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Land Use / Land Cover Mapping using Remote Sensing Data in Pravara River Basin, Akole, Maharashtra, India

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Abstract

The land use/land cover pattern of a region is consequence of natural and socio-economic factors and their application by man in time and space. Land use/land cover is a significant part in understanding the connections of the human being doings with the situation and thus it is necessary to be able to simulate changes. Land is used for the motivations such as crops, forests, mining, transport, housing, entertaining, manufacturing and cost-effective. The unused lands are unproductive waste and i.e. barren and fallow land. To record the land use/land cover information from surveying and data collection is not always possible in view of time and cost involved in data collection. In view of this the objective of present paper is to mapping the general land use/land cover pattern of Akole Tahsil. For completion of objective secondary data were obtained from the images LISS 3 and LANDSAT 8 remote sensing satellite for the period 2011 and 2015 respectively. There is observed the changes in land use/land cover pattern in the study area. From the analysis it can be conclude, there is much scope is in the field of utilization in barren and open scrub and replacing by agriculture.

Keyword: Land use/ land cover, remote sensing, change detection.

Introduction

Land is necessary for human survival, because it's available for human with living space[1] to fulfill all mandatory needs of human kind like food and other raw materials which are used in the satisfaction of his wants. Land factor is essential for human development; therefore role of man is become very important in education and development of his physical environment. Land utilities like climate, water, soil, topography are not equal on the earth; therefore various agricultural activities of human kind are restricted. It is essential to shift from generalities to particularities in country like India or even in study region where agriculture is the only means of livelihood for majority of people[2]. Such studies are fundamental for future planning. The main objective is to highlight the spatio-temporal pattern of land use in the study region. The Tehsil is considered as a study unit and land use categories are based on the census classification.

The idea of depicting the use of land in a map was first conceived by Saucer in 1919. Stamp in Britain is given a contribution regarding land use mapping study. The concept of land use has been defined by Stamp in 1962. The land should fulfill all the necessary and legitimate needs of nation[3] Land is used for the purposes such as crops, forests, pastures, mining, and transportation, residential, recreational, industrial and commercial. The unused lands are uncultivable waste and i.e. barren and fallow land. According to Nanavati conservation of land is also connected with land use[4]. The land use and land cover classification were carried out in Sangamner area, a part of Pravara basin by Deshmukh et al[5]. Likewise, Freeman given the idea about surface utilization of all developed and available lands for a specific point at a given time and space is described as land use[6]. Multiple advance digital database are supporting for digital land cover mapping after the Geo-referencing[7] of satellite data.

Strategies role of land use study is very important in the settlement of economic, social and cultural progress of human kind. Day by day pressure of population is making impact on land because growing population needs more food and other necessary materials. Therefore we need to use each and every piece of available land. This needs strong scientific, rational and economic preparation to use available resource of land, on another side we have to maintain ecological and socio-economic balance[8]. The development in the remote sensing environment now a day support for change detection and monitoring of earth surface resources[9]. The land use study in its spatial context is essential to understand the regionalization of the area of optimum land use, degraded areas etc. The land use is the result of a combination of both natural genesis and human influences which have been brought to bear on it in the past and of those which are still active in the present[10]. Satellite remote sensing imagery and it's coupled in GIS environment for land use/land cover analysis is a key to many diverse applications such as environment, forestry, hydrology and agriculture[11]. Any areas natural resource management watershed management[12] planning and monitoring depend on accurate information about the land cover in a region. Methods for land use change detection from

intensive field sampling with plot inventories is a complex. However, the extensive analysis using the remotely sensed data has proven to be more cost effective for large regions land use / land cover analysis. In view of this the general land use / land cover pattern of Akole area were identified using remote sensing database.

