Available online at http://www.ijabbr.com

International journal of Advanced Biological and Biomedical Research

Volume 1, Issue 8, 2013: 813-821

The Possibility of created the vegetation cover maps in the Central Zagros forest by using the IRS satellite image

Sahar Delpasand [1], Maryam Moradnezhadi [2], Zahra Hossaini [3] and Yousef Askari [*4]

[1]M.Sc. Student of forestry, University of Yazd, Yazd, Iran

[2]M.Sc. Student of forestry, University of Tehran, Karaj, Iran

[3]M.Sc. Student of forestry, University of Shahrekord, Shahrekord, Iran

[4]Ph.D student of forestry, University of Shahrekord, Shahrekord, Iran

ABSTRACT

The preparation of vegetation cover maps by used the land inventory and a traditional method has a lot of cost and time. But today, remote sensing is one of the main sources of data collection and information production for study and monitoring land resources, and was efficient tools for providing quickly and timely data and information needs for program planning in the natural resource filed. In the variety of available remote sensing data the satellite images has a minimum of cost and time for creating vegetation cover maps. The aim of this study is the capability of Liss-III sensor from IRS- P6Resorce satellite for creating vegetation cover maps in the Chaharmahal and Bakhtiari Province (the area of study site was 34177 ha) in the central zagros forest. By using the different methods includes the creating the color composite, principal component analysis and vegetation index enhancement the satellite image, Then by using the supervised classification method and maximum likelihood function the image was divided into four separate classes.

Key words: Liss-III sensor, IRS- P6Resorce satellite, vegetation cover maps, supervised classification, maximum likelihood function, Chaharmahal and Bakhtiari 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

Corresponding Author E-mail: Askari.yousef@yahoo.com

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). Natural resources, especially ranges and forests are dynamic and changeable as time passes. Therefore having accurate, precise and update data in short periods, is necessary for managing in local and national scales (Rafieyan *et al*, 2008). The several study accrued in the using the satellite image for study of forest parameter and vegetation cover maps include: The researcher Comparison of pixel-based and object-based approaches for forest type mapping using satellite data in the zagros forest and results showed that accuracy assessment of forest type maps showed that the object-oriented classification approach considerably improved the results comparing with pixel-based classification approach (from 25.5% to 44.4%). The study also indicated that the combined nearest neighbour and membership function methods could improve the results over the other techniques (Shataee et al, 2007). Researcher studied the Changes in Zagros's forests extension using aerial photos and satellite imagery and results showed that using the best selected ETM+ bands could better classify forest and non-forest areas than other images by the maximum likelihood algorithm with 81.3% overall accuracy and 0.64 Kappa coefficient. The result of forest extent change detection using forest map of 1955 and 2002 showed that 4853 ha of the forest area have been reduced and 953 ha increased in this period (Rashid Amini et al, 2008). The researcher studied application of aerial photographs and satellite images for visualization of forest cover changes and Results indicated the notable reduce of forest area (37%) since 50 years ago. Maximum amount of canopy drop (45%) have been occurred from 1955 to 1969. Canopy percent on forest region indicate ascending trend (+15%) from 1969 to 1997 and lightly descending trend from 1997 to 2003 (Soosani *et al*, 2009). The researcher evaluated of the capability of IRS- LISS III and SPOT- HRG data for identification and separation of pollarding forest areas in Northern Zagros and Fused bands of SPOT 5 images showed the highest overall accuracy is equal to 65.3% and the highest Kappa coefficient is equal to 0.63. The highest overall accuracy (70%) and Kappa coefficient (0.60) was obtained using the first component analysis resulted from PCA in combination to bands 1 and 4 IRS-P6 data. According to the results of classifying of these two images, the data obtained before pollarding and during of vegetation growth season, showed better results. Regardless of spectral interference between soil and trees crown cover, the results showed the high capability of above mentioned images to separate the pollarding areas and to prepare the map of the area (Moradi *et al*, 2009). The researcher determine land use change detection using LandSat and IRS satellite imagery through a post classification comparison and results showed that the extent of the City increased from 74 km2 in 1987 to about 148km2 in 2006, with a growth rate of 5%. Most changes occurred in west and northwest of the City (Rafiei and Salman Mahini, 2011). Researcher studied on the Capability Investigation on ETM+ Data for Forest Type Mapping in the Zagros Forests and results showed that the classified map using maximum likelihood classifier could be better than other maps with an overall accuracy 68% and Kappa coefficient 0.29 for Oak and mixed forest types. Results generally showed a moderately capability ETM+ data to provide forest types map in the Zagros forest. This study would suggest the utility of best spatial resolution imagery and in other regions (Parma *et al*, 2011). Researcher studied on the capability of IRS-P6 satellite data for predicting quantitative attributes of forests and results showed that the best models (at first just original bands and then combined of original and synthetic bands) were selected using RMSE, Bias, Correlation and the F values (the best model for tree density: $R2$ adj = 0.31 & for basal area: $R2$ adj = 0.38). Using slope, aspect, and elevation ancillary data did not improve the results (Pir Bavaghar, 2011). The researcher Presented of the suitable model for determining of fraction vegetation in arid area using of Satellite data IRSLissIII and results showed that the model in which MSAVI1 was used has the highest accuracy (R2=0.866) and therefore is the most suitable model for estimation of vegetation fraction in the study area (Ebrahimi Khousfi et al, 2012). The aim of this study is the capability of Liss-III sensor from IRS- P6Resorce satellite for creating vegetation cover maps in the Chaharmahal and Bakhtiari Province in the central zagros forest.

