A Study of Landuse (LU) Around Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol, Kolhapur

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Abstract:

The land use / land cover analysis is of relationship between people and land. Man is using the land for various purposes like grazing, agriculture, urban, mining and many more. Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol district Kolhapur (Maharashtra) is one of the reputed sugar factory in South-Western Maharashtra. The area of 10 km radius from Datta sugar factory is considered study area for present study. The primary and secondary source of data both are utilized in this study. The tabulation of secondary data is carried out and graphical presentation is made. The satellite image classification is carried out to understand the general landuse. The collected data is analyzed by graphical and mapping activity. Finally the discussion of derived results and interpretation is made.

Keywords: Landuse (LU), Sugar Factory, Image Classification, Irrigation, etc.

Introduction

The land use / land cover analysis is of relationship between people and land. Man is using the land for various purposes like grazing, agriculture, urban, mining and many more. According to Mayer and Turner (1996) l*and 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. The detail information of land use and land cover is essential for all developmental activities, land resource evaluation, management and planning as well as well as environmental assessment. Accessing land use and land cover is essential to understand both the positive and negative aspects of a project on the respective region. In this section an attempt is made to understand the landuse condition within 10 km radius from factory site.

Data

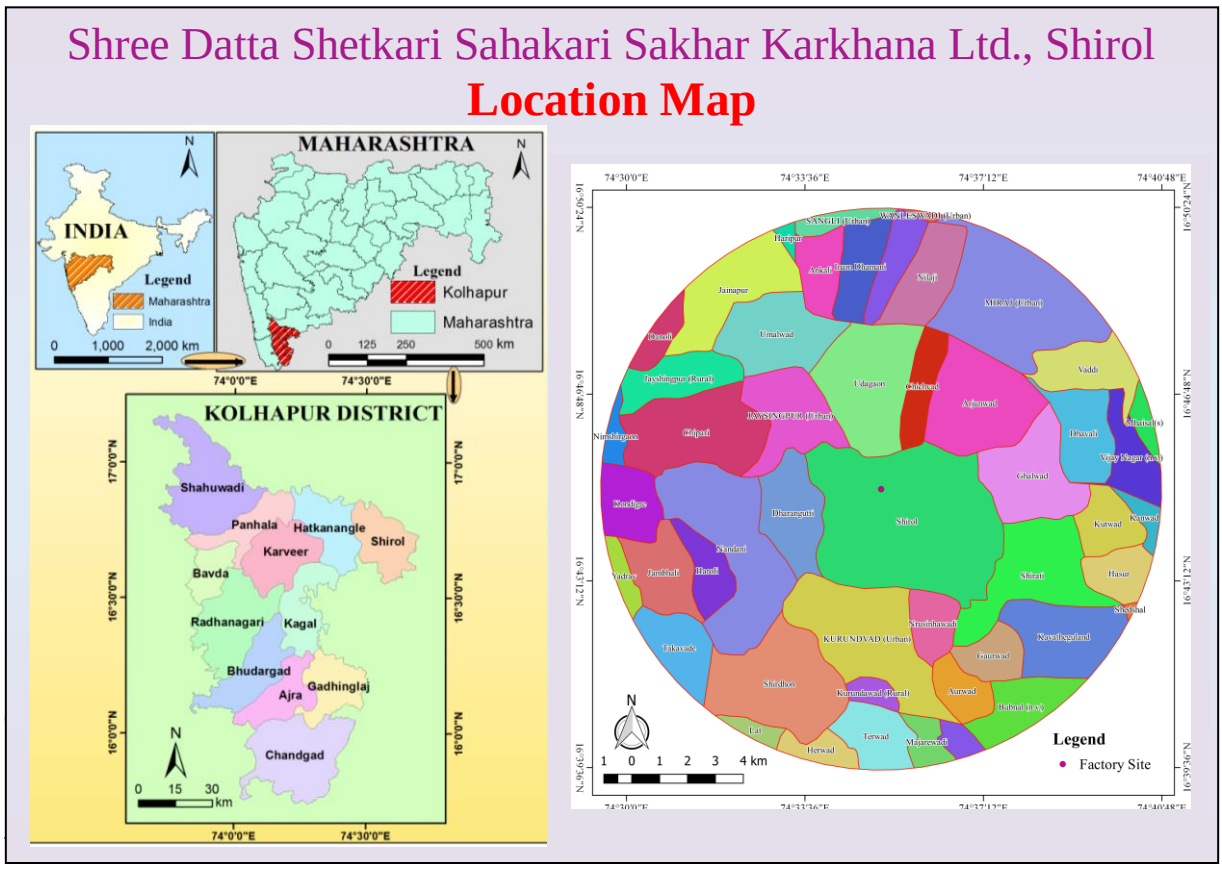
Generally the study of landuse and landcover is carried out on different levels i.e. general landuse / landcover, urban land use, agriculture land use, etc. (Saymote, 2012). The data is most essential component in analysis and decision making process. The data for landuse study is associated with the site and level on which it is being implementing. The landuse data published in census is one of the authentic data which is useful for different analysis. The census data is having quantification of land under forest, agriculture uses, fallow land, etc. this is made available for different kinds of users. The general landuse dataset of year 2011 is tabulated from census 2011 and systematically utilized in present study. The computer aided digital image analysis is essential to utilize the capabilities of remote sensing data. The Landsat satellite dataset of ETM (Enhance Thematic Mapper) sensors is used to check the Landuse / Landcover conditions.

