



RESEARCH ARTICLE

AN ANALYSIS OF LAND USE AND LAND COVER CHANGE IN THIRUVAIYARU BLOCK, THANJAVUR DISTRICT IN TAMIL NADU

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ABSTRACT

In this paper an attempt has been made to analyse the landuse and landcover change detection in Thiruvaiyaru block of Thanjavur district using remote sensing and GIS techniques. The total area of the study is 163.88 sq.km. It lies between the long 78° 48' E to 79° 9' E and Lat. 10° 48' to 11° 56' N. In this block there are totally 62 villages. This area has a multi various land use. The satellite imageries LANDSAT 5TM (2005) and LANDSAT 7ETM (2015) data's are used and the scale is 1:50,000. It is located in the central part of Tamil Nadu. Landuse and Landcover change detection maps were generated and classified into agriculture land, built-up land, fallow land, Uncultivable land, river sand, water bodies, and vegetation land for the year 2005 and 2015 based on NRSA classification. Each landuse and landcover has been from change to have positively and negatively for the two decades, especially agriculture land, sandy area, 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.

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INTRODUCTION

Land is the basic resource of human society. It is the most significant among the natural resources of the country and most of its inhabitants depend on agriculture for their livelihood. Land is being used by people for various purposes. The basic requirement of human society is 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. The fourth need is recreation and fifth is the communication. These also require land, but, agricultural areas should not be considered for allotment for these purposes. Only lands not suitable for agriculture should be taken into consideration. Land use change always been of involves interest to geographers. This topic of geographic research is in land use change identification, location and mapping the sites and areas of different types of change and by updating the existing land use records and maps. The above said information is important in providing an updated inventory of the existing land resources that are being used by human beings. Using this information on change, the interaction among the forces and the effects of land use change on associated attributes such as land quality, land value and

tenure can be studied in a comprehensive manner Bryant (1976). These investigations often enhances the knowledge, and provide a sound basis, from which better management and planning policies, regarding land resources. Thus there is no doubt of the importance of an efficient and accurate acquisition procedure to obtain this change information. 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 landuse and landcover change in Thiruvaiyaru block of Thanjavur district.

Location of the study area

Thiruvaiyaru, means Five Rivers around the city Thiruvaiyaru is a panchayat town in the Thanjavur District it is situated on the banks of the river Cauvery 13km from Thanjavur. Thiruvaiyaru is Located at north Latitude of 10° 48' 49" to 10° 56' 15" and East Longitude of 78° 58' 48" to 79° 9' 58" and cover the survey of topographic sheet no 58N and 58 J/3. It has an averages elevation of 38 metres (124feet). The block of Thiruvaiyuru is north corner of Thanjavur districts in Tamil Nadu state. It is bounded on the North by Ariyalur District

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south by Thanjavur block. East by papanasam taluk and west by budalur taluk Thiruvaiyaru taluk is central location. The block having 62 revenue villages and about 163.88sq.km and shown in figure. The study area slope is generally gentle slope to flat lying perelained terrain with a gently easterly gradient of in 20m towards the coast. The maximum elevation of land surface is about 38 above mean sea level. The study area is a plain terrain with a gently slope towards east and south east direction. In the study area major rivers are Coleroon river have flown in the northern part of the taluk Cauvery and kodamurutti Rivers are flowing in the central part of the study area vannar and vettar Rivers are flowing in the southern part rest of them are canals such canals are punavasal channel and kadungal vaikkal vaikkal its tributaries are important water resources for fulfilling the agricultural purposes of the taluk.