MATERIALS AND METHODS

Site description

This study located in the Chaharmahal and Bakhtiari Province in the central zagros forest. The area of study site was 34177 ha and used the Liss-III sensor from IRS- P6Resorce satellite image for preparation vegetation cover maps.

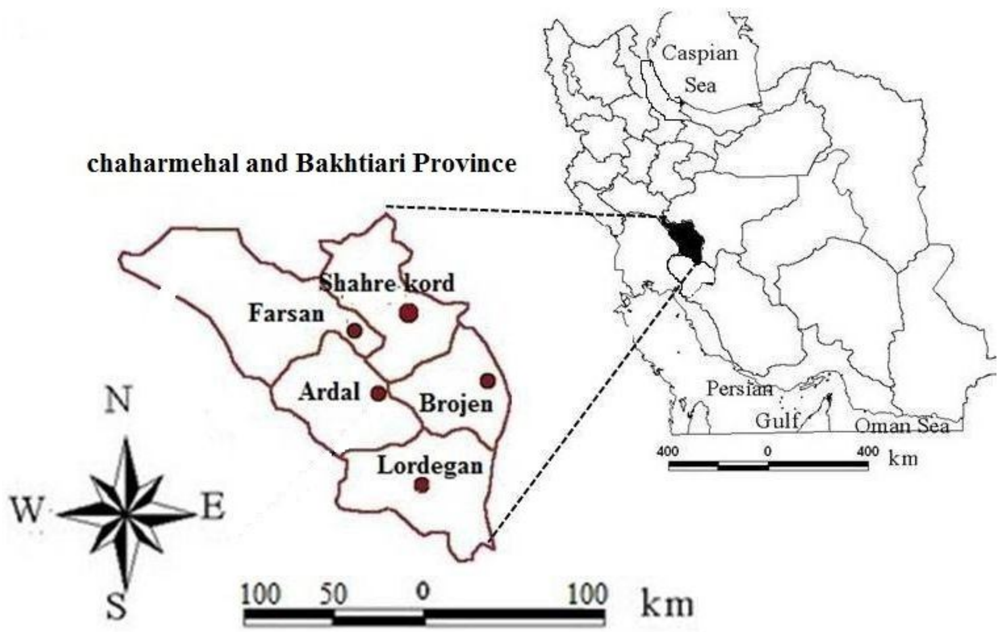

Figure 1. Location of chaharmehal and Bakhtiari Province in the Iran.

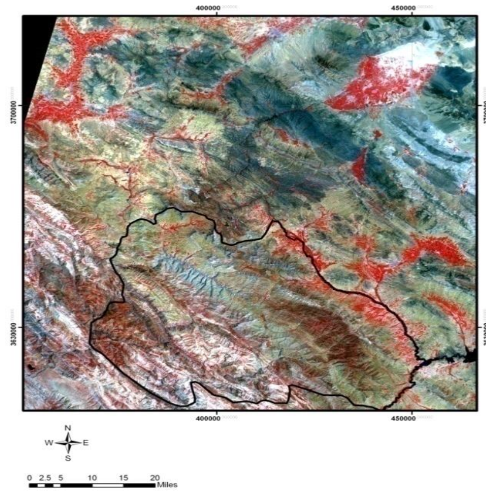

Figure 2. Study site in the IRS satellite image.

