RESEARCH REVIEW JOURNALS
Volume-04
Issue-04
April -2019

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com [UGC Listed Journal]

Landuse Assessment of Villages around Utopian Sugar Ltd., Kacharewadi, Solapur District (Maharashtra)

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ARTICLE DETAILS

Article History
Published Online: 15 April 2019

Keywords
Land use, Sugar Factory, Irrigation, Landuse Classification, Developmental Projec, etc.

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ABSTRACT

Land use / land cover information is an important aspect which is outcome of relationship between man and environment. Comprehensive information of land use and land cover is the basic pre-requisite for all developmental activities. This study is focusing on the landuse of 10 km radius from Utopian sugar factory site. In this study both primary and secondary sources of data is utilized. The satellite dataset and empirical data sets are used to conduct the study. The image classification technique used to analyze satellite data. Using temporal satellite dataset visual image interpretation is made to interpret the landuse status. The mapping of different types of land uses around sugar factory is carried out through this paper. This factory is located in the drought prone region and well is main source for irrigation. The sugar factory is established in dry region but factory has taken initiative towards developing irrigation facility. As a result, there are changes in agriculture landuse and cultivation of cash crops is increased. This is positive indicator for economic development of farmer as well as overall development of region.

1. Introduction

Land use / land cover information is an important aspect which is an outcome of relationship between man and environment. The land is used for different purposes that may be agriculture, grazing, mining, urban, etc. According to Mayer & Turner (1994) land use is the way in which, and the purposes for which, human beings employ the land and its resources e.g. farming, mining, lumbering, etc. Comprehensive information of land use and land cover is the basic pre-requisite for all developmental activities, land resource evaluation, planning and environmental assessment, etc. Accessing land use and land cover information is very much important to understand the positive and negative interaction between man and nature. This study is focusing on the landuse of 10 km radius from the Utopian sugar factory site.

2. Objectives

The main objective of this paper is to comprehend the Landuse (LU) of Villages surrounding to Utopian Sugar Ltd., Kacharewadi, Solapur District, Maharashtra. The associated objectives are:

- To understand the village wise general landuse of study area
- To check the irrigation and landuse condition of study area.

3. Study Area

The present study is focusing on the landuse condition of villages surrounding to Utopian Sugar Ltd. There are total 29 villages come under this circle covering total 31416 ha. area within 10 km radius. The shape of study area is circular hence villages located near factory site have covered 100% area, on the contrary marginal villages are covering area from 5 to 80%.

4. Data

The classification and mapping of landuse and landcover is carried out in different levels i.e. general landuse/landcover, urban landuse, agriculture landuse, etc. (Saymote, 2012). The landuse data published in census is one of the authentic data with certain dimensions and the quantification of land under forest, agriculture, fallow land, etc. are made available. In present study the data of general landuse is taken from 2011 census. The Landsat satellite dataset is utilized for image classification. The Google satellite images are used to understand temporal changes and visual interpretation.

5. Methodology

The general landuse data of 2011 census is extracted, tabulated and analyzed with graphs. The land use and land cover conditions are understood through remotely sensed datasets. Digital landuse / landcover mapping is carried out by image classification method on Landsat images. The supervised image classification technique is used for mapping landuse / landcover of the study area. Finally the quantification of generated landuse class is carried out and interpretation is made.

6. General Landuse

The categories of general landuse may vary from user to user and nature of study. Table 1 represents nine categories of landuse and total area under it. The total area of 29 villages is 51658.3 ha. The landuse classes are ranging minimum from 26.1 ha. (forest) to maximum 41680.8 ha (Net Sown Area).