Study Area: Present study area is the part of Pravara basin in Ahmednagar district of Maharashtra. The study area extends from source of River Pravara up to Akole Tahsil extending between 73^0 37' 33.35" East to 74^0 05' 12.97" East longitudes and 19^0 28' 10.27" North to 19^0 38' 43.19" North latitudes (figure-1). The maximum height of study area is 1646 m. from actual sea level where as minimum height is 580 m. from actual sea level. Geologically, this region is part of Kalsubai subgroup formation where large physical diversity along with lineament[13] and high density of natural streams. There is large diversity in rainfall pattern due to physical setting of study area which is responsible for generation of different land cover. The average temperature of study area is 29^0C with the average rainfall is 543.5 mm. Study area is rapidly altering their land cover, especially toward agriculture[14] due to availability of water from Bhandardara reservoir and Pravara River. Pravara river is important river in this area[15] which drain the surrounded area and responsible for changing the land use / land cover. Recently the construction of Nilwande dam and its proposed canals over Pravara River also support for developing intensive agricultural patterns. In the study area land use are noted by barren land, settlement, open scrub, rocky / open space, agriculture, dense forest, sparse vegetation and water bodies.

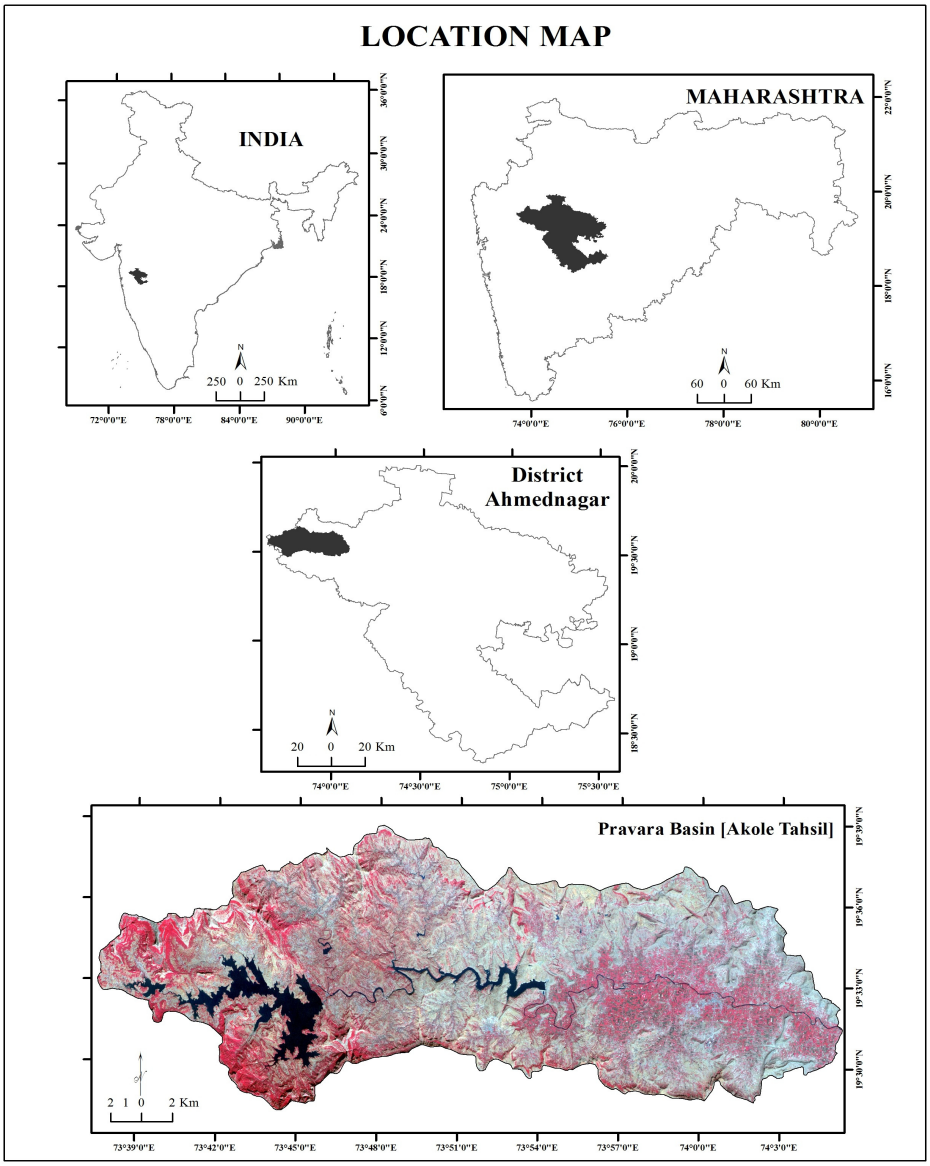

Figure-1
Location map of study area

Methodology

Secondary data were collected from remote sensing imageries such as LISS 3 and LANDSAT 8 for the period 2011 and 2015 respectively. The selected image from 2011 and 2015 respectively for assessment of land use and land cover pattern. These images were classified in the Erdas image processing software