

# LAND COVER CHANGE DETECTION OF MANGALDAI BLOCK, DARRANG DISTRICT ASSAM USING REMOTE SENSING AND GIS APPLICATION

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**Abstract:** The particular study is an effort to explicate the variation in the land cover pattern of the Administrative Block Mangaldai of Darrang District, Assam. Transformation of land cover is a functional process which continuously effect on the earth's surface by natural and anthropogenic causes. Land cover change detection is the process that the beneficence of demonstrating the modification related to land cover with context to geospatial data. Study takes place over a period of time (1987-2019). Multi temporal remote sensing satellite imageries of LANDSAT (MSS, ETM+, OLI) high resolution Google earth image & for reference toposheet resolution 1:50,000 to determine the land cover classes of the above mentioned year. Study area grouped into four land cover categories of regional level (Anderson classification scheme level- iv). GIS software's endows potential technique for analysis land cover issues in different time period. GIS system also quantified, mapped and depicts the respective issue. Changed are depicted, calculated & shown in general statistics are conclusive. Present paper studies the area managed administrative block which includes Chapai, Rangamati, Dahi, Kalaigaon. Total area of the block is 722.31 sq.K.m. Topographically area is flat and located in the north bank of the Brahmaputra River situated in the alluvial plains of Brahmaputra.

**Keywords-** Land cover, Land Use, Remote sensing, GIS, Drarrang, Mangaldai block.

## I. INTRODUCTION

Land is one essential element which playing a crucial role in earth surface and human uses. Land always demarcates the humanitarian needs of economic, social & cultural progress. Human use lands are land use and the physical cover of lands is land cover. People used in their own way to modify any area land cover. Fallacious use of land creates issues in land cover change pattern which leads to major environment change. Land cover refers to the physical characteristics of the Earth's surface like vegetation, water, soil, forest, hills and others. Land use refers changes done by anthropogenic activities [1][2]. Land use and land cover change study are very essential for determining the current scenario and for the management of natural resources and environmental problem [3]

Land cover transformation is a broad & prominent feature in Mangaldai. It is very Masculine in the area of Rangamati, Cereng Chaponi, Moamari chaponi, Moamari borghop, Bandia Chaponi and Tangani jhar which are located alongside the river Brahmaputra. Due to various manmade and natural causes Mangaldai reducing significant level of land cover which is changing day by day. Homestead (houses accompanied by natural vegetation), Agricultural land (especially seasonal agriculture), Water (river, pond, natural lake) and urban development changed are some main factor classified. The study focused on the Mangaldai block on land cover change and impact on ecosystem.

## II. STUDY AREA:

Mangaldai is a Administrative block of Darrang district lie between the latitude from 26°35'30" to 26°11'30"N and longitude from 91°55'0" to 91°10'30"E. The block occupied total area 722.31 sq km and it has an average elevation of 39 m situated in the north bank of Brahmaputra river, situated at approximately 65 km from Guwahati and 90 km from Tezpur. The study area is characterized by modified monsoon with well marked seasonality. Seasonal agriculture is the chief occupation of the 80% of the villagers in Mangaldai. Topographically the area is a flat plain sloping towards south and drained by southerly flowing rivers (like Mangaldai, Noa, Kuiapani and tangani) ultimately meeting the river the Brahmaputra in the south.