Methodology

The general landuse data from 2011 census is tabulated and arranged using spreadsheet. The graphical representation of important aspects is carries out. The review of landuse status is complied with statistical tables, graphs and its interpretation is made. The landuse / landcover condition due to natural and human activities can be well understood using remote sensing satellite dataset. In second phase digital landuse / landcover mapping is carried out with the help of Landsat satellite images. The supervised image classification technique is used for mapping landuse / landcover of the study area.

Study Area

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol district Kolhapur (Maharashtra) is one of the reputed sugar factory in South-Western Maharashtra. The study area for environmental impact assessment is 10 km from respective factory site. The study area of 10 km radius is covering 2 two different tahsils i.e. Shirol and Miraj from Kolhapur and Sangli districts respectively. There are total 49 localities out of which 5 are urban centres (2 from Kolhapur and 1 from Sangli district which are parts of Municipal Corporation) and 44 are villages. There are 9 villages from Sangli district and 35 villages from Kolhapur district occupying more or less area.



localities). The general landuse classes are ranging from minimum 148.70 ha. (0.20) i.e. land under miscellaneous tree crops on the contrary maximum is 32094.50 ha (42.32%) which is net sown area. The area under non-agricultural uses occupies 2.08% and barren and uncultivable land covered 2.64% land. The proportion of cultivable waste land is 4.03% (3057.20 ha) and fallow lands other than current fallow is 4.13% i.e. 4.13% to total area of 49 villages. Total irrigated land is 19255.30 ha. which becomes 25.39% to total and total un-irrigated area is 11239.40 ha which become 14.82%.

Table – 1 : Summary of General Landuse of Study Area

Sr No	Category	Area in Ha.	Percentage to Total Area
1	Forests	362.20	0.48
2	Area Under Non-Agricultural Uses	1577.10	2.08
3	Barren and Un-Cultivable land	1998.90	2.64
4	Permanent Pastures and Other Grazing Lands	1085.90	1.43
5	Land Under Miscellaneous Tree Crops etc.	148.70	0.20
6	Cultivable Waste Land	3057.20	4.03
7	Fallow Lands Other Than Current Fallows	3135.50	4.13
8	Current Fallows	1878.00	2.48
9	Net Area Sown	32094.50	42.32
10	Total Irrigated Land Area	19255.30	25.39
11	Total Un-Irrigated Land Area	11239.40	14.82
	Total	**75832.70**	**100.00**

Source: District Census of Indian (Soft Copy in CD form)

