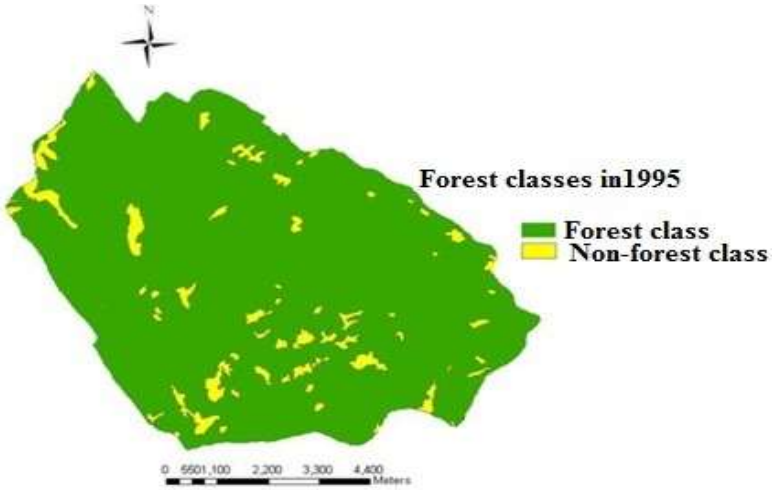

Figure 3: forest cover maps in 1995 in study area (Landsat Satellite image)

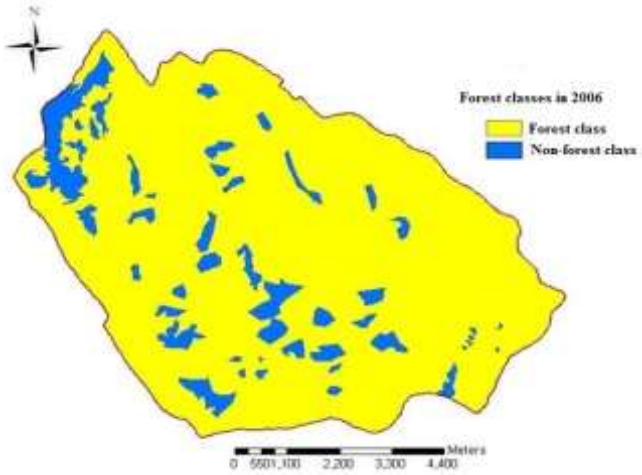

Figure 4: forest cover maps in 2006 in study area (IRS-1C Satellite image)

Figure 4 showed the area of forest and non – forest classes was 6242.4 and 1083.1 hectare. These results showed that the 462.6 hectare of this forest was destroyed in the 1995 to 2006 period.

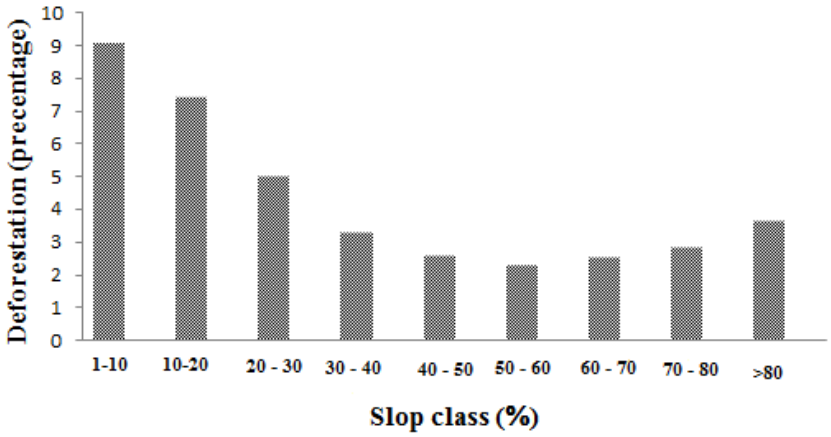

Figure 5: deforestation in the slope classes in study area

Results showed that the maximum of deforestation occurred in the lower slope classes (0 - 10% slope)