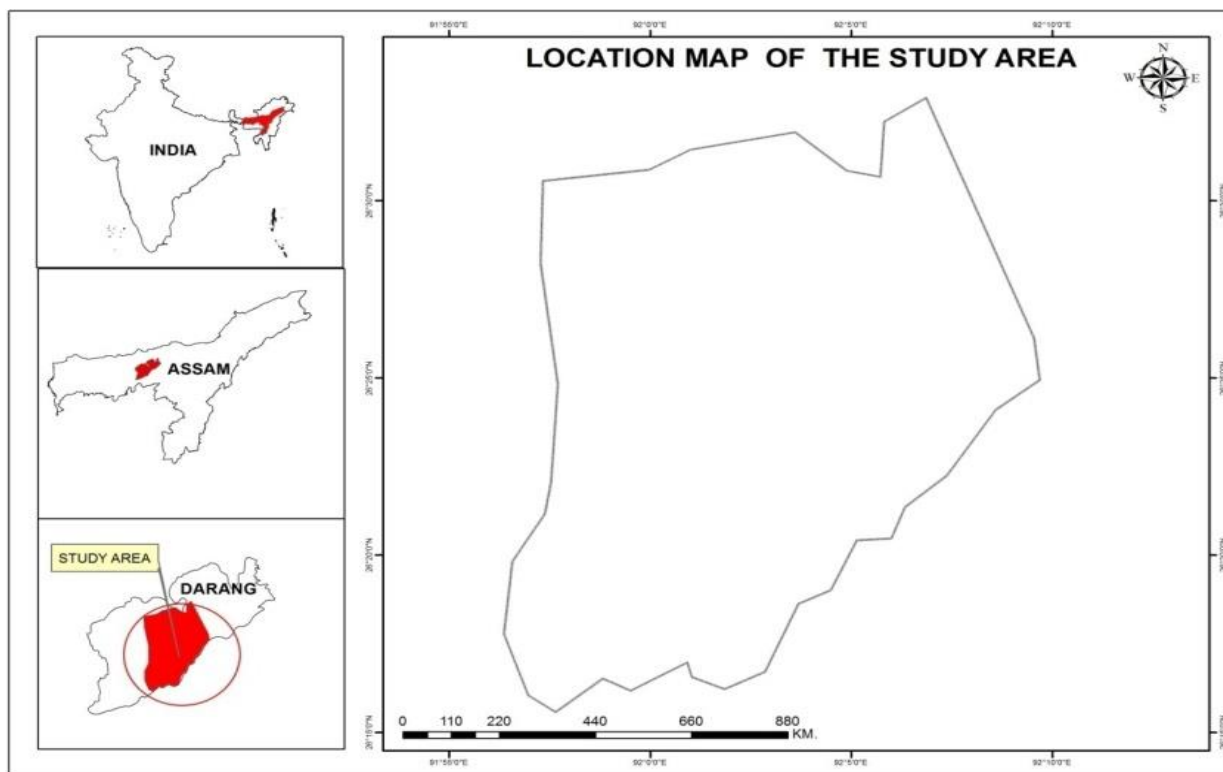


Fig1: Location Map of the Study Area

**III. STATEMENT OF THE PROBLEM:**

Changes in Land use Land cover are a dynamic process taking place on the surface and it becomes a central component in current strategies in managing natural resources and monitoring environmental changes [4] Mangaldai block of Darrang district is located with alongside of Brahmaputra River. The main problem related to the area is landslide, which contribute most in land cover changes. Despite the high risk found in flood prone areas, which effect in landslide issues. Most common contribution are anthropogenic like massive agricultural practice, unplanned urban development and boring practices on land areas determined to the land cover pattern changing.

**IV. OBJECTIVE:**

The present study is aimed to at the following objectives-

1. To detect the area under different Land Cover changes with the help of Remote Sensing and GIS.
2. To analyses the changes that is taking place in the land cover pattern in the study area from 1987 to 2019.

**V. DATA SET AND METHOD:**

**(i) (i) Data set:**

Satellite and Sensor	Year	Resolution (m)
Landsat MSS	1987	79
Landsat ETM+	1999	30
Landsat TM	2010	30
Landsat OLI/TIRS	2019	30

Table 1: Datasets Used For Comparison of Information Content

**(ii) Methods:**

We firstly carried a ground based survey to collect primary data about our focused area. Then GIS software’s EARDAS and ArcGIS are used to create and evaluate different thematic, classified and boundary maps of the discussed area. For reference and verification we use the SOI toposheet downloaded from NAKSE, used toposheet are 83B/2, 83B/3, 83B/6, 83B/7, 78N/14, 78N/15 and high resolution Google Earth Images are used for cross checking. The method and materials involved in the study are different for different parameters but guided to solve the main problem. Thus, the methodology has been divided into various steps based on techniques employed and data used. These are categorized into the following major types.

