EFFECT OF WATERSHED DEVELOPMENT PROGRAMME IN GUDHA GOKALPURA VILLAGE, BUNDI DISTRICT, RAJASTHAN

- A REMOTE SENSING STUDY

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ABSTRACT

The study area is a part of the Blandi River watershed covering Gudha Gokalpura village. Digital images from IRS-1C LISS III acquired on January 13, 1997 and January 05, 2000 have been analysed in the present study.

The study area has been classified into four landuse/landcover units, namely, cultivation, open shrub, wasteland and water body based on the satellite data. The area covered by water bodies has reduced in the later period (January 2000). Present investigation attributes this to lower precipitation during 1999. However, the amount of water in the Blandi River in Gudha Gokalpura village has increased in the later period (January 2000) and the area covered by other landuse/landcover units in both the years remained almost the same. This has happened, as the development programme was mainly concentrated in this area. It is suggested from the above observations that ancillary information, like precipitation in this context, is very important when studying the change detection to decipher the effect of watershed development programme. Two types of wastelands were discriminated in the present study. They are wasteland with sparse babool and salt affected/ weathered quartz land. Salt affected lands seriously affect the productivity of the area, which need to be treated accordingly.

The satellite data shows pervasive lineaments trending NE-SW which have been formed due to intensive shearing. The shear zone is expected to be a potential zone for ground water if other conditions are favourable. Silvipasture developed by BAIF Development Research Foundation in the north-eastern side of the major dam in the study area could not be demarcated from the satellite data of January, as the grass is cut during the month of November.

STUDY AREA

The study area is a part of the Blandi River watershed covering Gudha Gokalpura village enclosed by longitudes $75^0 22' 56''$ E to $75^0 26' 30''$ E and latitudes $25^0 32'$ N to $25^0 35' 20''$ N, and falls in the Survey of India toposheet 46 O/6. It covers an area of 18.4821 km^2 out of which 3.9287 km^2 is occupied by Reserved Forest**.**

DATA

Digital data from IRS-1C LISS III acquired on 13 January 1997 and 05 January 2000 along with Survey of India toposheet have been analysed in the present study.

ANALYSIS

The satellite image of 1997 has been geocoded with respect to the Survey of India toposheet. The satellite data of 2000 is, in turn, geocoded with respect to the already geocoded satellite data of 1997. Contour lines at the interval of 20 m, drainage network and road network have been vectorized from the Survey of India toposheet. EASI/PACE, one of the most powerful Image Processing / GIS software, has been used for all the analyses.

Digital Standard False Colour Composites from the satellite data have been prepared for the general interpretation and that of 1997 along with other vector layers is shown in the Figure 1. The study area has been classified into four **landuse/landcover** units, namely, cultivation, open shrub, wasteland and water body, based on the satellite data (Figures 2 and 3). Wasteland is covered mostly with very sparse shrub which is mainly *babool.* Area covered by different units is given in the Table 1.

Landuse/landcover Unit	Area (km^2)	
	1997	**2000**
Cultivation	4.204	3.977
Open Shrub	5.566	6.168
Wasteland	7.676	8.055
Water Body	1.035	0.282

Table 1. Area covered by landuse/landcover units in the year 1997 and 2000.

Analyses have been carried out to calculate the spatial variation of all the landuse/landcover units and the output is given in Table 2 which should be interpreted just like a confusion matrix. For example, wasteland in 1997 (total 7.676 km^2) has converted to 0.013 km^2 of cultivation, 1.529 km^2 of open shrub, 0.00 km^2 of water body and 6.134 km^2 remained the same.

Landuse/ landcover		2000				
		Cultivation	**Open Shrub**	**Wasteland**	**Water Body**	
1997	**Cultivation**	2.798	1.201	0.204	0.002	**4.204**
	Open Shrub	0.867	3.093	1.599	0.007	**5.566**
	Wasteland	0.013	1.529	6.134	0.000	**7.676**
	Water Body	0.299	0.345	0.118	0.273	**1.035**
		3.977	**6.168**	**8.055**	**0.282**	**Total**

Table 2. Landuse/landcover change in square kilometres from 1997 to 2000

There is not much variation in the total area covered by cultivation, open shrub and wasteland from 1997 to 2000. But the area covered by water bodies has considerably reduced in the later period (January 2000). This is due to the lower precipitation during 1999 (Table 3). However, the amount of water in the Blandi River and density of vegetation in Gudha Gokalpura village (central portion of the study area) has increased. This has happened, as the development programme was mainly concentrated in this region.

Year	Annual Rainfall (mm)
1996	838
1999	439

Table 3. Annual rainfall during 1996 and 1999.

Normalised Difference Vegetation Index (**NDVI**) has been prepared from the satellite data of 1997 to understand the vigour and density of vegetation. Three classes made from the NDVI map are Poor vegetation (NDVI 0.0 to 0.16), Moderate Vegetation (0.16 to 0.33) and Dense vegetation (NDVI > 0.33). The vegetation in the study area consists mostly of crop. Hence, crop with excellent vigour and density is represented as Dense Vegetation. The area covered by different classes is given in Table 4. Here, “Other Classes” includes water body, wasteland, etc. It can be seen from the NDVI map that the Reserved Forest includes only poor vegetation and wasteland.

Vegetation	Area Covered (km^2)
Poor Vegetation	6.263
Moderate Vegetation	2.576

Dense Vegetation	0.362
Other Classes	9.280

Table 4. Area covered by NDVI classes

Satellite data of 1997 has been used to classify the **wasteland**. Salt affected land and area covered with weathered quartz were not classified into two units, mainly due to the limitations of the satellite data and their smaller aerial extent. Area covered by each class is given in Table 5. Here, "Other Classes" includes water body, cultivation area, etc.

Waste Land Unit	**Area in km^2**
Waste Land with sparse *babool*	7.476
Salt Affected/ Weathered Quartz	0.200
Other Classes	10.805

Table 5. Area covered by Wastelands

CONCLUSION

The satellite data shows pervasive lineaments trending NE-SW, which have been formed due to intensive shearing. The shear zone is expected to be a potential zone for ground water. The drainage pattern can be seen affected by the lineaments. A large dam (western part of the study area) constructed across the Blandi River serves good amount of water to the area. A small dam can also be seen in northern portion of the study area. A major lineament system passes through these two dams. The vegetation in the study area consists mainly of crop, which is concentrated along the drainage network. Changes in the course of the river could be noticed at many places, when the drainage network vectorised from the Survey of India toposheet is overlaid onto the satellite data, due to erosion along the river coast and structural controls.

Even though there is not much variation in the total area covered by cultivation, open shrub and wasteland from 1997 to 2000, the area covered by water bodies has considerably reduced in the later period (January 2000). This is due to lower precipitation during 1999. However, the amount of water in the Blandi River and density of vegetation in Gudha Gokalpura village (central portion of the study area) have increased. This has happened, as watershed development programme was mainly concentrated in this region. The Reserved Forest in the study area is either barren or has only sparse vegetation. Silvipasture developed by BAIF in the northeastern side of the major dam in the study area could not be demarcated from the satellite data of January, as the grass is cut during the month of November. Salt affected lands seriously affect the productivity of the area, which need to be treated accordingly. Watershed development programme has played an active role in the development of the region even though the rainfall was low.

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