Table – 1
Summary of General Landuse of Study Area

Category	Area in Ha.	% to Total Area
Forests	26.1	0.05
Area Not Under Agricultural Uses	1082.3	2.10
Barren and Un-cultivable land	863.3	1.67
Permanent Pastures and Other Grazing Lands	566.1	1.10
Land Under Miscellaneous Tree Crops etc.	2079.8	4.03
Cultivable Waste Land	2384.9	4.62
Fallow Lands Other than Current Fallows	1467.5	2.84
Current Fallow Land	1507.5	2.92
Net Sown Area	41680.8	80.69
Total	**51658.3**	**100.00**

Source : District Census of India, Solapur District

Figure 1 is graphical representation of general landuse summary. Out of total nine categories only one category i.e. Net Sown area is having 80% share, whereas rest all eight categories are having share less than 5%. The natural vegetation (forest) is occupied least area i.e. only 0.05% to total area followed by barren and un-cultivable land is 1.67%, permanent pastures and other grazing lands1.10%. The share of land under miscellaneous tree crops etc. is 4.03%, cultivable waste land 4.62% and fallow lands other than current fallows 2.84%, whereas current fallow land is 2.92%.

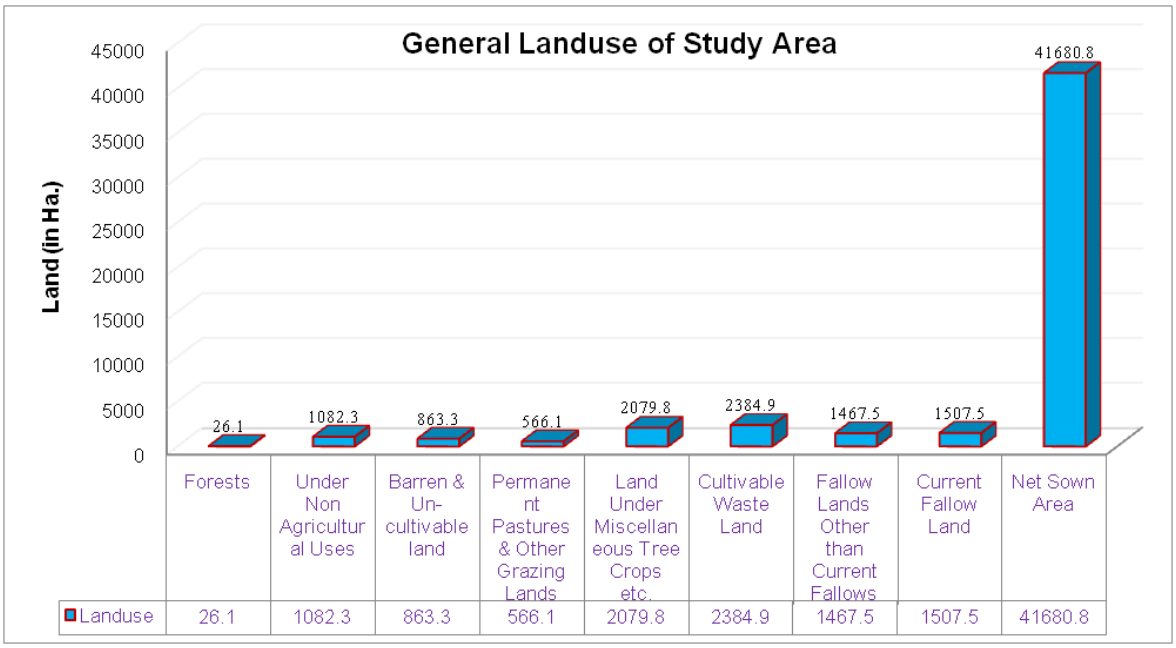


Figure 1

7. Village wise General Landuse

There are total 29 villages laying in 10 km radius, out of which only 14 villages are laying completely within this radius of 10 km whereas rest 15 villages have occupied land from 5% to 80%. Although these 29 villages are not fully coming under 10 km radius but for this study complete area of all 29 villages are considered.