- i) Remote Sensing and GIS Methods
- ii) Field Work
- iii) Statistical Method

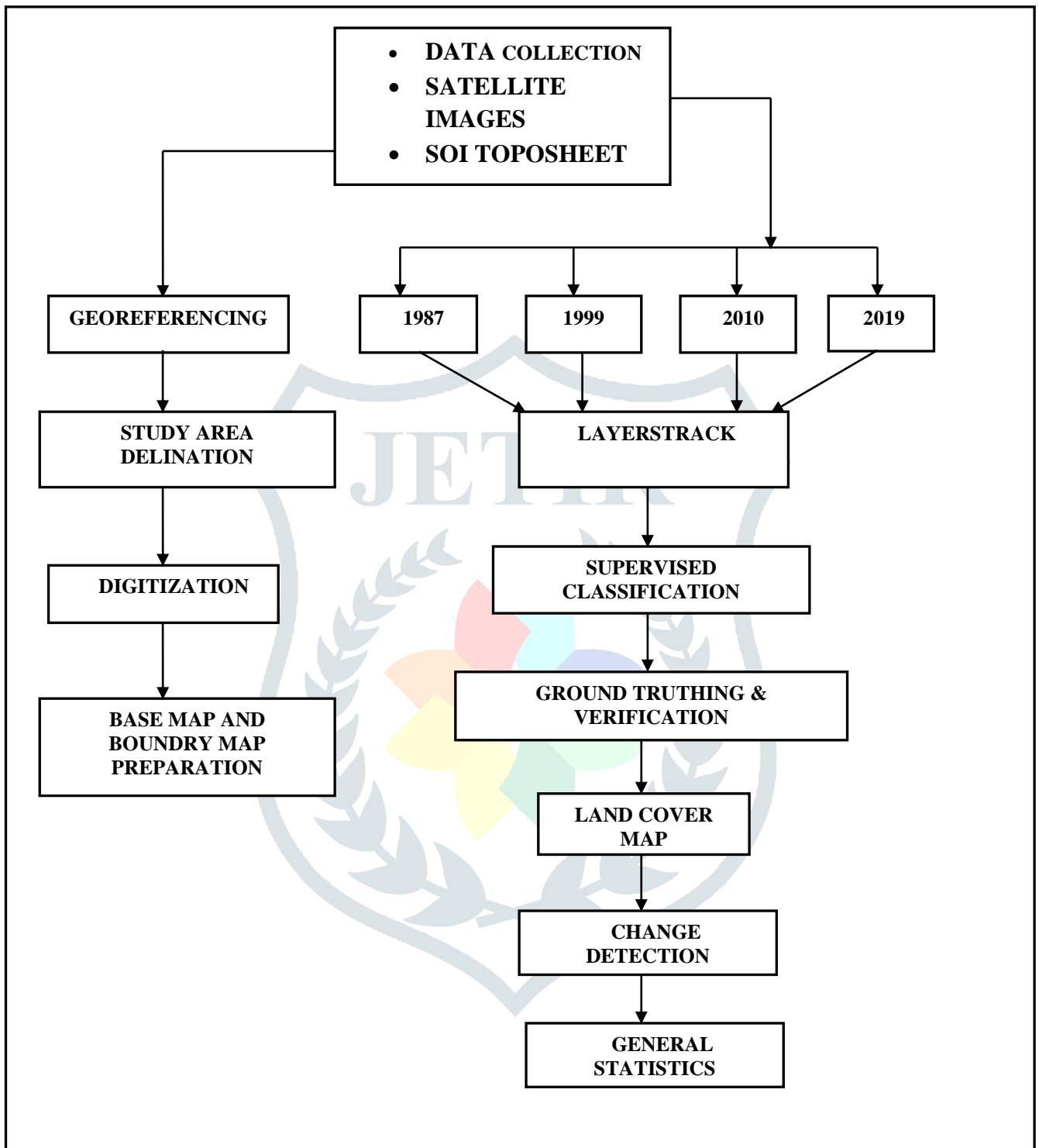


Table 2: Showing Flow Chart Methodology

For the preparation of LULC map, methodology adopted was on screen visual interpretation of satellite images. Using visual interpretation keys like tone, texture, size and pattern are verified with the help of Google earth Survey of India toposheet and field check [5] [6] [7][8].