Methods:

In this study used the five band (2, 3, 4 and 5 separately) by GEOTIFF format from IRS- P6Resorce satellite image. In the first stage the five bands stacked in the one file and subset the study area. This image not radiometric and atmospheric error. By using the different methods includes the creating the color composite, principal component analysis and vegetation index (Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI) from table 1) enhancement the satellite image.

Table 1: vegetation index in the study area

Normalized Difference Vegetation Index	NDVI
Ratio Vegetation Index	RVI
Soil Adjusted Vegetation Index	SAVI

For study of vegetation cover NDVI and for isolation of bare soil SAVI index was the best index. For detections of land use in the study site used the Histogram methods, and similar land use has a similar digital number (DN). The suitable color composite for this study was the combination of three bands (red, green and blue), and 432 are the best combination. For classification used the training area sample and inventoried the 48 training sample (sufficiently homogeneous distribution of the satellite image). In the next stage for control the ability to separate classes used the ability to separate classes table (table 2).

Table 2: ability to separate classes by used the training sample

AGRICULTURE [Green] 585 points: FOREST [Blue1] 895 points: (1.92371925 1.97197996) RANGE [Magenta1] 355 points: (1.99984074 2.00000000) SOIL [Orange2] 363 points: (2.00000000 2.00000000)
FO [Blue1] 895 points: AGRICULTURE [Green] 585 points: (1.92371925 1.97197996) RANGE [Magenta1] 355 points: (1.85985487 1.96588734) SOIL [Orange2] 363 points: (2.00000000 2.00000000)
RA [Magenta1] 355 points: AGRICULTURE [Green] 585 points: (1.99984074 2.00000000) FOREST [Blue1] 895 points: (1.85985487 1.96588734) SOIL [Orange2] 363 points: (1.99997142 1.99999996)
SOIL [Orange2] 363 points: AGRICULTURE [Green] 585 points: (2.00000000 2.00000000) FOREST [Blue1] 895 points: (2.00000000 2.00000000) RANGE [Magenta1] 355 points: (1.99997142 1.99999996)
Pair Separation (least to most); FOREST [Blue1] 895 points and RANGE [Magenta1] 355 points - 1.85985487 AGRICULTURE [Green] 585 points and FOREST [Blue1] 895 points - 1.92371925 AGRICULTURE [Green] 585 points and RANGE [Magenta1] 355 points - 1.99984074 RANGE [Magenta1] 355 points and SOIL [Orange2] 363 points - 1.99997142 FOREST [Blue1] 895 points and SOIL [Orange2] 363 points - 2.00000000 AGRICULTURE [Green] 585 points and SOIL [Orange2] 363 points - 2.00000000

The ability to separate class's resolution between 0 to 2 and the number 2 represents the highest ability to separate. Then by using the supervised classification method and maximum likelihood function the image was divided into four separate classes (agriculture, range, forest and land).

Table 3: interpretation key for classification of image and maps

maps	color composite (432)	classes
Green	Bright Red	agriculture
Blue	Dark red	forest
Mgnta	Pink	range
Orange	Green	bare soil

Unfortunately, due to lack of a ground truth map was not possible to verify the classification, but visual interpretation and compared in different color combinations showed suitable ability to separate the images of the four-story ranch, forest, agricultural and bare soil.