by supervise and unsupervised classification techniques for land use/land cover classification. The study area boundary was superimposed over satellite imagery and cropped the study area. After those administrative boundaries of selected villages were also superimposed on classified satellite images known as the village wise land use/ land cover analysis. Obtained results were converted in percentage of area from hectors unit by mathematical calculation for to know the areas under various sectors. Final land use/ land cover maps were prepared from LISS 3 and LANDSAT 8 satellite images.

Results and Discussion

General Land Use/ land Cover Pattern in 2011: In the 2011 the massive land were covered by Sparse Vegetation which is mainly observed at bottom hilly area. The western part of study area dominated by Sparse Vegetation cover. Similarly eastern area covered by Sparse Vegetation around the Pravara River. The percentage of Sparse Vegetation area shown is the 47.62 % area.

After that the second dominated area by Barren land. It covers approximately 26.34% of area under barren land. This and cover mainly dominated in the north east direction of study area. The settlement in the study area only covered the 307.5318 hector area which is in the 0.53% area. It may be due to undulating topography and tribal small hamlets population. Similarly open Scrub occupied the 2.08 % area and rocky / open space covered the 1.59% of area under land use (figure-2).

Table-1
Land use /Land cover pattern in 2011 (from LISS 3 data)

Land use	Area_ha	Area %
Barren land	15327.06	26.34%
Settlement	307.5318	0.53%
Open Scrub	1210.753	2.08%
Rocky / Open Space	922.579	1.59%
Agriculture	6298.037	10.82%
Dense forest	3562.216	6.12%
Sparse Vegetation	27712.36	47.62%
Water bodies	2851.486	4.90%
Total	**58192.02**	**100%**

