



AN ANALYSIS OF LAND USE AND LAND COVER CHANGE DETECTION IN THOTTIYAM BLOCK, TIRUCHIRAPPALLI DISTRICT –USING REMOTE SENSING AND GIS

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ABSTRACT

An attempt has been made to analyse the land use and land cover change detection in Thottiyam block of Tiruchirappalli district using remote sensing and GIS techniques. The total area of the study is 278.02 sq.km. It lies between the long 78o 10' E to 78o 25' E and Lat. 10o 50' to 11o 10' N. This area has a multivariuous land use. The satellite imageries LANDSAT 5TM (1990), LANDSAT 7ETM (2000) AND LISS 111 (2010) data's are used and the scale is 1:50,000. It is located in the central part of Tamil Nadu. Land use and Land cover change detection maps were generated and classified into agriculture land, built-up land, fallow land, natural vegetation, river sand, water bodies, and scrub without scrub land for the year 1990, 2000 and 2010 based on NRSA classification. Each land use and land cover has been from change to have positively and negatively for the three decades, especially agriculture land, sandy area, natural vegetation and fallow land, which is about 19.62, 6.56, 13.16 and 14.91 percentages respectively. These images were taken for comparing the classifications. The Landsat 5TM and 7ETM images were taken from GLCF. For more accurate perception and understanding the LISS 111 image.

KEYWORDS

Land use land cover change detection Thottiyam block and GIS

INTRODUCTION

Land is the basic resource of human society. It is the most significant among the natural resources of the country and a large section of its inhabitants depend on agriculture for their livelihood. Land is being used by people for various of these three food is an essential requirement purposes. The basic requirements of human society are shelter and clothes food. Farmers produce food from the land. The second important basic need of the people is home. It takes a very higher priority in its demand of land. The other need of mankind is work. For that, land can provide right location for work place or industries. Besides these there are the fourth need that is recreation and fifth is the communication. These also require land but the allotment of land for these purposes should not necessarily be suitable for agriculture.

Ilanthirayan and Kumaraswamy (1996), made an attempt to study in changing diction of Land use and Land cover pattern of Lalgudi taluk, of Tiruchirappalli District. They have studied and traced out the rapid changes of the agricultural resources. The data from IRS and LANDSAT satellites were used in their studies. They have classified the land use in both NRSA and USGS methods.

Land is one of the critical natural resource on which most developmental activities are taking place. For success of any planning activity, detailed and accurate information regarding the land cover and the associated land use is of paramount importance. In order to undertake a proper, systematic, and structured land cover land use mapping, it is important to identify land cover and land use classes as per a classification scheme, such as USGS land use and land cover classification scheme (A.M. Chandra.et.al., 2007).

Land-use-induced land-cover change (LULCC) has been one of the major environmental changes driven by human activities. During the last 300 years, the large-scale deforestation that occurred in the northern temperate regions has significantly contributed to the rise in concentration of atmospheric carbon dioxide and to the underlying global temperature increase (e.g., Pongratz and Caldeira, 2012; Ciais et.al., 2013).

Anderson (1971) has studied the land use classification using recent geographic applications of remote sensing and Rhind and Hudson (1980) have described the urban land use model in Britain. Jensen (1981) explains change detection can be performed manually by means of visual digital change detection techniques have been developed. Gautam et.al, (1982) has been studied the use remote sensing technique in land use within a very short time and accurate manner. The present are also mapping and analysis the land use and land cover change detection in Thottiyam block of Tiruchirappalli

district.

STUDY AREA

The study area is located in the western part of Tiruchirappalli district of Tamil Nadu State. It is surrounded by Thathaiyangarpettai found in north Andanallur in south and Musiri block in east. It lies between the North latitude of 10 o 50'N to 11 o 10' N and East longitude of 78 o 10' E to 78 o 25' E and covering the Survey of India topographic sheet no 58 I/ 16, 13, 1 (Fig 1) and it has an area of 278.02 sq.km. The study area is well connected by road and railway transport. The block contains 26 revenue villages and two towns panchayats Majority of the area has paddy crop in two seasons. Apart from paddy paddy sugarcane and banana are raised.