Population

The total population of Thanjavur district is 2,402,781 of which male and female population are 1,183,112 and 1,219,669 respectively (Census, 2011). In 2001, Thanjavur had population of 2,216,138 of which males were 1,096,638 and remaining 1,119,500 were females (Census, 2001). The district has a population density of 691 people per km². Its population growth rate over the decade 2001-2011 was 8.42%. Thanjavur has a sex ratio of 1031 females for every 1000 males, and a literacy rate of 82.72% (Census, 2011). Out of total population 64.61 % population of Thanjavur districts lives in rural areas of villages. The total population of Thanjavur district living in rural areas is 1,552,325 of which males and females are 765,784 and 786,541 respectively (Census, 2011). Density of population is high in Papanasam, Kumbakonam and Thanjavur taluk and least in Thiruvidadimarudur, Orathanadu, and Peravurani. Kumbakonam and Thanjavur Kumbakonam, Thiruvidadimarudur taluks have low sex ratio. Proportion of urban population is high in Thanjavur taluk. Highest literates are found in Thanjavur and lowest in Peravurani. Birth rate shows gradual declining trend in five taluks namely Thiruvidadimarudur, Papanasam, Peravurani, Thiruvaiyaru and Orathanadu during 1991-2001. Still birth rate also, shows declining trend. Thiruvidadimarudur, Thanjavur and Papanasam taluks show declining trend of maternal mortality rate while in other taluks it varies.

Location map of the study area

Objectives

The main objectives of the study are

1. To prepare a landuse and landcover map and analyse the change for the years 2005 and 2015.

Methodology

The survey of India Toposheets of 58 M/ 16, 4, 8 in 1:50,000 scale of Thiruvaiyaru block is registered, digitized and analyzed with the help of Arc GIS imagine software for landuse and landcover change analysis in the years 2005 and 2015. Totally, seven landuse and landcover classes were established in the study area, as agriculture land, built-up land, fallow land, vegetation, Uncultivable land, water bodies and sandy area. Two dated LANDSAT images were compared with supervised classification technique. In the supervised

classification technique, two images with different years are independently classified.

Land use and land cover changes in Thiruvaiyaru block 2005 AND 2015

This Thiruvaiyaru block as an area of (163.88sq.km). The area under investigation lies between the long 78° 58' E to 79° 9' E and Lat. 10° 48' to 10° 56' N. This area has a multi various land use. Such land use has been identified and the area has been calculated, the land under use agriculture land, Uncultivable land, built-up land, fallow land, vegetation, river sand, water bodies. In this block there are totally 62 villages. Each land use and land cover positively and negatively has been changed in the years. 2005 and 2015 every 9 year of the selected year. The changes have been discussed below. Table 4.1 and Fig 4.1.

Agriculture land

Land use map prepared gives an idea of how land use pattern keeps the trends of change. Mainly in 2005, what were the changes of the land use pattern of agriculture land, built-up land, water bodies, and vegetation and. The detailed changes are analyzed into change detection part. This particular land has undergone drastic changes in the area. The agriculture lands were located in all villages. Most of the agriculture lands were located around the settlements. There are under agriculture activities in this block. This area has been seen busy agriculture activities in 2005 higher than the year. In 2005 the agriculture land occupied an area of 74.32sq.km. There are located in village Southern part of Vilangudi, Rajendiram, Peramur, Konerirajapuram, Karuppur, Ambathumelakaram, Kaduveli, Karukkudi, Eswarankovilpathu, Allur, Sathanur, kuzhimathur, perumpuliyur, Karuppur. In 2015 agriculture land was found in (69.17sq.km). They are location in the village western part of suyampatchanallur, vadukakkudi, Avikkarai, Aachanur, karur, Kuzhimathur, Naducauvery, rayampettai, suysmpatchanallur, Nagathi, punavasal, Sathanur, Thennancheri, Tiruchchatturai, vellamperambur. There are over all agriculture land changes (24.80%) in this block. Shows the different land use pattern and their proportion to the total area. Because of the land converted to Uncultivable land and fallow land. Because of increasing population and migration of people to good infrastructural facilities in this block. So much of agriculture lands were transformed in to uncultivable land to fallow land and converted to built-up land. Most of the area is occupied by the built-up land in high concentration with gradual reduction of agricultural activities. Changing land use and land cover of Thiruvaiyaru block. In all these two years 2005, and 2015 agriculture lands were decreased to 24.80%.