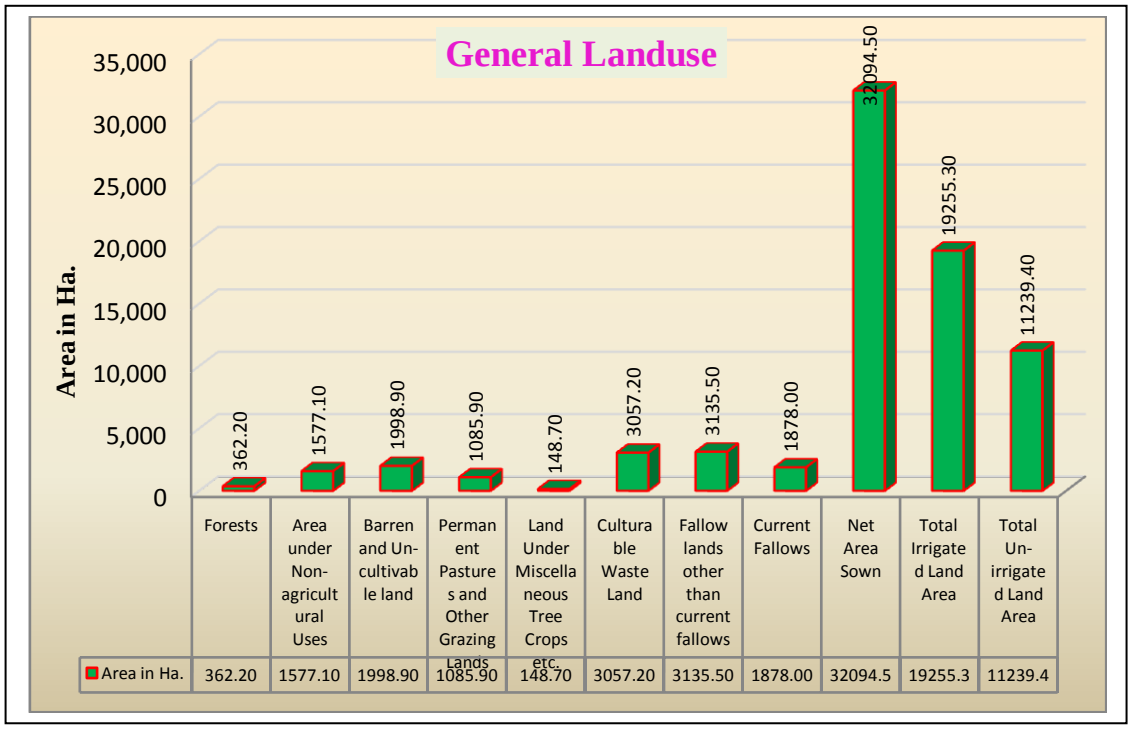


Fig. 2

Village wise General Landuse of Study Area

The village wise condition of general landuse is comprehended and presented in Table No.2. There are total 49 villages coming in 10 km radius, out of which half i.e.24 villages are laying completely within this radius and rest 25 villages have occupied land from 5% to 95% area. The statistical landuse data for 44 villages are available but it is not available for rest 5 urban centres.

Table – 2 : Village wise General Landuse of Study Area

Villages / City	Forests	Area under Non-agricultural Uses	Barren and Un-cultivable land	Permanent Pastures & Other Grazing Lands	Land Under Miscellaneous Tree Crops etc.	Cultivable Waste Land	Fallow lands other than current fallows	Current Fallows	Net Area Sown	Total Irrigated Land Area	Total Un-irrigated Land Area
Arjunwad	0	2	221.4	2.2	0	50	0	0	643.4	424	219.4
Aurwad	0	4.6	0	0	0	44.6	11.5	76.6	338.8	203	135.8
Bastawad	0	26.2	0	0	0	58.6	2	0	292.4	0	292.4
Bubnal	0	5	23	0	0	73	0	0	567	567	0
Chichvad	0	31.7	10	0	0	10	10	0	334.6	294.6	40
Chipari	0	3.1	52.3	25.2	72.8	14.2	4.2	50	656.6	121.9	534.8
Danoli	236.4	36.4	350	71	0	0	3.2	313	1708	1395	313
Dharangutti	0	73.7	0	0	0	457.4	0	0	477.9	140	337.9
Gaurwad	0	2.7	0	0	8.1	0	6.1	31.7	200.4	125.2	75.2
Ghalwad	0	6.2	170.1	5.8	0	0	0	0	499.7	499.7	0
Haroli	0	15	25	30	5	19	17	9	310	210	100
Hasur	0	22.4	22.2	8.4	0	47.8	11.1	9.1	445.1	268.3	176.8
Herwad	0	2	171	51.4	0	280	43.2	0	688	450	238
Jainapur	0	96.8	22.1	53.9	0	46.2	0	0	482	122	360
Jambhali	0	47.6	0	0	0	55.2	0	0	519.2	62	457.2
Jayshingpur (R.)	0	91.8	0	0	0	0	6.7	0	136.5	48.5	88
Kanwad	0	54	0	0	0	80	0	0	428	219	209
Kavatheguland	0	8.3	0	0	0	16	0	12.4	867	867	0
Kondigre	0	2.7	25.2	26.6	45.8	30.9	17.7	78.7	458.1	150	308.1
Kurundawad (R)	0	159.8	0	0	0	267.8	0	0	1369.4	922.7	446.7
Kutwad	0	1	14	0	0	15	28	78	232	160	72
Lat	0	3	100	46	2	260	170	64	1608	579	1029
Majarewadi	0	16	0	0	0	99.1	0	0	234.9	152.3	82.6
Nandani	0	150.6	0	0	0	180.7	0	0	1360.7	528	832.7
Nimshirgaon	125.8	1.3	71.1	67.6	15	130.9	36.6	158.6	457.4	288.1	169.4
Nrusinhawadi	0	26.5	0	0	0	61.5	0	8.2	320.5	320.5	0
Shedshal	0	36.9	167	8.5	0	115.5	0	5.1	470.8	413.6	57.2
Shirati	0	2.3	37.2	0	0	0	0	24.5	1109.1	1109.1	0
Shirdhon	0	5	40.1	8.3	0	0	41.7	0	1788.8	1788.8	0
Shirol	0	0	0	579	0	0	2588	759	1829	0	229
Takavade	0	1.7	18.9	0	0	105	0	29.7	871	871	0
Terwad	0	6.4	134	40	0	22.7	25.7	40	775	625	150
Udagaon	0	2	180	45	0	260	0	0	1259	960	299
Umalwad	0	52.5	20.8	17	0	180.3	0	0	236	185	51
Yadrav	0	64.7	0	0	0	0	0	0	781.8	152.9	628.9

Ankali	0	1.4	54.4	0	0	0	0	0	394.9	394.9	0
Bamani	0	2	21.1	0	0	0	0	57.2	329.8	251.7	78.1
Dhavali	0	31.2	0	0	0	0	0	0	617.8	568.3	49.4
Haripur	0	103.7	0	0	0	0	0	0	457.3	220	237.3
Inam Dhamani	0	1.5	48	0	0	0	0	0	464.6	464.6	0
Mhaisal (s)	0	218.4	0	0	0	52.9	62.8	50.2	3167.7	1194.6	1973.2
Nilaji	0	6	0	0	0	22.9	50	23	440.3	357	83.3
Vaddi	0	111	0	0	0	0	0	0	1176	445	731
Vijay Nagar	0	40	0	0	0	0	0	0	290	136	154
Total	**362.2**	**1577.1**	**1998.9**	**1085.9**	**148.7**	**3057.2**	**3135.5**	**1878**	**32094.5**	**19255.3**	**11239.4**