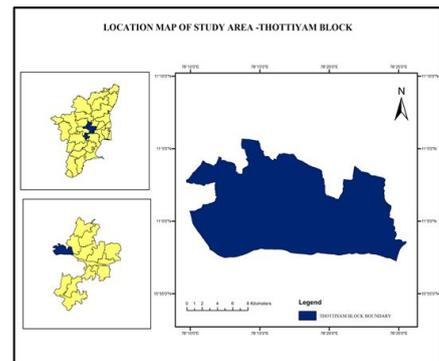
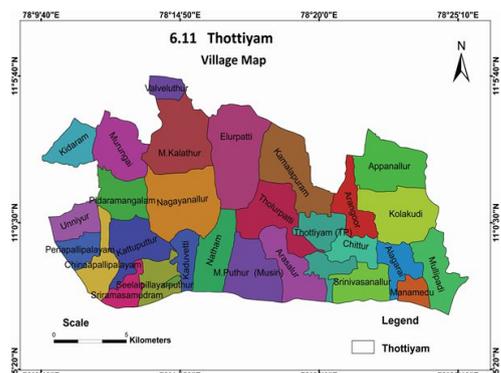


FIG:1



3. OBJECTIVES

The main objectives of the study area

1. To prepare Landuse and Landcover map and analyse the change for the years 1990, 2000 and 2010.

4. METHODOLOGY

The Survey of India toposheets of 58 M/ 16, 4, 8 in 1:50,000 scale of Thottiyam block is registered, digitized and analyzed with the help of Arc GIS and ERDAS imagine software for landuse and landcover change detection analysis in the years 1990, 2000 and 2010. Totally, seven landuse and landcover classes were established in the study area, as agriculture land, built-up land, fallow land, natural vegetation, scrub without scrub land, water bodies and sandy area. Two dated LANDSAT images and one LISS- III images were compared with supervised classification technique. In the supervised classification technique, three images with different years are independently classified.

5. LAND USE AND LAND COVER CHANGE DETECTION THOTTIYAM BLOCK- 1990, 2000, AND 2010

5.1 AGRICULTURAL LAND

The crop land of the study area is used for farming activities. It includes food crops, horticultural crops and commercial crops of different kinds under irrigated and rain fed conditions. These are, however, grown in different seasons. The entire block of Thottiyam has food crops, plantation crops and horticulture. The important food crops are paddy, plantation crops and banana. The percentage of the land use and land cover of the study area is given, with variations in the Thottiyam block. The agriculture land formed is (139.62sq.km) in the year of 1990. The agriculture land is located in the villages of southern side also Natham, Musiriputhur, Tholurpatti, Kaduvetti, Mullipadi, Srinivasanallur, Seelaipillaiyurputhur, Sriramasamudram, Chinnappallipalam, P.pallipalayam, Unniyur, Manamedu, Mullippadi and Alagarai, The area mostly covered is the agriculture land in this block.

In 1990 compared to 2000 agriculture land of (-3.25%) has decreased. The year 2000 occupied an area of 136.37sq.km. In 2000 compared to 2010 agriculture land has decreased to (-7.26%). particularly villages include Valvelputhur, Murungaikalathur, Elurpatti, Nagainallur, kamalapuram, eastern side of Appananallur, Arangoor, Kulakkudi, Chittur, Thottiyam, Srinivasanallur, Alagarai, Manamedu. In 2010 the block occupied an area of 129sq.km. In 2010 compared to 1990 year is has been decreased to (- 10.51%) because of the land being converted for natural vegetation with fallow land in villages such as Kidaram, Murungai, Pidaramangalam, Uniyur, Seethapatti, p.pallipalayam, Kattuputhur, Chinnappallipalayam, Natham, Musiriputhur, Thilurpatti, Kaduvetti, Mullipadi and Srinivasanallur.

5.2 BUILT-UP LAND

It is defined as an area of human habitation developed due to non-agriculture area that which has a cover of buildings, transports, and communication, utilities in association with water and vegetation as vacant lands. The built-up land has been increasing day by day. The built-up land has been referred to in the entire study area. Built-up land occupied an area of 24.11sq.km in the year 1990. The built-upland has been found particularly in villages such as in Valvelputhur, Murungaikalathur, Elurpatti, Nagainallur, Kamalapuram, Kidaram, Uniyur, Seethapatti, Kattuputhur, Kamalapuram, Kulakkudi, Arangur, Chittur and Alagarai. In 2000 the built-up land occupied an area of 27.13 sq.km in the year respectively.

