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Monitoring Wastelands of Hisar District, Haryana Through Space Technology

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Abstract – The task of providing food security to our country's population is a serious challenge. This challenge needs to be met in the face of changing consumption patterns, impacts if the climate changes and degradation of the finite land and water resources. Thus there is a pressing need for enlarging arable area by way of reclaiming wastelands as well as for sustainable agriculture through which crop yields can be increased without adverse environmental impacts. To convert the wastelands to cultivable land, it is necessary to estimate and monitor the area under wastelands. IRS-IC/ID LISS-III digital data of three seasons i.e. Kharif, Rabi and Zaid for the years 2005-06 and 2008-09 was used. It was found that degraded grazing land in the district is 107.58 followed by open scrub. Other classes like stabilized sand dunes, waterlogged, mining area etc. were also observed. Change analysis matrix shows that the wastelands are decreased from 138.91 to 132.89 sq.km during the study period.

Keyword – Monitoring, Wastelands, LISS-III, IRS-1C/1D.

1. INTRODUCTION

For planning reclamation/conservation and ameliorative measures for the restoration of wastelands, it is necessary to have their spatial extent at the state and district level. Keeping this in view, National Wasteland Development board (NWDB) was constituted with the objective of bringing five million hectares of land every year under fuel wood and fodder plantations.

IRS-IC/ID LISS-III digital data for the three season i.e. Kharif, Rabi and Zaid for the year 2008-09 was used for interpretation in the district adopting WGS-84 datum and UTM projection system. The vector data of wastelands generated during 2005-06 was also used to generate change detection matrix in all the district of the state (Manual, NRSA 2007). This study was carried out with the goal to update the wasteland vector layer of 2005-06 using three season satellite data of 2008-09, to identify the depict areas with major wasteland change between 2005-06 and 2008-09 and for the preparation of wastelands category-wise spatial change statics.

The study indicates that Haryana state has a total area of 2145.92 sq.km. under wasteland which constitutes 4.85 % of the total geographical area of the state (Arya et.al. 2014). If these wastelands will be under cultivation and other purposes like afforestation and horticulture can help in development of the socio-economic status of the people and increase the overall economic growth of the state.

2. STUDY AREA

The district Hisar is an abbreviation of Hisar-e-Feroza. The name acquired by the original town is the result of construction of a fort (Hisar) by Feroz Shah Tughlaq about A.D. 1354. Hisar district has rich pre-Harappan sites of Banawali Rakhigarhi (Rakhi Shahpur and Rakhi Khas) and Siswal, which take back to the first half of the 3rd Millennium B.C. and possibly even earlier. The Hisar district, a part of the Indo-Gangetic alluvial plain is situated between 28°53'45" to 29°49'15" N latitudes and 75°13'15" to 76°18'15" E longitudes (Hooda et. al. 2003-06) It occupies an area of 3983 sq.km. and is bordered on the east by Rohtak district, on the west by Fatehabad district & Rajasthan state, on the south by Bhiwani district and on the north by Jind district (Statistical Abstract, 2010). The location of the district in the state is shown in Fig-1.

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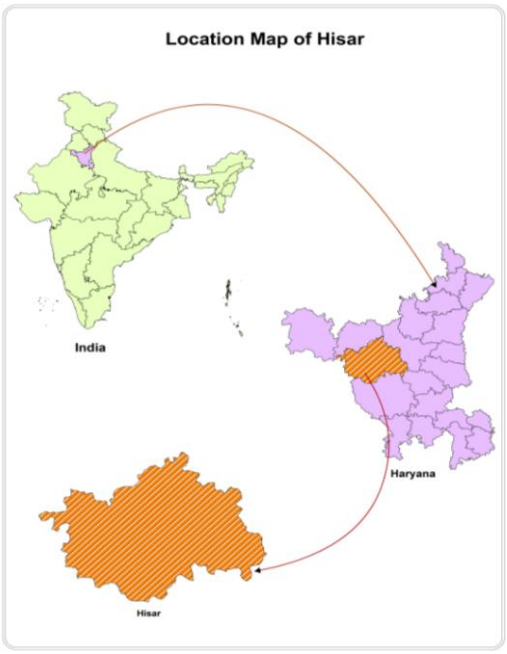

Fig. 1. Location map of study area

3. Material & Methods

Information on wastelands was derived from multi-temporal data either by digital analysis or visual interpretation. Visual interpretation was carried out displaying the digital data on the color monitor and wasteland categories were delineated through on screen interpretation. Software's ARC/MAP. 9.2, ERDAS IMAGINE 9.3, Microsoft Office 2007 were used for this study UNIP/ISRIC (1991). Digital data was loaded and geo-referenced with the help of ground control points by using image processing software. Details of methodology of wastelands change analysis is described in the flow chart (fig. 2). The methodology involved on-screen interpretation of multi season IRS-IC/ID LISS-III digital data from NRSC (National Remote Sensing Centre) of Rabi, Kharif & Zaid crops for the year 2008-09 for interpretation of various wastelands categories. Ground truth data collected from various places was used to finalize the map.