**Land cover classification scheme:** We have selected a suitable classification scheme for all satellite imageries to easily interpret the land cover classification. Selected classification scheme is Anderson Classification Scheme (IV) Regional level.

Class	Name	Description
1	Water bodies	a)Streams/river perennial b)Pond/ lake
2	Agricultural land	a)Plantation agriculture b)Kharif and rabi crop land c)More than two crop land
3	Homestead	This class includes all the rural houses that are accompanied by vegetation mostly fruit and wood trees; evergreen woody vegetation along the roads, canals, rivers and railways; and small towns and growth centers
4	Sand bar	These are narrow sand bank or floodplain which are seasonally cultivated and habituated(special case in our study area)
5	Built up area	A developed area where both urban and rural settlements takes place.
6	Natural vegetation	Natural vegetation refers to a plant community which has grown naturally without human aid

Table 3: Showing land cover classification scheme for our study.

**VI. RESULT AND DISSCUSION:**

To find out the land cover changes pattern we have taken four LANDSAT images of 1987 to 2019 of Mangaldai Administrative Block. There were mainly nine classes to find out and analysis by 40 years satellite data images which have been processed by various GIS and Remote Sensing software, viz Agricultural land plantation agriculture, Built up area urban and rural built up, Natural water bodies river stream perennial, Water bodies pond/lake, Sandbar/seasonal agricultural land, Agricultural land kharif and rabi crop land, Homestead, Natural vegetation, Agricultural land more than two crop.

In given below we show the land cover map generated from the 1987 to 2019. We show the trend of changing pattern in each land cover category with the help of satellite map-