Table-2
Village wise General Landuse of Study Area

Village Name	Non-Agri	Barren_UnCulti	Perm_Pastu	Misc_Tree_Crop	Cult_Waste	Perm_Fallow	NSA
Akole	6	80.9	0	13	95.9	0	490.4
Andhalgaon	31	122	0	0	145.6	0	790.2

Bhalwani	55.2	0	254	330	18	0	707.8
Degaon	88.5	0	0	0	275	0	752.5
Dongargaon	60	0	0	0	101	0	640
Ganeshwadi	5	150	28	0	25	0	2510.5
Gharniki	1.2	5.3	1.7	0	10	0	623.3
Gonewadi	6.4	5.1	0	0	0	0	1007.6
Gunjegaon	270	0	0	0	603	0	11812
Hajapur	19	0	0	0	0	0	1145
Hivargaon	22	0	0	0	0	0	1051
Jalihal	43.9	95.2	39.4	0	15.7	22.3	1051
Junoni	17	96.1	24.1	0	21.2	87.2	1684.5
Kacharewadi	11.3	3	2	2	5.3	3	1335.5
Khadaki	30.9	0	0	0	48	0	755.1
Khomnal	1	19.7	27.7	0	394.2	0	500
Khupsangi	38.6	0	0	0	47	0	620.4
Laxami Dahiwadi	16.8	51.4	0	0	0	0	1100
Lendave Chichale	155	0	0	0	104	0	1691
Mahamadabad (Shetfal)	2.8	35	32.3	0	0	0	771.4
Mangalvedha	1.7	77.8	22.9	0	0	0	712
Marapur	32	0	0	0	0	0	2495
Metkarwadi	21.7	0	0	0	0	1150	1058.9
Nandeshwar	49.4	0	21.2	1412	96	109	2248.6
Patkhal	78.7	0	0	0	21	0	1179.3
Shelewadi	4	10	25.2	0	0	16	313.6
Shetphal	7	0	0	319	0	0	370.4
Tanali	1.2	23.8	5.2	4	220	80	1063.6
Tavashi	5	87.4	82.4	0	139	0	1200.2
	1082.3	**863.3**	**566.1**	**2079.8**	**2384.9**	**1467.5**	**41680.8**

Source : District Census of India, Solapur District

Table 2 represents village wise landuse of nine categories. It is observed that for many categories the data is not available hence, it is mentioned as zero. The villages like Laxami Dahiwadi, Andhalgaon, Khupsangi and Mangalvedha are very big in size whereas the rest villages are comparatively small in size.

8. Irrigation and Landuse

The irrigation is key aspect which produces transformation in a region. There is very close relationship between irrigation and landuse. Based on different sources of irrigation different types of crops are cultivated. Due to irrigation cash crops are cultivated as a result economic condition of farmer is changing. Generally the sugar factories are established in periphery of river but Utopian sugar factory is exception for it. There is only one river which is passing through northern edge of study area. During conducted field visit it is observed that this area is drought prone and agriculture is not well developed except few villages on the bank of river. The irrigation facilities are not that much developed in this area.

Table-3

Summary of Irrigated and Un-Irrigated Land

Category	Area in Ha.	Percentage
Total Irrigated Land Area	9086	21.79
Total Un-irrigated Land Area	32594.7	78.20

Source : District Census of India, Solapur District

Table 3 represents the summary of total irrigated and un-irrigated land of 29 villages. The total study area is 41680.8 ha. out of which only ¼ is irrigated (i.e. only 9086 ha., 21.79%) and about ¾ is un-irrigated (i.e. 32594.7ha, 78.20%).

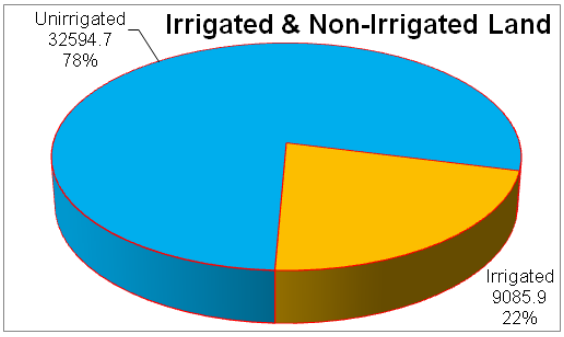


Figure 2

8.1 Source of Irrigation

Table-4
Source of Irrigation

Irrigation Source	Area in Ha.	% to Total Irrigated Area
Canals	1566.60	17.24
Wells	5479.10	60.30
Tank	24.50	0.27
Water Fall	400.00	4.40
Other	1615.60	17.78
	9085.80	100.00