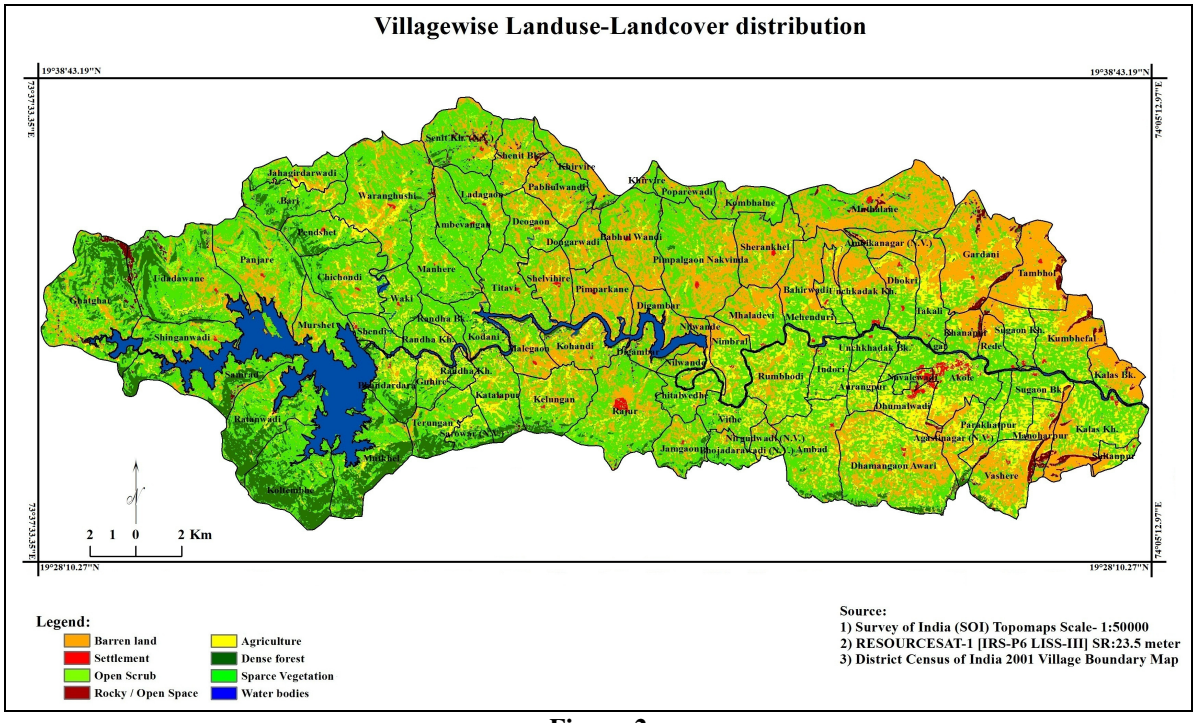

Figure-2
General land use / land cover

General Land Use/ Land Cover Pattern in 2015: The land use/ land cover area are rapidly chanced during 2011 to 2015. Here is main area covered by barren land which is 30.41%. Then the open scrub covered the 20.84% of area under land cover area. Remains portion where covered by another land use/land cover features in study area. The settlement in the study area is covered only 1.13% area. Similarly, the dense forest covered minimum land cover area with 2.89% of area. In case of water bodies, area occupied by water bodies is around 3.53 %. In the study area the right canal and left canal also occurring the land use, which construction process in ongoing. These canals are located in eastern part of study area. The land use pattern in the study area, especially in the eastern direction of the study area is altering due to Nilwande canals in future.

Table-3
Land use / Land cover pattern in 2015 (from Landsat 8 data)

LISS3_LUClass	Area_ha	Area %
Barren land	17695.08	30.41%
Settlement	655.9049	1.13%
Open Scrub	12127.36	20.84%
Rocky / Open Space	4478.077	7.70%
Agriculture	5486.499	9.43%
Dense forest	1684.635	2.89%
Sparse Vegetation	14007.46	24.07%
Water bodies	2057	3.53%
Total	**58192.02**	**100%**

Assessment of Land Use/ Land Cover Changes: From the image processing results and acquired land use/ land cover data its reveled that, the land use/ land cover pattern in the study area are changed. Table 3 is showing the comparative changes in general land use/ land cover pattern during 2011 and 2015. Change is observed in various categories viz. Area under sparse vegetation (-23.55%), barren land (+ 4.07%), dense forest – (-3.23 %), agricultural land (-1.39) and water bodies (-1.37). Barren land, open scrub, settlement, open space etc. land use and land cover were increased from 2011 to 2015. Agriculture, forest, water bodies, sparse vegetation reduced from 2011 to 2015 in the study area. In the study region as a whole area under forest, land for cultivation, decreased and area under barren land has been increasing. Alarming negative changes in sparse vegetation is the subject of environmental degradation. In the study area it is observed that the water bodies also decreasing. It may be the result of excessive water transformation from dams to the lower sections of dams. Over all scenario of general land use/ land cover are detected as changeable and prone to environmental degradation. These acquired results are unsafe for future planning of the agriculture in study region. These problems are mainly due to increasing population, over utilization of water, lack of wise utilization of resources etc.