Built –up-land

The block of Thiruvaiyaru is located in the northern portion of the study area. The present study area covers 62 villages. Among the villages categorized based on the size of the population leads to all portion of the block. The major settlements are categorized based on the density of the population. It is defined as an area of human habitation developed due to non agriculture area. Which has a cover of building, transport and communication, utilities association with water, vegetation and vacant lands. Migration of people is from rural to urban has become quite common.

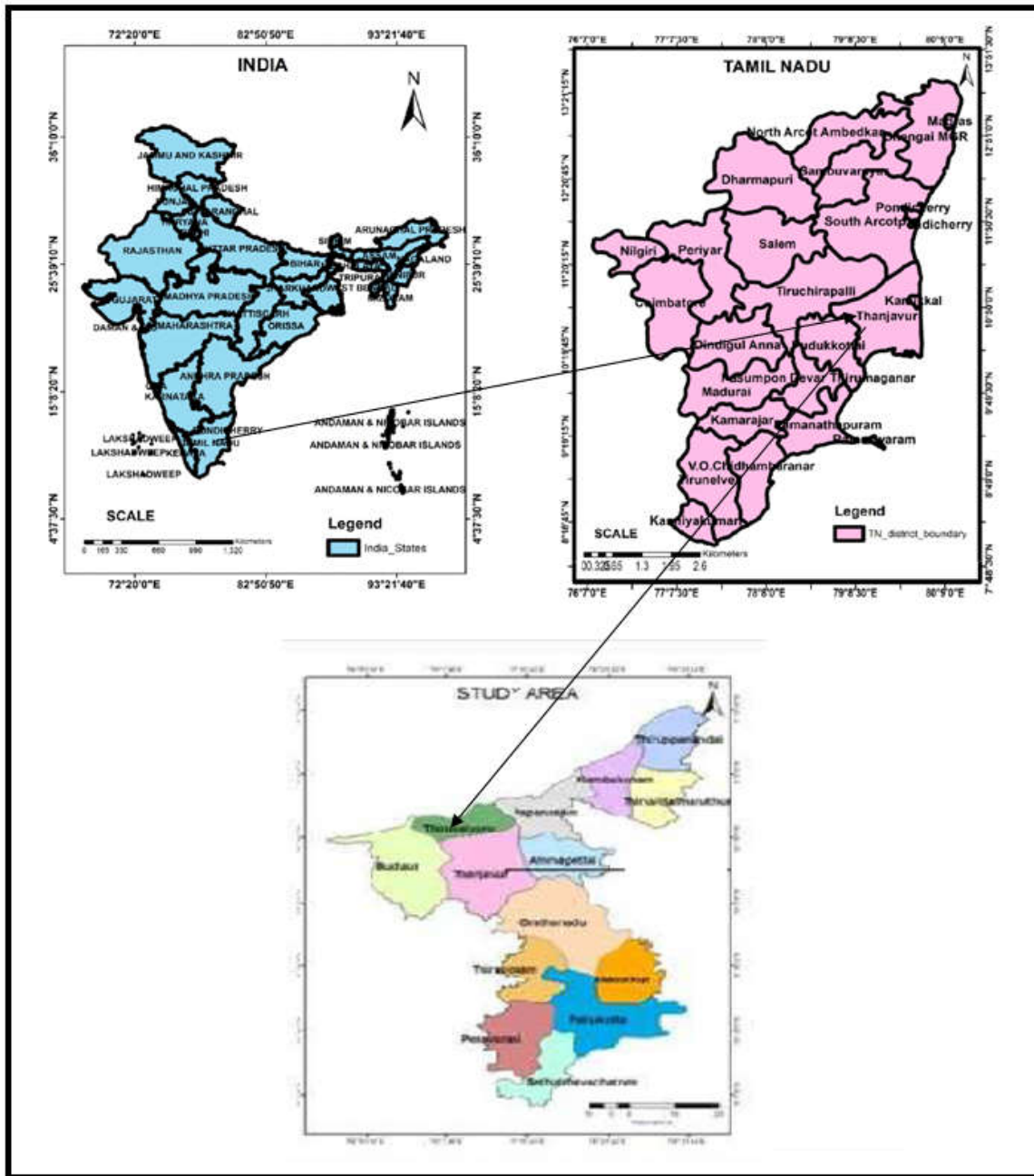


Fig.1. Location Map

The built up land is increasing day by day. The built up land has spread in over the entire study area. In 2005 built-up land occupied an area of (18.60sq.km). In 2005 compared to 2015 the built-up lands were increased in (22.56%) respectively. Built-up land denotes urban settlements where as built-up land indicates rural settlements. Rural settlements migration of the converted to urban settlements reason for school colleges govt offices in all other facilities and transportation in urban area. The village settlements were extended in the area. Such as Northern side of punavasal, Keelaturuppanthuruthi, Kalyanapuramsethi, karupur, Konerirajapuram, Manakkarambai, Mealtirupanturuthi, Peramur, Semmankudi, Thenperambur, Thiruvallampozhil some villages extended in this block. Settlements Over all spread in this area but particularly North to Eastern side was high concentration in this block. The built-up land has been increased day by day due to density population from the category of uncultivable land, agriculture land fallow lands. The transportation facilities have been well developed in this block. The built-upland

increased in this block. From 2005 to 2015 built-up land was increased to 22.56% in this block.

Fallow land

This is an agriculture land but temporarily not used for cultivation It is described as an area under agriculture land, which is taken up for cultivation but temporarily allowed to rest uncropped one or more seasons but less than one year. Waste land is described as degraded land. It can be brought under vegetative cover with reasonable efforts but at present they are unutilized and are deteriorating due to the lack of appropriate land, water, and soil management or on account of natural cause. Land with scrub, it is one of the waste lands categories. It is generally associated with foothills, bazadas, relatively high topography like the upland, the high ground area covered by a thin veneer of soils, eroded lands, and bad Lands topography and so on. The lands were demarcated in the north part of the study area. In 2005 the fallow land occupied an area of 21.52sq.km. This has increased because of the