In 1990 compared to 2000 the built-up land was increased to (3.06%) respectively. The village settlements were extended in the villages such as Murugai, Appananallur, Arangur, kulakkudi, Chittur, Thottiyam, Srinivasanallur, Alagarai, Manamedu and Mullippadi. In 2000 compared to 2010 the built-up land has been increased to (4.01%) in this area respectively. The 2010 built-up land occupied an area of 31.21 sq.km in this block. Mainly in the villages of the north to east to west of Appananallur, Arangoor, Kulakkudi, Chittur, Thottiyam, Srinivasanallur, Alagarai, Manamedu, Mullippadi, Valvelputhur, Murungaikalathur, Elurpatti, Nagainallur, Kamalapuram, Kidaram, Murungai, Pidaramangalam, Uniyur, Seethapatti, p.pallipalayam, Kattuputhur, Chinnappallipalayam, Seelaipillaiyur, Puthur and Sriramasamudram. In 2010 compared to 1990 in the nineteen year built up land has been increased to (7.05%) respectively in this block. In this block the transportation facilities mostly developed, due to over population, agriculture land converted to fallow land and built-up land in this block. From 2010 to 1990 built-up land had over all changes of 20.92% in this block.

5.3 FALLOWLAND

This is an agriculture land but temporarily not cultivated. It is described as an area under agriculture land which is taken up for cultivation but is temporarily allowed to rest uncropped for one or more season, but less than one year. The lands were seen devoid of crop fallow land has been identified as 21.38sq.km in the year 1990. In this period fallow land was concentrated in Nagayanallur, Tolorpatti, Kamalapuram, Arangur, Natham, and Pidaramangalam.

In 2000 the fallow land was observed over an area of 23.04 sq.km. This increase is due to changes in monsoon. It is natural when a land in the vicinity of township that was going as waste people are tempted to convert the same for some other land use probably being primarily of housing. In 1990 compared to 2000 the fallow land has been found increased to (1.66%) in the villages north and east of Valvelputhur, Murungaikalathur, Elurpatti, Nagainallur, Kamalapuram, Appanallur, Arangur, Kulakkudi, Chittur, Thottiyam, Srinivasa nallur, Alagarai, Manamedu and Mullippadi. In 2010 the fallow land occupied an area of 24.60sq.km. In 2000 compared to 2010 1.56% of increase in fallow land is observed. Such lands were located in Kidaram, Murungai, Pidaramangalam, Uniyur, Seethapatti, P.Pallipalayam, Kattuputhur, Chinnappallipalayam, Seelaipillaiyurputhu and Sriramasamudram. In 1990 compared to 2010 fallow land has been increased to (3.22%). The delta it land has increased due to changes in monsoon over a long period. Two cropping system has been brought down to a single crop system in the field for more than a decade. The fallow land must have been the area left for settlement and house plots in the vicinity of the major developing villages such as Murungaikalathur, Elurpatti, Tolorpatti and Kulakkudi. From 1990 to 2010 the fallow land had over all changes of 9.78 in this block.

5.4 NATURAL VEGETATION

Forest land is not available in the study area. It is described as an area under tree crop planted, adopting certain agriculture management techniques. It includes coconut, banana, cashew plantation, palm tree, aracanut, area and other horticulture nurseries. These plantations have been seen in the entire study area. The natural vegetation has been observed in 37.09sq.km in this year 1990. The plantations were highly concentrated in the villages such as Natham, Musiriputhur, Tholurpatti, Kaduvetti, Mullipadi and Srinivasanallur. In 1990 compared to 2000 it has been found to be decreased by (-0.9%) in this block. In 2000 it occupied an area of 36.19sq.km. It was identified in the villages of Naganallur, Namalapuram, Murungaikalathur, Appananallur, Arangoor, Kulakkudi, Chittur, Thottiyam, Kaduvetti, Mullipadi and Srinivasanallur. In 2000 compared to 2010 it has been decreased by (-1.18%) in this block. It was identified in 35.01sq.km in this 2010. In 2010 compared to 1990 (2.08%) has been decreased in this area. It is located in villages of Kidaram, Murungai, Pidaramangalam, Uniyur, Seethapatti, P.Pallipalayam, Kattuputhur and Chinnappallipalayam. In this block the natural vegetation lands were decreased because of shortages of irrigation and poor rainfall. This land has been converted to other types of land use primarily of built-up land. This area's natural vegetation is concentrated in the entire study block. From 2010 to 1990 in these year natural vegetation had over all changes of 6.31% in this block.