Conclusion

The land use/ land cover change detection is the supportive techniques for any further planning. Remote sensing data has wide range of application in land use/ land cover mapping and change detection also. The total geographical area of study area is 58192.02 hector. Land utilization is classified in eight categories like barren land, area under forest, sparse vegetation etc. in study area. Table 3 clearly shows the changed pattern of land use and land cover in study area of 2011 – 2015sparse vegetation area is most precious category of land among other land use category. These changes occurred may be due to changing population, and related socioeconomic environment alteration. The remote sensing data such as LISS 3 and Landsat 8 are the potential data for identification of land use and land cover in any diverse area. Spectral reflection structures of plains have helped to know of landforms[17]. Identification of land use/land cover from remote sensing data can be help for the further land planning and decision support system.

References

1. Bhagawat R., Application of Remote Sensing and GIS: Land Use/Land Cover Change In Kathmandu Metropolitan City, Nepal, *Journal of Theoretical and Applied Information Technology,* 72-80, **(2011)**

2. Gajbhiye S. and Sharma S.K., Land Use and Land Cover change detection of Indra river watershed through Remote Sensing using Multi-Temporal satellite data, *International Journal of Geomatics and Geosciences*, **3(1),** 89-90, **(2012)**

3. Stamp L.D., Applied Geography, Penguin Books, Suffolk, 105-107 **(1930)**

4. Nanavati M.B. and Anjaria J. J., The Indian Rural Problem, Vora and Co. Bombay, **(1951)**

5. Deshmukh K.K. and Aher S.P., Particle size analysis of soils and its interpolation using GIS technique from Sangamner area, Maharashtra, India, *Int. J. of Env. Sci*., **3(10)**, 32-37 **(2014)**

6. Freeman T.W., Geography and Planning, Hutchinson, University Library, London **(1968)**

7. Aher S., Parande A. and Deshmukh P., A Geomatics of the Image Processing: Image Georeferancing, *Proceedings published by Int. J. of Computer Applications*, 20-23 **(2011)**

8. Mohammad N., Investigating Land Use and Land Cover Change in Bahrain: 1987-2013, *Geospatial Technologies project,* **(1980)**