changes in monsoon. It is natural, when a land in the neighbourhood of township was going waste, due to density of people some land is converted probably for housing. In 2005 compared to 2015 the fallow land (16.12%) had been increased in this block. The fallow land is in high concentration in north to south particularly in the villages name kandiyur, mannarsamuthiran, maharajapuram, maruvur, sathanur, Thennancheri, Thiruvaiyaru, Semmankudi, Rajendiram, valappakkudi, varahur, Thulasenthira. In 2015 Fallow land occupied an area of (24.66 sq.km). This was increased in this year. The increase was in the villages found in the eastern side of suyampatchanallur, vadukakkudi, Avikkarai, Achanur, karur, Kuzhimathur, Naducauvery, rayampettai, suysmpatchanallur, Nagathi, punavasal, Sathanur, Thennancheri, Tiruchchatturai, vellamperambur, Punavasal, Keelatrappanthuruthi, Kalyanapuramsethi, karupur, Konerirajapuram, Manakkarambai, Mealtiruppanturuthi, Peramur, Semmankudi, Thenperambur, Thiruvallampozhil. The fallow land was increased due to changes of monsoon over a long period. Two cropping system have been brought down into a single crop system in the field. This fallow land must have been the area on the Eastern side of settlement and house plots in the neighbourhood of the major developing town like revenue village. From 2005 to 2015 fallow land had over all changes ie 16.12%.

Vegetation

The vegetation is located over the entire block. In 2005 this area occupied 19.18sq.km. It has decreased in this year. In the year of 2005 compared to 2015 vegetation had decreased to (-13.87%). It was identified in villages on the southern side of Vilangudi, Rajendiram, Peramur, Konerirajapuram, Karuppur, Ambathumelakaram, Kaduveli, Karukkudi, Esvarankovilpathu, Allur, Sathanur, kuzhimathur, perumpuliyur and Karuppur. In 2015 it was identified in an area of (16.30sq.km). In the villages such as punavasal, Keelatrappanthuruthi Kalyanapuram sethi, karupur, Konerirajapuram, Manakkarambai, Mealtiruppanturuthi, Peramur, Semmankudi, Thenperambur, Thiruvallampozhil. In this block, vegetation was decreased because of shortage of irrigation facilities and changes of monsoon, soil erosion, flood in a particular reason in this block. This land has been converted into built-up land and other facilities are there. From 2005 to 2015 vegetation had over all changes 13.87%.