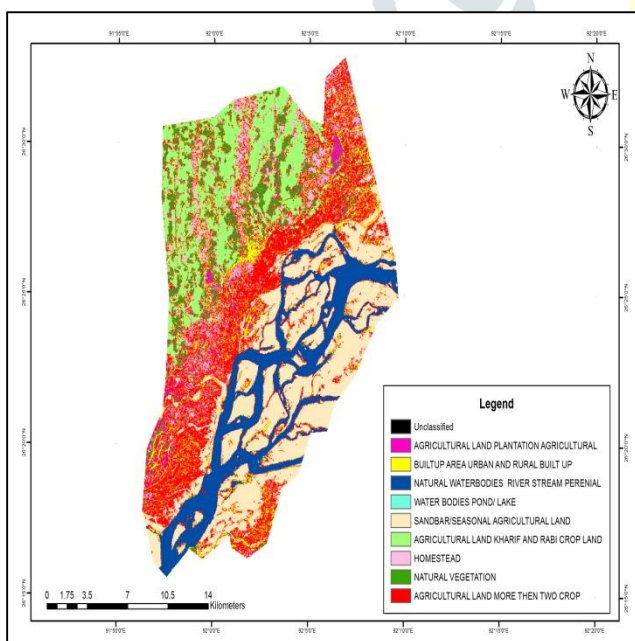


Fig 2: Land Classification Map of 1987 LANDSAT image

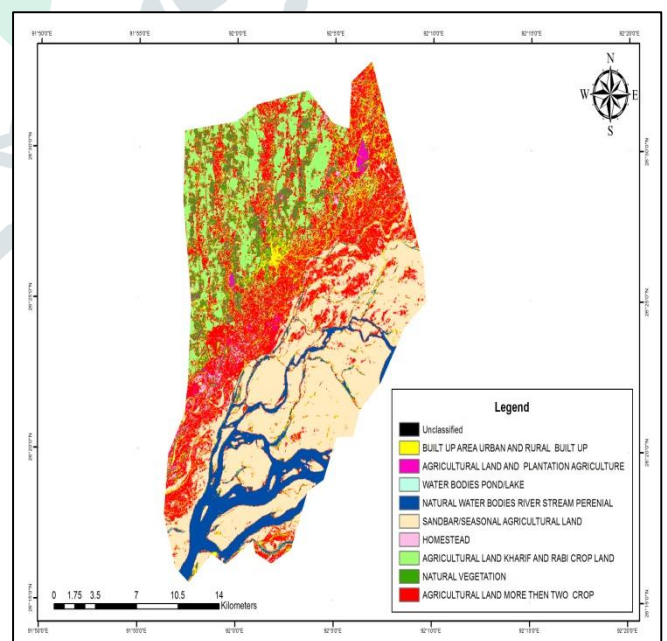


Fig3: Land Classification Map of 1999 LANDSAT image

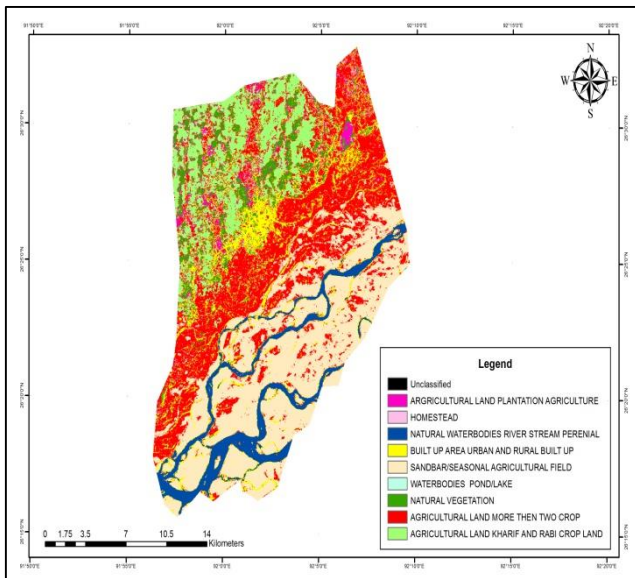


Fig 4: Land Classification Map Of 2010 LANDSAT Image

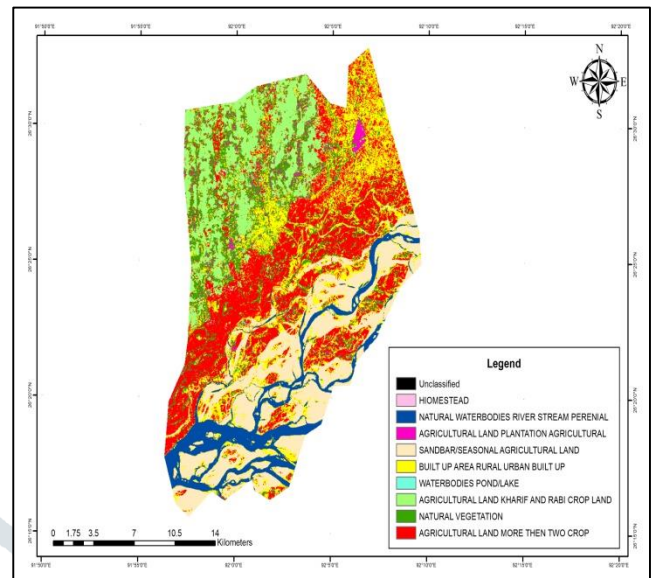


Fig 5: Land Classification Map Of 2019 LANDSAT Image

But in simple way we describe two/three classes in one way like as Water bodies, Agricultural land, Homestead, Sandbar, Built up area and Natural vegetation. Here we show the overall changes accuracy are given below –

Year	Water bodies (sq k.m)	Agricultural land(sq k.m)	Homestead (sq k.m)	Sandbar (sq k.m)	Built up area (sq k.m)	Natural vegetation (sq k.m)
1987	62.99	197.09	29.19	377.32	31.36	24.36
1999	43	198	6.63	407.14	38.48	27.54
2010	30.86	475.08	3.23	137.78	50.93	23.45
2019	39.49	186.92	0.71	348.29	89.77	56.17

Table 4: Land coverage identified by LANDSAT data classification of the study area