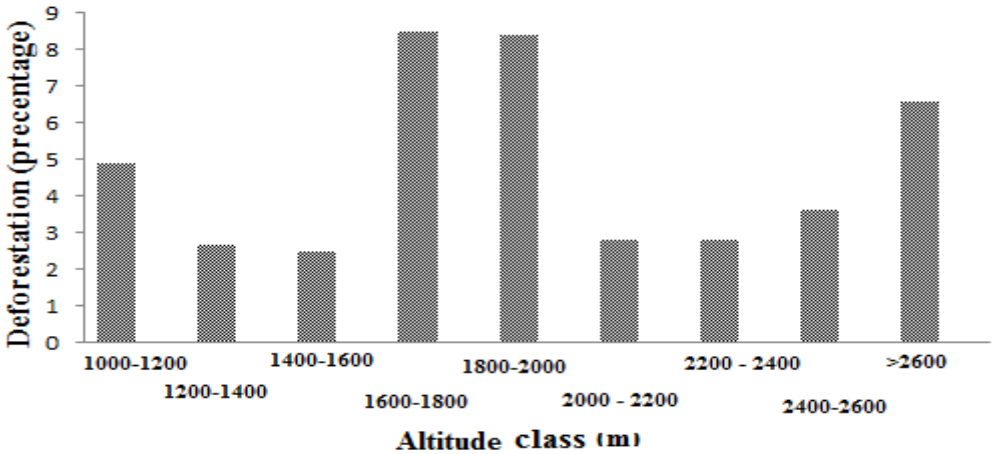

Figure 6: deforestation in the altitude classes in study area

Results showed that the maximum of deforestation occurred in the 1600 – 1800 and 1800 – 2000 altitude classes slope and by increase the altitude deforestation reduced.

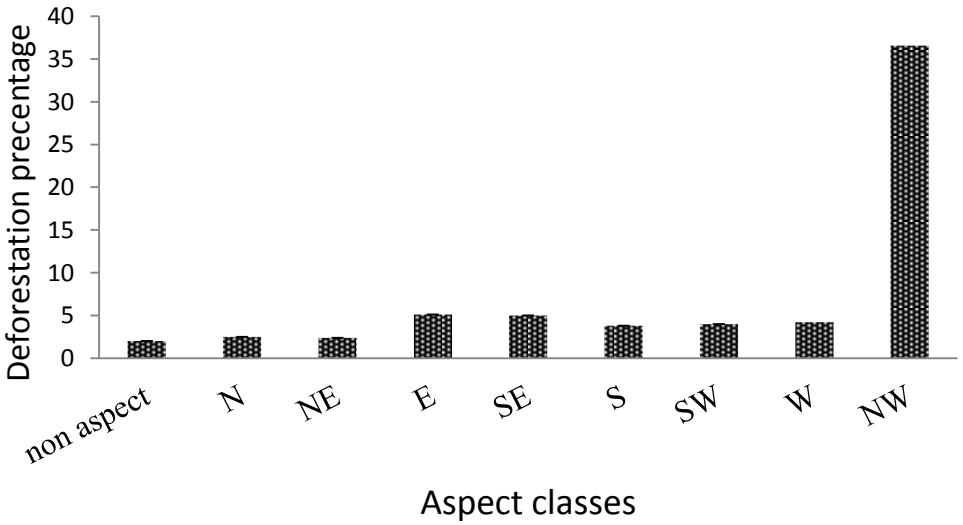

Figure 7: deforestation in the aspect classes in study area

Results showed that the maximum of deforestation occurred in the NW and W aspect and minimum of deforestation occurred in the non – aspect areas.

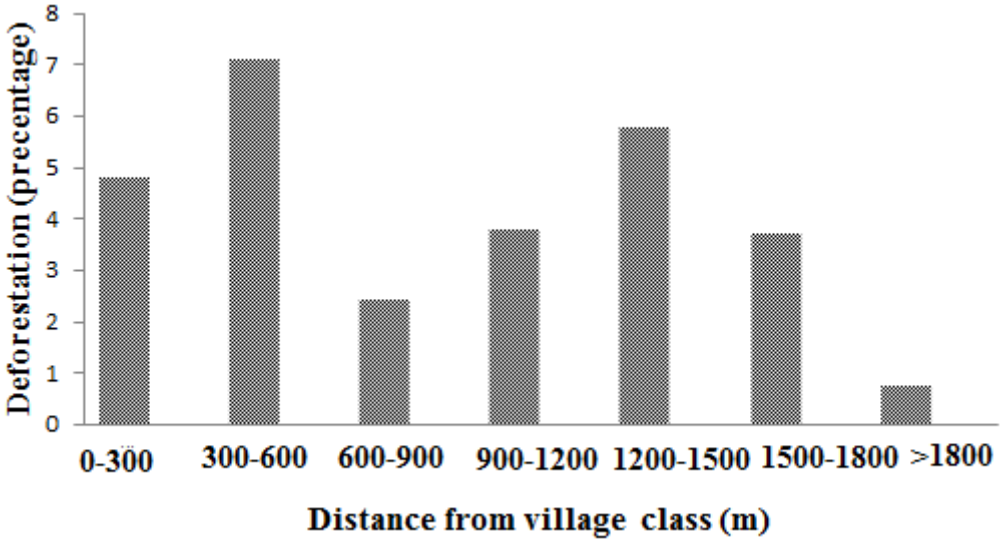

Figure 8: deforestation in the distance from village classes in study area

Results showed that the maximum of the deforestation occurred in the 300 – 600 m distance from village and minimum of deforestation occurred in more 1800 meter distance from village.