Source : District Census of India, Solapur District

The sources like canal, well / tube well, tank, etc. are providing irrigation to 9085.80 ha. land. The maximum land is irrigated by wells i.e. 5479.10 ha. (60.30%), whereas the tanks are providing irrigation to only 24.50 ha. (0.27%). The canals are proving irrigation to 1566.60 ha. (17.24%).

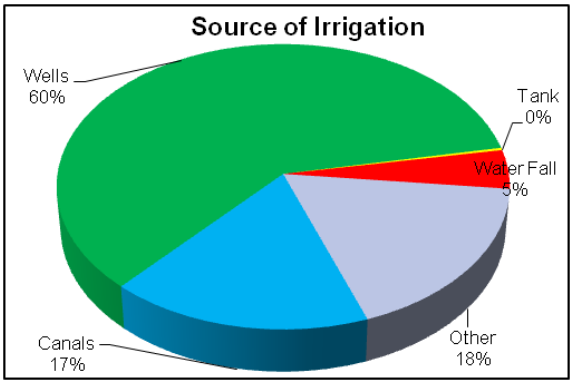


Figure 3

Table-5
Village-wise Irrigation Status of Study Area

Name	Canals	Wells	Tank	Water Fall	Other
Akole	25.2	295.2	0	0	0
Andhalgaon	367.8	192.1	0	0	0
Bhalwani	2.9	259.6	0	0	0
Degaon	0	100	0	0	125
Dongargaon	0	60	0	0	240
Ganeshwadi	0	145	0	0	0
Gharniki	0	0	0	0	510
Gonewadi	0	0	4.5	0	0
Gunjegaon	20	70	0	0	16
Hajapur	16	33	0	400	0
Hivargaon	0	431	20	0	0
Jalihal	236.4	508.5	0	0	39.8
Junoni	118.3	673.2	0	0	0
Kacharewadi	0	700.7	0	0	200
Khadaki	0	105	0	0	0
Khomnal	0	60	0	0	0
Khupsangi	0	89	0	0	0
Laxami Dahiwadi	0	220	0	0	0
Lendave Chichale	0	180	0	0	0
Mahamadabad (shetfal)	0	125.6	0	0	0
Mangalvedha	0	162.4	0	0	0
Marapur	0	100	0	0	0
Metkarwadi	40	80	0	0	0
Nandeshwar	0	145	0	0	0
Patkhal	0	40.7	0	0	0
Shelewadi	0	88.1	0	0	4.6
Shetphal	0	140	0	0	0
Tanali	500	300	0	0	0
Tavashi	240	175	0	0	480.2

Source : District Census of India, Solapur District

Table 5 represents village-wise irrigation status of study area. The wells are the main source of irrigation in all villages. Few land patches near river are irrigated whereas most of the outer areas are un-irrigated and dry. Villages like Andhalgaon, Tanali, Tavashi, Jalihal, etc. are irrigated by canals.

9. Landuse Classification

Land is most important resource which meets needs of people to feed, to move around and to settle; hence, the relationship of man with land is as old as man (Saymote, 2012). When the users of land decided to utilize it for different purposes, land use / land cover change occurs producing both desirable and undesirable impacts. The analysis of land use / land cover change is essentially the analysis of changing relationship between people and land (Saymote, 2016). The use to which we put land could be grazing, agriculture, urban development, and mining among many others. Land use is the way in which, and the purposes for which, human beings employ the land and its resources e.g. farming, mining, lumbering, etc. Land cover describes the physical state of the land surface i.e. cropland, forests, wetland, water bodies among others (Meyer & Turner, 1994). In this section appraisal of landuse condition is carried out using satellite image.