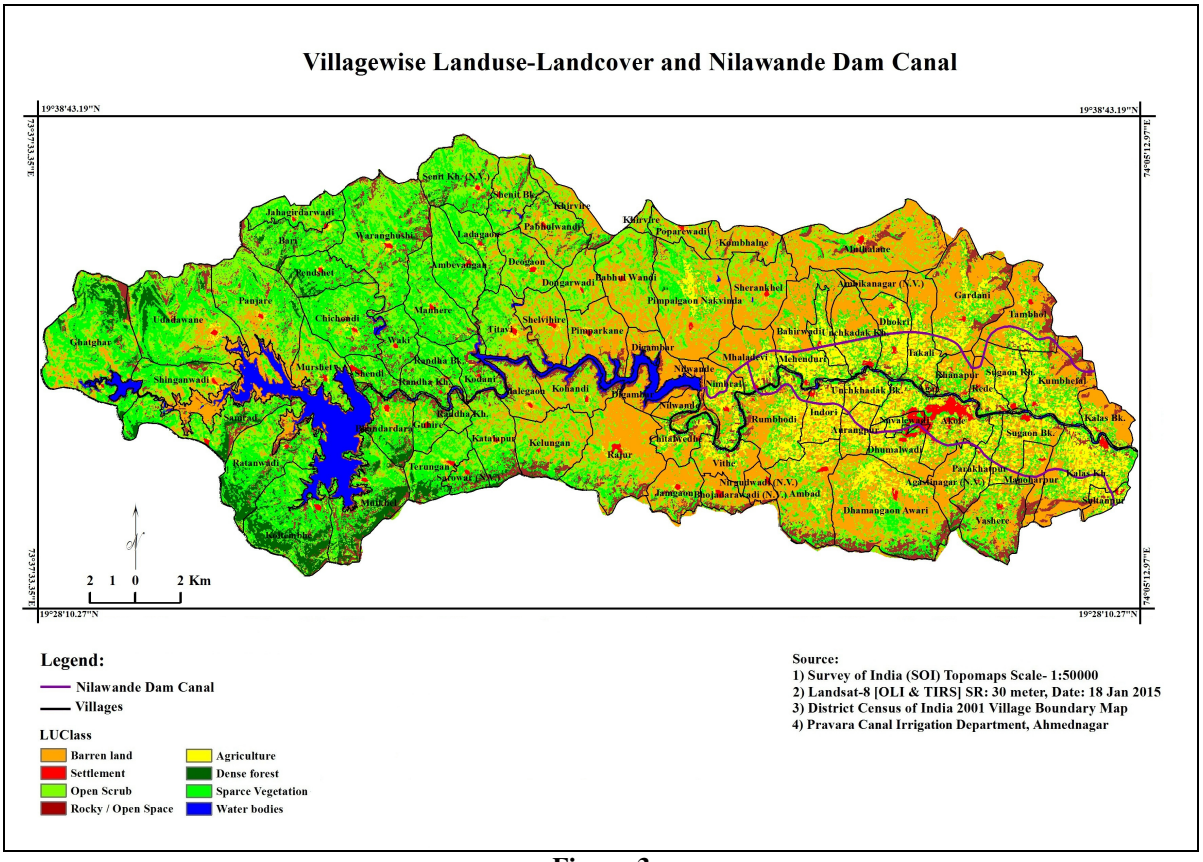

Figure-3
General land use/ land cover

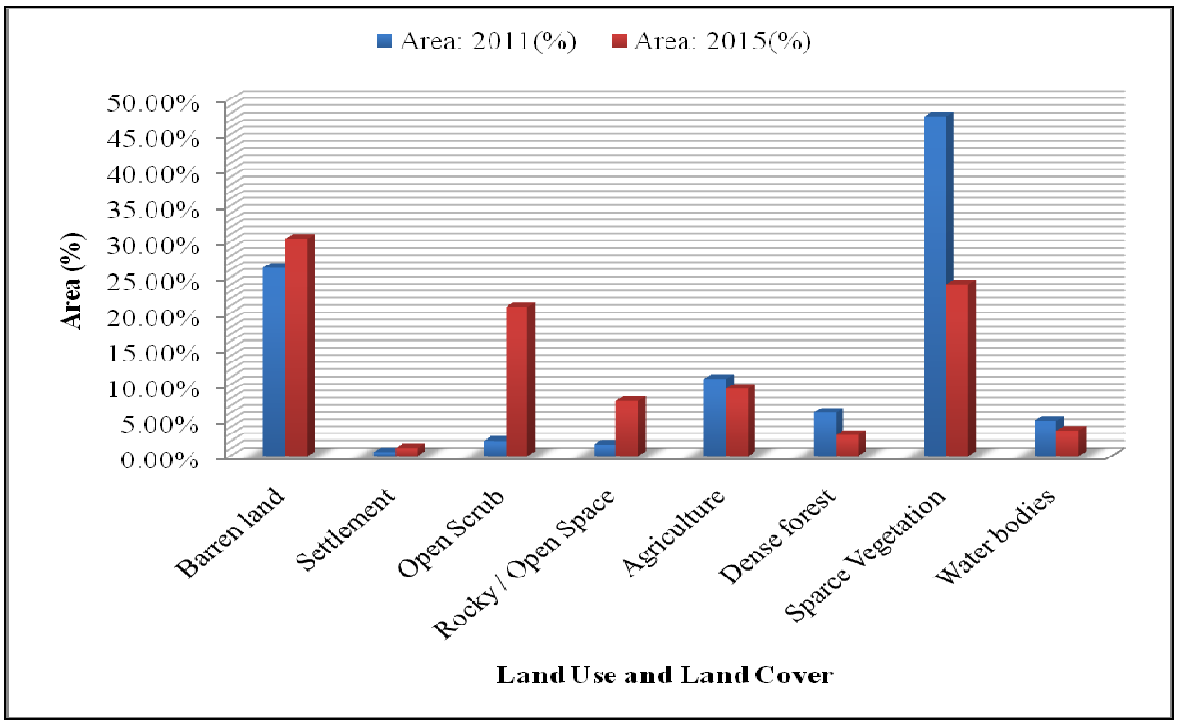

Figure-4
Land use/ land cover cahnges from 2011 to 2015

Table-3
Changes in General Land Use/ Land Cover Pattern during 2011-2015

Land Use Category	2011		2015		Volume change
	Area (hect.)	Area (%)	Area (hect.)	Area (%)	
Barren land	15327.06	26.34	17695.082	30.41	04.07
Settlement	307.5318	0.53	655.90494	1.13	00.60
Open scrub	1210.753	2.08	12127.36	20.84	18.76
Rocky/Open space	922.579	1.59	4478.78	7.70	06.11
Agriculture	6298.037	10.82	5486.4991	9.43	-01.39
Dense forest	3562.216	06.12	1684.6348	2.89	-03.23
Sparse vegetation	27712.36	47.62	14007.459	24.07	-23.55
Water bodies	2851.486	04.90	2056.9996	3.53	-01.37
Total	58192.02	100	58192.02	100	--

Source: Socio-Economic Review & District Statistical abstract –Ahmednagar District

9. Aher S.P. and Dalvi S.N., Remote Sensing Technique for Monitoring the Glacier Retreating Process and Climatic Changes Study, *Indian Streams Research J.,* **2(8),** 2-6 **(2012)**

10. Vink A.P.A., Land Use in Advancing Agriculture, *Springer Velag.*, **3,** 3-17 **(1975)**

11. Pralhad Y.V. and Deore R.S., Population Growth and Changing Land use Profile in Girna River Basin in Nashik District (MS), *Shodh, Samiksha Aur Mulyankan*, **2,** 11-12, **(2010)**