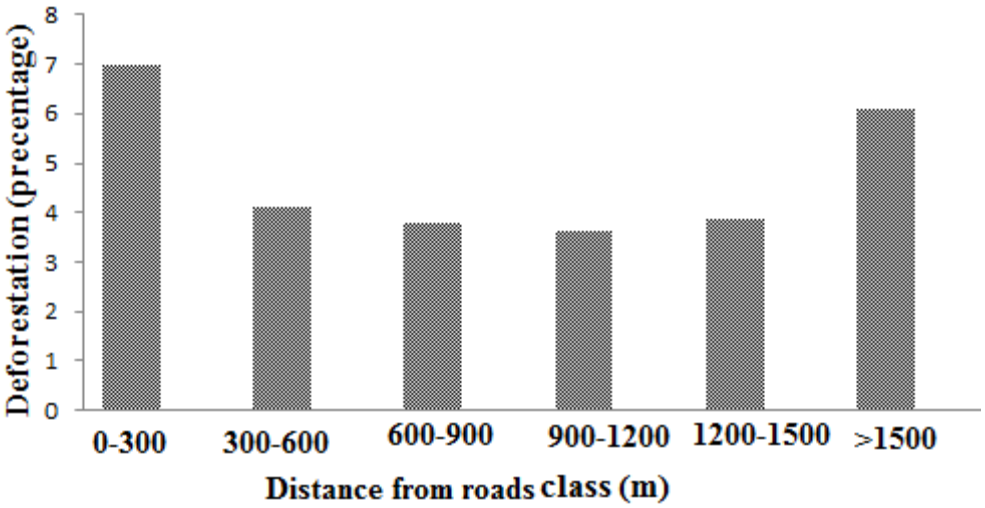

Figure 9: deforestation in the distance from roads classes in study area

Results showed that the maximum of deforestation occurred in the 0 – 300 m distance from roads and minimum of the deforestation occurred in more 1500 meter distance from roads. 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 to 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. Change detection is useful in many applications such as land-use changes, habitat fragmentation, rate of deforestation, etc. Several different techniques of change detection have been used from time to time to extract information from remote-sensing imageries (Chakraborty, 2009). In this researches used the IRS-1Cand LANDSAT image. Results showed that the maximum likelihood classifiers exhibited the highest results with 96% overall accuracy and 74% kappa coefficient. Results of LANDSAT image in 1995 showed after classification of image forest and non – forest classes has 6083.3 and 621.1hectare area (Figure 3). . Results of IRS-1Cimage in 2006 showed after classification of image forest and non – forest classes has was 6242.4 and 1083.1hectare (Figure 4). These results showed that the 462.6 hectare of this forest was destroyed in the 1995 to 2006 period, because in Zagros forest Agriculture, pastoralism, and woodcutting caused the loss of natural vegetation. Our study emphasis the high rate of deforestation in the southern Zagros forest and this study reached this results (sussman et al, 1994), (Andrés et al, 2004), (Rafyayan et al, 2006), (Amini et al, 2009), (Miettinen et al, 2011) and emphasis the deforestation and reduced the forest area and cover. to determination of major element of deforestation study of physiographical element, village and roads parameter and effect of this element on the rate of deforestation. Results showed that the maximum of deforestation in the study area occurred in the lower slope (0 – 10% slope), 1600 – 1800 and 1800 – 2000 meter altitude classes, NW and W aspect classes, 300 – 600 m distance from village classes and 0 – 300 m distance from roads, but minimum of deforestation occurred in the higher slope (more the 50 %), more the 2000 meter altitude, non – aspect areas, more 1800 m distance from village and more the 1500 m distance from roads. This result showed that the village and roads in the forest lead to deforestation and was the major element of forest destruction because by increases the distance from village and roads deforestation reduced. In the physiographical element slope, aspect and altitude was effect on the deforestation and maximum of deforestation occurred in the lower slope, 1600 to 2000

meter altitude classes, NW aspect. Our results showed that the human utilization was the major element of forest destruction and other researcher reached this result include (Andrés *et al*, 2004) and (Amini *et al*, 2009). Overall results showed that the IRS-1Cand LANDSAT satellite image was suitable tools to change detection in the different period and in this study 462.5 hectare of this forest reduced by lands for agriculture, road construction, overexploitation, and unscientific extraction of plant resources for medicine and food. Human utilization was major element of deforestation and by increased the altitude and distance from village and roads deforestation reduced. Results showed the human utilization have negative effect on the forest cover. Maximum of deforestation observed in the less 600 m distance from village and roads. In the base of this study suggested the conservation forest planning focused on the nearest of village and less of 600 meter distance from village and roads. 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 forest cover.

Conclusion

Overall results showed in the 1995 to 2006 periods 462.5 hectare of forest in study area reduced Human utilization was major element of deforestation and by increased the altitude and distance from village and roads deforestation reduced. Maximum of deforestation observed in the less 600 m distance from village and roads. To approach the sustainable forest management in the southern zagros suggested the forest prevention of livestock grazing and irregular tree cutting in the degraded forest stands.

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