Figure 4 is representation of survey of India toposheet view of study area. The drainage pattern, water tanks, roads, contours and settlement patches are represented on it. Figure 5 is the Google street view of study area. It represents the village limits, road network and water bodies within 10 km periphery from factory site.

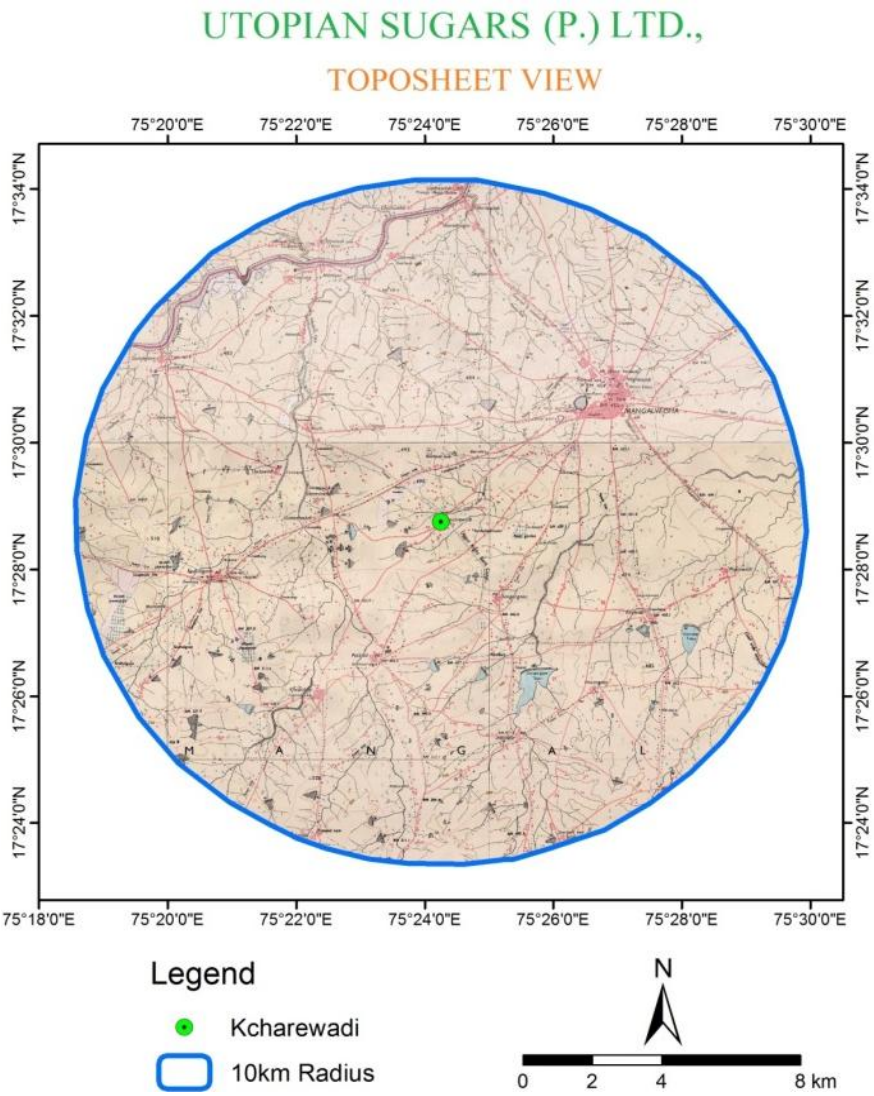
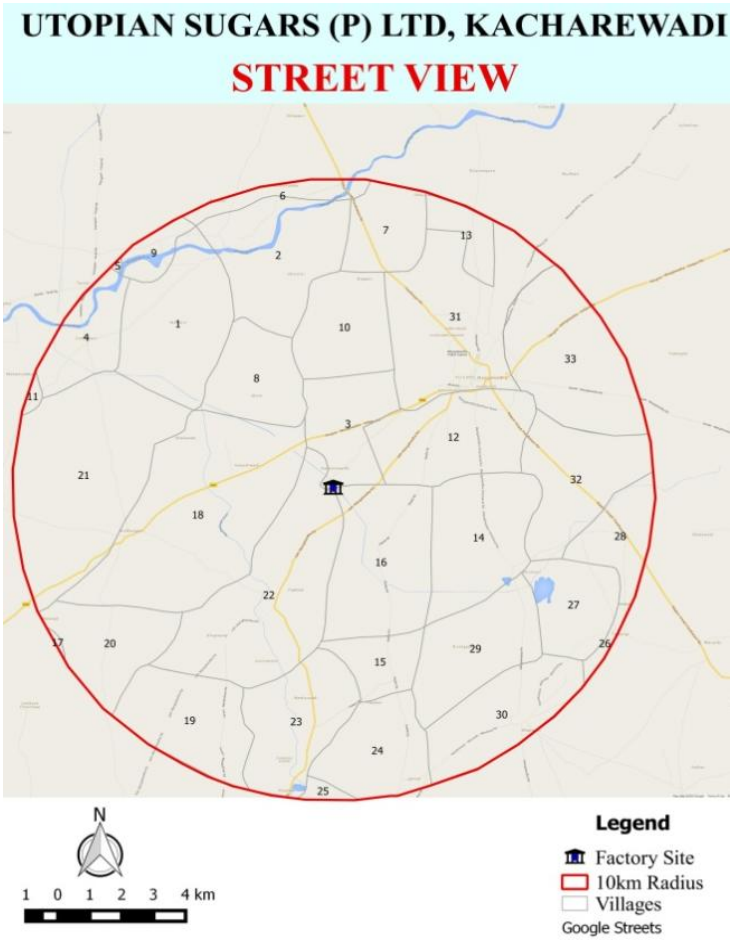