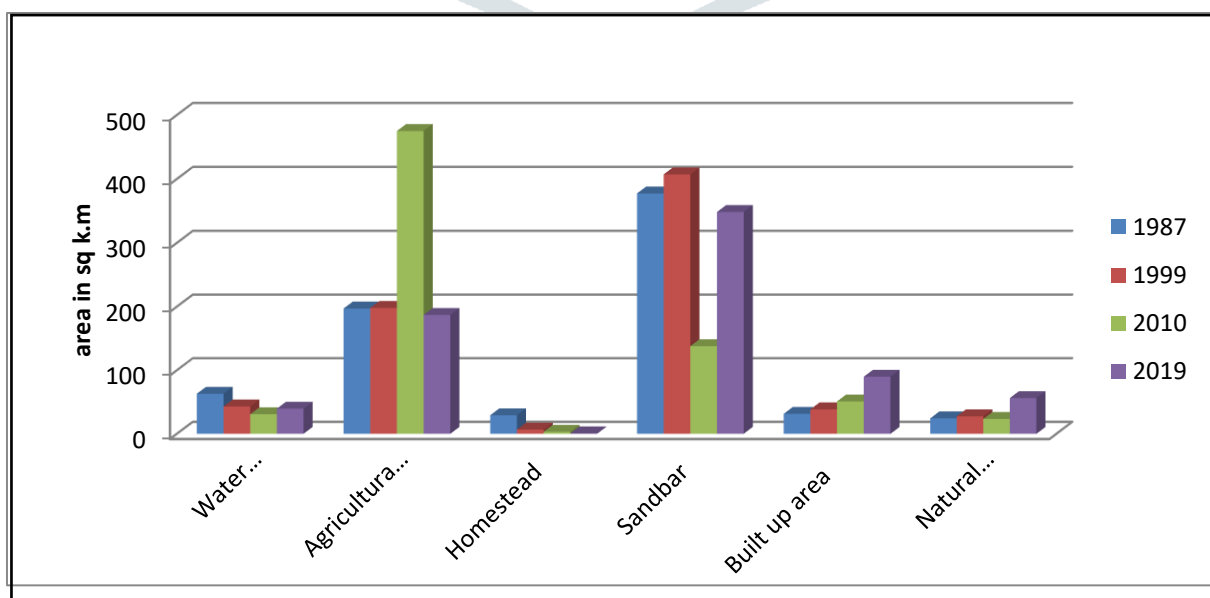


Fig 6: Showing land coverage in area sq k.m



The most important change was observed in sandbar. Sandbar has large coverage of area in the Mangaldai block. Total area of Mangaldai is 722.31 sq km, but under in this category it is increase and decrees by yearly. It was 30, 32, 11, 27% increase or decrees continuously during in 1987, 1999, 2010 and 2019.

Agricultural land is most important to observe and analysis the changing pattern. Because it's depends upon many things. In the year 1987 it was vast decrees of agricultural land areas of 18% , in 1999 it was increase a little of 19% but in 2010 it was a huge increase in agriculture cultivate amount of 45% . Next in 2019 it is same as 1987 amount of 18%.

In Mangaldai block records continuously increase in built up area to be observed mainly by last 40 years. It was continuously increasing in each year. By the year 1987 it was increase in 15% and thoroughly it's going up to 1820, 45% in the year of 1999, 2010 and 2019.

Water bodies are important natural resource in which all physical and cultural activities are dependent. Without presence of water no natural and anthropological phenomenon's can be haven like agricultural activities are widely dependent of water availability. In the year 1987 water bodies were increased 36% and continuously during in 1999, 2010 and 2019 was 24, 18, and 22% respectively.

Natural vegetation is the most important thing to survive. Without vegetation man and animal can do nothing. But because of population land areas converted by settlement day by day. There is some changes about this mentioned years like in 1987 it was 18% , in 1999 it was 21% and in 2010 & 2019 it is 18 or 43% in total land area of 722.31 sq km.

Homestead Another most important change of land cover is decreasing homestead by dropping agricultural land. Population of Mangaldai block is increasing day by day. So important agricultural and non agricultural lands decreasing by. In 1987 it was 73%, in 1999 it was 17%, and 2010 or 2019 is rapidly decrease in 8 or 2%.