5.5 WATER BODIES

Three type of water systems found here are rivers, canals and tanks. River Cauvery drains in the southern portion of the study area with adjoining canal system passing over here. Tank irrigation is less in the regions. Most of the water bodies were located in the southern part of the study area. Water bodies were identified in Vennar and Vadavar channel. In 1990 the total area of water bodies was 23.20sq.km. In the period 1990 -2000 water bodies decreased to (-2.07%) particularly in the villages of Natham, Sriramasamudram, Chinnappallipalayam, P.Pallipalayam, Srinivasanallur and Manamedu. In 2000 the area occupied 21.13sq.km. In 2000 compared to 2010 year (-1.83%) has been decreased to in this block because of the water flow and ground water condition had been poor. In 2010 the total area of water bodies was 19.31sq.km. In 2010 to 1990 in the nineteen years period it has been decreased by (-3.89%). Small tanks and water bodies was aligned with in the settlement of villages and town. They have been converted to in housing flats. From 2010 to 1990 water bodies with over all changes of 11.80% were found.

5.6 SCRUB/WITHOUT SCRUB LAND

All other waste lands that do not qualify for utility under this class are brought here. Beside scrub land, other lands including here are lands with soil that were too shallow and concretionary or otherwise chemically degraded, eroded lands etc. This land was a type of waste

land. The land was gradually decreased in this block. In 1990 the total area is 21.55sq.km, the were higher than the year between 1990 and 2010. In 1990 compared to 2000 the scrub land has increased to (0.48%) The land is located in villages Nagayanalli, Tholurpatti, Thottiyam, Elurpatti and murungaikalathur. In 2000 it occupied as an area of 22.03sq.km in this block. In 2000 compared to 2010 has been increased to (3.05%) in the villages of Valvelputhur, Murungaikala thur, Elutpatti Nagainallur and Kamalapuram. In 2010 compared to 1990 the year has been decreased in (3.53%) in this block. The scrub without scrub land area has been reduced for other activities like small industries or built up land. The built up land includes govt offices, education institutions, industries etc. From 2010 to 1990 the scrub without scrub land had over all changes of 10.71% in this block.

5.7 RIVERSAND

This river sand is the sand spread over in river bed. It was noticed in Vennar and Vadavar, and the main river basin Cauvery. During 1990 the area observed under this category was 11.02 sq.km (3.96%). In 1990 compared to 2000 (-7.02%) has been increased. It was located in villages of Sriramasamudram, Seelaipillaiyurputhur, Chinnappalipalayam, Kattuputhur, Mullipadi and Manamedu. In 2000 the land occupied an area of 18.04sq.km (6.48%). This land 2000 compare to 2010 has been increased in to (-3.66%) in the area of southern side mostly covered in this block. From 1990 to 2010, the nineteen years has (-10.68 %) It has been observed in the river basin. because of water bodies and ground water level have reduced and the sandy area in the river were increased in this block. From 1990 to 2010 river sand had over all changes of 8.13% in this block.

TABLE 1.1 LAND USE AND LAND COVER CHANGES IN THOTTIYAMBLOCK

Description	1990(Area in sq.km)	2000(Area in sq.km)	2010(Area in sq.km)	1990-2000	2000-2010	1990-2010	% changes
Agricultural Land	139.62	136.37	129.11	-3.25	-7.26	-10.51	10.02
Built up land	24.05	27.22	31.21	3.04	3.99	6.11	13.38
Fallow land	21.38	23.04	24.60	1.66	1.56	3.22	4.95
Natural vegetation	37.09	36.19	35.01	-0.9	-1.18	-2.08	21.67
Water bodies	23.20	21.13	19.31	-2.07	-1.82	-3.89	18.3
Scrub/ without scrub	21.55	22.03	25.08	0.48	3.05	3.53	14.65
Sandy area	11.02	12.04	13.70	1.02	1.66	2.68	16.44
Total	278.02	278.02	278.02	-	-	-	100