Water bodies

The major river Kollidam flows in the west to east direction which is found in the southern parts (south most) of the study area. There is a concentration of three drainage system with the small river like kollidam and cauvery River. A canal has been identified in the north and the central and the south parts of the study area. The canal flows from north to south and the southeast direction and finally it joins the river Cauvery. A number of streams are noticed throughout the study area in which the southern streams have been perennial. In 2005 area occupied was (18.13sq.km). In villages such as suyampatchanallur, vadukakkudi, Avikkarai, Achanur, karur, Kuzhimathur, Naducauvery, rayampettai, suysmpatchanallur, Nagathi, punavasal, Sathanur, Thennancheri, Tiruchchatturai, vellamperambur it was found. In 2005 compared to 2015 water bodies increased (-11.66%) to in these years. In the villages like kandiyur, mannarsamuthiran, maharajapuram, maruvur, sathanur, Thennancheri,

Thiruvaiyaru, Semmankudi, Rajendiram, valappakkudi, varahur, Thulasenthira. In 2015 occupied in this area an (15.92sq.km). In 2005 to 2015 the water bodies had over all changes 11.66% in this block.

Uncultivable land

Uncultivable land is described as degraded land that can be brought under vegetative cover with reasonable efforts but at present they are unutilized and are deteriorating due to the lack of appropriate land, water, and soil management or on account of natural cause. Uncultivable it is one of the waste land categories. In 2005 occupied as an area of (8.01sq.km). In 2005 compared to 2015 uncultivable land has (10.30%) decreased in this block. Some villages in the north to western side of suyampatchanallur, vadukakkudi, Avikkarai, Achanur, karur, Kuzhimathur, Naducauvery, rayampettai, suysmpatchanallur, Nagathi, punavasal, Sathanur, Thennancheri, Tiruchchatturai, vellamperambur. Uncultivable lands were found. But in 2015 year the uncultivable land had increased. From 2005 to 2015 they had uncultivable land over all changes 10.30%.

River sand

The river sand is that sand that is spread over in the river bed. It was noted in the southern side of Kollidam River and Cauvery river basin. The area observed in this category was 4.12sq.km 2005. In 2005 compared to 2015 the river sand has increased to (0.69%). It been noted in kollidam and Cauvery river basin. In the river much of the sand has been found in this place from south to north but southern side was mostly covered by villages of punavasal, Keelatrappanthuruthi, Kalyanapuramsethi, karupur, Konerirajapuram, Manakkarambai, Mealtiruppanturuthi, Peramur, Semmankudi, Thenperambur, Thiruvallampozhil. The 2015 river sand occupied an area of 3.98sq.km. Some of the agriculture land in high concentration is in southern part of the block.

Summery and Conclusion

Land is non-renewable resource and hence assessment of land use and land cover in temporal sequence is essential for planning and development of land and water resources. In this context the present study was carried out in Thiruvaiyaru block the land use and land cover practices of the years 2005 and 2015. The following land use and land cover pattern was observed, such as Agriculture land (74.32) sq.km, Built-up land (18.60) sq.km, Fallow land (21.52) sq.km, vegetation (19.18) sq.km, Water bodies (18.13) sq.km, uncultivable land (8.01) sq.km, Sandy area (4.12) sq.km. The year 2015 of land sat satellite data has interpreted, the following land use and land cover has been observed such as Agriculture land (69.17) sq.km, Built-up land (23.70) sq.km, Fallow land (24.66) sq.km, vegetation (16.30) sq.km, Water bodies (15.92) sq.km, uncultivable land (10.15) sq.km, sandy area (3.98) sq.km. Finally, the 2005 and 2015 land use and land cover data has been compared and analyzed that, there will be drastic change in land use and land cover categories of such as Agriculture land 24.80%, Built-up land 22.56%, Fallow land 16.12%, vegetation 13.87%, Water bodies 11.66%, uncultivable land 10.30%, sandy area 0.69%. Mainly a decreasing trend has been identified in the categories of agriculture land, water bodies, and vegetation lands. Built-up land, uncultivable land River sand, fallow land, shows a trend of increase in this area.