Source: District Census Handbook

IRRIGATION AND LANDUSE

The irrigation is most vital element of socio-economic and overall transformation for particular region (Saymote, 2016). The study area is situated in well developed watershed of Krishna River particularly on the bank of Panchganga River. Due the various sources of irrigation land is been irrigated as a result different types of cash crops are cultivated. Sugarcane is one of the important crop been cultivated which is raw material for sugar factory. There is very close relationship between irrigation and landuse. Generally when irrigation sources are developed that time several transformations are automatically taking place in that area (Ramotra and Saymote, 2013). As a result the economic status of farmer is seems changing. The river passing through study area is providing source of water for the agriculture. During conducted field visit it is observed that the agriculture is well developed in all villages except urban centres and mining patches around Jaysingpur. Due to surrounding urban patches employment opportunities have generated same time datta sugar factory have provided jobs.

Table – 3 represents the summary of total irrigated and un-irrigated land of 49 villages of study area. Total land of study area is 31024.6 ha. out of which total irrigated land is 19785.2 ha. In other words out of total area 57% land is un-irrigated and rest 43% land is irrigated (Figure 3)

Table – 3 : Summary of Irrigated and Un-Irrigated Land

Sr No	Category	Area in Ha.	Percentage
1	Total Irrigated Land Area	**19785.2**	**63.77**
2	Total Un-irrigated Land Area	**11239.40**	**36.23**

Source: District Census of Indian (Soft Copy in CD form)

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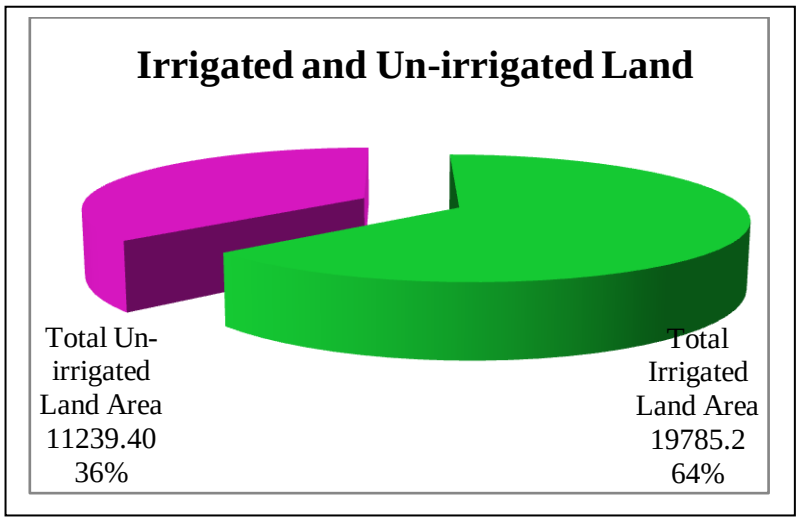


Fig. 3

Source of Irrigation

The India is agriculture based country but most of the agricultural land is not giving proper returns. The agriculture of an area will develop if irrigation facilities are adequate (Sule and Barkade, 2014). Unfortunately most of agriculture is un-irrigated hence it is essential to comprehend the status of irrigation in study area. The irrigation facilities can change the landuse and ultimately socio-economic condition of study area. The irrigation system of Krishna and Panchganga River is well developed.

There are different sources of irrigation like canal, well/tube well, tank, river, etc. The total irrigated area is 19785.2 ha by various sources of irrigation i.e. canal, well/tube well, tank, etc. The highest land is irrigated by other sources of irrigation (8832.8 ha.) which is 44.64% to total irrigated area. The river irrigation is main source of irrigation in study area. The second highest category is wells and tube wells is 7244.8 ha (36.63%.). The proportion of tanks and lakes is 3.67% (726.6 ha) and this area is of plane topography hence water fall are not available hence no irrigation is developed on waterfall.

Table – 4 : Source of Irrigation

Category	**Area in Ha.**	**Percentage to Total Irrigated Area**
Canals (C)	2981	15.07
Wells/Tube-wells (W/TW)	7244.8	36.62
Tanks/Lakes (T/L)	726.6	3.67
Water Falls (WF)	0	0.00
Others (O)	8832.8	44.64
Total	**19785.2**	**100.00**