12. Deshmukh P., Wawale S., Aher S. and Thorat S., Demarcation of Drainage Network for Watershed Management of Sangamner Tahsil using Topographical and Remote Sensing Database, *Indian Stream Research Journal*, **2(1),** 1-4 **(2012)**

13. Aher S.P., Shinde S.D., Jarag A.P. and Gawali P.B., Identification of Lineaments in the Pravara Basin from ASTER-DEM Data and Satellite Images for their Geotectonic Implication, *International Journal of Earth Sciences,* **2(7),** 1-5 **(2014)**

14. Thorat S., Deshmukh P., Wavale S. and Aher S., Scope and Opportunities of Agro-Tourism in Akole Tehsil of Ahmednagar District, *Golden Res. Thoughts,* **1(12),** 1-4 **(2012)**

15. Aher S.P., Bairagi S.I., Deshmukh P.P. and Gaikwad R.D., River change detection and bank erosion identification using topographical and remote sensing data, *Int. J. of Appl. Information Sys.,* **2,** 1-7 **(2012)**

16. Gatade D.G. and Pol N.S., Changes in general land use pattern in Sangli district: A geographical analysis, *Golden Research Thoughts*, **2,** 1-8 **(2013)**

17. Wawale S.G., Geomorphologic analysis of Pravara River using Topographical and Remote Sensing database: a case study of Pravara River in Ahemadnagar district of Maharashtra, *Online International Interdisciplinary Research Journal*, **2(4),** 55-63 **(2012)**