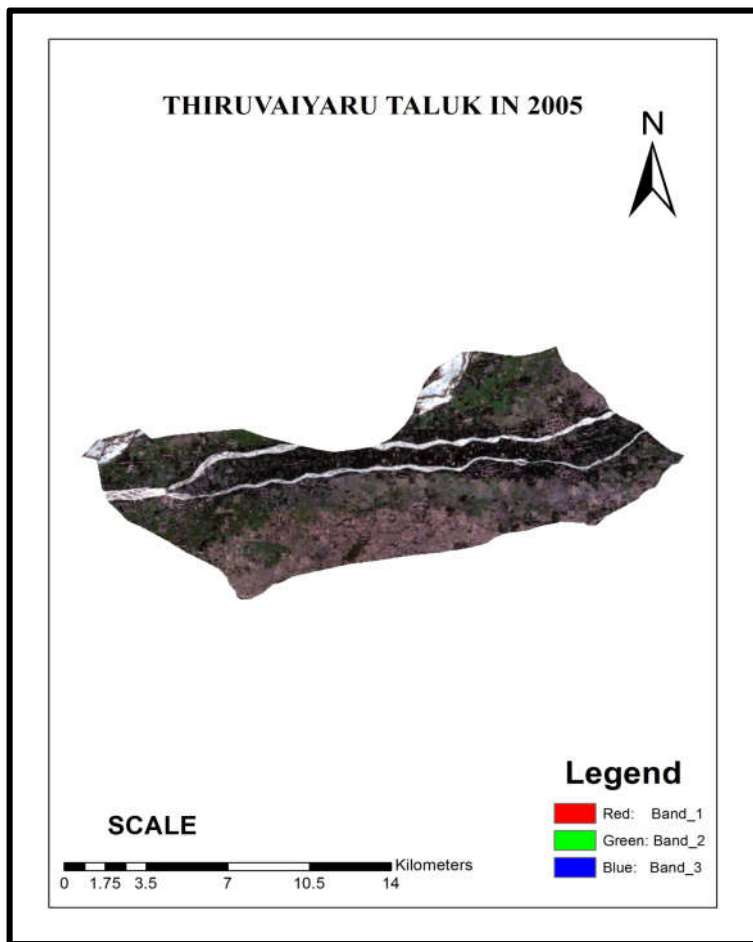


Fig. 4.3. Lands at 5tm images in Thiruvaiyaru block -2005

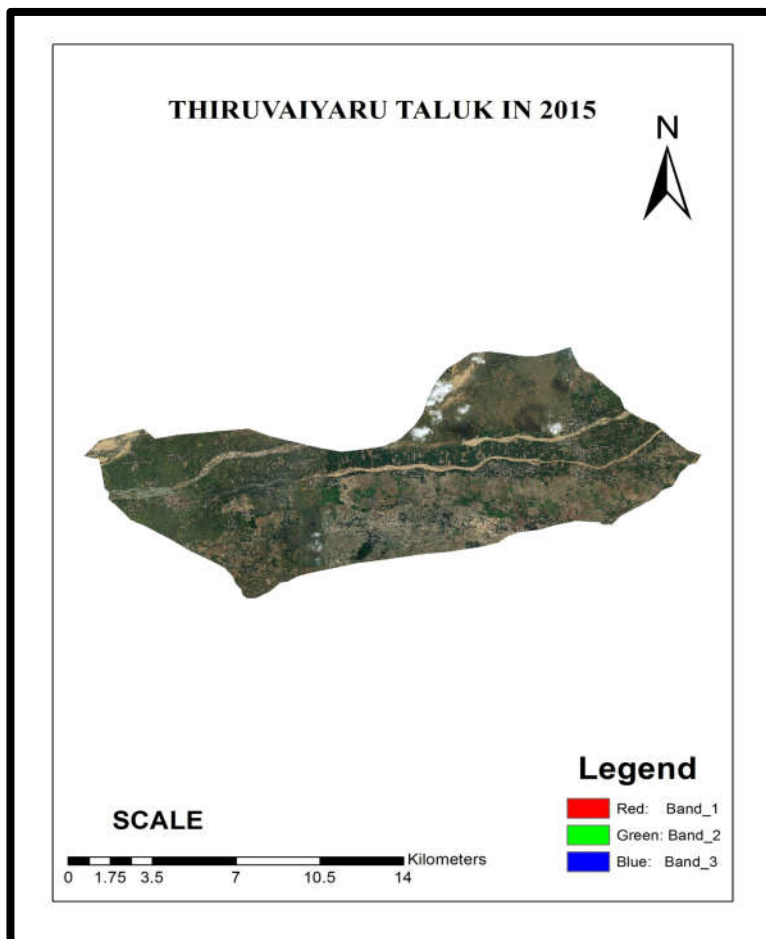


Fig. 4.4. Landsat 5tm, image in Thuraiyur block -2015

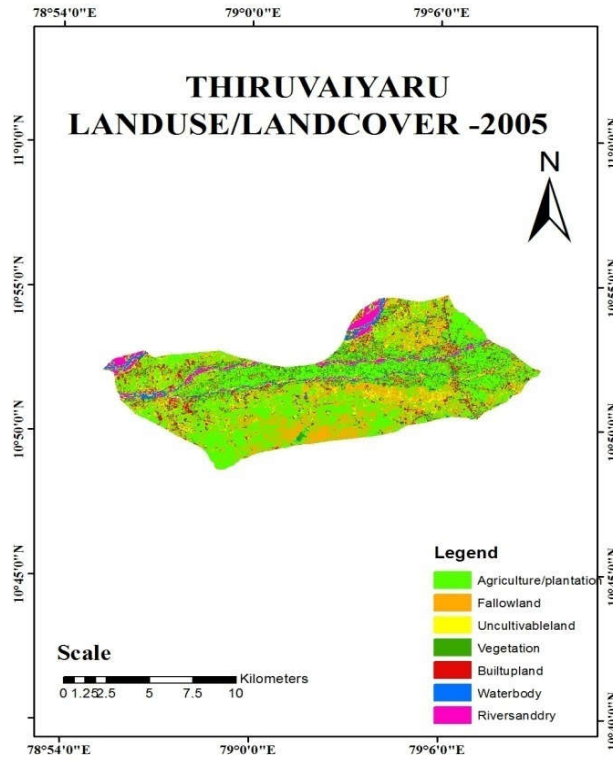


Fig. 4.5. land use and land cover changes in Thiruvaiyaru block-2005

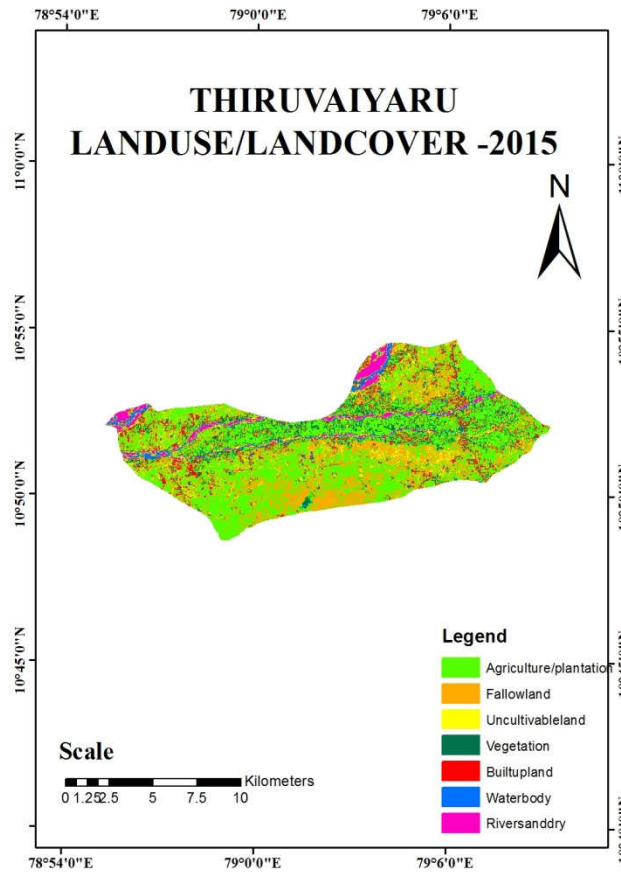
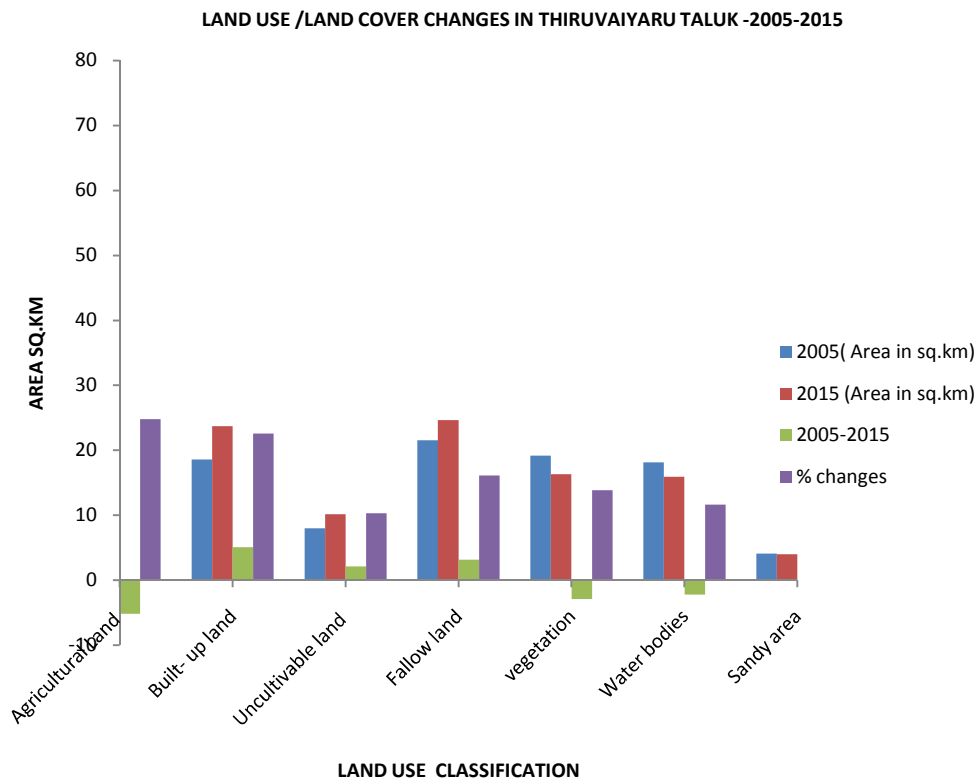


Fig. 4.6. Land use and land cover changes in Thiruvaiyaru block -2015

Table 4.2 Land use and land cover changes in Thiruvaiyaru block

| Classification | 2005(Area in sq.km) | 2015 (Area in sq.km) | 2005-2015 | % changes |
|-------------------|---------------------|----------------------|-----------|-----------|
| Agricultural Land | 74.32 | 69.17 | -5.15 | 24.80 |
| Built- up land | 18.60 | 23.70 | 5.1 | 22.56 |
| Uncultivable land | 8.01 | 10.15 | 2.14 | 10.30 |
| Fallow land | 21.52 | 24.66 | 3.14 | 16.12 |
| vegetation | 19.18 | 16.30 | -2.88 | 13.87 |
| Water bodies | 18.13 | 15.92 | -2.21 | 11.66 |
| Sandy area | 4.12 | 3.98 | 0.14 | 0.69 |
| Total | 163.88 | 163.88 | - | 100 |

**Fig. 4.7. Land use and land cover changes in Thiruvaiyaru block -2005 -2015**

It also helps in identifying the status of various land use and land cover 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 land use 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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