Source: District Census handbook

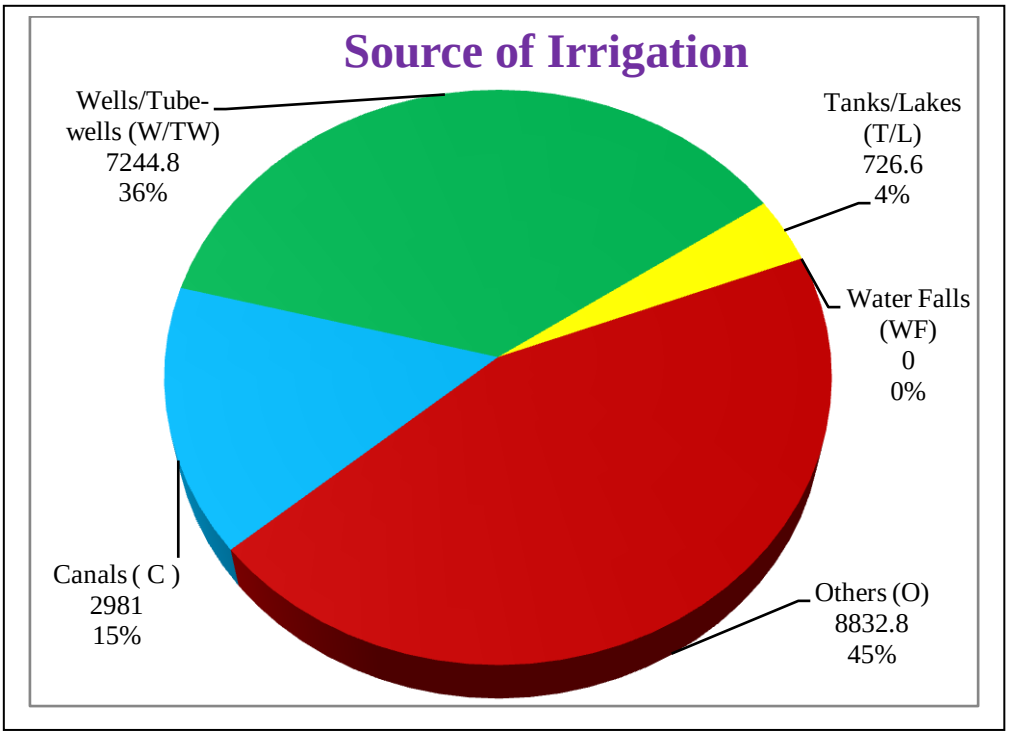


Fig.4

Village wise Irrigation

The general irrigation pattern of study is discussed in above section; but it is essential to understand clear condition of village level irrigation. Table – 5 represents the irrigation status; but the data of urban areas is not available hence it is not incorporated. The villages near to river are having quite good share of irrigated land whereas in villages in urban fringe areas un-irrigated land is more. There are few villages like Chichvad, Chipari, Haroli, Hasur, Herwad, etc. Villages like Nandni, Kurundwad, Kondigre, etc. are having share of wells and tube wells is more. Villages like Danoli, Shirati, Udgaon, Mhaisal, etc. are having river irrigation share more.

Table No - 5 : Village-wise Irrigation Status of Study Area

Villages / City	Canals (C)	Wells/Tube-wells (W/TW)	Tanks/Lakes (T/L)	Water Falls (WF)	Others (O)
Arjunwad	0	0	0	0	424
Aurwad	0	0	0	0	203
Bastawad	0	0	0	0	0
Bubnal	0	567	0	0	0
Chichvad	250.6	44	0	0	0
Chipari	52.2	69.7	0	0	0
Danoli	0	0	7.8	0	1387.2
Dharangutti	0	140	0	0	0
Gaurwad	0	0	0	0	125.2
Ghalwad	0	50	0	0	449.7
Haroli	73	107	0	0	30

Hasur	223.2	45.1	0	0	0
Herwad	325	125	0	0	0
Jainapur	0	122	0	0	0
Jambhali	0	20.4	0	0	41.6
Jayshingpur (R.)	0	48.5	0	0	0
Kanwad	0	219	0	0	0
Kavatheguland	867	0	0	0	0
Kondigre	26.5	123.5	0	0	0
Kurundawad (R)	0	922.7	0	0	0
Kutwad	0	0	0	0	160
Lat	0	187	0	0	392
Majarewadi	0	152.3	0	0	0
Nandani	0	238.9	0	0	289.1
Nimshirgaon	208	80.1	0	0	0
Nrusinhawadi	320.5	0	0	0	0
Shedshal	0	0	0	0	413.6
Shirati	0	9	0	0	1100.1
Shirdhon	0	1600	188.8	0	0
Shirol	0	0	0	0	530
Takavade	0	871	0	0	0
Terwad	530	95	0	0	0
Udagaon	0	60	0	0	900
Umalwad	105	80	0	0	0
Yadrav	0	152.9	0	0	0
Ankali	0	44.8	0	0	350.1
Bamani	0	251.7	0	0	0
Dhavali	0	0	0	0	568.3
Haripur	0	75	0	0	145
Inam Dhamani	0	0	0	0	464.6
Mhaisal (s)	0	557.2	0	0	637.3
Nilaji	0	0	0	0	357
Vaddi	0	50	0	0	395
Vijay Nagar	0	136	0	0	0
Total	**2981**	**7244.8**	**726.6**	**0**	**8832.8**