RESULT AND DISCUSSION

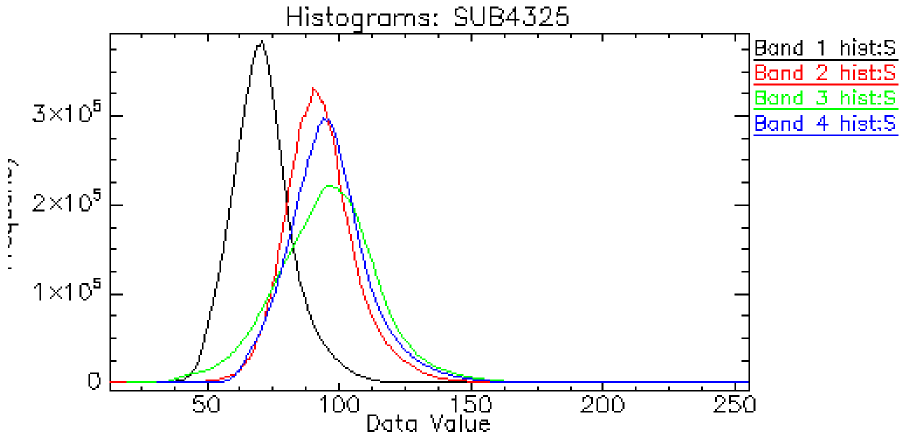

Figure 3: histogram of four bands in this study

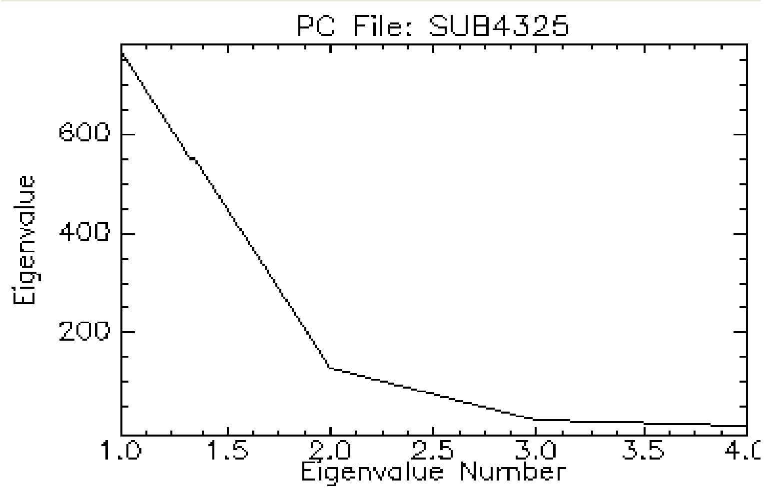

Figure 4: the quantity of PC (eigenvalue)