Land use category	Area in % at 1987	Area in % at 1999	Change % (1987-1999)	Area in % at 2010	Change % (1999-2010)	Area in % at 2019	Change % (2010-2019)
Water bodies	36	24	12	18	6	22	-4
Agricultural land	18	19	-1	45	-26	18	27
Homestead	73	17	56	8	9	2	6
Sandbar	30	32	-2	11	21	27	-16
Built up area	15	18	-3	24	-6	43	-19
Natural vegetation	18	21	-3	18	3	43	-25

Table 5: Land coverage change year wise in study area, 1987-2019

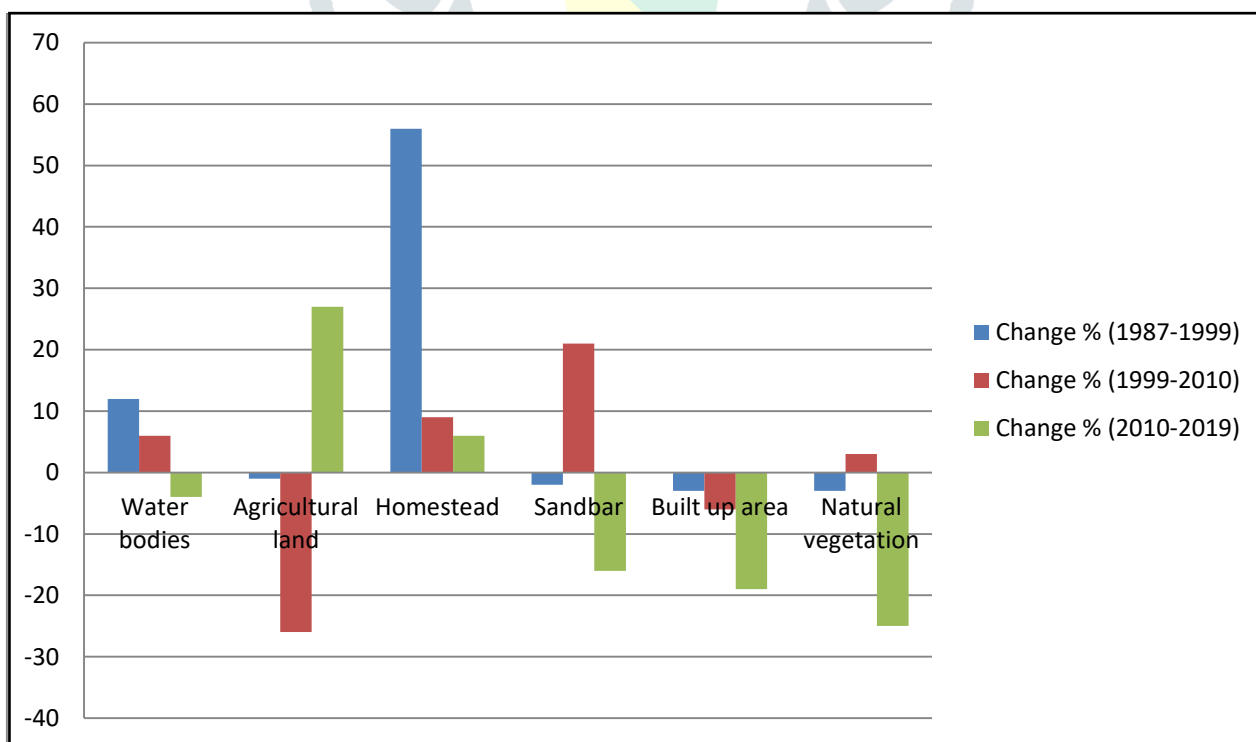


Fig 7: Showing land cover change detection year wise (1987 to 2019)

**VII. CONCLUSION:**

Now a day's land cover change detection is the main current component for developing and monitoring a block. The most noticeable change of sandbar and agricultural area was detected 1987 to 2019 in our study. Human or people performances play very important role in virtually or forcibly for land cover change at locally, regionally, and even global scales. The changes in land cover obviously reflect to pressure due to rising population. Now a day's Remote Sensing and GIS technique are very important tools for detect land use and land cover changes pattern. The study was conducted on a very small part of the country and differences in the characteristics of data are substantial considering rapidly developing satellite technology. So, it is difficult to reach a decisive conclusion based on such materials along [9]

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