Source: District Census handbook

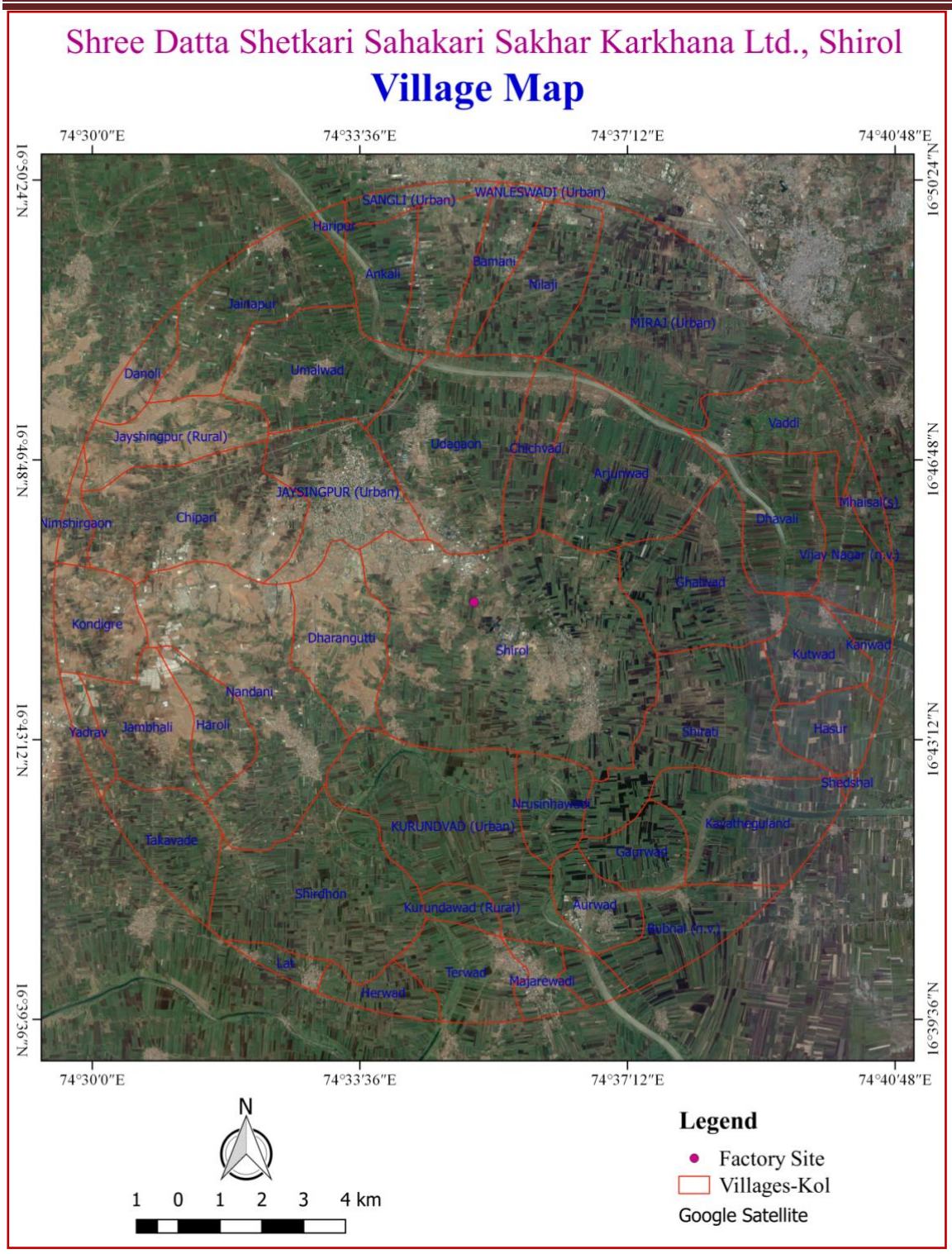
LANDUSE WITH SATELLITE DATA

According to Mayer the first thing people ever used to meet their basic needs was land – to feed themselves, to move around and to settle. Hence, the relationship of people with land is as old as man. 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, 2012). 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, 1995).

Figure -5 represents the study area in true colour satellite image. In below given figure the 10 km boundary of study area is overlaid on 1 meter spatial resolution satellite image dataset. The village wise condition of study area on 1M spatial resolution can be understood. The roads, river, land parcel, crop land and other features are clearly visible in this image. The landuse classification of NRSC is used to represent the condition in study area. The yellow patch is agriculture land and read patches are built-up (Fig-6). The image classification work is carried out on the dataset which is acquired from Enhanced Thematic Mapper (ETM+) sensor (Fig.7). The green patches are agriculture land, read are settlement patches and blue is the water body. The last figure represents the road network of study area. .


Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol
Village Map
74°30'0"E
74°33'36"E
74°37'12"E
74°40'48"E
16°50'24"N
16°46'48"N
16°43'12"N
16°39'36"N
SANGLI (Urban)
WANLESWADI (Urban)
Haripur
Bamani
Ankali
Nilaji
Jaintapur
MIRAJ (Urban)
Danoli
Umalwad
Vaddi
Jayshingpur (Rural)
Udagaon
Chichvad
Arjunwad
JAYSINGPUR (Urban)
Nimshirgaon
Chipari
Dhavali
Ghatwad
Kondigre
Dharangutti
Shirol
Kutwad
Kanwad
Nandani
Yadrav
Jambhali
Haroli
Shirati
Hasur
Shedshal
Nrusinhawadi
KURUNDVAD (Urban)
Kavathegulband
Takavade
Gamwad
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Aurwad
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N
1 0 1 2 3 4 km
Legend
Factory Site
Villages-Kol
Google Satellite

Fig. 5

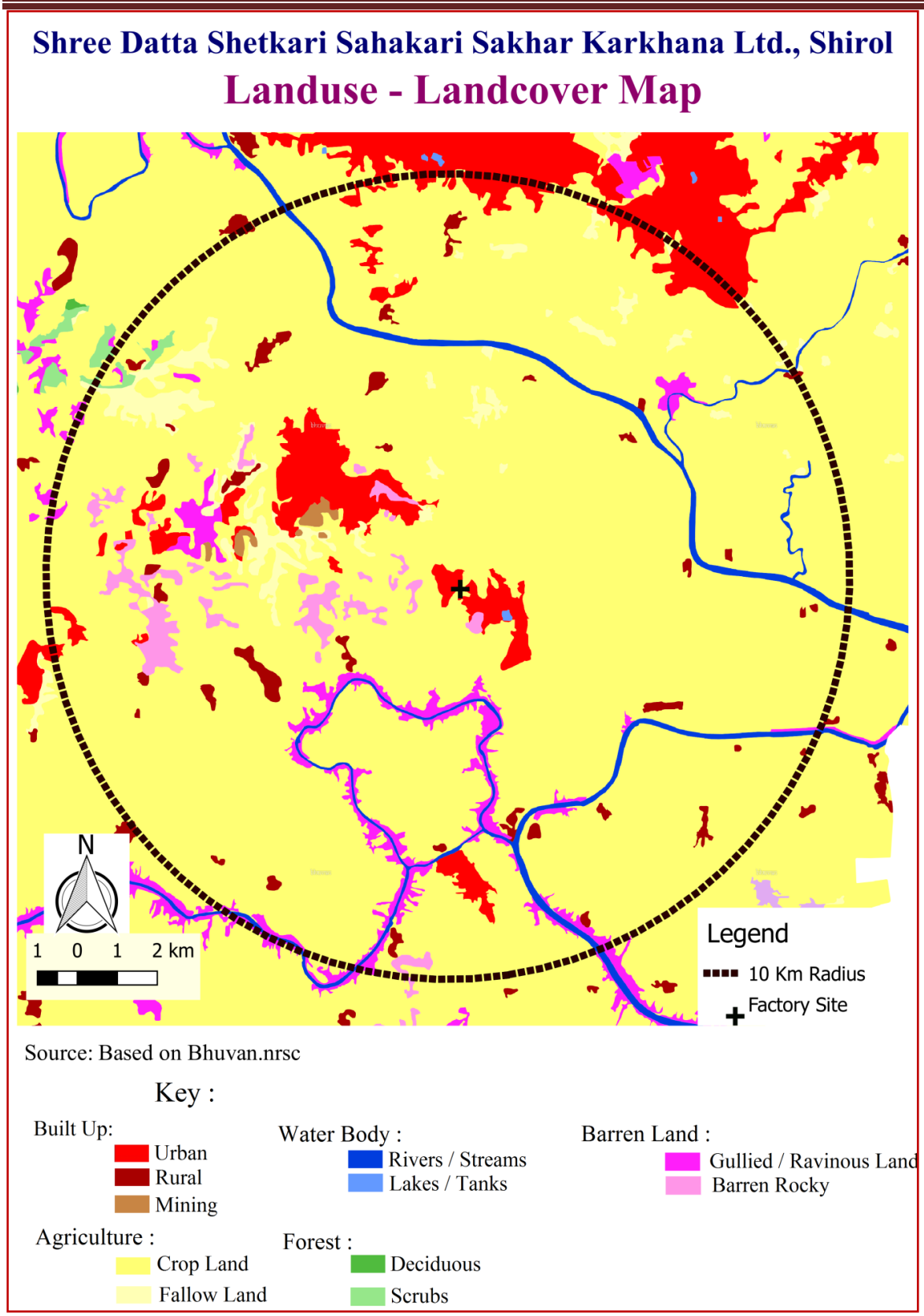
Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol
Landuse - Landcover Map
N
1 0 1 2 km
Legend
10 Km Radius
Factory Site
Source: Based on Bhuvan.nrsc
Key :
Built Up:
Urban
Rural
Mining
Water Body :
Rivers / Streams
Lakes / Tanks
Barren Land :
Gullied / Ravinous Land
Barren Rocky
Agriculture :
Crop Land
Fallow Land
Forest :
Deciduous
Scrubs