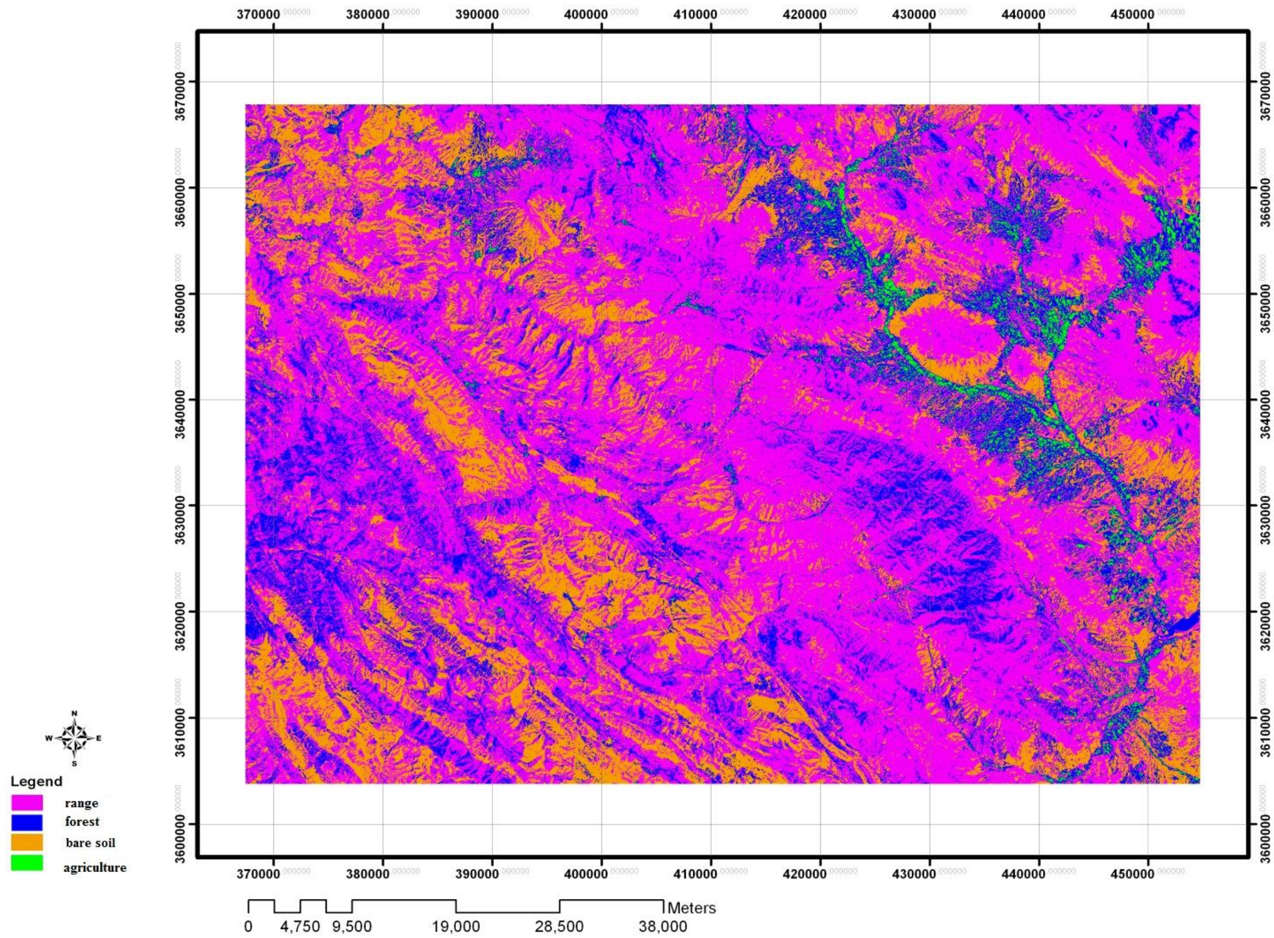

Figure 5: the land use classes by using the maximum likelihood function

Conclusion

Anderson (1976) showed that the ability classification for study a land use by using the satellite image has an accuracy more the 85%. Nassiri (1996) showed that the acceptable accuracy for land-use mapping is more the 85%. Alavipanah et al (2001), Masoudi et al (2001) and Bolstad and Lillesand (1991) showed that the maximum likelihood function was a higher accuracy for land use mapping. These results showed that the NDVI vegetation index is a suitable index for studied the vegetation cover and Filekash (2000) indicate that the NDVI vegetation index is suitable index for study of land use in the rangelands. Matsushita et al, 2007 studied the NDVI and SAVI for study the vegetation cover and results showed that the poor coverage area used the SAVI index. Results showed that the first element of PCA has a maximum of eigenvalue and information (figure 3) and Dwivedi (1998), Khajeddin (1995) and Masoud (2006) indicated that PCA have a suitable efficiency for separated the vegetation cover. Overall results showed that the IRS- P6Resorce satellite image was a suitable efficiency for preparation vegetation cover maps in the central zagros forest and Rashid Amini et al, (2008); Moradi *et al*, (2009); Parma *et al*, (2011) and Pir Bavaghar, (2011) reached the similar results. Authors suggested to study the vegetation cover and mapping used the IRS- P6Resorce satellite image.

REFERENCES

Alavipanah, S.K., Poyafar, A.M., Khalilpoor, S.A., Mashhadi, N., 2001. Study of vegetation cover and salinity with RS & GIS (case study: saline River of Karaj). Journal of Research in Geography. 6(1): 69-86.

Anderson, J.R., 1976. A land use and land cover classification system for use with remote sensor data, US Govt. Print. Off.

Bolstad, P.V., Lillesand, T.M., 1991. Rapid maximum likelihood classification. Photogrammetric engineering and remote sensing. 57, 67-74.

Dwivedi, R.S., Sreenivas, K., 1998. Image transforms as a tool for the study of soil salinity and alkalinity dynamics. International Journal of Remote Sensing. 19, 605-619.

Ebrahimi Khousfi Z, Mirakbari M, Kalantari S, Ebrahimi Khousfi M, 2012. Presentation of the suitable model for determining of fraction vegetation in arid area using of Satellite dataIRSLissIII Case Study: Sade Nahrein-Tabas, Watershed Management Research, 94, 55-62.

Fattahi M, 1994. Study on Zagros oak forests and the most important their destruction causes. Institute of Forests and Rangelands Research press, Sanandaj, Iran.

Forest and Rangeland Organization of Iran, 2002. Strategies for sustainable forest management in Zagros forests, Technical Report, Forest and Rangeland Organization, Teheran, Iran, 70 p.