The Vector data of wastelands generated during 2005-06 was used to generate change detection, methodology flow chart is shown in fig-2. Survey of India topographical maps were used for identifying villages' locations, major transport network, cultural features and annotation of major towns and cities (Manual, NRSA 2010).

4. Results & Discussion

Description of Wastelands

Wasteland mapping of the Hisar district was completed with multi season satellite data for the year 2008-09. The total area under various wasteland categories is 132.89 sq. km. which contributes 3.34 % of the total geographical area of the district. The area of these wastelands is given in Table-1; the graphical and pictorial representations are shown in Fig-3. The brief description of these wasteland categories is as follows:

Scrub Land:

This is the land, which is generally prone to deterioration and have scanty vegetation cover. Such land occupies relatively high topographic locations. It is intensively cultivated district, and therefore, the area under this class is very less. Prominent patches are observed near Hisar City and Piranwali village in the central part and Bagla village in the west part of the district. The total area under open class is 16.32 sq.km. which covers 0.41 % of total geographical area which was 16.38 during 2005-06. Area under this category is decreased by 0.06 sq.km. The area under land with dense scrub is 0.28 sq.km during 2008-09, whereas it is nil during 2005-06. It might be possible that some area which was under land with open scrub during 2005-06 has shifted to land with dense scrub during 2008-09.

Waterlogged and Marshy land (Permanent/Seasonal):

Mostly the waterlogged area in the district is either in the local depressions or along the canals. During rainy season, the water accumulates in the depressions and creates water logging. Water logging is also caused due to canal seepage along the banks. Seasonal and Permanent waterlogged areas were identified in the district. The areas which were waterlogged only in kharif season were classified as seasonal waterlogged areas whereas, if water logging was observed in all the three seasons, those areas were put under permanent waterlogged areas. The prominent patch of permanent water logging is observed near Hisar City and seasonal water logging is observed around Baas and Mohna village in the south-east, Hisar City and Dhansu village in the Centre. The area under permanent waterlogged category was 0.61 sq.km. i.e. 0.02 % during 2005-06 of the total geographical area of the district and is increased by 0.11 sq.km in 2008-09. The area under seasonal waterlogged was 3.80 sq.km. i.e. 0.10% during 2005-06 and is decreased by 1.02 sq.km in 2008-09.

Salt Affected Land (Moderate):

Salt affected land is generally characterized as the land that has adverse effects on the growth of most plants due to the action or presence of excess soluble salts (saline) or high exchangeable sodium. The salt affected land is found either near the canals due to canal seepage or in the low lying areas where water table has come up. This class lies in the south-eastern part of the district. The area under moderately salt affected class was 0.37 sq. Km. which covers 0.01 % of the total geographical area during 2005-06. Area under this category is increased by 0.05 sq.km in 2008-09.

Degraded Pasture/ Grazing Land:

These are spread mainly on village panchayat lands associated with village surroundings. The pasture and grazing land with natural plantation have become degraded due to neglected land management (lack of proper soil conservation and drainage measures). These

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overgrazed lands are covered by bushes, scrubs or with scattered trees. This is the major category of wasteland in the district. Area under this category was 110.51 sq.km. i.e. 2.77% of total geographical area of the district in 2005-06. Area under this category is decreased by 2.93 sq.km in 2008-09. Prominent patches are observed near Uklana, Kallarbhaini and Barwala villages in the north, Sadalpur, Kalirawan and Agroha villa villages in the south, Bas, Nara and Kapro villages in the east.ges in the west, Chaudhriwas, Balasamand, Saharwa

Degraded Land under Plantation Crops:

These are the degraded lands that have been brought under plantation crops after reclamation. These do not come under notified forest area. Prominent patch is found near Chaudhriwas village in the south-western part of the district. The area under this category during 2005-06 was 1.81 sq.km. and covers 0.05 % of total geographical area in the district. Area under this category is decreased by 0.29 sq.km in 2008-09.

Sands – Semi Stabilized to Stabilized (15-40m):

Soil of the some areas is sandy but no big dunes are present in the district. It is mainly scattered at the eastern part between Barwala and Kapro villages, and in the western and south-western part of the district. The area under this category during 2005-06 was 4.89 sq.km, area in the district, which is 0.12 % of the total geographical area. Area under this category is decreased by 2.19 sq.km in 2008-09.