Fig. 6

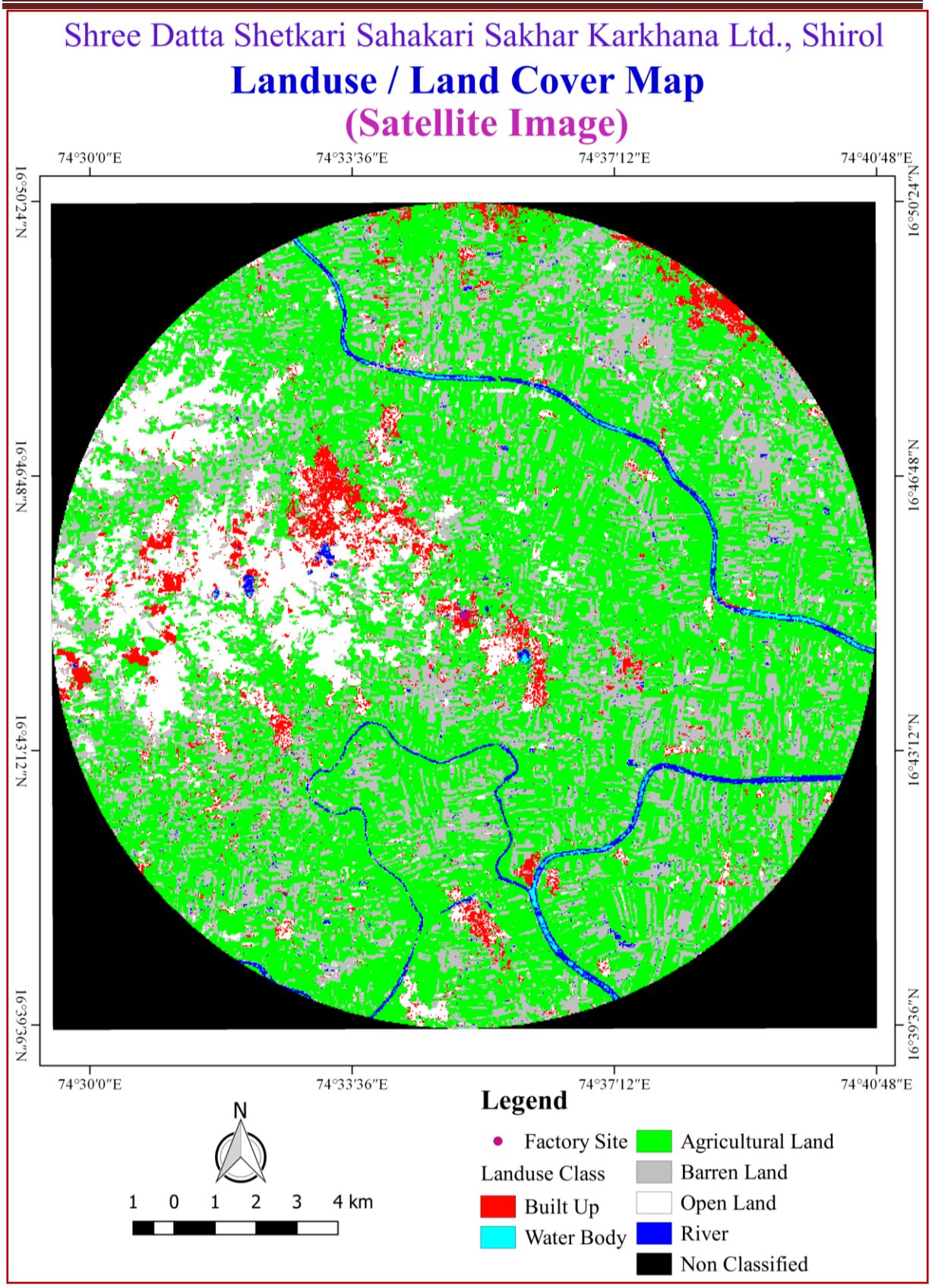

Fig. 7

Conclusion:

The present landuse study represents interesting results. The total area under study is 75832.70 ha. Which are ranging from minimum 148.70 ha. (0.20) i.e. land under miscellaneous tree crops on the contrary maximum is 32094.50 ha (42.32%) which is net sown area. The area under

non-agricultural uses occupies 2.08% and barren and uncultivable land covered 2.64% land. There are total 49 villages laying under in 10 km radius, out of which half i.e.24 villages are laying completely within this radius and rest 25 villages have occupied land from 5% to 95% area. Total land of study area is 31024.6 ha. out of which total irrigated land is 19785.2 ha. In other words out of total area 57% land is un-irrigated and rest 43% land is irrigated.

There are different sources of irrigation like canal, well/tube well, tank, river, etc. The total irrigated area is 19785.2 ha by various sources of irrigation i.e. canal, well/tube well, tank, etc. The highest land is irrigated by other sources of irrigation (8832.8 ha.) which is 44.64% to total irrigated area. The river irrigation is main source of irrigation in study area. The second highest category is wells and tube wells is 7244.8 ha (36.63%.). The proportion of tanks and lakes is 3.67% (726.6 ha) and this area is of plane topography hence water fall are not available hence no irrigation is developed on waterfall. The villages like Chichvad, Chipari, Haroli, Hasur, Herwad, etc. Villages like Nandni, Kurundwad, Kondigre, etc. are having share of wells and tube wells is more. Villages like Danoli, Shirati, Udgaon, Mhaisal, etc. are having river irrigation share more.

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