Haidari M, Shabanian N, Haidari R.H, Bazyar M, 2012. Structural diversity of oak forests in Kurdistan Province (Case study: Oak forest), IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS), 4(3): 37-43.

Haidari M, Jalilvand H, Haidari R.H, Shabanian N, 2012. Study of Plant Biodiversity in Grazed and Non-grazed Areas in the Iran-o-Turanian Ecological Zones (Case Study: Yazd Province, IRAN), Annals of Biological Research, 3 (11):5019-5027.

Haidari M, Namiranian M, Gahramani L, Zobeiri M, Shabanian N, 2013. Study of vertical and horizontal forest structure in Northern Zagros Forest (Case study: West of Iran, Oak forest), European Journal of Experimental Biology, 3(1):268-278.

Hosseini S.A. O, Haidari M, Shabanian N, Haidari R.H, Fathizadeh O, 2012. The impact of single selection method logging on the tree and shrub diversity in the Hyrcanian forests, European Journal of Experimental Biology, 2 (6):2229-2237.

Khajeddin, S.J., 1995. A survey of the plant communities of the Jazmorian Iran, using LANDSAT MSS Data. Unpublished PhD Thesis. University of Reading.

Marvi-Mohajer MM, 2005. Silviculture, Tehran University Press, Tehran, Iran.

Masoud, AA, and K. Kike, 2006 .Arid land salinization detected by remotely –sensed land cover changes, a case study in the Siwa region. Nw Egypt, Journal of Arid Environments, 66, 151 -167.
Masoudi, M., Alavipanah, S.K., Nejabat, M., 2001. Accuracy assessment of supervised classification methods for landuse and cover mapping. Iranian Journal Of Range And Desert Research. 5, 14.

Matsushita, B., Yang, W., Chen, J., Onda, Y., Qiu, G., 2007. Sensitivity of the Enhanced Vegetation Index (EVI) and Normalized Difference Vegetation Index (NDVI) to topographic effects: A case study in high-density cypress forest. Sensors. 7, 2636-2651.

Moradi A, Oladi J, Fallah A and Fatehi P, 2009. Evaluation of the capability of IRS- LISS III and SPOT-HRG data for identification and separation of pollarding forest areas in Northern Zagros (Case Study: Kurdistan, pollarded forests of Baneh), Iranian Journal of Forest and Poplar Research 17(3): 450-463.

Nassiri, A., 1998. Spatial and Spectral classification for provide land use map. Agriculture Ministry, Programming and Deputy and General Administration of Statistics and Information, NO 77/26.

Parma R, Shataee Sh, Khodakarami Y and habashi H, 2011. Capability Investigation on ETM+ Data for Forest Type Mapping in the Zagros Forests (Case Study Ghalajeh Forests, Kermanshah Province), J. of Wood & Forest Science and Technology, 18(1) 61-76.

Pir Bavaghar M, 2011. Evaluation of capability of IRS-P6 satellite data for predicting quantitative attributes of forests (case study: Northern Zagros forests), Iranian Journal of Forest, 3(4), 277-289.

Rafieyan O, Gashasi J and Ahmadi Sani N, 2008. Updating the Land Cover Map Using Satellite Data. In Order to Integrated Management of Natural Resources, World Applied Sciences Journal 3 (1), 48-55.

Rafiei R, Salman Mahini A, 2011. Determine land use change detection using LandSat and IRS satellite imagery through a post classification comparison, Journal of Applied RS & GIS Techniques in Natural Resource Science, 2(3), 51-61.

Rashid Amini M, Shataee Sh, Ghazanfari H.O and Moaieri M.H, 2008. Changes in Zagros's forests extention using aerial photos and satellite imagery (Case study, Armerdeh forests of Baneh), J. Agric. Sci. Natur. Resource, Vol. 15(2), 23-34.

Shataee S, Darvishsefat A.A and Sobhani H, 2007. Comparison of pixel-based and object-based approaches for forest type mapping using satellite data, Journal of the Iranian Natural Res, 60(3), 869-881.

Soosani J, Zobeiri M and Feghhi J, 2009. Application of aerial photographs and satellite images for visualization of forest cover changes (Case study: Zagros forests, Iran), Iranian Journal of Forest and Poplar Research 17(2), 236-249.