Figure 4



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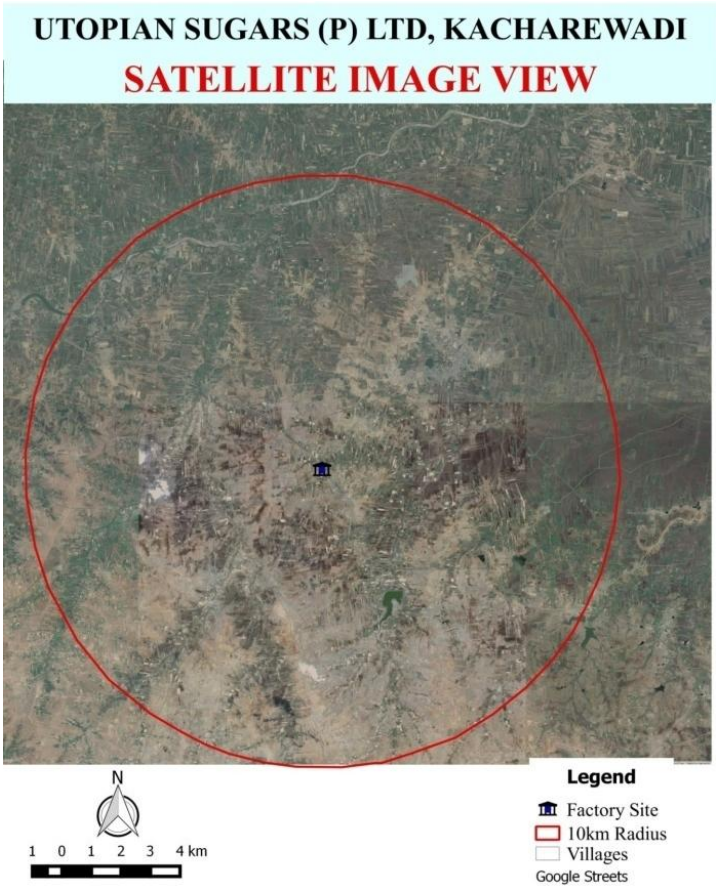