Mining Wastelands:

Mine dumps also includes the area of brick kiln in which surface sand of that area is lifted app. 2 to 3 feet for making of bricks. This land can be brought under cultivation after regular inputs in few years. Some patches are observed near Khanda Kheri village in the east of the district. The area under this category during 2005-06 was 0.54 sq.km. which covers 0.01% of the total geographic area of the district. Area under this category is increased by 0.03 sq.km.

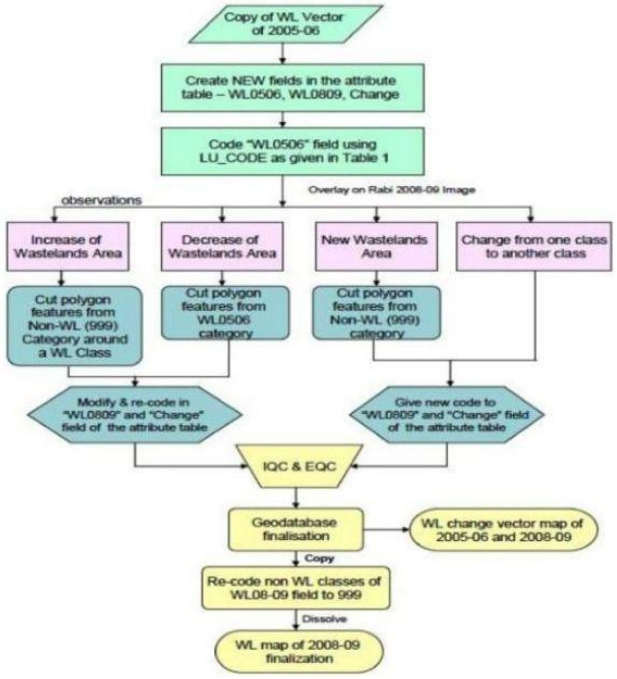

Fig. 2. Methodology flow chart

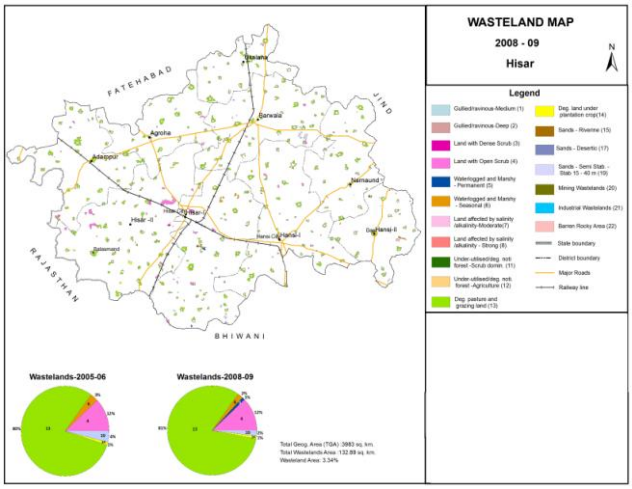

Fig. 3.

5. CONCLUSIONS

The data reveals that the total wastelands area in 2008-09 of the district is about 132.89 sq.km, which accounts for 3.34% of the total geographical area, which was 3.49% during 2005-06. Total wasteland area decrease by 6.02 sq.km. which is 0.15 % of the total geographical area. The increasing population pressure, urbanization and industrialization have put a great stress on natural resources resulting in the decrease in agricultural area. So, there is an urgent need to identify and reclaim these degraded lands in the state. Degraded Pasture/ Grazing Lands are spread mainly on village panchayat lands associated with village surroundings. This is the major category of wasteland in the district consisting of 107.58 sq.km. i.e. 2.70 % of total geographical area of the district.

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Table-1: Wastelands under different Categories and change detection.

SI	Wasteland Categories	2008-09	% to TGA	2005-06	% to TGA	Change
1	Land with Dense scrub	0.28	0.01	0.00	0.00	0.28
2	Land with Open scrub	16.32	0.41	16.38	0.41	-0.06
3	Water logged & Marshy land permanent	0.72	0.02	0.61	0.02	0.11
4	Water logged & Marshy land seasonal	2.78	0.07	3.80	0.10	-1.02
5	Land affected with salinity/alkalinity-Moderate	0.42	0.01	0.37	0.01	0.05
6	Degraded pasture/grazing land	107.58	2.70	110.51	2.77	2.93
7	Degraded land under plantation crops	1.52	0.04	1.81	0.05	-0.29
8	Sands–Semi stablised- stablished Moderate High 15-40 m	2.70	0.07	4.89	0.12	-2.19
9.	Mining Wastelands	0.57	0.01	0.54	0.01	0.03
Total		**132.89**	**3.34**	**138.91**	**3.49**	**-6.02**

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