FIG 1.2. LAND USE AND LAND COVER CHANGES IN THOTTIYAMBLOCK

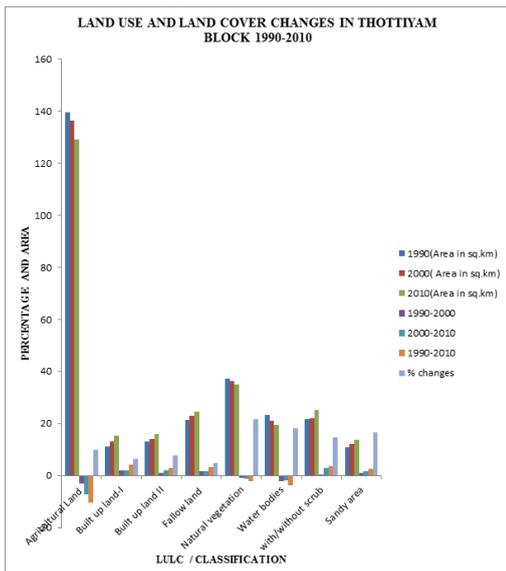


FIG.1.3. LANDSAT 5TM, 7ETM AND LISS 11I IMAGES IN THOTTIYAMBLOCK

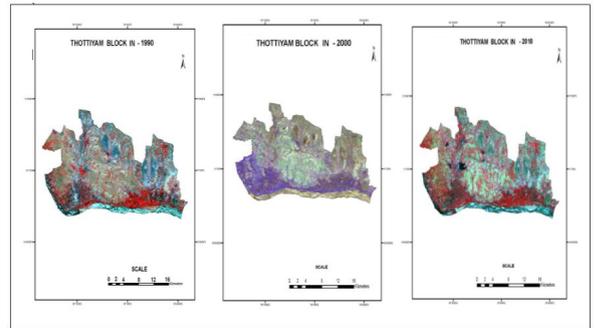
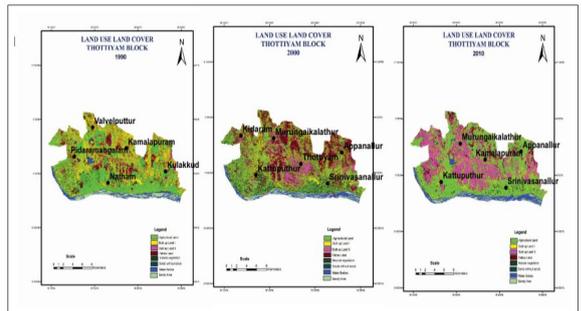


FIG.1.4. LAND USE AND LAND COVER MAP IN THOTTIYAMBLOCK



6. SUMMARY AND CONCLUSION

Land is non-renewable resource and hence assessment of landuse and landcover in temporal sequence is essential for planning and development of land and water resources. In this context the present study was carried out in Thottiyam block. The landuse and landcover practices of the years 1990, 2000 and 2010, in 1990 landuse and landcover pattern was observed, such as Agriculture land (139.62) sq.km, Built-up land I and II (11.05) and (13.11) sq.km, Fallow land (21.38) sq.km, Natural vegetation (37.09) sq.km, Water bodies (23.20) sq.km, Scrub without scrub land (21.55) sq.km and Sandy area (11.02) sq.km.

In the year 2000 the following landuse and landcover pattern was observed, such as Agriculture land (136.37) sq.km, Built-up land I and II (13.09) and (14.13) sq.km, Fallow land (23.04) sq.km, Natural vegetation (36.19) sq.km, Water bodies (21.13) sq.km, Scrub/ without scrub land (22.03) sq.km and Sandy area (12.04) sq.km. The year 2010 of LANDSAT satellite data has interpreted, the following landuse and landcover has been observed such as Agriculture land (129.11) sq.km, Built-up land (15.16) and (16.05) sq.km, Fallow land (24.06) sq.km, Natural vegetation (35.01) sq.km, Water bodies (19.31) sq.km, scrub without scrub land (25.08) sq.km and sandy area (13.70) sq.km.

Finally, in 1990, 2000 and 2010 landuse and landcover data has been compared and analyzed that, there will be drastic change in landuse and landcover categories, such as Agriculture land 10.02%, Built-up land 6.32%, and 7.6%, Fallow land 4.95%, Natural vegetation 21.67%, Water bodies 18.3%, Scrub/ without scrub land 14.65% and sandy area 16.44%. Mainly a decreasing trend has been identified in the categories of agriculture land, water bodies, and natural vegetation lands. Built-up land, River sand, scrubs without scrub and fallow land shows a trend of increase in this area. It also helps in identifying the status of various landuse and landcover categories at a particular time. The study area has rural settlements that have been changed in to urban settlements due to the declining process started on agriculture and its allied categories of landuse practices, because of low rainfall, climatic changes migration of population from rural to urban in search of jobs and other infrastructural facilities was found.

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