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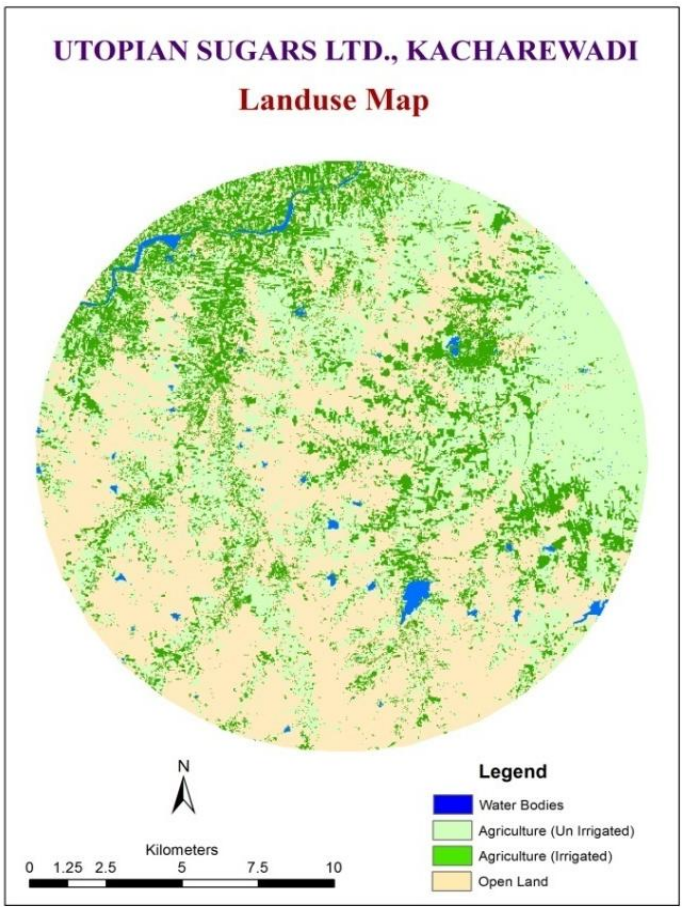

Figure 6

Figure 6 is the satellite view of study area from Google. This is true color image showing green patches which are agricultural patches and the brown patches are open land. There are two water tanks containing water but river in northern part river is dry.

The above given Figure 7 is output of image classification for study area. Enhanced Thematic Mapper (ETM+) sensor of Landsat satellite dataset is used for image classification. The class wise statistics of general landuse is given in Table 6.

Table-6
General Landuse Statistics, 2014

Landuse Category	(Area in Ha.)	% to Total
Open Land	14387.48	45.82
Water Bodies	1174.36	3.74
Irrigated Agriculture	6631.68	21.12
Un Irrigated Agriculture	9206.48	29.32
	31400	**100**

Source: Derived from the image classification statistics

10. Limitation

The primary data collection for landuse study is having some limitations. Hence census data is utilized for statistical analysis. The free available satellite dataset is used in this study. The statistics derived from satellite image and statistics from census is not matching. The total area of 29 villages and circumference of circle both areas are different. The spectral signature of used satellite image is having some problems which put limitation on image classification process.

11. Conclusion

Accessing land use and land cover information is very much important to understand the positive and negative interaction between man and nature. The changes in landuse is the outcome of human activities in that region. The developmental projects are important agents in the process of socio-economic transformation and landuse changes. The present study is the analysis of the landuse condition around sugar factory during the initial phase of establishment of sugar factory. Out of total area about 75% area is occupied by the open land and area not under agriculture category. The share of water body is about 4% and rest is land under agriculture. Villages like Andhalgaon, Tanali, Tavashi, Jalihal, etc. are irrigated by canal. The highest land is irrigated by wells i.e. 5479.10 ha. (60.30%). The natural vegetation (forest) is occupied least area i.e. only 0.05% to total area,the share of

land under miscellaneous tree crops etc. is 4.03%, cultivable waste land 4.62% and maximum area under cultivation.

The study area is known as drought prone region but in coming days it is expected that the sugar factory will take initiative towards developing irrigation facility which leads to cultivation of cash crops as a result economic condition of farmer will change and overall development of region will take place.

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